Teacher Energized Resource Manual

Class : 6th
Subject : Mathematics

CENTRAL BOARD OF SECONDARY EDUCATION

Preface

In consonance with the move towards outcome-based education where focus is on developing competencies in students, the Central Board of Secondary Education is delighted to share the *Teacher Energized Resource Manual* that will aid teachers in aligning their classroom transaction to a competency framework.

Each chapter of the Resource Manual corresponds to the respective chapters in the NCERT textbooks. The chapters have been chunked by concept; these concepts have been linked to the NCERT Learning Outcomes; and an attempt has been made to delineate Learning Objectives for each concept. Every chapter has a set of assessment items, where two items have been provided as examples for each Learning Objective. Teachers can use these to assess if the learner has acquired the related concept. Needless to say, the items are illustrative examples to demonstrate how competency-based items can be prepared to measure Learning Objectives and Outcomes. The variety in item forms is suggestive of the ways in which a particular concept can be assessed to identify if the learner has attained different competencies. We trust and hope that teachers would be able to generate many more similar test items for use in practice.

Your observations, insights and comments as you use this Resource Manual are welcome. Please encourage your students to voice their suggestions as well. These inputs would be helpful to improve this Manual as these are incorporated in the subsequent editions. All possible efforts have been made to remove technical errors and present the Manual in a form that the teachers would find it easy and comfortable to use.

Acknowledgements

Patrons:	Shri Ramesh Pokhriyal 'Nishank', Minister of Education, Government of India
	Shri Sanjay Dhotre, Minister of State for Education, Government of India
	Ms. Anita Karwal, IAS, Secretary, Department of School Education and Literacy, Ministry of Education, Government of India
Advisory and Creative Inputs	Our gratitude to Ms. Anita Karwal, IAS, for her advisory and creative inputs for this Resource Manual during her tenure as Chairperson, Central Board of Secondary Education.
Guidance and Support:	Shri Manoj Ahuja, IAS, Chairman, Central Board of Secondary Education
	Dr. Joseph Emmanuel, Director (Academics), Central Board of Secondary Education
	Dr. Biswajit Saha, Director (Skill Education & Training), Central Board of Secondary Education
Writing Team	Shri Harsh Singh, CSF New Delhi Ms. Arushi Kapoor, CSF, New Delhi Ms. Ishmannan Kaur, CSF, New Delhi Shri Saurabh Karn, CSF New Delhi

Review Team   Dr. Indrani Bhaduri, Prof and Head, Educational Survey Division, NCERT

Dr. Sweta Singh, Jt. Secretary (Academics), Central Board of Secondary Education

Shri. Al Hilal Ahmed, Jt. Secretary (Academics), Central Board of Secondary Education

Shri Rahul Sofat, Air Force Golden Jubilee Institute, Delhi

Dr. Dharam Prakash, Retired Professor, NCERT, New Delhi

Ms Anita Sharma, Principal, S D Public School, Delhi

Ms. Ishita Mukherjee, Delhi

Ms. Gurpreet Bhatnagar, Delhi

Ms Deepika Batra, S D Public School, Delhi.

This Resource Manual utilizes a lot of quality content available in public domain. Citations have been provided at appropriate places within the text of this Manual. The creators of these content materials are appreciated for making it available to a wider audience through the internet. We would be happy to incorporate citations if any of the content used does not already have it.

HOW TO USE THIS MANUAL

The goal of the Teacher Energized Resource Manual (TERM) is to provide teachers with competency-based education resources aligned to NCERT textbooks that would support them in the attainment of desired Learning Outcomes and development of requisite competencies of the learner. The TERM has equal number of corresponding chapters as NCERT Textbooks with listing of Concepts, Learning Outcomes developed by NCERT and Learning Objectives. Competency based test items for each corresponding Learning Objective and sample activities for enrichment have been provided.

Learning Objectives:

Each chapter has a *Learning Objectives* table. The table also lists the Concepts covered in the chapter. Learning Objectives are broken down competencies that a learner would have acquired by the end of the chapter. They are a combination of skills and what the learner would use this skill for. For example, the first Learning Objective in the table below relates to the skill of *application* and the students will use this competency to obtain the highest common factor of 2 positive integers. Teachers can use these specific Learning Objectives to identify if a student has acquired the associated skill and understands how that skill can be used.

Concepts	Learning Objectives	Learning Outcomes
Euclid's Division	Apply Euclid Division Algorithm in order to obtain HCF of 2 positive integers in the context of the given problem	Generalises properties of numbers and relations among them studied earlier, to evolve results, such as, Euclid's division algorithm, fundamental theorem of arithmetic in order to apply them to solve problems related to real life contexts
	Apply Euclid Division Algorithm in order to prove results of positive integers in the form of ax+b where a and b are integers	
Fundamental Theorem of Arithmetic	Use the Fundamental Theorem of Arithmetic in order to calculate HCF and LCM of the given numbers in the context of the given problem	
Irrational Numbers	Recall the properties of irrational number in order to prove that whether the sum/difference/product/quotient of 2 numbers is irrational or not	
	Apply theorems of irrational number in order to prove whether a given number is irrational or not	
Decimal Representation of Irrational Numbers	Apply theorems of rational numbers in order to find out about the nature of their decimal representation and their factors	

Concepts:

The important concepts in a particular chapter are listed in the first section. Most often, they follow a logical order and present a sequence in which these are likely to be covered while teaching. In case, your teaching strategy is different and presents them in a different order, you need not worry. Teach the way, you consider the best. You only need to ensure their understanding and the attainment of desired learning objectives.

Learning Outcomes (NCERT):

A mapping of Learning Outcomes developed by the NCERT and Learning Objectives is provided in last column of the table. The Learning Outcomes have been developed by the NCERT. Each Learning Objective is mapped to NCERT Learning Outcomes and helps teachers to easily identify the larger outcome that a learner must be able to demonstrate at the end of the class/ chapter.

Test items:

For each Learning Objective, at least two competency-based test items have been provided. Although, the items in this resource manual are multiple choice questions, which assess developed competencies of a student rather than only knowledge, it must be kept in mind that there can be different kinds of assessment that can easily align with competency-based education. Teachers can use these items to assess if a learner has achieved a particular Learning Objective and can take necessary supportive actions. Teachers are also encouraged to form similar questions which assess skills of students.

LOB: Apply Euclid Division Algorithm in order to obtain HCF of 2 given numbers in the context of the given problem
1. A worker needs to pack 350 kg of rice and 150 kg of wheat in bags such that each bag weighs the same. Each bag should either contain rice or wheat. Which option shows the correct steps to find the greatest amount of rice/wheat the worker can pack in each bag?   **Option 1:** Step 1: $350 = 2(150) + 50$ Step 2: $150 = 3(50) + 0$ Step 3: Greatest amount: 50 kg   **Option 2:** Step 1: $350 = 2(150) + 50$ Step 2: $150 = 2(50) + 0$ Step 3: Greatest amount: 50 kg   **Option 3:** Step 1: $350 = 2(150) + 50$ Step 2: $150 = 3(50) + 0$ Step 3: Greatest amount: 150 kg   **Option 4:** Step 1: $350 = 2(150) + 50$ Step 2: $150 = 2(50) + 0$ Step 3: Greatest amount: 150 kg   **Correct Answer:** Option 1

Fig: 3

Suggested Teacher Resources

At the end of each chapter, certain activities have been suggested which can be carried out by the teachers with learners to explain a concept. These are only samples and teachers can use, adapt, as well as, create activities that align to a given concept.

TABLE OF CONTENTS

H4Q1P4

1.   KNOWING YOUR NUMBERS

Learning outcome and Learning Objectives:

Content area / Concepts	Sub-concept	Learning Objectives	Learning Outcome
Comparing Numbers	How many numbers can you make?	Find the place value of the digit in order to list total numbers.	Applies appropriate operations (addition, subtraction, multiplication and division) in order to solves problems involving large numbers
		List the total numbers you can make from the given digits in order to know the place value of the digit in the number.	
	Shifting digits	Arrange the digits of a given number in order to make smaller or bigger number.	
	Introducing 10,000	Add 1 to the greatest 1 digit,2-digit, 3-digit number and so on in order to get the smallest next digit number.	
	Revisiting place value	Expand the given number in order to know the place value of a given digit in a particular number.	
	Introducing 1,00,000	Write the 6 digits number in expanded form in order to write its number name.	
	Larger numbers	Add and subtract one from number in order to find predecessor and successor of a given number.	
		Add bigger digits numbers in order to understand the situations dealing with larger numbers.	
	An aid in reading and writing large numbers	Use places of the digits of a particular number in order to read it easily.	
Large Numbers in Practice	Estimation	Read the given situation in order to find the approximately estimated number.	
	Estimating to the nearest tens by rounding off	Estimate the number to the nearest tens in order to round off.	
	Estimating outcomes of number situations	Estimate the outcome of a number in order to get a quick round off number.	
	To estimate sum or difference	Round off the numbers in order to find their sum and difference easily.	
	To estimate products	Round off the numbers in order to find their product easily.	
Using Brackets	Expanding bracket	Use bracket to solve the problem in order to make calculation quick and to avoid confusion	
Roman Numerals		Write numbers in the form of roman numerals in order to represent and interpret the numbers written in a clock, timetable etc.	
		Apply the rules of roman numbers operations in order to perform arithmetic operation on them	

Test items

LG: Find the place value of the digit in order to list total numbers.

Level of difficulty: Medium
Bloom's Level: Understanding

1. In which of these numbers, the value of the digit 2 is 10 times the value of the digit 2 in the number 7429?

    Option 1: 7492
    Option 2: 7249
    Option 3: 2974
    Option 4: 2794

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing

2. How many numbers can you form using the digits 1, 5, 6 and 9 without repetition of the digits such that the value of the digit 6 in all those number is 100 times the value of the digit 6 in the number 9561?

    Option 1: 1
    Option 2: 3
    Option 3: 4
    Option 4: 6

Correct Answer: Option 4

LG: List the total numbers you can make from the given digits in order to know the place value of the digit in the number.

Level of difficulty: Medium
Bloom's Level: Understanding

1. What is the place value of 6 in the greatest 4-digit number formed using the digits 4, 5, 6 and 9 without any repetition?

    Option 1: 6
    Option 2: 60
    Option 3: 600
    Option 4: 6000

Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing

2. What is the place value of 8 in the smallest possible number formed using the digits 3, 4, 5 and 8 without repetition such that the number is greater than 3548?

    Option 1: 8
    Option 2: 80
    Option 3: 800
    Option 4: 8000

Correct Answer: Option 2

LG: Arrange the digits of a given number in order to make smaller or bigger number.

Level of difficulty: Medium
Bloom's Level: Understanding

1. Anamika is forming 5-digit numbers using all the digits of the number 74064 without repetition. What is the smallest number that she can form keeping the same digits at consecutive places?

    Option 1: 04467
    Option 2: 40467
    Option 3: 44067
    Option 4: 76440

Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing

2. The number below is the second largest number that can be formed using the digits, *h*, *m*, *p* and *s* without repeating a single digit.
"*hsmp*"
If one of the digits of the number is 0, what would be the smallest 4-digit number that can be formed using all these digits?

    Option 1: *pmsh*
    Option 2: *pmhs*
    Option 3: *mpsh*
    Option 4: *mphs*

Correct Answer: Option 1

LG: Add 1 to the greatest 1 digit, 2-digit, 3-digit number and so on in order to get the smallest next digit number.

Level of difficulty: Medium
Bloom's Level: Understanding

1. If we add 1 to the greatest 4-digit number, what will we get?

    Option 1: Greatest 3-digit number
    Option 2: Smallest 4-digit number
    Option 3: Greatest 5-digit number
    Option 4: Smallest 5-digit number

Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Analysing

2. Three students write numbers as described below.
Student 1: (Greatest 4-digit number + 1) – (Greatest 3-digit number + 1).
Student 2: (Smallest 5-digit number – Smallest 4-digit number)
Student 2: (Greatest 4-digit number – Greatest 3-digit number)
Based on the information, which statement is correct?

    Option 1: All three students have written the same number.
    Option 2: All three students have written three different numbers.
    Option 3: Student 1 and Student 2 have written the same number.
    Option 4: Student 1 and Student 3 have written the same number.

Correct Answer: Option 1

LG: Expand the given number in order to know the place value of a given digit in a particular number.

Level of difficulty: Medium
Bloom's Level: Understanding

1. Which option correctly represents the expanded form of 67,043?

    Option 1: 6 × 100000 + 7 × 10000 + 4 × 100 + 3 × 10
    Option 2: 6 × 100000 + 7 × 10000 + 4 × 100 + 3 × 0
    Option 3: 6 × 10000 + 7 × 1000 + 4 × 10 + 3
    Option 4: 6 × 10000 + 7 × 1000 + 4 × 10 + 3 × 0

Correct Answer: Option 3

9

Level of difficulty: Hard
Bloom's Level: Analysing
2. The expanded form of a number is 8 × 10000 + m × 1000 + 6 × 100 + 5 × 10 + 4. What is the greatest possible value of m if the number is smaller than 84,000?
    Option 1: 7
    Option 2: 4
    Option 3: 3
    Option 4: 0
Correct Answer: Option 3

LG: Write the 6 digits number in expanded form in order to write its number name.

Level of difficulty: Medium
Bloom's Level: Understanding
1. What is the number name of 632078?
    Option 1: Six lakh thirty-two thousand seventy-eight
    Option 2: Eight lakh seven thousand two hundred thirty-six
    Option 3: Eight lakh seventy thousand two hundred thirty-six
    Option 4: Six lakh three thousand two hundred seventy-eight
Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Analysing
2. The expanded form of a 6-digit number is 5 × 100000 + m × 10000 + n × 100 + 4 × 10 + 3. If all the digits are unique, what is the number name of the greatest possible number?
    Option 1: Five lakh nine thousand eight hundred forty-three
    Option 2: Five lakh ninety thousand eight hundred forty-three
    Option 3: Five lakh ninety-nine thousand nine hundred forty-three
    Option 4: Five lakh ninety-nine thousand eight hundred forty-three
Correct Answer: Option 2

LG: Add and subtract one from number in order to find predecessor and successor of a given number.

Level of difficulty: Medium
Bloom's Level: Understanding
1. If the predecessor of a number is 18, what is the successor of that number?
    Option 1: 20
    Option 2: 19
    Option 3: 18
    Option 4: 17
Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Analysing
2. Romesh finds the successor of a number as per which is smaller than the predecessor of the smallest 4-digit number. Given that p, q and r have their maximum possible values, which pair of equations is true?
    Option 1: $p - q = 1$ and $q - r = 1$
    Option 2: $p - q = 1$ and $q - r = 0$
    Option 3: $p - q = 0$ and $q - r = 1$
    Option 4: $p - q = 0$ and $q - r = 0$
Correct Answer: Option 1

LG: Add bigger digits numbers in order to understand the situations dealing with larger numbers.

Level of difficulty: Medium
Bloom's Level: Applying

10

1. Arvind sold gadgets worth ₹ 2,76, 914 in the first month and gadgets worth ₹3,99,458 in the second month at his electronics store. How much was the sale for the two months together?
   Option 1: ₹ 6,76,372
   Option 2: ₹ 6,75,365
   Option 3: ₹ 5,65,365
   Option 4: ₹ 5,66,475
Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Applying

2. A book fair was organised in a city for five days. The table below shows the number of visitors on the book fair each day.

Day	Number of Visitors
1st	80,001
2nd	1,15,311
3rd	1,85,524
4th	2,46,922
5th	2,90,761

How many visitors visited the fair in all?
   Option 1: 6,06,418
   Option 2: 6,09,539
   Option 3: 9,18,418
   Option 4: 9,18,519
Correct Answer: Option 4

LG: Use places of the digits of a particular number in order to read it easily.

Level of difficulty: Medium
Bloom's Level: Understanding

1. What is the place value of the digit 6 in the numeral 54968732?
   Option 1: 6
   Option 2: 6000
   Option 3: 60000
   Option 4: 600000
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing

2. What is the difference of the place value and face value of the digit 6 in the numeral 98463251?
   Option 1: 5994; as the place value of 6 is 6000 and its face value is 6.
   Option 2: 59994; as the place value of 6 is 60000 and its face value is 6.
   Option 3: 3251; as the place value of 6 is 63251 and its face value is 60000.
   Option 4: 54000; as the place value of 6 is 60000 and its face value is 6000.
Correct Answer: Option 2

LG: Read the given situation in order to find the approximately estimated number

Level of difficulty: Medium
Bloom's Level: Understanding

1. A news reporter reported that approximately 65,000 spectators attended the final match of the series. What could be the actual number of spectators who attended the match?
   Option 1: 40,453
   Option 2: 56,912
   Option 3: 64,654
   Option 4: 78,813
Correct Answer: Option 3

Level of difficulty: Medium
Bloom's Level: Understanding
2. According to an article, approximately 75,000 people visited India Gate for New Year celebration last year. What could be the actual number of people who visited India Gate for the celebration?

      Option 1: 37,500
      Option 2: 50,212
      Option 3: 75,315
      Option 4: 1,00,000

Correct Answer: Option 3

LG: Estimate the number to the nearest tens in order to round off.

Level of difficulty: Medium
Bloom's Level: Understanding
1. What is 3539 rounded off to the nearest ten?

      Option 1: 3600
      Option 2: 3500
      Option 3: 3540
      Option 4: 3530

Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing
2. What is the number 37 rounded off to the nearest ten?

      Option 1: 30 as the gap between 37 and 30 is greater when compared to the gap between 37 and 40.
      Option 2: 40 as the gap between 37 and 40 is smaller when compared to the gap between 37 and 30.
      Option 3: 30 as the digit at the tens place is 3.
      Option 4: 40 as the next digit to 3 is 4.

Correct Answer: Option 2

LG: Estimate the number to the nearest hundreds/thousands in order to round it off.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Which digit makes this statement true? 4?73 rounded to the nearest hundred is 4,900.

      Option 1: 5
      Option 2: 6
      Option 3: 8
      Option 4: 9

Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing
2. If $1c500$ and $1d499$ are the smallest and the greatest numbers which are rounded off to the nearest thousand as 16000, which relation is true for c and d?

      Option 1: $c = 1 - d$
      Option 2: $d = 1 + c$
      Option 3: $c = d + 11$
      Option 4: $d = c + 11$

Correct Answer: Option 2

LG: Round off the numbers in order to find their sum and difference easily.

Level of difficulty: Medium
Bloom's Level: Understanding

12

1. Which expression best estimates the value of the expression 8820 – 5270?
   Option 1: 9000 – 5000
   Option 2: 9000 –6000
   Option 3: 8000 – 6000
   Option 4: 7000 - 6000
Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Applying
2. There are 4,10,541 females and 5,08,683 males in a city. Which expression best estimates the population of the city?
   Option 1: 300000 + 400000 = 700000
   Option 2: 400000 + 500000 = 900000
   Option 3: 500000 + 500000 = 1000000
   Option 4: 500000 + 600000 = 1100000
Correct Answer: Option 2

LG: Round off the numbers in order to find their product easily.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Which expression best estimates the value of the expression 1277 × 6865?
   Option 1: 1000 × 6000
   Option 2: 1000 × 7000
   Option 3: 2000 × 6000
   Option 4: 2000 × 7000
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Applying
2. Advik has to buy 18 curtains for his home. If each curtain costs ₹1,975, approximately how much money will he need?
   Option 1: 10,000
   Option 2: 20,000
   Option 3: 30,000
   Option 4: 40,000
Correct Answer: Option 4

LG: Use bracket to solve the problem in order to make calculation quick and to avoid confusion

Level of difficulty: Medium
Bloom's Level: Understanding
1. Which option correctly calculates the value of the expression 7 × 15 + 9 × 15?
   Option 1: (7 + 9) + 15 = 16 + 15 = 31
   Option 2: (7 × 9) + 15 = 63 + 15 = 68
   Option 3: (7 + 9) × 15 = 16 × 15 = 240
   Option 4: (7 × 9) × 15 = 63 × 15 = 945
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Applying
2. Shishir bought 7 t-shirts for ₹250 each and 4 trousers at the same cost. How much did he spend in all?
   Option 1: 1,007; as 7 + 4 × 250 = 7 + 1000 = 1,007
   Option 2: 1,754; as 4 + 7 × 250 = 4 + 1750 = 1,754
   Option 3: 2,750; as (7 + 4) × 250 = 11 × 250 = 2,750
   Option 4: 2,750; as (7 × 4) × 250 = 28 × 250 = 7,000
Correct Answer: Option 3

LG: Write numbers in the form of roman numerals in order to represent and interpret the numbers written in a clock, timetable etc.

Level of difficulty: Medium
Bloom's Level: Understanding
1. What is 77 in Roman numeral?
    Option 1: VIIVII
    Option 2: LXVII
    Option 3: LXXVII
    Option 4: XXXCVII
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Applying
2. Which of these is the correct representation of the Roman numeral DCXCIV in Hindi-Arabic numeral?
    Option 1: 694; as DCXCIV = DC + XC + IV = 600 + 90 + 4
    Option 2: 716; as DCXCIV = DC + XC + IV = 600 + 110 + 6
    Option 3: 214; as DCXCIV = D + C + X + C + I + V = 100 + 50 + 10 + 50 + 4
    Option 4: 216; as DCXCIV = D + C + X + C + I + V = 100 + 50 + 10 + 50 + 1 + 5
Correct Answer: Option 1

LG: Apply the rules of roman numbers operations in order to perform arithmetic operation on them

Level of difficulty: Medium
Bloom's Level: Understanding
1. What is the value of 50 + (50 – 1) in Roman numeral?
    Option 1: IC
    Option 2: LIL
    Option 3: XCIX
    Option 4: XCVIV
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing
2. There are 15 marbles each in 3 bags. A teacher asked his students to find the total number of marbles in all 3 bags and express their answer in Roman numeral.
    Based on the information, one of the students calculates the total number of marbles as 45 and represents it as VL. Which is true about the student's answer?
    Option 1: The student calculates the total marbles correctly and also represents it in Roman numeral as VL because V = 5, L = 50 and writes V is to the left of L.
    Option 2: The student calculates the total marbles correctly but represents it in Roman numeral incorrectly because V = 5, L = 50 and V cannot be written to the left of a symbol of greater value.
    Option 3: The student incorrectly calculates the total number of marbles because to find the total number of marbles, 15 should be added to 3 instead of multiplying and in Roman numeral 18 = XVIII.
    Option 4: The student incorrectly calculates the total number of marbles because to find the total number of marbles, 15 should be added to 3 instead of multiplying and in Roman numeral 18 = XIIIV.
Correct Answer: Option 2

14

Suggested Teacher Resources

I Lesson Plan

Objective	1. Estimate the number in a given problem in order to get the approximate quantity 2. Estimate the number to the nearest tens in order to round off 3. Estimate the number to the nearest hundreds in order to round it off 4. Estimate the number to the nearest thousands in order to round it off
Material Required	Multi coloured chalks
Previous Knowledge	Plotting numbers on number line, comparison of natural numbers, addition, subtraction, multiplication and division of natural numbers, able to find midpoint between two natural numbers
Procedure	Teacher will start with a question. **Q) What does approximation/estimation mean? Why is it beneficial for us?** Ans: Approximation or estimation means a value which is nearly but not exactly equal to the actual value. It's useful in situations where its time consuming to measure the accurate value. Present students with an example: Imagine a big celebration like a wedding. When the organisers don't know how many people will actually show up, they take an approximation of the guests that can arrive and prepare food accordingly. Another example could be our country's budget where ministers provide a certain amount of funds to various departments like for "Education". It's only a reasonably good estimate of the expenditure the country needs for education that year. Teacher can ask students to find out this year's budget expenditure for education from home. In this class students will try to find estimations of some values and solve related questions. Setup: Divide students into pairs and provide them following worksheet. Students will have 60 sec to solve as many problems they can solve. Teacher will reinforce that it's not expected of them to solve all the questions. Just do as many as they can within 60 sec.

Find the midpoint.

#			#		
1	0	10	23	6000	7000
2	0	100	24	600	700
3	0	1000	25	60	70
4	10	20	26	260	270
5	100	200	27	9260	9270
6	1000	2000	28	80	90
7	30	40	29	90	100
8	300	400	30	990	1000
9	400	500	31	9990	10,000
10	20	30	32	440	450
11	30	40	33	8300	8400
12	40	50	34	680	690
13	50	60	35	9400	9500
14	500	600	36	3900	4000
15	5000	6000	37	2450	2460
16	200	300	38	7080	7090
17	300	400	39	3200	3210
18	700	800	40	8630	8640
19	5700	5800	41	8190	8200
20	70	80	42	2510	2520
21	670	680	43	4890	4900
22	6700	6800	44	6660	6670

15

After 60 sec are over teacher will read aloud the right answer and student will circle the correct and self-correct the wrong ones.

Activity: Estimate 73 to its nearest tens by rounding off.

Setup: Draw a number line on the floor as shown.

Teacher will ask 4 students to volunteer. Each student will be given a card with a number (70, 73, 75, 80) written on it which they will hide form the rest of the class for the moment.

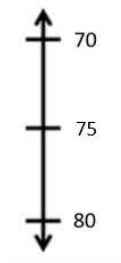Ask: Between which tens does 73 lies?

Ans: 70 and 80

Students with digit 70 and 80 will reveal themselves and stand on the either of the outer edge of the number line.

Ask: What is the midpoint of these number?

Ans: 75.

Student with card 75 will reveal and stand at the midpoint of the number line.

Ask: Where would 73 lies? Between 70-75 or 75-80?

Ans: it lies between 70-75.

The Student with number 73 will stand between 70 and 75.

Say: Since 73 lies between 70-75, 73 is closer to 70 than 80. Hence, we can round off or estimate or approximate 73 as 70.

This is how we round of number to their nearest tens.

Steps: Lets round off 89

1. Identify numbers in tens between which 89 lies. Which is 80 and 90.
2. Plot 80 and 90 on vertical number line. Plot the midpoint which is 85.
3. Identify if 89 lies between 80-85 or 85-90. Here 89 lies between 85-90. Hence 89 is closer to 90 rather than 80.
4. Hence 89 can be round off to 90.

Q) Ask students to do these same steps for: 34, 62 and 65.

Students will struggle with 65.

Repeat the activity for 65. Ask students to discuss what could be round off value for 65.

Say: Since 65 lies exactly in the middle and is at equal distance between 60 and 70. To resolve this problem students will take the higher values which is 70 in this case.

Say: Steps that were taken for estimating a number to its nearest tens by rounding off can be done for estimating a number to nearest hundred or thousand by rounding of.

Q) Estimate 347 to its nearest tens and hundred by rounding off.

Ans: by repeating the same steps taken in above activity the estimate of 347 to its nearest tens would be 350.

For estimating to nearest hundred replace tens with hundred in the steps

1. Identify numbers in hundred between which 347 lies. Here it would be 300 and 400.
2. Plot 300 and 400 on number line. Plot the midpoint which is 350.
3. Identify if 347 lies between 300-350 or 350-400. Here 347 lies between 300-350. Hence 347 is closer to 300 rather than 400.
4. Hence 347 can be round off to 300.

Q) Estimate 478, 555 to their nearest hundred by rounding of.

16

	Ans) 500 and 600. Q) What would be the steps to estimate the number to nearest thousand by rounding of?
Source	https://betterlesson.com/lesson/489757/rounding-numbers-to-any-place

2 **Activity**

Expand the given number in order to know the place value of a given digit in a particular number.
Materials required: Algebraic tiles, arrow cards

Setup:
**What Are Arrow Cards?**
Arrow cards are a set of place value cards with an "arrow" or point on the right side. Students can organize the cards horizontally or vertically to represent numbers in expanded notation. They can overlap cards and line up the arrows to form multi-digit numbers.
153 is represented as follows:

Arrow cards form a useful transition between base ten blocks and written numerals. Base ten blocks are very concrete. They look exactly like their value. Using base ten blocks, 300 is represented with 3 hundred squares; each hundred squares is the size of 10 tens or 100 ones.

17
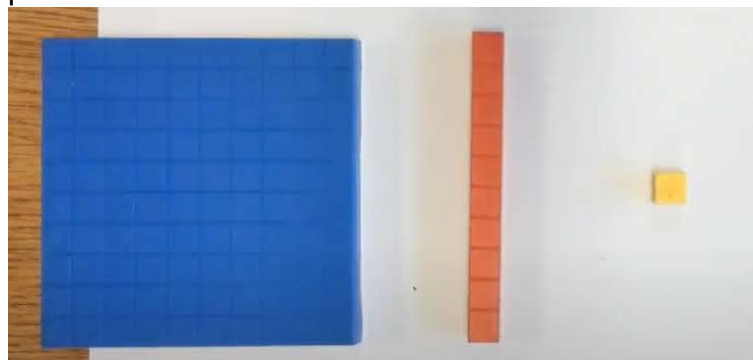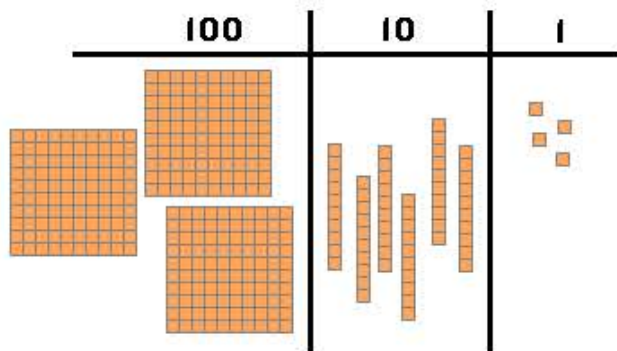
Notes:
1. Each place holds 1 digit from 0 – 9
2. Each digit has a value
3. Students must start in the greatest place when writing the expanded form
4. Every word that student says when they read a number, must be written for the word form

Students can use a place value chart given below to help write numbers in expanded form.

Lakh	Ten Thousand	Thousand	Hundred	Tens	Ones

Q) Write down expanded form of 7352. Write 7352 in words.
Steps:
1. Write down the given number in the place value table starting from the right most digit. One digit will occupy one cell. Leave the unoccupied cell as it is.

Lakh	Ten Thousand	Thousand	Hundred	Tens	Ones
		7	3	5	2

2. **Find the arrow cards which matches the number and length from the place values mentioned in the place value table. As shown below**.

7 3 5 2	Original number
7 0 0 0	Arrow card of 7000
3 0 0	Arrow card of 300
5 0	Arrow card of 50
2	Arrow card of 2

3. Numbers can be initially decomposed using family groups together. As follows the required number is ＿＿ Thousand, ＿＿ Hundred ＿＿＿＿.

Additional questions:
Q) Write the following numbers in expanded and written form:
1. 3787474
2. 987244
3. 3223

Reference:
1. http://www.teachersofindia.org/en/article/making-your-own-arrow-cards
2. https://www.educationworld.com/a_curr/Teaching-Place-Value-With-Arrow-Cards.shtml

3. https://www.youtube.com/watch?v=3UvOmZ0cK-o
4. https://www.kentuckymathematics.org/docs/Arrow_Card_Template_10-thous-100-thous.pdf

2. WHOLE NUMBERS

QR Code:

D7W9Y1

Learning outcome and Learning Objectives:

Content area / Concepts	Learning Objectives	Learning Outcome
Introduction	Understand the predecessor of One in order to know the whole number.	-
Whole Numbers	Explain the whole number in order to know the predecessor of 1 and the subtraction of the two same number.	
The Number Line	Define unit distance in order to construct the number line	
	Draw the Number line in order to represent the whole number.	
	Draw a number line in order to find the predecessor and successor of a given number	
	Represent the Numbers on Number line in order to perform number operation.	
Properties of Whole Numbers	Apply properties of whole number in order to simplify arithmetic expression.	
Patterns in Whole Numbers	Represent numbers in order to form line, rectangle, triangle and a square.	
	Form number patterns in order to verbal calculation and to understand numbers better.	

Test items

LG: Understand the predecessor of One in order to know the whole number.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Predecessor of which of these numbers is a whole number and NOT a natural number?
    Option 1:0
    Option 2: 1
    Option 3:10
    Option 4:100
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing
2. Which of the following statements is true?
    Option 1: Predecessor of any natural number is the smallest whole number.
    Option 2: Predecessor of the smallest natural number is the smallest whole number.
    Option 3: Predecessor of a natural number can never be a whole number.
    Option 4: Predecessor of the smallest whole number is the smallest natural number.
Correct Answer: Option 2

LG: Explain the whole number in order to know the predecessor of 1 and the subtraction of the two same number.

Level of difficulty: Medium
Bloom's Level: Applying
1. Which of these expressions represents the least whole number?
    Option 1: 1 + 0
    Option 2: 0– 1
    Option 3: 10 × 1
    Option 4:12 – 12
Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Analysing
2. Consider the statement below.
    "Every whole number has a whole number as its predecessor" Which of these is a valid conclusion about the statement?
    Option 1: Yes, because the predecessor of 0 is a whole number.
    Option 2: No, because the predecessor of 0 is not a whole number.
    Option 3: No, because the predecessor of 1 is not a whole number.
    Option 4: Yes, because the predecessor of any whole number is a whole number.
Correct Answer: Option 1

LG: Define unit distance in order to construct the number line.

Level of difficulty: Medium
Bloom's Level: Applying
1. Aryan plotted whole numbers 0 to 7 on a number line. How many unit distances did he draw?
    Option 1: 0
    Option 2: 1
    Option 3:7
    Option 4:8
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Creating
2. Consider the statement below. "A student plotted 5 consecutive even whole numbers on a number line." Which of these is a valid conclusion about any 2 consecutive even numbers?
      Option 1: They are separated by 1 unit.
      Option 2: They are separated by 2 units.
      Option 3: They are separated by 5 units.
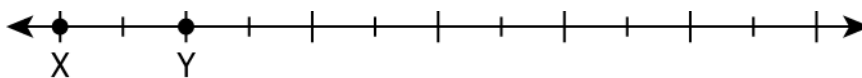   **Option 4**: They are separated by 10 units.
  Correct Answer: Option 2

LG: Draw the Number line in order to represent the whole number.

Level of difficulty: Medium
Bloom's Level: Creating
1. If X and Y two consecutive whole numbers, how many whole numbers can be shown on the number line below?
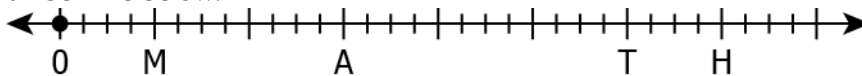

      Option 1: 2
      Option 2:5
      Option 3:7
      Option 4: 8
  Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing
2. Observe the number line below.

  If Rahul has to write the whole numbers that correspond to the alphabets M, A, T and H, which table correctly matches the alphabets to their corresponding whole numbers?

  Option 1:

M	1
A	2
T	3
H	4

  Option 2:

M	1
A	3
T	5
H	6

  Option 3:

M	3
A	6
T	9
H	12

  Option 4:

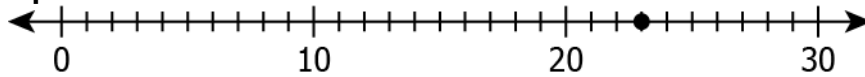 | M | 1 |
  |---|---|
  | A | 3 |
  | T | 6 |
  | H | 7 |

  Correct Answer: Option 4

LG: Draw a number line in order to find the predecessor and successor of a given number.
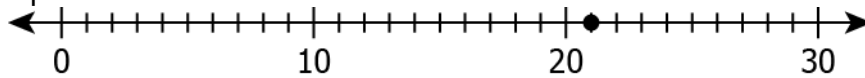Level of difficulty: Medium

Bloom's Level: Analyzing

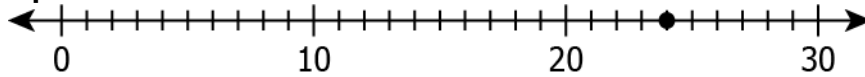1. Which of these number lines shows the predecessor of 23?
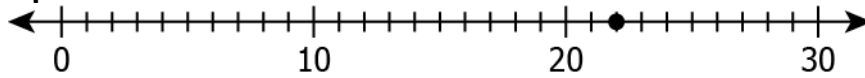
   Option 1:

   Option 2:

   Option 3:
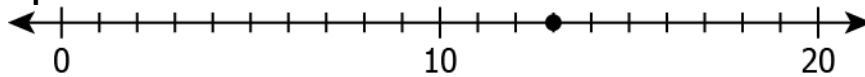

   Option 4:

Correct Answer: Option 4
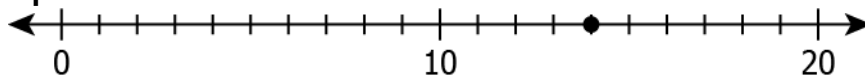
Level of difficulty: Hard
Bloom's Level: Analyzing

2. Consider the statement below. "*Successor of the predecessor of 14.*" Which of these number lines correctly represents the number in the statement?
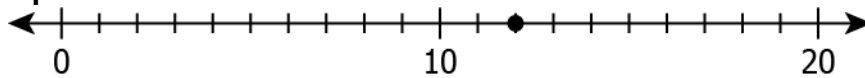
   Option 1:

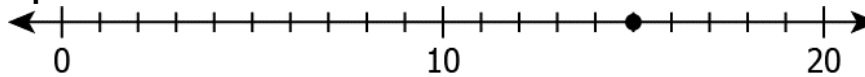   **Option 2**:

   Option 3:

   Option 4:
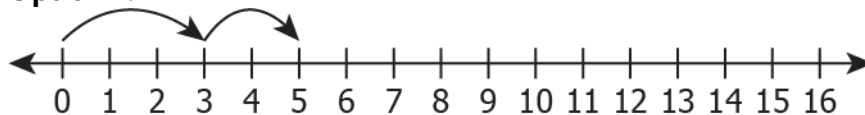

Correct Answer: Option 2

LG: Represent the Numbers on Number line in order to perform number operation.
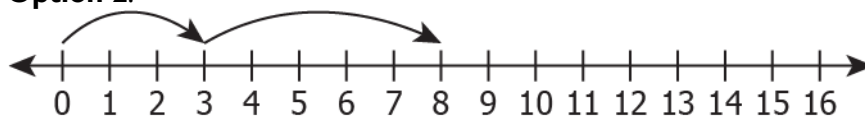
Level of difficulty: Medium
Bloom's Level: Applying

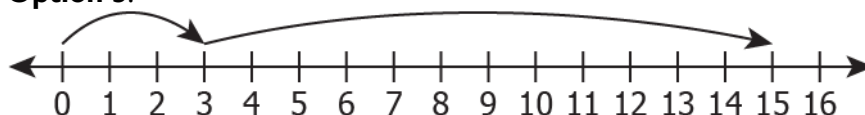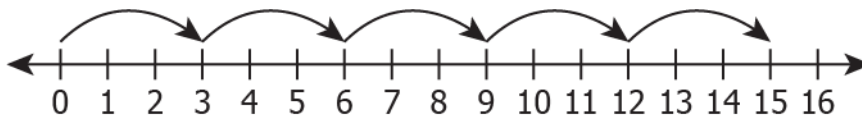1. Which number line shows the 5 times 3?

   Option 1:

   Option 2:

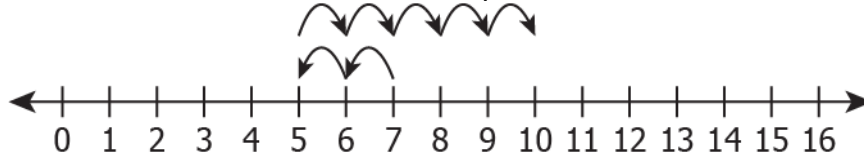   **Option 3**:

   Option 4:

23

Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Evaluating
2. Which operation of numbers does this number line represent?

Option 1: 7 – 5 + 10
Option 2:7 – 5 + 5
Option 3:7 – 2 + 10
Option 4: 7 – 2 + 5
Correct Answer: Option 4

LG: Apply properties of whole number in order to simplify arithmetic expression.

Level of difficulty: Medium
Bloom's Level: Applying
1. Raghav solves the expression 5 × (1 + 4) as *u* + *v*. Which option is true for the values of *u* and *v*?
    Option 1: $u = 5; v = 4$
    Option 2: $u = 5; v = 20$
    Option 3: $u = 5; v = 5$
    Option 4: $u = 6; v = 20$
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Applying
2. Consider the following claims.
    Claim 1: (16 + 9) + 2 = 16 + (9 + 2) = 27 shows associativity of addition for whole numbers
    Claim 2: 13 – 61 = – 48 shows the closure property of whole numbers under subtraction
    Claim 3: 5 × 4 = 20 shows the closure property of whole numbers under multiplication
    Which option is correct?
    Option 1: Only claim 2 is correct
    Option 2: Only claim 1 and 2 are correct
    Option 3: Only claim 1 and 3 are correct
    Option 4: All claims are correct
Correct Answer: Option 3

LG: Represent numbers in order to form line, rectangle, triangle and a square.

Level of difficulty: Medium
Bloom's Level: Applying
1. How many dots can be arranged such that there should be the same number of dots in each row and column?
    Option 1: 12
    Option 2:15
    Option 3: 16
    Option 4: 20
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Applying/Understanding

24

2. Consider the following claims.
    Claim 1: Numbers 36, 45, 55 and 66 are forming pattern of triangular numbers.
    Claim 2: Numbers 20, 28, 34 and 42 are forming pattern of rectangular numbers.
    Which option is true about the claims?
    Option 1: Only Claim 1 is correct
    Option 2: Only Claim 2 is correct
    Option 3: Both Claim 1 and Claim 2 are correct
    Option 4: Neither Claim 1 nor Claim 2 is correct
Correct Answer: Option 3

LG: Form number patterns in order to verbal calculation and to understand numbers better.

Level of difficulty: Medium
Bloom's Level: Analysing
1. Observe the pattern below.

    $34 \times 5 = 34 \times \frac{10}{2} = 17 \times 10 = 170 \times 1$

    $34 \times 15 = 34 \times \frac{30}{2} = 17 \times 30 = 170 \times 3$

    Which of these options completes the pattern $34 \times 45 = $ ___?
    Option 1:
    $34 \times \frac{50}{2} = 17 \times 50 = 170 \times 5$
    Option 2:
    $34 \times \frac{45}{2} = 17 \times 45 = 85 \times 9$
    Option 3:
    $34 \times \frac{90}{2} = 17 \times 90 = 170 \times 9$
    Option 4:
    $34 \times \frac{110}{2} = 17 \times 110 = 170 \times 11$
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing
2. Observe the pattern below. $91 \times 9 = 91 \times (100 - 1) = 9100 - 91 = 9009$. Which of these is equivalent to 91×9999?
    Option 1: $91 \times (1000 - 1) = 91000 - 91 = 90909$
    Option 2: $91 \times (1000 + 1) = 91000 + 91 = 91091$
    Option 3: $91 \times (10000 - 1) = 910000 - 91 = 909909$
    Option 4: $91 \times (10000 + 1) = 910000 + 91 = 910091$
Correct Answer: Option 3

Suggested Teacher Resources

❶ Lesson Plan

Objective -: Students will be able to show how to use place value to round whole numbers.
Material Required-: Activity Sheet
Procedure-:
- Teacher will start whole class discussion on rounding whole numbers.
- Let the students know that rounding is a very important skill in their everyday lives. If the students know that a skill will benefit them, they are more attentive to the lesson.
- Teacher will tell the students that when you round, you can use place value to help you. A number line is another tool that can be used to help you round.

Q. There are 5,278 people at the amusement park. About how many people are there, rounded to the nearest thousands place? Let's find out.
1. What number is in the thousands place? (5 is in the thousand place)
2. What number is to the right of the 5? (2 is to the right of 5)

Let's review the rules of rounding.
Rules of Rounding: -
- If the number to the right is 5 or more (5, 6, 7, 8, or 9), the underlined digit goes up by one. All numbers behind the underlined place are changed to zeros. (It rounds up.)
- If the number to the right is 4 or less (4, 3, 2, 1, or 0), the underlined digit stays the same and all numbers behind it becomes zeros. (It rounds down.)
- There is a 2 in the hundreds place, therefore, the 5 stays the same. All numbers behind it becomes zeros. e.g. 5,278 rounds to 5,000. This means that 5,278 is closer to 5,000 than 6,000.

By placing the number on the number line, you can see that 5,278 is closer to 5,000 than 6,000.

❷ Activity

Activity-:
Time- 30min
- The students continue practicing the skill with a partner. Each group is given the below sheet to solve. They must first solve the problem by using the place value chart and blocks. Then the students must use paper and pencil to add the problem. Their addition problems with paper and pencil must show regrouping if it was necessary.

26

- As the students work together, then teacher will monitor their progress. If the students are having a difficult time, I ask guiding questions to help lead the students to the answer.

Adding Whole Numbers
Group Activity

Use the place value chart and blocks to solve these problems.

1. 254 + 158 =

2. 715 + 153 =

3. 168 + 328 =

4. 289 + 195 =

5. 435 + 326 =

Possible Questions:
1. What is the largest digit you can put in a place?
2. When you have a two-digit number, how do you regroup? Show me with the place value blocks.
3. In which place do you begin adding?
4. How does adding with place value blocks help you add with paper and pencil?

Independent Activity-:
Time- 10 min
After the students finish their group activity, I have the students complete an independent assignment. This is to find out what each individual student has learned from the lesson. The students need a piece of paper and pencil for this assignment. I have the Write to Explain (Adding Whole Numbers) assignment on your Smart board.
Write to Explain:
238 + 153= _____.
How can using a place value chart and blocks help you solve this problem?

Source-:https://betterlesson.com/lesson/496392/rounding-whole-numbers
https://betterlesson.com/lesson/502655/adding-whole-numbers?from=search

3. PLAYING WITH NUMBERS

QR Code:

A8R2S2

NCERT Learning outcome:

Content area / Concepts	Learning Objectives	Learning Outcome
Introduction	Arrange the numbers in a row in order to determine the factors of a given number.	Identifies number patterns through factorization in order to recognise and appreciate (through patterns) the broad classification of numbers as even, odd, prime, co-prime, etc.
Factors and Multiples	Determine the numbers which exactly divide the given number in order to find the factors.	
Prime and Composite Numbers	Write the factors of a given number in order to determine prime and composite numbers	
Common Factors and Common Multiples	Evaluate the factors of given two or more numbers in order to find the common factors and multiples.	
Some More Divisibility Rules	Apply the rules of divisibility in order to find the factors of a number quickly.	
Prime Factorisation	Factorise a number through prime factorisation in order list the primes factors.	
Highest Common Factor	List down the common factors of given numbers in order to determine their HCF.	Applies the concept of HCF or LCM in order to solve problems in a real-life situation
Lowest Common Multiple	List down the common multiples of given numbers in order to determine their LCM.	
Some Problems on HCF and LCM	Apply the concept of HCF in order to solve related real-life problems.	
	Apply the concept of LCM in order to solve related real-life problems.	

28

Test items

LG: Arrange the numbers in a row in order to determine the factors of a given number.

Level of difficulty: Medium
Bloom's Level: Understanding

1. Jagat arranges 21 marbles into rows such that each row has equal number of marbles. If there are 3 rows each having (a)_ marbles indicating that (b)_ and (c)_ are the factors of 21. Which of these options correctly identifies a, b and c?

   Option 1:

a	3
b	3
c	7

   Option 2:

a	18
b	3
c	7

   Option 3:

a	7
b	3
c	7

   Option 4:

a	10
b	7
c	3

Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Understanding

2. In a sitting arrangement, some people are made to sit in 9 rows such that each row has 4 people. If the same number of people are rearranged in m rows with n number of people in each row, which of these cannot be the value of *m* and *n*?

   Option 1: 12 and 3
   Option 2: 8 and 5
   Option 3: 18 and 2
   Option 4: 6 and 6
Correct Answer: Option 2

LG: Determine the numbers which exactly divide the given number in order to find the factors.

Level of difficulty: Medium
Bloom's Level: Applying

1. Which of these is a factor of 96?
   Option 1: 43
   Option 2: 14
   Option 3: 16
   Option 4: 36
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Understanding

2. The factors of a number 667 are consecutive prime numbers p and q, $p > q$. What is/are the factor(s) of the number $(p - q)$?

    Option 1: 2 and 3
    Option 2: 2 and 13
    Option 3: 7
    Option 4: 52

Correct Answer: Option 1

LG: Write the factors of a given number in order to determine prime and composite numbers.

Level of difficulty: Hard
Bloom's Level: Analysing

1. Which of these can be concluded about the number 713?

    Option 1: As it has no factor other than 1 and itself, it is a prime number.
    Option 2: As it has two factors 23 and 31 other than 1 and itself, it is a prime number.
    Option 3: As it has two factors 23 and 31 other than 1 and itself, it is a composite number.
    Option 4: As it has no factor other than 1 and itself, it is a composite number.

Correct Answer: Option 3

Level of difficulty: Medium
Bloom's Level: Understanding

2. What are the factors of 1147? Is it a prime number or a composite number?

    Option 1: 1, 1147; composite
    Option 2: 1, 1147; prime
    Option 3: 1, 31, 37, 1147; composite
    Option 4: 1, 31, 37, 1147; prime

Correct Answer: Option 3

LG: Apply the rules of divisibility in order to find the factors of a number quickly.

Level of difficulty: Hard
Bloom's Level: Evaluating

1. A number $57a2b$ is divisible by 9 and $36b2$ is divisible by 11, where a and b are the missing digits. Which of these could be the relation between a and b?

    Option 1: $a = 2b$
    Option 2: $b - a = 3$
    Option 3: ab
    Option 4: $a - b = 3$

Correct Answer: Option 4

Level of difficulty: Medium
Bloom's Level: Understanding

2. A 4-digit number $51m2$ is divisible by 3, where m is the missing digit. Which of these cannot be the value(s) of m?

    Option 1: 1, 5, 9
    Option 2: 1
    Option 3: 4
    Option 4: 1, 4, 7

Correct Answer: Option 1

LG: Factorise a number through prime factorisation in order list the primes factors.

Level of difficulty: Easy
Bloom's Level: Understanding

1. The prime factorisation of 145 is _.

    Option 1: 5 × 29
    Option 2: 3 × 3 × 3 × 5

Option 3: 1× 145
Option 4: 1× 4 × 5
Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Understanding
2. The table below describes three numbers, X, Y and Z.

X	Greatest 2-digit number whose prime factorisation consists of only the factors 2 and 3.
Y	A number whose prime factorisation consists of only the factors 2, 3 and 11.
Z	It is a whole number having value equal to Y ÷ X.

Based on the given description of the numbers, a student makes two conclusions.

Conclusion I: The prime factorisation of Y could be 2 × 2 × 3 × 3 × 11.

Conclusion II: X = 96.

Which conclusion is correct?

Option 1: only conclusion I
Option 2: only conclusion II
Option 3: both the conclusions
Option 4: neither of the conclusions
Correct Answer: Option 2

LG: List down the common factors of given numbers in order to determine their HCF.

Level of difficulty: Hard
Bloom's Level: Evaluating
1. If p is the greatest number which divides both 144 and 96, which of these is the greatest common factor of $p - 3$ and $p + 2$?
Option 1: 48
Option 2: 5
Option 3: 450
Option 4: 2880
Correct Answer: Option 2

Level of difficulty: Easy
Bloom's Level: Evaluating
2. Which option lists the common factors of 212 and 112 and determines the greatest number that divides both of them?
Option 1: 212 × 112
Option 2: 2
Option 3: 2 × 2
Option 4: 4 × 28 × 53
Correct Answer: Option 3

LG: List down the common multiples of given numbers in order to determine their LCM.

Level of difficulty: Easy
Bloom's Level: Understanding
1. Which is smallest number divisible by both 48 and 76?
Option 1: 912
Option 2: 4
Option 3: 28
Option 4: 264
Correct Answer: Option 1

LG: List down the common multiples of given numbers in order to determine their LCM.
Level of difficulty: Hard
Bloom's Level: Analysing
2. Consider the conditions about the numbers *m* and *n*:
   Condition 1: both are 2-digits numbers
   Condition 2: one is odd and one is even
   If $m \times n = 180$, what is the smallest common multiple of *m* and *n*?
       Option 1: 60
       Option 2: 90
       Option 3: 180
       Option 4: 36
Correct Answer: Option 1

LG: Evaluate the factors of given two or more numbers in order to find the common factors and multiples.

    Level of difficulty: Hard
    Bloom's Level: Understanding
1. *p* exactly divides the numbers 42 and 70. Which of these could be a possible prime number that divides *p*?
       Option 1: 14
       Option 2: 3
       Option 3: 7
       Option 4: 5
Correct Answer: Option 3

    Level of difficulty: Easy
    Bloom's Level: Understanding
2. The numbers which exactly divide 75 and 45 are _.
       Option 1: 3, 5 and 15
       Option 2: 15 and 25
       Option 3: 3, 15 and 25
       Option 4: 9 and 15
Correct Answer: Option 1

LG: Apply the concept of HCF in order to solve related real-life problems

    Level of difficulty: Hard
    Bloom's Level: Evaluating
1. Rajan has 36 candies of type A, 45 candies of type B and 18 candies of type C. He wants to pack candies in boxes such that:
   - same type candies are packed in each box with no candies leftover
   - each box has the same number of candies
   What would be least number of boxes required by Rajan for packing?
       Option 1: 11
       Option 2: 180
       Option 3: 99
       Option 4: 9
Correct Answer: Option 1

    Level of difficulty: Medium
    Bloom's Level: Applying
2. Nisha has 28 inches long red ribbon and 36 inches long green ribbon. For a craft project, she needs both colored ribbon pieces of equal lengths. What is the greatest length she can have for each piece assuming that all ribbon is used?
       Option 1: 4 inches

Option 2: 64 inches
Option 3: 8 inches
Option 4: 252inches
Correct Answer: Option 1

LG: Apply the concept of LCM in order to solve related real-life problems

Level of difficulty: Hard
Bloom's Level: Evaluating
1. Three friends Deepak, Suman and Ravi are members of a library. Deepak visits the library every third day; Suman visits every fifth day and Ravi visits on every Sunday. If they met on 12th April, Sunday, after how many days they will meet again?
    Option 1: 7
    Option 2: 105
    Option 3: 280
    Option 4: 15
Correct Answer: Option 2

Level of difficulty: Medium
Bloom's Level: Applying
2. Jagat has a jar of different coloured marbles. He is using them to make packs of marbles such that each pack has 12 red, 15 blue and 9 green marbles. After making packs, there are no marbles left in the jar. What is the least possible number of marbles that could be in the jar at the beginning?
    Option 1: 12
    Option 2: 180
    Option 3: 360
    Option 4: 3
Correct Answer: Option 2

Suggested Teacher Resources

| I | Lesson Plan |

Objective	Students will be able to understand the difference between a factor and a multiple.
Material Required	None
Previous Knowledge	Tables
Procedure	The teacher will start the class by asking: **What is the difference between a factor and a multiple?** After student's brainstorm ideas for two minutes, Teacher will give students the opportunity to call out ideas about the difference between a factor and a multiple for one minute. As students volunteer ideas and comparisons Expected responses: • Factors are used to create numbers • Multiples are the result of numbers • Multiples can go on forever • Factors are limited • Factors can be used to simplify fractions • Multiples can be used to make denominators common • Multiples are used to make equivalent fractions

Factors		Multiples	
Characteristics	**Problem Solving**	**Characteristics**	**Problem Solving**
• Every number greater than zero has a limited number of factors. • The first factor of every number greater than zero is 1. • Factors never go beyond the number you are finding factors for.	When dealing with problems involving factors, you will normally be attempting to find a way to make even groups using two or more different items that come in different number sets	• There is no limit to the number of multiples a number can have. • The first multiple of every number greater than zero is the number you are finding multiples for. • Multiples never go below the number you are finding multiples for.	When dealing with problems involving multiples, you will normally be attempting to find out when two different events that occur at the same time will occur at the same time again.

34

	Then the teacher asks the students:
	
	1. Find all the factors of the following quantities:
	       18 56 144
	2. Provide the first 12 multiples of the following quantities:
	      8 12 20
	And share their responses with the class.

Independent Activity	In this task, they attempt to guess Juanita's secret number using clues the she provides in the task description. In order to successfully identify her number, they need to apply their knowledge of factors and multiples, as well as prime numbers. Juanita has a secret number. Read her clues and then answer the questions that follow: **Juanita says, "Clue 1" My secret number is a factor of 60."** 1. Can you tell what Juanita's secret number is? Explain your reasoning. 2. Daren said that Juanita's number must also be a factor of 120. Do you agree or disagree with Daren? Explain your reasoning. 3. Malcolm says that Juanita's number must also be a factor of 15. Do you agree or disagree with Malcolm? Explain your reasoning. 4. What is the smallest Juanita's number could be? Explain. 5. What is the largest Juanita's number could be? Explain. 6. Suppose for Juanita's second clue she says, "Clue 2: My number is prime." 7. Can the class guess her number and be certain? Explain your answer. 8. Suppose for Juanita's third clue she says, "Clue 3: 15 is a multiple of my secret number." 9. Now can you tell what her number is? Explain your reasoning. 10. Your secret number is 36. Write a series of interesting clues using factors, multiples, and other number properties needed for somebody else to identify your number.
Source	https://betterlesson.com/lesson/512238/factors-multiples

2 **Activity**

Step 1
Let's make rectangles
The teacher gives each of the children in the class a specific number of bottle tops and asks them to arrange them in all possible rectangular arrays.
The bottle tops should be arranged in rows. Single straight lines, both horizontal and vertical, are also acceptable.
Each time a rectangle is formed, the number of rows is a factor of the given number.
When it is not possible to arrange the given bottle tops in a rectangular form, shift bottle tops one by one from the end to form a new row. For example, to find all possible factors of six we follow the steps below:
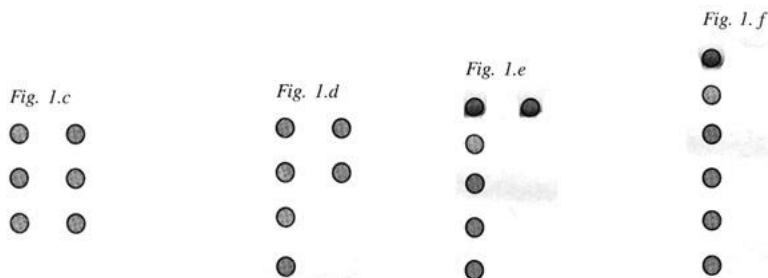
Fig. 1.a
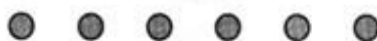
Fig. 1.a shows six bottle tops in a single row. So, 1 is a factor of 6.

Fig. 1.b

Fig.1b shows two rows with 3 tops in each row. A rectangle is formed, so 2 is a factor of 6.

35

The figure that follows has 3 rows with 2 tops in each row. Since a rectangle is formed with three rows, 3 is a factor of 6.

Fig. 1.c *Fig. 1.d* *Fig. 1.e* *Fig. 1. f*

In Fig. 1.d. a rectangle is not formed, so this should be ignored.
Figure 1.e has two bottle tops in the first row and one in each of the remaining rows. No rectangle is formed, so 5 is not a factor of 6. The next possible rectangular arrangement is a vertical line with six rows. So, 6 is a factor of 6.

Prime or not?
Teacher can also ask the children to check whether a given number is prime or not using this method. The reason is that no rectangular form other than a single horizontal or vertical line is possible for a prime number.

Step 2: The highest common factor (HCF)
The teacher would say:
let us see how to find the HCF of two given integers.
Use two sets of bottle tops, each of a different colour, for the two given numbers.
Arrange the two sets of bottle tops on either side of a demarcation line: for convenience, we may take the smaller number of bottle tops on the left and the larger on the right.
Arrange the bottle tops on the left in a vertical line.
Ask the children to justify this arrangement. The reason, as we know, is that HCF is always lesser than or equal to the greatest factor of the smaller number.
Now arrange the ones on the right in as many rows as there are on the left. If you are able to arrange these in a rectangle, then the number of rows in the arrangement is the required HCF.
If such an arrangement is not possible, change the arrangement on the left to the next possible rectangular arrangement, and then accordingly change the arrangement on the right as well.
When both the sides are in a rectangular arrangement with the same number of rows, the number of rows is the HCF.
For example, let us try to find the HCF of two numbers, 6 and 20.
In the first step, we arrange 6 bottle tops in a vertical line to the left of the demarcation line (Line of Control!).
We now arrange the 20 other bottle tops on the right. We find that we cannot arrange these in a rectangle (Fig. 2.a).
So, 6 is not the HCF of 6 and 20.

Fig. 2.a *Fig. 2.b* *Fig. 2.c*
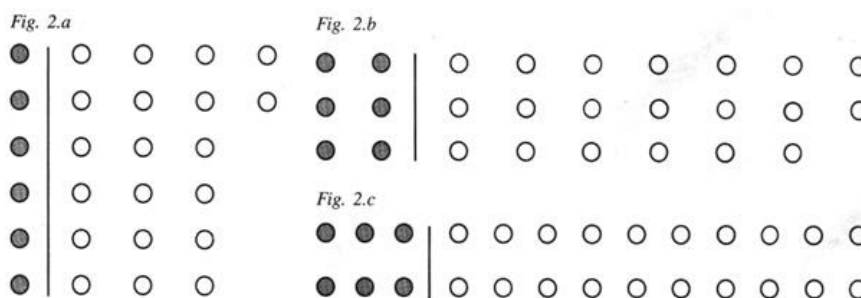
We now change the arrangement on the left to three rows of two bottle tops each.
Then we change the arrangement of the 20 bottle tops.
Again, we find that these do not form a rectangle (Fig. 2.b).
The next step is to change the arrangement on the left yet again into two rows of three bottle tops each.
Now we find that we can arrange the 20 bottle tops in two rows.
Therefore 2 is the HCF of 6 and 20 (Fig. 2.c).
This idea can be extended to teach LCM too.

4.   BASIC GEOMETRICAL IDEAS

QR Code:

N1G5R6

NCERT Learning outcome:

Content area / Concepts	Learning Objectives	Learning Outcome
About geometrical shapes	Discuss and give example(s) in order to explain the importance of a point.	
A Line Segment	Give example(s) in order to describe a line segment.	
A Line	Give example(s) in order to describe a line.	
Intersecting Lines	Examine the given lines in order to identify intersecting lines among them.	
Parallel Lines	Examine the given lines in order to identify parallel lines among them.	
Ray	Describe a ray in order to identify it from the given figures.	
	Compare the given figures in order to identify a ray, line, line segment among them.	
Curves	Give example(s) in order to demonstrate an understanding of a simple curve and a curve that is not simple.	
	Describe an open curve and a closed curve in order to distinguish between the two.	Provides examples from surround in order to describes geometrical ideas like line, line segment, open and closed figures, angle, triangle, quadrilateral, circle, etc.
Polygons	Discuss the parts of a closed curve in order to determine the position of a point with respect to it.	
	Examine the given curves in order to identify polygons and non-polygons.	
	Draw rough sketch of a polygon in order to label and describe its elements.	
Angles	Discuss the elements of an Angle: Vertex, arm, interior and exterior in order to identify it for the given angles.	
	Give example(s) in order to name an angle in the given figure.	
Triangles	Describe the elements of a triangle in order to identify it among the given figures.	
Quadrilaterals	Describe the elements of a quadrilateral in order to identify it among the given figures.	
Circles	Describe the parts of a circle in order to identify them in the given circle.	
	Draw a rough sketch of a circle in order to label and describe its elements.	
	Determine the parts of closed curves in order to identify the position of a point with respect to a polygon and a circle.	

Test items

LG: Discuss and give example(s) in order to explain the importance of a point.

    Level of difficulty: Medium

38

Bloom's Level: Understanding
1. Which of these cannot be represented by a point?
    Option 1: Tip of the needle
    Option 2: A vertex of a triangle
    Option 3: Tip of pen
    Option 4: Length of a box
Correct Answer: Option 4

Level of difficulty: Medium
Bloom's Level: Understanding
2. A point determines the_ on a map.
    Option 1: location of a place
    Option 2: distance between two places
    Option 3: direction
    Option 4: roads
Correct Answer: Option 1

LG: Give example(s) in order to describe a line segment.

Level of difficulty: Easy
Bloom's Level: Understanding
1. Which of these represents a line segment?
    Option 1: Cap of a bottle
    Option 2: A bead
    Option 3: Tip of a compass
    Option 4: A needle
Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Understanding
2. Consider the two statements about the distance between two points.
    Statement 1: It is represented by a line segment because it measures the length between the starting and end points.
    Statement 2: It is represented by a line because it measures the length between the starting and end points.
    Which of the above statement(s) is/are correct?
    Option 1: Only statement 2
    Option 2: Both statements 1 and 2
    Option 3: Only statement 1
    Option 4: Neither statement 1 nor statement
Correct Answer: Option 3

LG: Give example(s) in order to describe a line.

Level of difficulty: Easy
Bloom's Level: Understanding
Question Text:
1. Which of these can be represented by a line?
    Option 1: Window blinds
    Option 2: Roads
    Option 3: Ruler
    Option 4: Spacebar on keyboard
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Understanding
2. Electric wire is represented by a _.

Option 1: line segment because it starts and ends on the same point.
Option 2: line because it starts and ends on the same point.
Option 3: line because it can extend indefinitely in both directions.
Option 4: line segment because it has no starting and end point.
Correct Answer: Option 3

LG: Examine the given lines in order to identify intersecting lines among them.

Level of difficulty: Hard
Bloom's Level: Understanding
1. Consider the line segments shown.
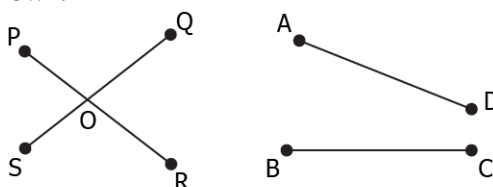
Figure 1   Figure 2

Which of these figures represent(s) intersecting line(s) and why?
Option 1: Figure 1; because lines have no point in common
Option 2: Figure 1; because lines have point O in common
Option 3: Figure 2; because lines have point D in common
Option 4: Figure 2; because lines have no point in common
Correct Answer: Option 2

Level of difficulty: Medium
Bloom's Level: Understanding
2. Which pair of lines in the following figure are not intersecting with each other in the figure shown?
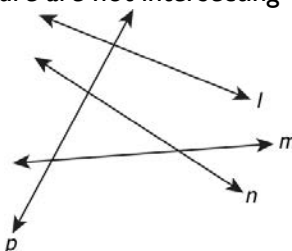
Option 1: *m* and *n*
Option 2: *m* and *p*
Option 3: *l* and *p*
Option 4: *l* and *n*
Correct Answer: Option 4

LG: Examine the given lines in order to identify parallel lines among them.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Which of these shows parallel lines?
Option 1:
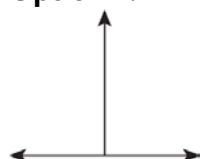
Option 2:
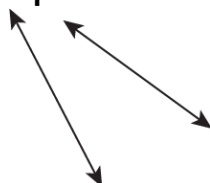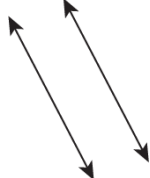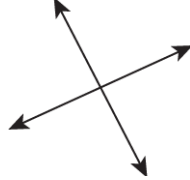
40

Option 3:

Option 4:

Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Understanding

2. A student drew a pair of lines as shown.
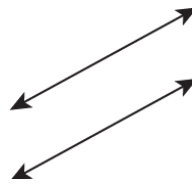
These are _.

        Option 1: intersecting lines because they will never intersect each other
        Option 2: parallel lines because they will never intersect each other
        Option 3: intersecting lines because they intersect each other
        Option 4: parallel lines because they intersect each other
Correct Answer: Option 2

LG: Describe a ray in order to identify it from the given figures.

Level of difficulty: Easy
Bloom's Level: Understanding

1. Which of these represents AB as a ray?
        Option 1:
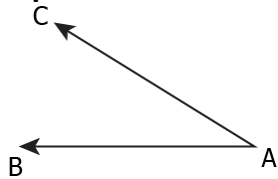
        Option 2:
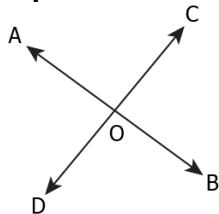
        Option 3:
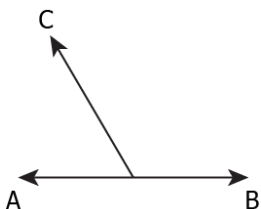
        Option 4:

Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Understanding
2. Consider the figure shown.

Which of these is true about the given figure and why?

Option 1: $\overline{BD}$ represents a line segment because it has only one end point.

Option 2: $\overleftrightarrow{AC}$ represents a line because it has two end points.

Option 3: $\overrightarrow{BC}$ represents a ray because it has only one endpoint.

Option 4: $\overleftrightarrow{AD}$ represents a line because it has two end points.

Correct Answer: Option 3

LG: Compare the given figures in order to identify a ray, line, line segment among them.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Observe the figure below.
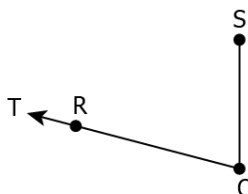
Which of the following is NOT true about the given figure?

Option 1: OT denotes a ray.
Option 2: TO denotes a ray.
Option 3: OS denotes a line segment.
Option 4: SO denotes a line segment.

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Understanding
2. Which statement(s) is/are correct about the figure shown below?
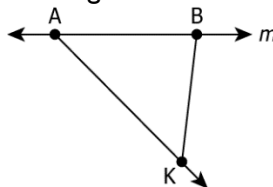
Statement 1: AB and *m* represents the same line.
Statement 2: Both AK and BK are rays.

Option 1: Only statement 1
Option 2: Only statement 2
Option 3: Both statements 1 & 2
Option 4: Neither statement 1 nor statement 2
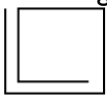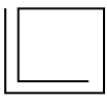
Correct Answer: Option 1

LG: Give example(s) in order to demonstrate an understanding of a simple curve and a curve that is not simple.

Level of difficulty: Medium

42

Bloom's Level: Understanding

1. In which of the following options, both figures are simple curves?

Option 1: and

Option 2: and

Option 3: and

Option 4: and

Correct Answer: Option 1

Level of difficulty: Medium
Bloom's Level: Understanding

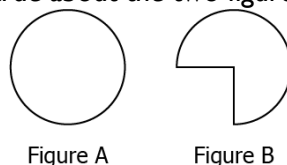2. Which of the following statements is true about the two figures shown below?

Figure A   Figure B

Option 1: Both figures A and B are simple curves because neither crosses itself.
Option 2: Both figures A and B are simple curves because their end points meet.
Option 3: Only figure A is a simple curve because it is not made up of any line segment.
Option 4: Only figure B is a simple curve because it is made up of at least one line segment.

Correct Answer: Option 1

LG: Describe an open curve and a closed curve in order to distinguish between the two.

Level of difficulty: Medium
Bloom's Level: Understanding

1. Consider the figure shown.
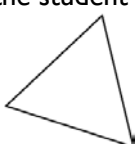
Which option correctly describes of the given figure?
   Option 1: It is a simple open curve.
   Option 2: It is a simple closed curve.
   Option 3: It is not a simple curve.
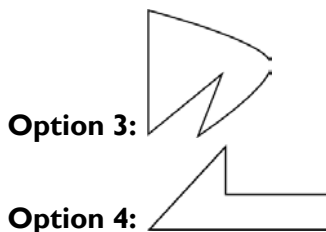   **Option 4:** It is not a curve.

Correct Answer: Option 2

Level of difficulty: Medium
Bloom's Level: Understanding

2. A student drew a closed curve that is made up of at least three line segments. Which of these can't be the curve that the student drew?
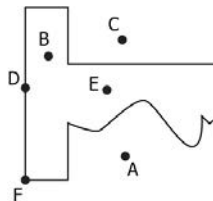
Option 1:

Option 2:

43

Option 3:

Option 4:

Correct Answer: Option 2

LG: Discuss the parts of a closed curve in order to determine the position of a point with respect to it.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Which points lie inside the curve shown below?

Option 1: Points A and C
Option 2: Points B and E
Option 3: Points B, D, E and F
Option 4: Points A, C, D and F
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Applying
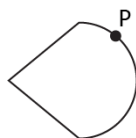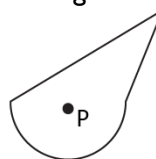2. In which of the following figures, the point P lies in the region of the curve?

Figure 1   Figure 2

Option 1: Only in figure 1
Option 2: Only in figure 2
Option 3: In both figures 1 and 2
Option 4: Neither in figure 1 nor in figure 2
Correct Answer: Option 3

LG: Examine the given curves in order to identify polygons and non-polygons.

Level of difficulty: Medium
Bloom's Level: Understanding
1. What is the minimum number of sides a polygon can have?
Option 1: 1
Option 2: 2
Option 3: 3
Option 4: 4
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Applying
2. Which of the following is true about the figure shown below?

44

Figure A   Figure B

Option 1: Only figure A is a polygon.
Option 2: Only figure B is a polygon.
Option 3: Both figures A and B are polygons.
Option 4: Neither figure A nor figure B is a polygon.
Correct Answer: Option 4

LG: Draw rough sketch of a polygon in order to label and describe its elements.

Level of difficulty: Medium
Bloom's Level: Understanding
1. A student drew a polygon PQRST with 5 sides. Which option shows the sides adjacent to the side ST?
    Option 1: PT and RS
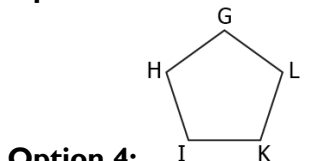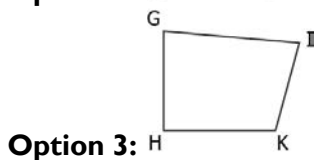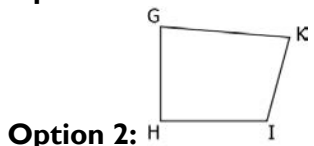   **Option 2:** PT and PQ
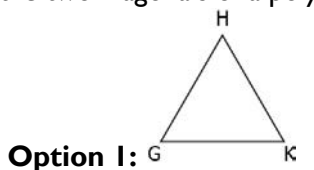   **Option 3:** RS and QR
    Option 4: PQ and QR
Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Applying
2. Of the two diagonals of a polygon, one is GK. Which of these can be the polygon?

Option 1:

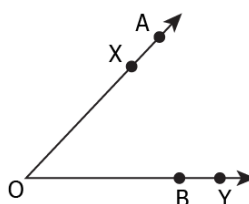**Option 2:**

Option 3:

Option 4:

Correct Answer: Option 3

LG: Discuss the elements of an Angle: Vertex, arm, interior and exterior in order to identify it for the given angles.

Level of difficulty: Medium
Bloom's Level: Understanding
1. What is the vertex in the figure shown?

45

Option 1: Point O
Option 2: Point A
Option 3: Point X
Option 4: Both points A and Y
Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Understanding

2. An ∠XYZ is made such that a point D is on the angle but not at vertex. Which of these can also be the name of the ∠XYZ?
    Option 1: ∠DXY
    Option 2: ∠DXZ
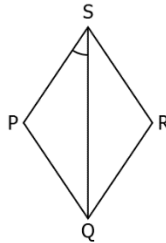   **Option 3:** ∠XYD
    Option 4: ∠XDZ
Correct Answer: Option 3

LG: Give example(s) in order to name an angle in the given figure.

Level of difficulty: Medium
Bloom's Level: Understanding

1. Observe the figure below:

What is the name of the angle marked in the figure?
    Option 1: ∠S
    Option 2: ∠PSR
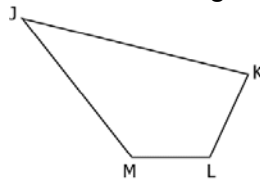   **Option 3:** ∠PSQ
    Option 4: ∠QSR
Correct answer: 3

Level of difficulty: Hard
Bloom's Level: Analysing
Question Text:

2. Which of the following statements is correct about the figure below?

    Option 1: An acute angle formed with J as vertex is ∠JKM.
    Option 2: An obtuse angle formed with M as vertex is ∠JML.
    Option 3: An obtuse angle formed with L as vertex is ∠LMK.
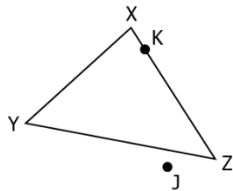   **Option 4:** An acute angle formed with K as vertex is ∠KLM.
Correct answer: 2

LG: Describe the elements of a triangle in order to identify it among the given figures.

Level of difficulty: Medium
Bloom's Level: Applying

1. In a triangle XYZ, point J is in the exterior and point K is in the interior. Which of these shows the triangle XYZ?

46
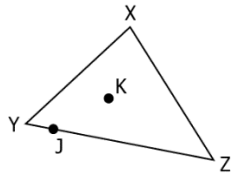
Option 1:
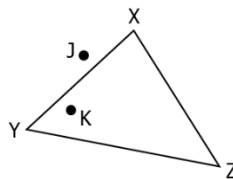
Option 2:

Option 3:

Option 4:

Correct answer: 4

Level of difficulty: Hard
Bloom's Level: Applying
2. Lalit constructs a figure such that it consists of two triangles.
    *   Point P is on both the triangles
    *   There is a total of 8 angles.
        Which of these figures could Lalit have constructed?

Option 1:
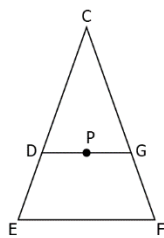
Option 2:
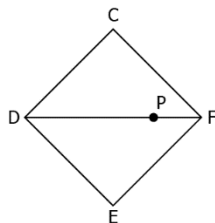
Option 3:
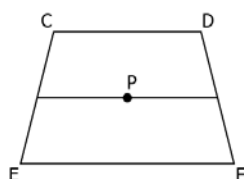
Option 4:

Correct answer: 3

47

LG: Describe the elements of a quadrilateral in order to identify it among the given figures.

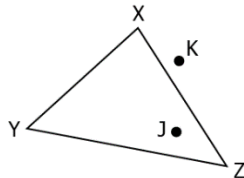**Level of difficulty:** Medium
Bloom's Level: Understanding

1. In a quadrilateral, Ritika draws its diagonals that intersect at point O. Which of these could she have drawn?
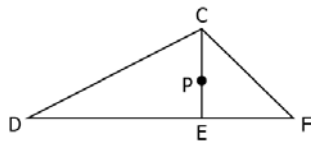
Option 1:

Option 2:
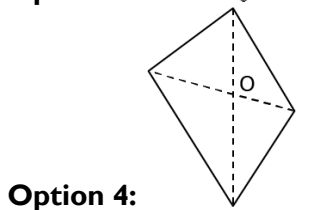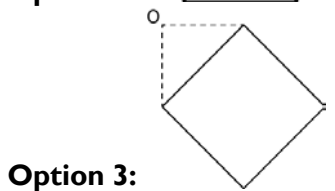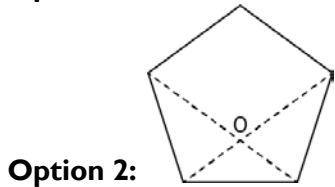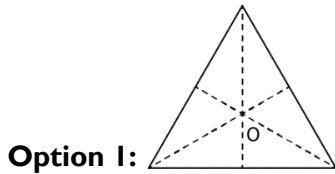
Option 3:

Option 4:

Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Analysing

2. A student draws a quadrilateral with the following description:
   - Points A and B are marked on the pair of opposite sides ET and KI respectively.
   - ∠T and ∠I are adjacent angles.
   - The intersection of line AB and diagonals intersect at point O.
     Which of the following quadrilaterals did the student draw?

Option 1:

Option 2:

48
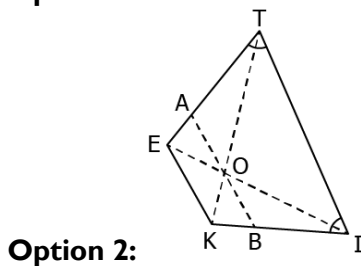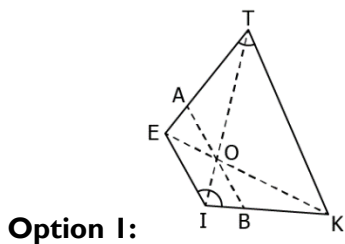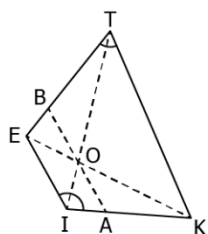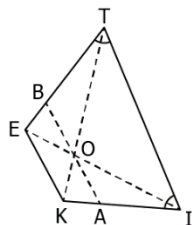
Option 3:

Option 4:

Correct answer: 2

LG: Describe the parts of a circle in order to identify them in the given circle.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Observe the figure below:
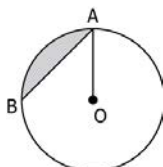
Which of these statements is correct?
 Option 1: Chord AB and the shaded region represents the segment.
 Option 2: OA is the diameter of the circle.
 Option 3: The circle is centred at point A.
 Option 4: AB is the radius of the circle.
Correct answer: 1

Level of difficulty: Hard
Bloom's Level: Analysing
2. Observe a circle with centre O.
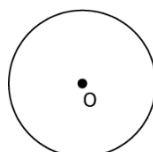
Which of the following statements is NOT correct for the circle shown?
 Option 1: Half part of the circle represents both the sector and segment of the circle.
 Option 2: The distance from the centre of a circle to its boundary is always equal.
 Option 3: The diameter of the circle is always a chord of the circle.
 Option 4: A circle can have only two diameters.
Correct answer: 4

LG: Draw a rough sketch of a circle in order to label and describe its elements.

Level of difficulty: Medium
Bloom's Level: Applying
1. Which of these is a circle showing a sector and a chord AG?
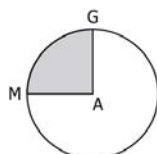
Option 1:
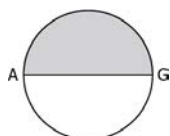
49
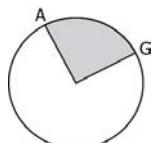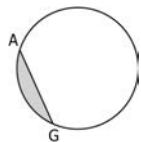
Option 2:

Option 3:

Option 4:
Correct answer: 2

Level of difficulty: Hard
Bloom's Level: Applying
2. A student draws a figure with the end points of the diameter as part of the boundary. In the figure, the diameter and the chord are the same and the area inside the boundary represents both the sector and segment. Which of these figures could the student have drawn?
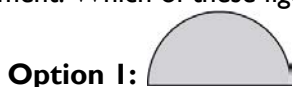
Option 1:
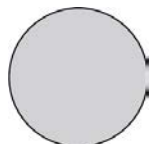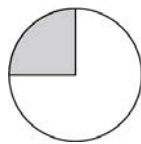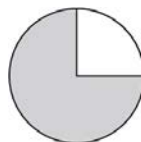
Option 2:

Option 3:

Option 4:
Correct answer: 1

LG: Determine the parts of closed curves in order to identify the position of a point with respect to a polygon and a circle.

Level of difficulty: Medium
Bloom's Level: Applying
1. Consider a circle shown.
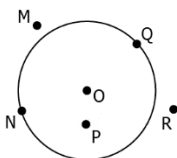
Which of these points lie inside the circle?
    Option 1: Points M and R
    Option 2: Points N and Q
   **Option 3:** Points O and P
    Option 4: Points N, P and Q
Correct answer: 3

Level of difficulty: Hard
Bloom's Level: Applying
2. Consider a figure shown.
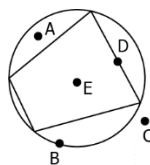
Which of these statements is true?

Option 1: Points A, D and E lie in the interior of the polygon.
Option 2: Points A, B and C lie in the exterior of the polygon.
Option 3: Points A, B, D and E lie in the interior of the circle.
Option 4: Points B and C lie in the exterior of the circle.
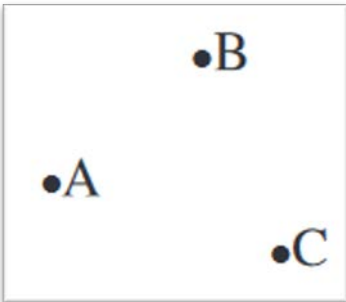
Correct answer: 2

Suggested Teacher Resources

I   **Lesson Plan**

Objective	1. Discuss and give example(s) in order to explain the importance of a point. 2. Give example(s) in order to describe a line.
Material Required	Worksheet, multi coloured chalks, pencil
Previous Knowledge	none
Procedure	Teacher will ask students to work with their peers. Ask students to take a pencil and mark a dot on the paper. The sharper the tip, thinner will be the dot. Ask what else have students seen that look like a dot? Take few answers. Teacher will define Points: A point is an exact location in space. It determines a location. For example, draw a rectangle which represents the classroom. Ask the students where would the teacher and few other students will be standing. Mark those locations within the rectangle. Given names to those points so that students can differentiate each other as follows. Here B is the teacher, A is student 1 and c is student 2. Ask students to make notes in the following table. Points

Definition: A point is an exact location in space. It determines a location.	 Diagram: Point A and Point B
Examples: A star, Coordinates, tiny bug/ant on the wall	Non-Examples: × (cross), ⬤ (filled circle)
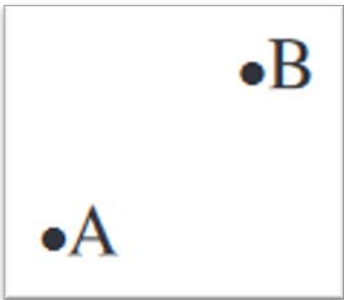
Ask Students to take a paper and fold it once. Ask students to draw over the crease that is visible when the fold was made.

Ask what else have students seen that look like that drawing?

Take few answers.

Teacher will represent line as a collection of points by joining several points in a straight path.

Teacher will define Line: A line is a straight path of points that goes on and on in two directions.

For example, imagine a rubber band that can stretch forever. 2 students are pulling it from either side. The more you pull the longer it will get and it will be straight.

Its represented as follows:

Ask students to make notes in the following table:

Line	
Definition: A line is a straight path of points that goes on and on in two directions.	Diagram:
Examples:	Non-Examples:

Discuss the following definitions with the kids

Parallel Lines: Lines that never intersect no matter how much we extend them.

Intersecting Lines: pass through the same point

Perpendicular lines: Lines that form square corners.

Divide students into groups of 3 and ask them to complete the following sheet.

Group Activity Sheet

Points, Lines, and Planes

Directions: With a partner, draw examples of a point, plane, line, parallel line, intersecting line, and perpendicular line.

Point	Plane	Line
Parallel lines	Intersecting lines	Perpendicular lines

Identify the following:

1.

2.
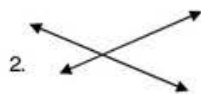
3. What term best describes the following:

Train tracks _____

Two roads that meet and form corners _____

Stripes in a flag _____

Guiding Questions:
1. What are the characteristics of this figure?
2. Does it have an end point? Does it have arrows on both ends?
3. Do they intersect? Do they form corners when they meet?

Example of student work

| Source | https://betterlesson.com/lesson/546614/points-lines-planes |
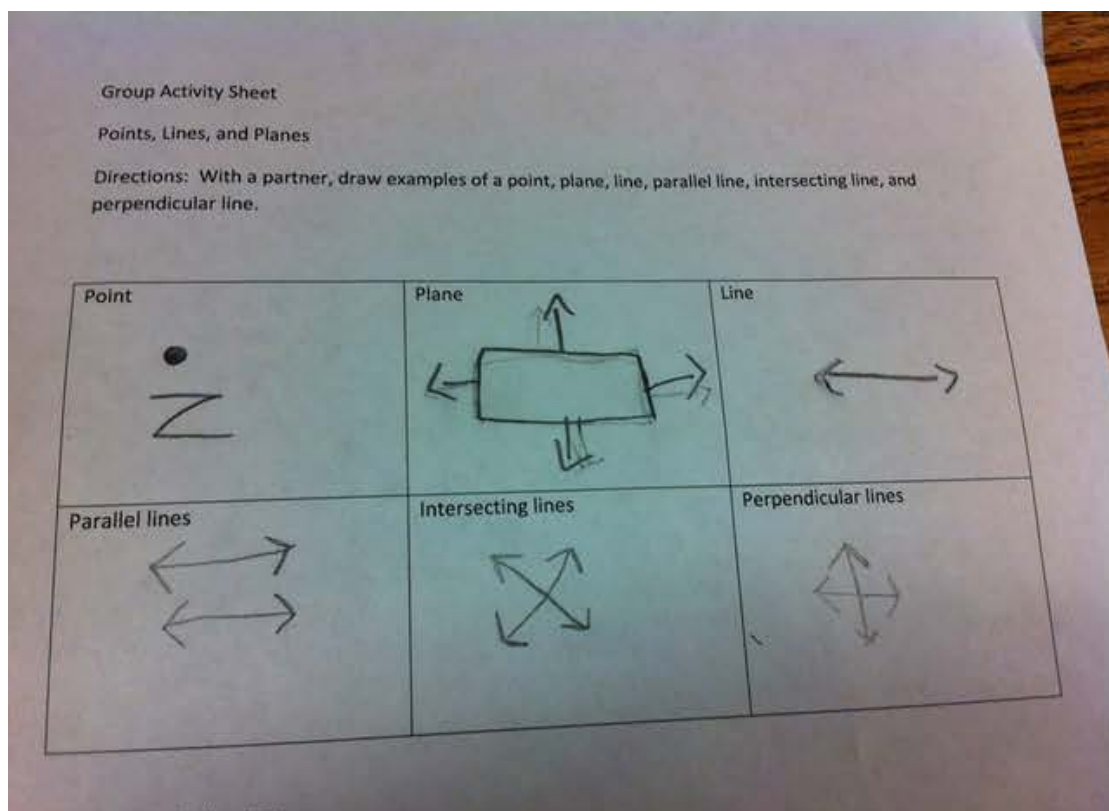
2   **Activity**

Objective: Students will be able to recognize and illustrate geometric properties in real life, including recognizing shapes have volume or are flat plane figures

Big Idea: You only need to open your eyes to discover geometry is everywhere!

Materials required: Worksheet,

Setup: This activity can be done in or outside of the classroom. To yield better connections with the content outside is preferable. Divide students into groups of 4 or 5.

Steps:

1. Teacher will give students the Geometry scavenger hunt Sheet. Students will read the intro mentioned in it and try to draw as many objects they can remember from memory in the corresponding shape.

Q) For any shape let's say Square ask students how do they know their answer is a square?

If they say window is square then ask why do they think window is a square?

Ask them to convince their partners that their answer is correct by explaining their thinking.

Geometry Scavenger Hunt

Geometry is the study of the points, lines, shapes, and figures in the world around us. You only need to open your eyes to discover geometry everywhere. As geometry detectives you must find objects with the following geometric properties. Write the name of the object and make a sketch. Good Luck!
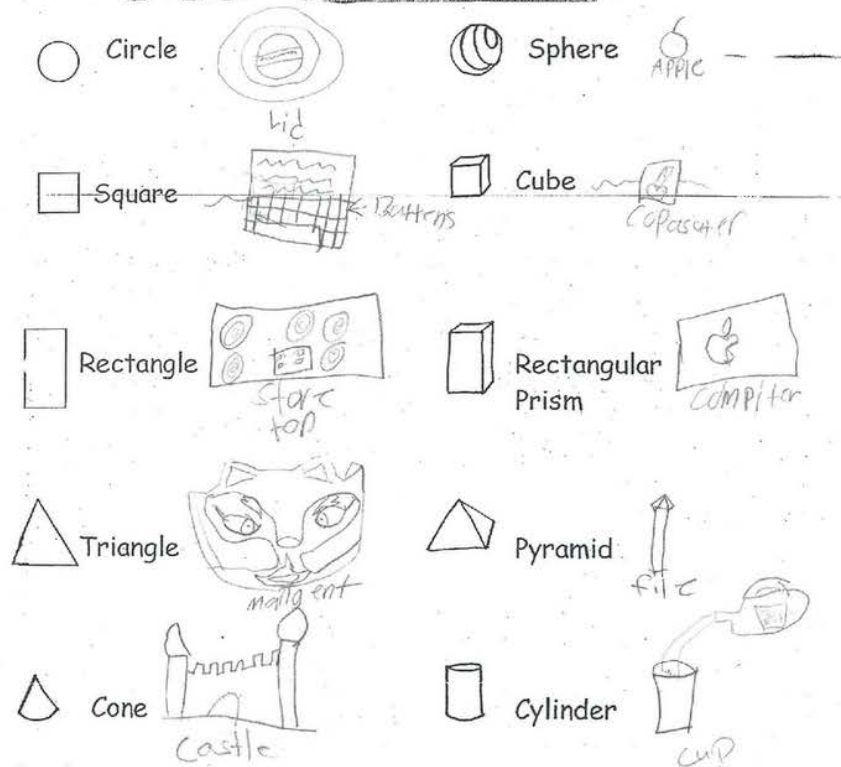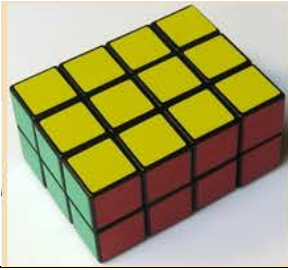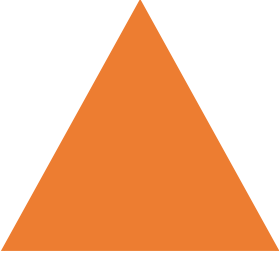
Teacher will discuss few answers.

2. Students will divide into groups of 4-5 and draw following table. Teacher will explain the rules of the scavenger hunt.

- In 15 min students have to find objects within the ground/class which corresponds to the respective space.
- students have to draw the said object and its name and the reason for their observation.
- Students will note down all the observations about the object they are finding to make distinction between 2D and 3D figures.

2D – 3D Scavenger Hunt	
2D Figures	**3D Figures**
Square	**Cube**
Rectangle	**Rectangular Prism**

55

Triangle	**Pyramid**
Any other Polygon	**Cylinder**
Q) Difference between 2D and 3D objects	

3. Once time is over teacher will take few large group answers and discuss them with the class.

Reference: https://betterlesson.com/lesson/resource/2596099/shape-scavenger-hunt-student-work

56

5. UNDERSTANDING ELEMENTARY SHAPES

QR Code:

G9X7N4

NCERT Learning outcome:

Content area / Concepts	Sub-concept	Learning Objectives	Learning Outcome
Measuring Line Segments	Develop tools to compare shapes	Measure the given line segments in order to compare them.	In order to demonstrate an understanding of angles: a) Identifies examples of angles in the surrounding b) Classifies angles according to their measure c) Estimates the measure of angles using 45°, 90°, and 180° as reference angles
Angles– 'Right' and 'Straight'	Rotation and Revolution	Examine the rotation of angles in order to classify angles based on the amount of rotation.	
Angles– 'Acute', 'Obtuse' and 'Reflex'		Compare the given angles in order to classify them as a right angle, straight angle or a complete angle.	
		Compare the given angles in order to classify them as an acute angle, obtuse angle or a reflex angle according to their measure.	
		Identify the different types of angles in our surroundings in order to demonstrate an understanding of angles.	
	Measuring angles	Use a protractor in order to measure the given angle and classify its type.	
		Use a protractor in order to draw an angle of the given measure.	
Perpendicular Lines	Perpendicular around us	Describe perpendicular and a perpendicular bisector in order to identify the same in the given figure.	
		Give example(s) of perpendicular lines in order to demonstrate an understanding of the same.	
Classification of Triangles	Naming triangles based on sides and angles	Observe the measure of sides of a triangle in order to classify it into different types (scalene, isosceles, equilateral) based on its sides.	Classifies triangles with different measurements in order to show different types of triangle based on their angles and sides. For example- scalene, isosceles or equilateral on the basis of sides, etc.
		Observe the measure of angles of a triangle in order to classify it into different types (acute, obtuse, right) based on its angles.	
Quadrilaterals	Comparing rectangle, square, rhombus, parallelogram and trapezium	Examine the given figures in order to classify type quadrilaterals based on their properties.	Classifies quadrilaterals with different measurements in order to show different types of quadrilaterals based on their sides and
Polygons	Illustration of polygons	Examine the given figures in order to identify polygons.	

		Describe polygons in order to classify them based on their number of sides and angles. (Up to 8 sides)	internal angles. For example – square, rectangle, rhombus, trapezium etc.
		Give example(s) in order to distinguish between regular and irregular polygons.	
Three Dimensional Shapes	Solid shapes	Describe solid shapes in order to distinguish them from flat shapes.	Classifies commonly found 3-d objects from the surroundings in order to find sphere, cube, cuboid, cylinder, cone etc.
		Examine the given solid shapes in order to identify their type (Cubes, Cuboids, cylinder, sphere, cone, prism, pyramid)	
		Describe the faces, edges and vertices of a 3D shape in order to discuss the various aspects of the given 3D object	Labels different parts of a 3-d objects in order to explain edges, vertices and faces of the given 3-d object

Test items

LG: Measure the given line segments in order to compare them.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Consider the figures below.
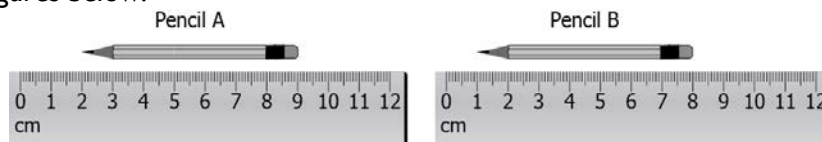
Which option correctly represents the lengths of two pencils, A and B?
> **Option 1:** Pencil A = Pencil B = 7 cm
> **Option 2:** Pencil A = Pencil B = 8 cm
> **Option 3:** Pencil A = 9 cm, Pencil B = 8 cm
> **Option 4:** Pencil A = 11 cm, Pencil B = 9 cm

Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Analysing
2. Consider the image below.
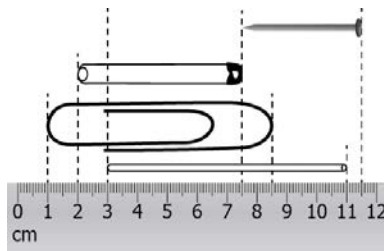
Which of these options correctly compares the lengths of objects?
> **Option 1:** Nail > Straw > Paper Clip >Safety pin
> **Option 2:** Paper clip < Safety pin < Straw < Nail
> **Option 3:** Nail > Safety pin > Paper clip > Straw
> **Option 4:** Nail < Safety pin < Paper clip < Straw

Correct Answer: Option 4

LG: Examine the rotation of angles in order to classify angles based on the amount of rotation.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Which of these will result a straight angle?
> **Option 1:** Turn from East to North by a right angle
> **Option 2:** Turn from South to East by three right angles
> **Option 3:** Turn from North to South by two right angles
> **Option 4:** Turn from West to South by three right angles

Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing
2. Consider the statements.
Statement 1: Taking a turn from South to North by two right angles will form a straight angle.
Statement 2: Taking a turn from West to South by three right angles will form a reflex angle.
Which of these statement(s) is/are correct?
> **Option 1:** Only Statement 1
> **Option 2:** Only Statement 2

Option 3: Both Statement 1 and Statement 2
Option 4: Neither Statement 1 nor Statement 2
Correct Answer: Option 3

LG: Compare the given angles in order to classify them as a right angle, straight angle or a complete angle.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Consider the angles shown.
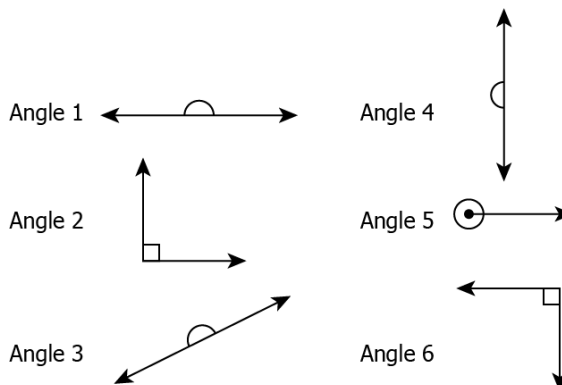
Which option correctly classifies the given angles?
    Option 1: There are 3 right angles, 2 straight angles and 1 complete angle
    Option 2: There are 2 right angles, 3 straight angles and 1 complete angle
    Option 3: There are 3 right angles, 1 straight angle and 2 complete angles
    Option 4: There are 2 right angles, 1 straight angle and 2 complete angles
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing
2. Consider the angles shown.

Angle P   Angle Q   Angle R   Angle S   Angle T
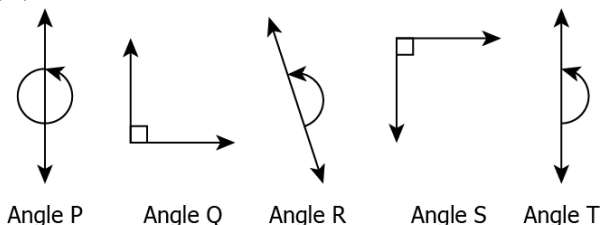
Which table correctly classifies the angles?

Option 1:

Angle P	**Complete angle**; As the rotating ray coincides with its initial position after making a complete rotation.
Angle Q	**Right angle**; As the initial position of the ray is horizontal and it rotates to occupy vertical position.
Angle R	**Straight angle**; As the initial and final positions of the rotation ray are opposite to each other on the same line.
Angle S	**Right angle**; As the initial position of the ray is horizontal and it rotates to occupy vertical position.
Angle T	**Straight angle**; As the initial and final positions of the rotation ray are opposite to each other on the same line.

Option 2:

Angle P	**Straight angle**; As the angle is formed on a straight line.
Angle Q	**Right angle**; As the initial position of the ray is horizontal and it rotates to occupy vertical position.
Angle R	**Complete angle**; As the initial and final positions of the rotation ray are opposite to each other on the same line.
Angle S	**Right angle**; As the initial position of the ray is horizontal and it rotates to occupy vertical position.
Angle T	**Straight angle**; As the angle is formed on a straight line.

Option 3:

Angle P	**Straight angle**; As the angle is formed on a straight line.
Angle Q	**Complete angle**; As the initial and final positions of the rotation ray are opposite to each other on the same line.
Angle R	**Right angle**; As the angle is formed on a slant line.
Angle S	**Complete angle**; As the initial and final positions of the rotation ray are opposite to each other on the same line.
Angle T	**Straight angle**; As the angle is formed on a straight line.

Option 4:

Angle P	**Right angle**; As the angle is formed on a straight line.
Angle Q	**Straight angle**; As the initial position of the ray is horizontal and it rotates to occupy vertical position.
Angle R	**Complete angle**; As the angle is formed on a slant line.
Angle S	**Straight angle**; As the initial position of the ray is horizontal and it rotates to occupy vertical position.
Angle T	**Right angle**; As the angle is formed on a straight line.

Correct Answer: Option 1

LG: Compare the given angles in order to classify them as an acute angle, obtuse angle or a reflex angle according to their measure.

Level of difficulty: Medium
Bloom's Level: Understanding

1. Consider the image below.
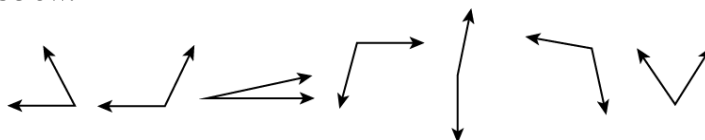
Classify the angles as acute and obtuse angles.

Option 1:
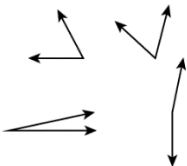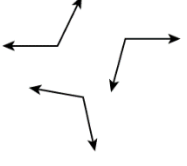
Acute Angles	Obtuse Angles

Option 2:

Acute Angles	Obtuse Angles

Option 3:

Acute Angles	Obtuse Angles

Acute Angles	Obtuse Angles

Option 4:

Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing

2. The figure shows 8 rays having a common vertex X.
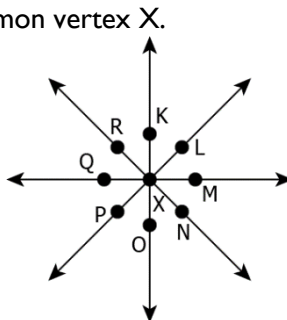
Which options correctly shows the number of acute, obtuse and reflex angles formed by different rays?

Option 1: 8 acute angles; As each pair of those rays that has one ray in between them forms an acute angle.

8 obtuse angles; As each pair of those rays that has three rays in between them forms an obtuse angle.

24 reflex angles; As each pair of those rays that has at least four rays in between them forms a reflex angle.

Option 2: 8 acute angles; As each pair of adjacent rays forms an acute angle.

8 obtuse angles; As each pair of those rays that has two rays in between them forms an obtuse angle.

24 reflex angles; As each pair of those rays that has at least four rays in between them forms a reflex angle.

Option 3: 8 acute angles; As each pair of adjacent rays forms an acute angle.

8 obtuse angles; As each pair of those rays that has two rays in between them forms an obtuse angle.

8 reflex angles; As each pair of those rays that has exactly four rays in between them forms a reflex angle.

Option 4: 8 acute angles; As each pair of those rays that has one ray in between them forms an acute angle.

8 obtuse angles; As each pair of those rays that has three rays in between them forms an obtuse angle.

24 reflex angles; As each pair of those rays that has exactly four rays in between them forms a reflex angle.

Correct Answer: Option 2

LG: Identify the different types of angles in our surroundings in order to demonstrate an understanding of angles.

Level of difficulty: Medium
Bloom's Level: Understanding

1. Consider the angles marked in the figures below.
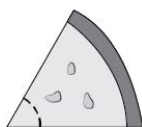
Angle A   Angle B   Angle C   Angle D

Which option correctly classifies the angles marked?

62

Option 1:

Angle A	Obtuse angle
Angle B	Obtuse angle
Angle C	Acute angle
Angle D	Right angle

Option 2:

Angle A	Acute angle
Angle B	Acute angle
Angle C	Obtuse angle
Angle D	Right angle

Option 3:

Angle A	Right angle
Angle B	Right angle
Angle C	Obtuse angle
Angle D	Acute angle

Option 4:

Angle A	Right angle
Angle B	Right angle
Angle C	Acute angle
Angle D	Obtuse angle

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing

2. A ladder is placed against a wall as shown below.
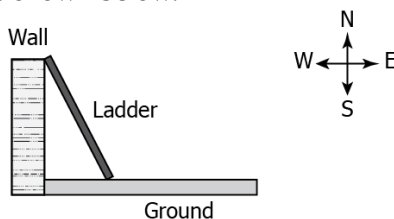
If the feet of the ladder are pulled towards east such that they remain on the ground only, which statement best describes the effect on inside angle between the wall and the ladder?

Option 1: The inside angle between the wall and the ladder will still be an acute angle.
Option 2: The inside angle between the wall and the ladder will still be an obtuse angle.
Option 3: The inside angle between the wall and the ladder will change from obtuse to a right angle.
Option 4: The inside angle between the wall and the ladder will change from acute to an obtuse angle.

Correct Answer: Option 1

LG: Use a protractor in order to measure the given angle and classify its type.

Level of difficulty: Medium
Bloom's Level: Understanding

1. Aniket has to measure and classify ∠COD shown below.
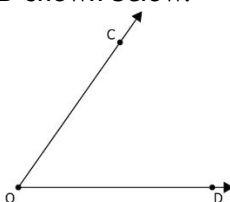
He places the protractor to measure the angle as shown.

63
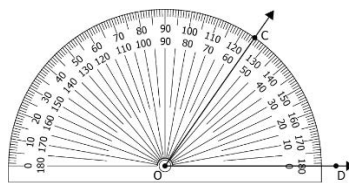
Which option correctly represents the measurement and type of ∠COD?

Option 1: ∠COD = 125°; Obtuse angle
Option 2: ∠COD = 125°; Acute angle
Option 3: ∠COD = 55°; Obtuse angle
Option 4: ∠COD = 55°; Acute angle

Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Analysing

2. A teacher asks his students to measure ∠BAC, ∠BAD and ∠BAE also classify their types.
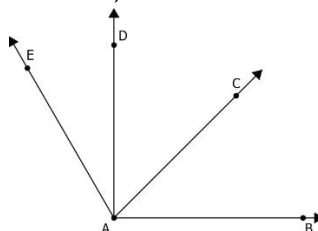
One of the students places the protractor as shown below.
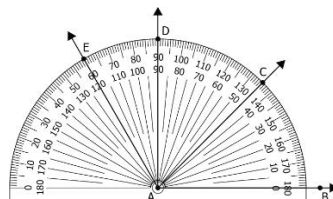
Based on the measurements, the student writes the answer as

∠BAC = 45°; Obtuse angle
∠BAD = 90°; Right angle
and ∠BAE = 120°; Acute angle. Which is true about the student's answer?

Option 1: The student measures the angles correctly as the mid-point of the protractor lies at the common initial point (vertex), A, and also classifies the angles correctly as obtuse angle < 90°, right angle = 90° and 90°< acute angle < 180°.

Option 2: The student measures the angles correctly as the mid-point of the protractor lies at the common initial point (vertex), A, but classifies the angles incorrectly as acute angle < 90°, and 90°< obtuse angle < 180°.

Option 3: The student measures the angles incorrectly as the mid-point of the protractor must lie at B, but the classification would still be the same with the correct angle's measures.

Option 4: The student measures the angles incorrectly as the mid-point of the protractor must lie at B and the classification will change for the correct angle's measures.

Correct Answer: Option 2

LG: Use a protractor in order to draw an angle of the given measure.

Level of difficulty: Medium
Bloom's Level: Understanding

1. Jignesh is drawing an angle of measure 80°. His part of work is shown below.

64
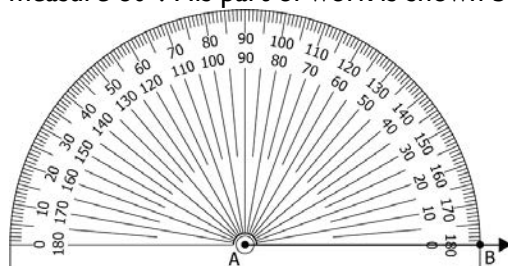
Which of the following shows the complete drawing?

Option 1:
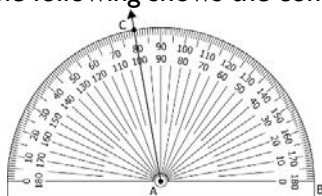
Option 2:
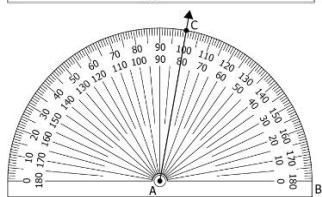
Option 3:
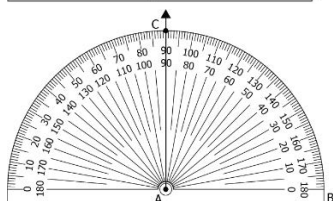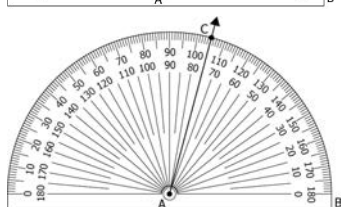
Option 4:

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing

2. A teacher asks his students if it is possible to draw an angle PQR of measure 60° given the locations of points P and Q as shown.
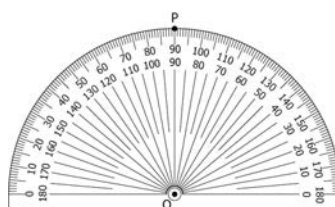
Which option shows the correct response to the teacher's question?

Option 1: Yes, there is one possibility to draw the required angle.
Option 2: Yes, there are two possibilities to draw the required angle.
Option 3: No, but relocating the point P to a different location can lead one possibility to draw the required angle.
Option 4: No, but relocating the point P to a different location can lead two possibilities to draw the required angle.

Correct Answer: Option 2

LG: Describe perpendicular and a perpendicular bisector in order to identify the same in the given figure.

Level of difficulty: Medium
Bloom's Level: Understanding

1. Consider the image below.
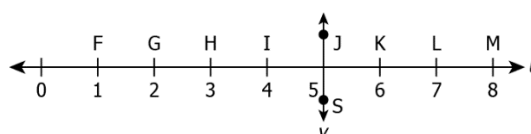
If line *u* is perpendicular to line *v*, which statement is correct?

Option 1: Line *u* is perpendicular to $\overline{JS}$; $\overline{JS}$ bisects $\overline{HL}$.
Option 2: Line *u* is perpendicular to $\overline{JS}$; $\overline{JS}$ bisects $\overline{FM}$.

65

Option 3: Line *v* is perpendicular to $\overline{FM}$; $\overline{JS}$ bisects $\overline{HK}$.
Option 4: Line *v* is perpendicular to $\overline{FM}$; $\overline{JS}$ bisects $\overline{FK}$.
Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Analysing
2. Anish draws a figure as shown.
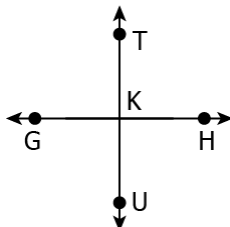
He says that $\overline{UT}$ is the perpendicular bisector of $\overline{GH}$.
Which condition is sufficient to justify his claim?
Condition A: $\overline{HK} \perp \overline{UT}$
Condition B: $\overline{GH} = 2\overline{GK}$
    Option 1: Both conditions together are sufficient, but neither condition alone is sufficient
    Option 2: Condition 2 alone is sufficient, but condition 1 alone is not sufficient
    Option 3: Condition 1 alone is sufficient, but condition 2 alone is not sufficient
    Option 4: Conditions 1 and 2 together are not sufficient
Correct Answer: Option 1

LG: Give example(s) of perpendicular lines in order to demonstrate an understanding of the same.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Consider the alphabets below.

How many alphabets have at least one perpendicular line?
    Option 1: One
    Option 2: Two
    Option 3: Three
    Option 4: Four
Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Understanding
2. Some books are placed on a wooden shelf as shown.
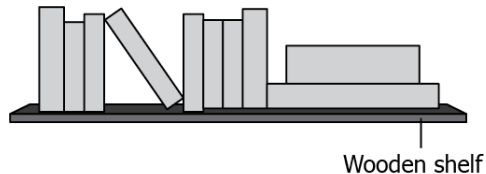
Wooden shelf

How many books are perpendicular to the wooden shelf?
    Option 1: 1
    Option 2: 2
    Option 3: 7
    Option 4: 9
Correct Answer: Option 3

LG: Observe the measure of sides of a triangle in order to classify it into different types (scalene, isosceles, equilateral) based on its sides.

Level of difficulty: Medium

66

Bloom's Level: Understanding

1. Three triangles, Triangle 1, Triangle 2 and Triangle 3, have their sides marked as AB, BC and AC. Which table correctly classifies the triangles?

Option 1:

Triangle	Classification	Justification
1	Triangle ABC is an isosceles triangle.	$AB = BC \neq AC$
2	Triangle ABC is scalene triangle.	$AB \neq BC \neq AC$
3	Triangle ABC is an equilateral triangle.	$AB = BC = AC$

Option 2:

Triangle	Classification	Justification
1	Triangle ABC is an isosceles triangle.	$AB \neq BC \neq AC$
2	Triangle ABC is scalene triangle.	$AB = BC \neq AC$
3	Triangle ABC is an equilateral triangle.	$AB = BC = AC$

Option 3:

Triangle	Classification	Justification
1	Triangle ABC is an isosceles triangle.	$AB = BC \neq AC$
2	Triangle ABC is scalene triangle.	$AB = BC = AC$
3	Triangle ABC is an equilateral triangle.	$AB \neq BC \neq AC$

Option 4:

Triangle	Classification	Justification
1	Triangle ABC is an isosceles triangle.	$AB = BC = AC$
2	Triangle ABC is scalene triangle.	$AB \neq BC \neq AC$
3	Triangle ABC is an equilateral triangle.	$AB = BC \neq AC$

Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Analysing

2. Consider the table.

Type of Triangle	Length of First Side	Length of Second Side	Length of Third Side
Scalene	5 cm	?	?
?	7 cm	8 cm	7 cm
Isosceles	9 cm	?	?
?	8 cm	8 cm	8 cm

Which option correctly completes the table?

Option 1:

Type of Triangle	Length of First Side	Length of Second Side	Length of Third Side
Scalene	5 cm	**5 cm**	**5 cm**
Equilateral	7 cm	8 cm	7 cm
Isosceles	9 cm	**8 cm**	**7 cm**
Scalene	8 cm	8 cm	8 cm

Option 2:

Type of Triangle	Length of First Side	Length of Second Side	Length of Third Side
Scalene	5 cm	**6 cm**	**8 cm**
Isosceles	7 cm	8 cm	7 cm
Isosceles	9 cm	**9 cm**	**5 cm**
Equilateral	8 cm	8 cm	8 cm

Option 3:

Type of Triangle	Length of First Side	Length of Second Side	Length of Third Side
Scalene	5 cm	**8 cm**	**8 cm**
Scalene	7 cm	8 cm	7 cm
Isosceles	9 cm	**9 cm**	**9 cm**
Isosceles	8 cm	8 cm	8 cm

Option 4:

Type of Triangle	Length of First Side	Length of Second Side	Length of Third Side
Scalene	5 cm	**6 cm**	**8 cm**
Equilateral	7 cm	8 cm	7 cm
Isosceles	9 cm	**9 cm**	**9 cm**
Isosceles	8 cm	8 cm	8 cm

Correct Answer: Option 2

LG: Observe the measure of angles of a triangle in order to classify it into different types (acute, obtuse, right) based on its angles.

Level of difficulty: Medium
Bloom's Level: Understanding

1. Consider the triangles below.
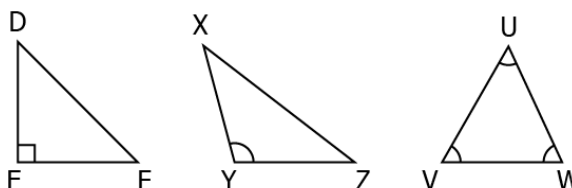
Which table correctly classifies the triangles with correct justification?
Option 1:

Triangle	Classification	Justification
DEF	Right angled triangle	∠E = 90°
XYZ	Obtuse angled triangle	90° < ∠Y < 180°
UVW	Acute angled triangle	∠U < 90°, ∠V < 90°, ∠W < 90°

Option 2:

Triangle	Classification	Justification
DEF	Right angled triangle	∠E = 90°
XYZ	Acute angled triangle	90° < ∠Y < 180°
UVW	Obtuse angled triangle	∠U < 90°, ∠V < 90°, ∠W < 90°

Option 3:

Triangle	Classification	Justification
DEF	Acute angled triangle	∠E = 90°
XYZ	Obtuse angled triangle	90° < ∠Y < 180°
UVW	Right angled triangle	∠U < 90°, ∠V < 90°, ∠W < 90°

Option 4:

Triangle	Classification	Justification
DEF	Obtuse angled triangle	∠E = 90°
XYZ	Right angled triangle	90° < ∠Y < 180°
UVW	Acute angled triangle	∠U < 90°, ∠V < 90°, ∠W < 90°

Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Analysing

2. A question in a mathematics book requires making different types of triangles using 8 vertices, A, B, C, D, E, F, G and H such that A and B must be the vertices of every triangle.
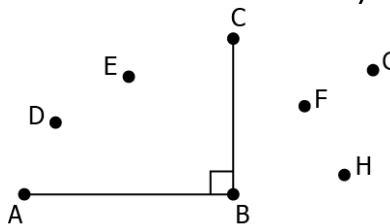
How many different types of triangles can be formed to correctly answer the question?
Option 1:

Number of right-angled triangles	1

Number of acute angled triangle	2
Number of obtuse angled triangle	3

Option 2:

Number of right-angled triangles	2
Number of acute angled triangle	I
Number of obtuse angled triangle	3

Option 3:

Number of right-angled triangles	I
Number of acute angled triangle	3
Number of obtuse angled triangle	2

Option 4:

Number of right-angled triangles	2
Number of acute angled triangle	3
Number of obtuse angled triangle	I

Correct Answer: Option I

LG: Examine the given figures in order to classify type quadrilaterals based on their properties.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Consider the quadrilaterals shown.
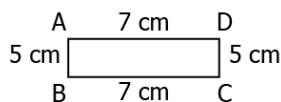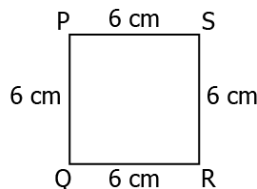
Quadrilateral I   **Quadrilateral II**   **Quadrilateral III**
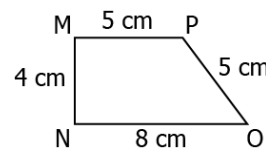
Which option correctly classifies the quadrilaterals?
Option 1:
- Quadrilateral I – Square
- Quadrilateral II – Rectangle
- Quadrilateral III – Trapezium

Option 2:
- Quadrilateral I – Rectangle
- Quadrilateral II – Square
- Quadrilateral III – Trapezium

Option 3:
- Quadrilateral I – Trapezium
- Quadrilateral II – Square
- Quadrilateral III – Rectangle

Option 4:
- Quadrilateral I –Trapezium
- Quadrilateral II – Rectangle
- Quadrilateral III – Square

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing
2. Three quadrilaterals are formed by joining triangles.
- Quadrilateral A: By joining two identical right-angled isosceles triangles at their hypotenuse.
- Quadrilateral B: By joining two identical scalene right-angled triangles at their hypotenuse.
- Quadrilateral C: By joining two identical equilateral triangles at a common side.

Which option correctly classifies the quadrilaterals based on their properties?
Option 1:

Quadrilateral	Type of Quadrilateral
Quadrilateral A	Rectangle; as the quadrilateral formed has four equal sides and four right angles
Quadrilateral B	Square; as the quadrilateral formed has equal opposite sides and four right angles
Quadrilateral C	Rhombus; as the quadrilateral formed is a parallelogram with four equal sides

Option 2:

Quadrilateral	Type of Quadrilateral
Quadrilateral A	Rectangle; as the quadrilateral formed has equal opposite sides and four right angles
Quadrilateral B	Square; as the quadrilateral formed has four equal sides and four right angles
Quadrilateral C	Rhombus; as the quadrilateral formed is a parallelogram with four equal sides

Option 3:

Quadrilateral	Type of Quadrilateral
Quadrilateral A	Square; as the quadrilateral formed has four equal sides and four right angles
Quadrilateral B	Rectangle; as the quadrilateral formed has equal opposite sides and four right angles
Quadrilateral C	Rhombus; as the quadrilateral formed is a parallelogram with four equal sides

Option 4:

Quadrilateral	Type of Quadrilateral
Quadrilateral A	Square; as the quadrilateral formed has four equal sides and four right angles
Quadrilateral B	Rectangle; as the quadrilateral formed is a parallelogram with four equal sides
Quadrilateral C	Rhombus; as the quadrilateral formed has equal opposite sides and four right angles

Correct Answer: Option 3

LG: Examine the given figures in order to identify polygons.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Consider the polygon shown.
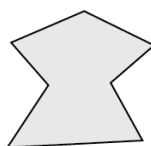
Lubna says that the given polygon is a heptagon. Is she correct?
      Option 1: No, because a heptagon is made of6 line segments.
      Option 2: Yes, because a heptagon is made of 7 line segments.
      Option 3: No, because a heptagon must have exactly3 reflex angles.
      Option 4: Yes, because a heptagon must have exactly 2 reflex angles.
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing
2. Consider the figures.
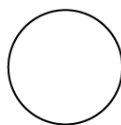
| Figure 1 | Figure 2 | Figure 3 | Figure 4 | Figure 5 | Figure 6 |
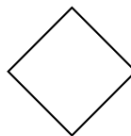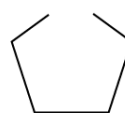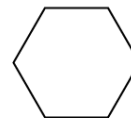
Which of these figure(s) can be classified as polygon(s)?

70

Option 1: Figure 3; as it is not made of line segments.
Option 2: Figures 2 and 5; as these are not closed figures.
Option 3: Figures 1, 4 and 6; as these are closed figures made of line segments.
Option 4: All 6 figures as these are flat shapes.
Correct Answer: Option 3

LG: Describe polygons in order to classify them based on their number of sides and angles. (Up to 8 sides)

Level of difficulty: Medium
Bloom's Level: Understanding
1. Observe the polygons shown.

Polygon A   Polygon B   Polygon C   Polygon D
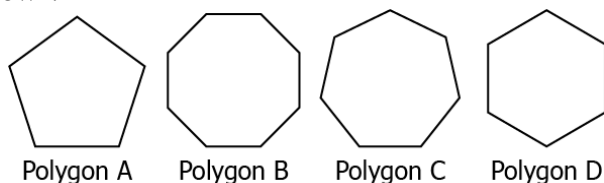
Which table correctly classifies the given polygons?
Option 1:

Polygon A	Polygon B	Polygon C	Polygon D
Pentagon	Heptagon	Octagon	Hexagon

Option 2:

Polygon A	Polygon B	Polygon C	Polygon D
Pentagon	Octagon	Hexagon	Heptagon

Option 3:

Polygon A	Polygon B	Polygon C	Polygon D
Pentagon	Octagon	Heptagon	Hexagon

Option 4:

Polygon A	Polygon B	Polygon C	Polygon D
Hexagon	Octagon	Heptagon	Pentagon

Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing
2. A task in a quiz requires making different types of polygons using 8 vertices, A, B, C, D, E, F and G such that A, B and C must be the vertices of every polygon. A student joins C to A and A to B as shown.
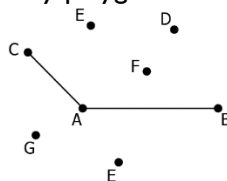
How many different types of polygons can the student form to correctly complete the task?
Option 1: 1
Option 2: 4
Option 3: 5
Option 4: 8
Correct Answer: Option 2

LG: Give example(s) in order to distinguish between regular and irregular polygons.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Which of the following correctly differentiates the given polygons as regular and irregular?

Polygon P   Polygon Q   Polygon R   Polygon S   Polygon T

71
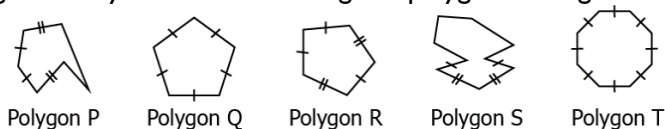
Option 1:

Regular Polygon	Irregular Polygon
Polygon Q, Polygon R, Polygon T	Polygon P, Polygon S

Option 2:

Regular Polygon	Irregular Polygon
Polygon P, Polygon S	Polygon Q, Polygon R, Polygon T

Option 3:

Regular Polygon	Irregular Polygon
Polygon P, Polygon R, Polygon S	Polygon Q, Polygon T

Option 4:
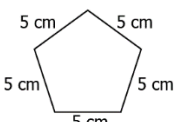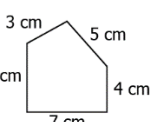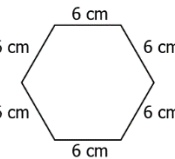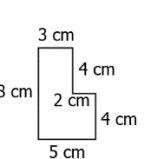
Regular Polygon	Irregular Polygon
Polygon Q, Polygon T	Polygon P, Polygon R, Polygon S

Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Analysing
2. Consider the table shown.

Is the table correctly distinguishing between regular and irregular polygons?

Option 1: Yes, because polygons with equal sides and equal angles are classified as regular polygons, whereas irregular polygons do not have all sides equal and all angles equal.

Option 2: No, because polygons with equal sides and equal angles are classified as irregular polygons, whereas regular polygons do not have all sides equal and all angles equal.

Option 3: Yes, because polygons with equal opposite sides are classified as regular polygons, whereas irregular polygons do not have equal opposite sides.

Option 4: No, because polygons with equal opposite sides are classified as irregular polygons, whereas regular polygons do not have equal opposite sides.

Correct Answer: Option 1

LG: Describe solid shapes in order to distinguish them from flat shapes.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Rahul and Avantika draw two shapes. Rahul draws a shape with four sides and four corners and Avantika draws a shape with 6 faces such that each face has four corners. Who among them has/have drawn a solid shape?

Option 1: Only Rahul
Option 2: Only Avantika
Option 3: Both Rahul and Avantika
Option 4: Neither Rahul nor Avantika

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing
2. A teacher describes the properties of some shapes in the table shown and asks his students to correctly classify the shapes as flat or solid.

Shape	Properties

72

P	Three identical sides and three vertices
Q	Six identical faces and each face has four vertices
R	A single base and the other faces are triangles.
S	Two identical circular ends joined by a curved surface

Which option correctly classifies the shapes?

Option 1:

Shape	Properties	Flat Shape/Solid Shape
P	Three identical sides and three vertices	Flat Shape
Q	Six identical faces and each face has four vertices	Solid Shape
R	A single base and the other faces are triangles.	Solid Shape
S	Two identical circular ends joined by a curved surface	Solid Shape

Option 2:

Shape	Properties	Flat Shape/ Solid Shape
P	Three identical sides and three vertices	Flat Shape
Q	Six identical faces and each face has four vertices	Flat Shape
R	A single base and the other faces are triangles.	Flat Shape
S	Two identical circular ends joined by a curved surface	Solid Shape

Option 3:

Shape	Properties	Flat Shape/ Solid Shape
P	Three identical sides and three vertices	Solid Shape
Q	Six identical faces and each face has four vertices	Solid Shape
R	A single base and the other faces are triangles.	Solid Shape
S	Two identical circular ends joined by a curved surface	Flat Shape

Option 4:

Shape	Properties	Flat Shape/ Solid Shape
P	Three identical sides and three vertices	Flat Shape
Q	Six identical faces and each face has four vertices	Solid Shape
R	A single base and the other faces are triangles.	Solid Shape
S	Two identical circular ends joined by a curved surface	Flat Shape

Correct Answer: Option 1

LG: Examine the given solid shapes in order to identify their type (Cubes, Cuboids, cylinder, sphere, cone, prism, pyramid)

Level of difficulty: Medium
Bloom's Level: Understanding

1. A teacher draws two shapes and asks her students to identify the shapes.
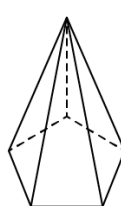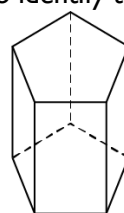
Figure P   Figure Q

The responses of two of the students are as
Student 1: Figure P is a pyramid.
Student 2: Figure Q is a prism.
Who is/are correct?

Option 1: Only Student 1
Option 2: Only Student 2
Option 3: Both Student 1 and Student 2
Option 4: Neither Student 1 nor Student 2

Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing

2. Ananya places two identical cubes one over the other. What would be the shape of the resultant solid?
Option 1: Cube

73

Option 2: Cuboid
Option 3: Triangular Pyramid
Option 4: Rectangular pyramid
Correct Answer: Option 2

LG: Describe the faces, edges and vertices of a 3D shape in order to discuss the various aspects of the given 3D object

Level of difficulty: Medium
Bloom's Level: Understanding
1. Which of these tables correctly represents the number of faces, vertices and edges in triangular pyramid and cuboid?
   Option 1:

Solid Shape	Number of faces	Number of vertices	Number of edges
Triangular pyramid	6	4	4
Cuboid	6	8	12

   Option 2:

Solid Shape	Number of faces	Number of vertices	Number of edges
Triangular pyramid	6	4	4
Cuboid	6	12	8

   Option 3:

Solid Shape	Number of faces	Number of vertices	Number of edges
Triangular pyramid	4	4	6
Cuboid	6	12	8

   Option 4:

Solid Shape	Number of faces	Number of vertices	Number of edges
Triangular pyramid	4	4	6
Cuboid	6	8	12

Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Understanding
2. Simran places a square pyramid at the top of a cube. How many faces, edges and vertices does the resulting shape have?
   Option 1: Faces = 9, Edges = 16 and Vertices = 9
   Option 2: Faces = 16, Edges = 9 and Vertices = 9
   Option 3: Faces = 10, Edges = 16 and Vertices = 9
   Option 4: Faces = 9, Edges = 16 and Vertices = 10
Correct Answer: Option 1

Suggested Teacher Resources

I	Lesson Plan

Objective-: Students will be able to define tessellation in order to understands shapes more clearly

Procedure-:

Teacher Action	Student Action
1.Teacher will draw the figure on board and will ask students to tell if the given figure is polygon or not	
	Polygon
	Not Polygon
	Polygon
	Not Polygon
	Polygon
• Teacher will answer the following-:	
1.They are made of straight lines joining their end points and the shape is "closed".	Polygon
2.Polygons that are equiangular (all angles are equal in measure) and equilateral (all sides have the same length).	Regular polygon
3.What is the total measurement of an equilateral triangle?	180
4.It is "patterned self – similarity"	Symmetry
5.What do you call to the imaginary line. where you could find the image and have both halves match exactly?	Line of symmetry

75

- Then Teacher will give puzzle to students.

Complete the puzzle to get the word.

T	E	S	S	E	L	L	A	T	I	O	N

Q1. What is the word

Q2. Based on the activity done how do you define tessellation.

Presentation
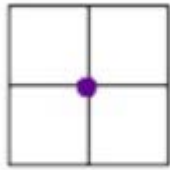
4.4.4.4

Q1. Can anyone point out the vertex?
Q2. How many polygons did you count?
Q3. How many sides does it have?
Q4. What do you call to this tessellation?
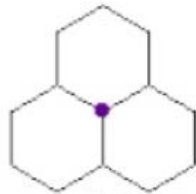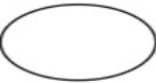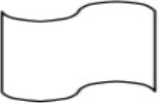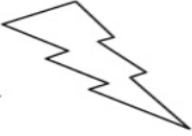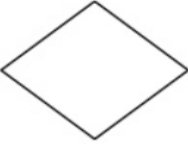
6.6.6

Q1. How many polygons that touch the vertex?
Q2. How many sides does it have?
Q3. What kind of tessellation is this?

Tessellation
Students answer may vary

4
4
4
A tessellation of square

There are 3 polygons
6 sides
Tessellation of regular congruent hexagons

1.

6.

2.

7.

3.

8.

4.

9.

5.

10.

1. Yes   6. No

2. Yes   7. Yes

3. No   8. No

4. No   9. Yes

5. Yes   10. No

2 Activity

Stick magnets with the same pole up in bottle lids. Float them in water. The two magnets will repel and travel far away. Three arrange in the shape of a triangle. Four make a square formation. So, place more magnets and have fun making different formations!

Duration:
00 hours 15 mins

Objective:
Have fun with polarity & the patterns.

Activity Steps:

77

When you place two magnets they repel each other and stabilize at the diameter

Place third magnet

Three magnets form equilateral triangle

Four magnets will form square

Five magnets will form regular pentagon

When you put sixth magnet at the centre it will form this pattern

78

Hexagon

Source-:
https://www.slideshare.net/shineofficial/lesson-plan-in-geometry-31458587
http://www.teachersofindia.org/en/activity/weekend-activity-geometry-magnets

6. INTEGERS

QR Code:

B2R8N4

Learning Objectives and Learning Outcomes:

Content area / Concepts	Sub-concept	Learning Objectives	Learning Outcome
Introduction	Tag me with a sign	Represent integers with their signs in order to differentiate positive number, negative number and zero from each other	Applies addition and subtraction rules involving positive and negative integers in order to solve real life problems.
		Denote numbers with their signs in order to represent real life situations like temperature scale, credit debit etc.	
Integers	Representation of integers on a number line	Represent the integer on Number Line in order to in order to determine its position with respect to other integers	
		Determine one more and one less of a given integers in order to find its predecessor and successor.	
	Ordering of integers	Determine the order of integers in order to represent them on number line and draw comparison between them.	
Addition of Integer	Addition of integers on a number line	Represent the integers on number line in order to perform arithmetic operations on them.	

79

Subtraction of Integers with the help of a Number Line		Apply the rules of integer's operations in order to perform arithmetic operations on them.	

Test items

LG: Represent integers with their signs in order to differentiate positive number, negative number and zero from each other

Level of difficulty: Medium
Bloom's Level: Applying
1. Which set shows all numbers less than 0?
   Option 1: 12, 23, 37
   Option 2: −15, 0, 15
   Option 3: −28, −9, 0
   Option 4: −54, −43, −39
Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Applying
2. The number $-x$ is a negative integer. Which of these is a valid conclusion about x?
   Option 1: x is any integer greater than or equal to 0.
   Option 2: x is any integer less than or equal to 0.
   Option 3: x is any integer greater than 0.
   Option 4: x is any integer less than 0.
Correct Answer: Option 3

LG: Denote numbers with their signs in order to represent real life situations like temperature scale, credit debit etc.

Level of difficulty: Medium
Bloom's Level: Applying
1. The depth of a submarine is 542 meters below the sea level. If 0 represents the sea level, what is the elevation of the submarine?
Option 1: 542
Option 2: −542
Option 3: $\frac{1}{542}$
Option 4: $-\frac{1}{542}$
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing
2. Aakriti has a certain amount of money. She spends more money than she has by borrowing some money from her friend. Aakriti made the following statements.
Statement I: The initial amount of money she has is represented by a positive integer.
Statement II: The amount she spent is represented by a negative integer.
Which of these statements is/are true?
   Option 1: Only statement I
   Option 2: Only statement II
   Option 3: Both statements I and II
   Option 4: Neither statement I nor statement II
Correct Answer: Option 3

LG: Represent the integer on Number Line in order to determine its position with respect to other integers

Level of difficulty: Medium
Bloom's Level: Understanding
1. Ajay plots two points A and B on the number line.

81

- Point A lies 3 points to the left of zero.
- Point B lies 5 points to the right of point A.

Which of these options correctly represents the points A and B?

Option 1:

B   A

-8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8

Option 2:

A   B

-8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8

Option 3:

A   B

-8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8

Option 4:

B   A

-8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8
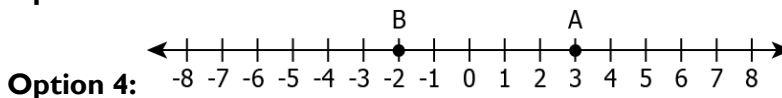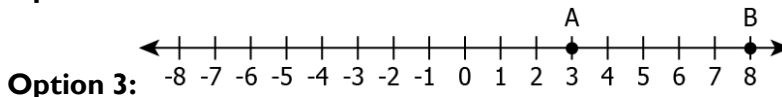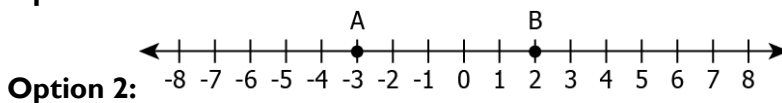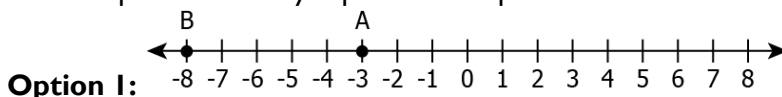
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Applying

2. A point U lies 3 steps to the left of an integer n, as shown below:

n

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5
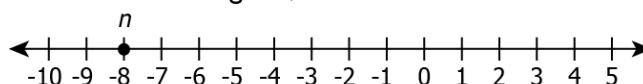
- Point U is moved 9 steps to its right to get point V.
- Point V is moved 5 steps to its left to get point W.

Which of these represents the position of point W with respect to n?

Option 1: It lies 1 step to the right of n.
Option 2: It lies 1 step to the left of n.
Option 3: It lies 4 steps to the right of n.
Option 4: It lies 4 steps to the left of n.

Correct Answer: Option 1

LG: Determine one more and one less of a given integers in order to find its predecessor and successor.

Level of difficulty: Medium
Bloom's Level: Applying

1. What is the successor of the predecessor of −12?

Option 1: −11
Option 2: −12
Option 3: −13
Option 4: −14

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Applying

2. The predecessor of an integer is $k + 13$ and the successor of the integer is $-k + 5$. What is the integer?

Option 1: −3
Option 2: −4
Option 3: −5
Option 4: −6

Correct Answer: Option 3

LG: Determine the order of integers in order to represent them on number line and draw comparison between them.

Level of difficulty: Medium
Bloom's Level: Applying

1. Which of these can be used to prove that $-4 > -7$ using a number line?

Option 1: On the number line 4 is to the left of –7.
Option 2: On the number line –4 is to the left of –7.
Option 3: On the number line 4 is to the right of –7.
Option 4: On the number line–4 is to the right of –7.
Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Analysing
2.   Given that *m* is a positive integer and *n* is a negative integer. Which of these statements is correct?
Option 1: The predecessor of *m* will be always greater than the successor of *n*.
Option 2: The predecessor of *m* will be always less than the successor of *n*.
Option 3: The predecessor of *m* and successor of *n* can never be equal.
Option 4: The predecessor of *m* and successor of *n* can be equal.
Correct Answer: Option 4

LG: Represent the integers on number line in order to perform arithmetic operations on them.

Level of difficulty: Medium
Bloom's Level: Applying
1.   Which number line shows the addition of −4 and its successor?
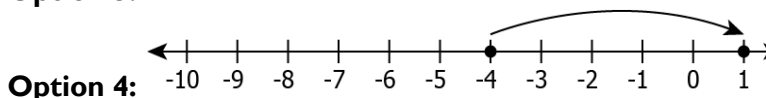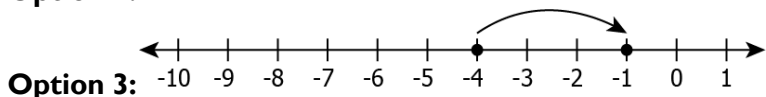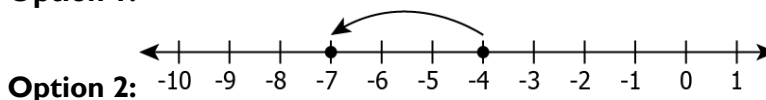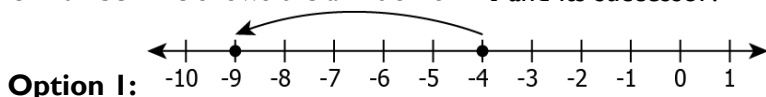
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing
2.   The value of $7 - 3 + p$ is the greatest negative integer. Which number line shows the value of p?
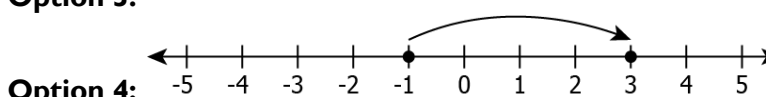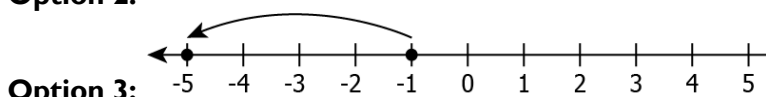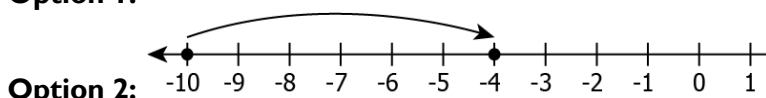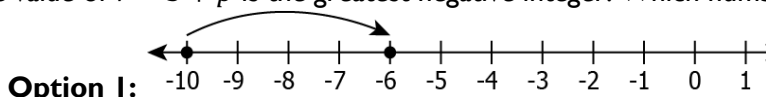
Correct Answer: Option 3

LG: Apply the rules of integer's operations in order to perform arithmetic operations on them.

Level of difficulty: Medium
Bloom's Level: Evaluating
1.   What is the result obtained on subtracting 98 from the sum of −126 and 154?
Option 1: 126
Option 2: 70
Option 3: –70

Option 4: –126
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analyzing
2. If $p = -54$ and $q = 29$, what is the largest negative integer that should be added to $(p + q) - (p - q)$ so that the result is a negative integer?
        Option 1: –59
        Option 2: –58
        Option 3: –47
        Option 4: –39
Correct Answer: Option 1

84

Suggested Teacher Resources

Lesson Plan

I

Objective	Determine the order of integers in order to represent them on a number line and draw a comparison between them.
Material Required	None
Prerequisite Knowledge	Integers
Procedure	The teacher will start the class by asking students:

The teacher will start the class by asking students:
- What are integers?
- What are negative numbers?
- Where do we see negative numbers in our life?
- What does it mean to be a negative number?

Then, the teachers ask students to discuss in pairs what they think about negative numbers.

Then the teacher will ask the pair to discuss the position of -4, -5, -6 on the number line.

Then the teacher will ask students if they know what is the temperature today? Then she'll ask if they knew how much it was yesterday and would ask them to compare them.
Then the teacher would introduce the following problem:
Given are the temperatures observed in Kashmir of a week:

Day	Temperature (degree C)
Monday	8
Tuesday	-2
Wednesday	-4
Thursday	-6
Friday	0
Saturday	-3
Sunday	-8

Then, the teacher would ask them to arrange them on a number line.
Then the teacher would ask them to arrange these days according to the coldest to the warmest temperature
The teacher would then ask them which was the coldest day and the warmest day in the week.

Then, the teacher would ask the students to plot the following integers on the horizontal and vertical number line:

- -12, -10, 0, 5, -4, -1
- 43, 41, 38, 56, 54, 45
- -43, -41, -38, -56, -54, -45
- 5, -5, 6, -6, 4, -4, 0

Follow-up: The teacher would ask them to record the temperatures of the following week and ask students to arrange them from coldest to warmest temperature.

Source	https://betterlesson.com/lesson/464457/what-are-integers

2 **Activity**

Activity 1:
Objective: To model addition of integers
Materials: Red and green buttons (10 of each), two dice as shown in Figure 6 (one for colour and one for number), square ruled paper for each child to record results.
Aim: 12 green or red out!
This is a cooperative game. The teacher would ask the students to record the various steps in square ruled paper as shown in Figure 8. At this point the teacher can introduce the words positive and negative, that the green button represents a positive and the red button represents a negative. "This is Positive 3." "This is Negative 4." And so on.

The red and green buttons are separated and placed separately on the table. The first team throws the colour die followed by the number die to pick up the respective buttons and lay them out. Example: If the colour die shows red and the number die shows 5, the team picks up 5 red buttons. The second team throws the dice and lays out its buttons. Example: If the colour die shows green and the number die shows 3, the team picks up 3 green buttons. The buttons are brought together (combined - 3 greens and 5 reds) and read out by the teacher as: "Now we have positive 3 and negative 5". Any pairs present are now removed. That leaves behind (2 reds) negative 2. The addition step is recorded as shown, both pictorially and in writing.

86

Pos 3 + Neg 5 = Neg 2
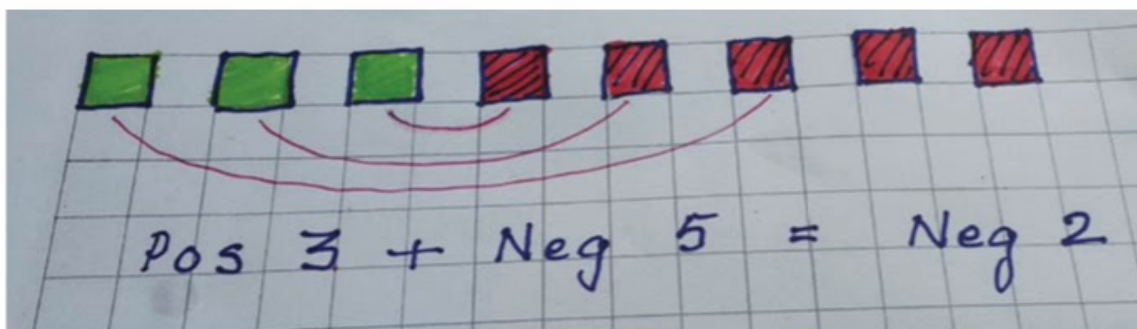
If at any point the sum becomes (12 green or red buttons) positive 12 or negative 12, the game is over! Note: This will give rise to all the three possible combinations – positive and positive, negative and negative, positive and negative (red and red, green and green, red and green). Since the numbers involved are small (all less than 7), students may be able to give the result without using the buttons. However, encourage them to record the results as it will help in building their ability to reconstruct it when necessary and aid as a visual memory. As additional practice, the teacher can also write a few combinations on the board (using numbers less than 10) to get students to do individual work. Positive 4, Negative 4 Negative 6, Positive 2 Positive 8, Negative 3 Some students who have grasped the concept may be able to give the answer without recourse to pictures. However, they should be encouraged to demonstrate their answers using pictorial models.

Pos 4 + Neg 4

Neg 6 + Pos 2

Pos 8 + Neg 3
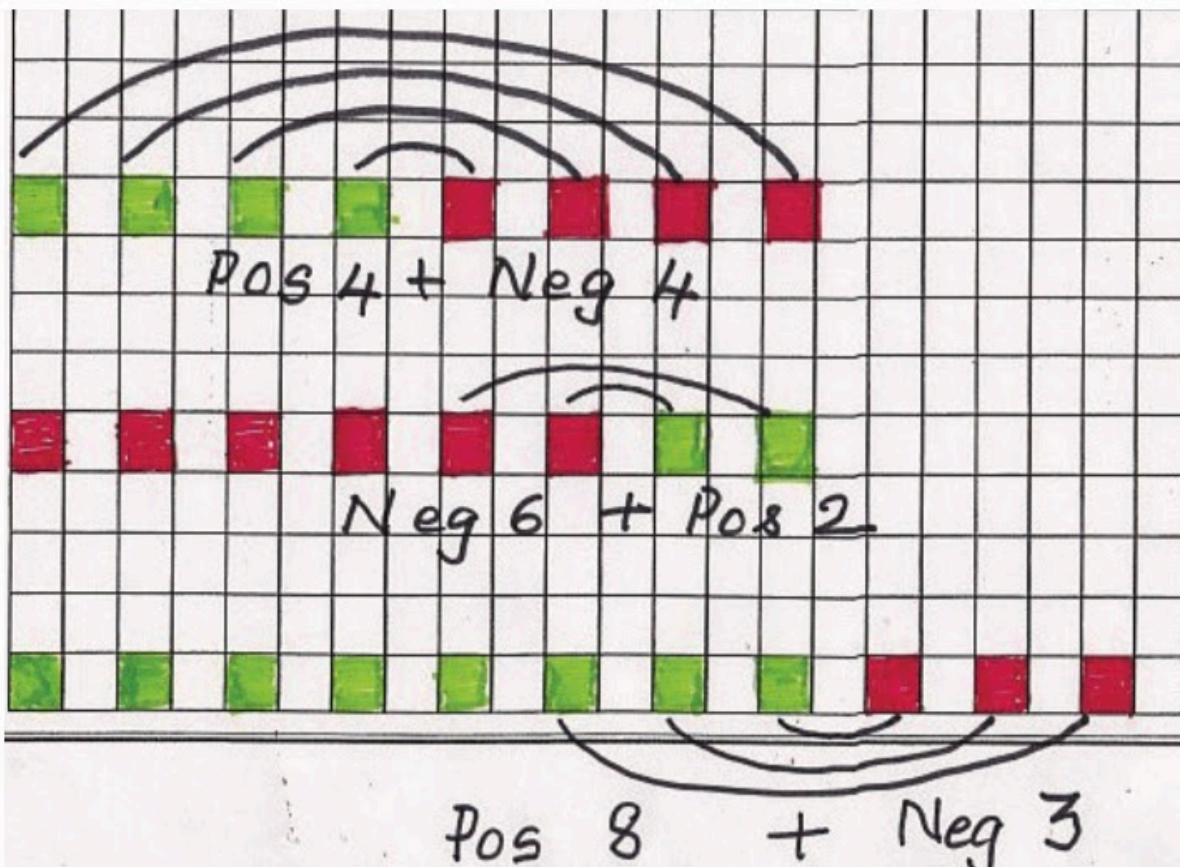
Note for the teacher: *In the initial stages, one uses the words positive and negative. At a later point, once the concept of addition and subtraction is understood thoroughly, the words can be replaced with the signs + and -. This is crucial, as students take time to feel comfortable with the new meaning assigned to + and -. If we can focus initially on the concept and introduce the sign gradually, that would make it easier for the students. This effectively means that + (plus) and – (minus) will be used initially only to indicate the operations and not as a sign of the number. We use, instead, Pos and Neg to indicate the signs.*

Activity 2:
Objective: Rules of addition of integers.
Aim: Observing and deriving the rules of addition of integers
The teacher poses multiple questions for each type of addition situation in integers (Pos+Pos, Neg+Neg, Pos+Neg).

87

Example: Pos 5 + Pos 4, Pos 2 + Pos 3, Pos 7 + Pos 1.
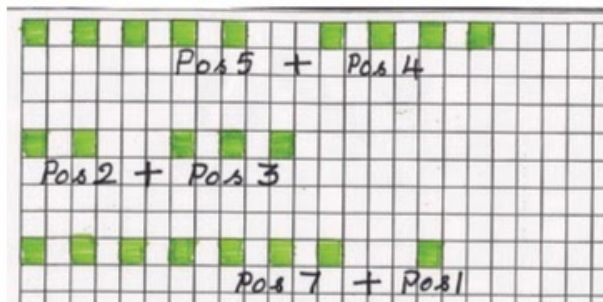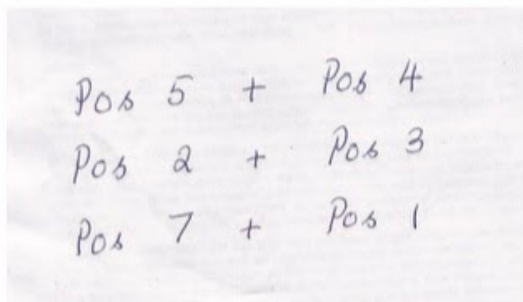
Students use the materials and record the results on a square paper. They notice that a positive number added to a positive number of results in an answer which is positive, and the number is the sum of the given two numbers. Similarly, questions are posed with two negative numbers.

Example: Neg 4 + Neg 6, Neg 2 + Neg 1, Neg 7 + Neg6
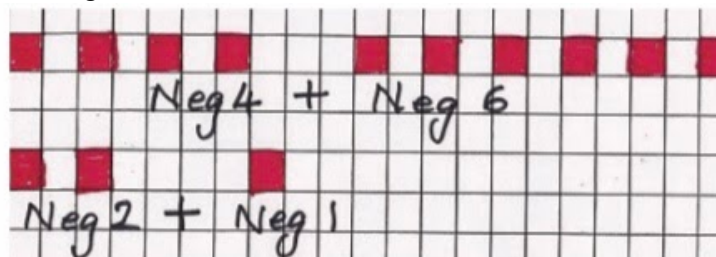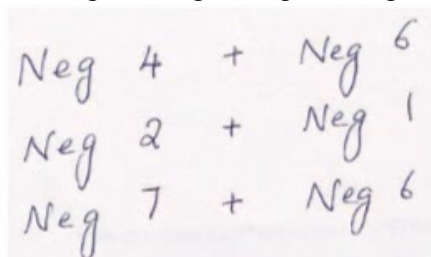
Students use the materials and record the results on square paper. They notice that a negative number added to a negative number of results in an answer which is negative, and the number is the sum of the given two numbers. The next step is slightly challenging, that is, when we consider a positive and negative combination

Example: Pos 5 + Neg 4, Pos 1 + Neg 7, Neg 5 + Pos 2, Neg 4 + Pos 7
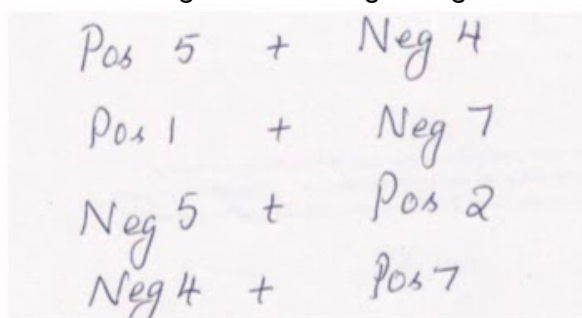
Again, let them record all the problems pictorially. Students will need to be guided with appropriate questions to discover the pattern. The teacher can at first help the students to focus on the numerical part of the answer. How does the answer connect with the two numbers? They will be able to see that the number in the answer is the difference of the given two numbers. How do we know if the result is positive or negative? The teacher points to a specific example and poses the questions, 'Are there more positives here or more negatives?' 'Does that affect the answer?' Slowly, help the students to formulate the rule for addition of a positive and negative integer. When a positive and a negative number are to be added, the number in the answer will be the difference of the two numbers and the sign will be that of the integer further from zero.

7. FRACTIONS

QR Code:

V6Z6S9

NCERT Learning outcome:

Content area / Concepts	Learning Objectives	Learning Outcome
Introduction	Represent a number as a part of the whole in order to determine the fraction	Calculates fractions and decimals in different real-life situations in order to identify the appropriate quantity of money, length, temperature etc. For example, 7½ metres of cloth. Distance between two places is 112.5 km etc.
A Fraction	Determine part and whole in order to label numerator and denominator of a fraction	
Fraction on the Number Line	Draw equal parts between the whole numbers in order to represent fractions on a number line	
Proper Fractions	Write proper fractions in order to deduce that they are always less than 1/numerator is less than denominator	
Improper and Mixed Fractions	Write fractions where numerator is greater than denominator in order to determine improper fractions	
	Write the improper fraction in the form of mixed fraction in order to represent it as a combination of whole and a part	
Equivalent Fractions	Multiply/Divide the numerator and denominator with the same number in order to find equivalent fractions	
	Perform cross multiplication among two fractions in order to verify their equivalence	
Simplest Form of a Fraction	Reduce the fraction in order to determine its simplest form	
Like Fractions	Check the denominators of the fractions in order distinguish between like and unlike fractions.	
Comparing Fractions	Inspect the numerators of the like fractions in order to determine larger and smaller fraction(s).	
	Determine the LCM of the unlike fractions in order to compare them.	
Addition and Subtraction of Fractions	Solve (addition/subtraction) the numerator and retain the denominator of the like fractions in order to perform addition and subtraction on the given fraction.	Calculates addition and subtraction of fractions and decimals in order to solve daily life problems involving quantities that measure between two integers
	Convert the given fractions into its equivalent fractions in order to perform addition and subtraction on them.	

89

Test items

LG: Represent a number as a part of the whole in order to determine the fraction.

Level of difficulty: Medium
Bloom's Level: Understanding

1. A rectangle is divided into equal parts as shown:

If Anuj shades any 3 parts of the rectangle, what fraction represents the unshaded part?

Option 1: $\frac{3}{5}$

Option 2: $\frac{5}{3}$

Option 3: $\frac{3}{8}$

Option 4: $\frac{5}{8}$

Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Analysing

2. In which of the following models, the fraction represented by shaded portion is the same as the fraction represented by unshaded portion?

Option 1:

Option 2:
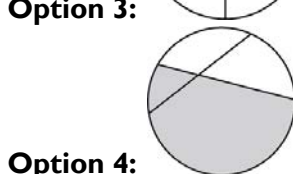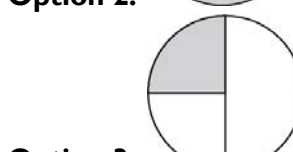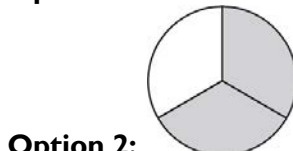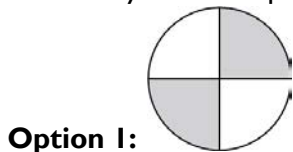
Option 3:

Option 4:

Correct Answer: Option 1

LG: Determine part and whole in order to label numerator and denominator of a fraction.

Level of difficulty: Medium
Bloom's Level: Understanding

1. Ajay wants to represents a fraction $\frac{3}{5}$ in a rectangular model. What is the minimum number of equal parts he needs to divide the rectangular model into?

Option 1: 2

Option 2: 3

Option 3: 5
Option 4: 8
Correct Answer: Option 3
Level of difficulty: Hard
Bloom's Level: Applying

2. Ajay divided a square into b equal parts and shaded a parts. Which of these represents the numerator of the fraction that represents the unshaded portion?

> **Option 1:** a
> **Option 2:** $a - b$
> **Option 3:** $b - a$
> **Option 4:** $a + b$

Correct Answer: Option 3

LG: Draw equal parts between the whole numbers in order to represent fractions on a number line.

Level of difficulty: Medium
Bloom's Level: Understanding

1. A number line is divided into equal parts and a point P is plotted on it as shown.
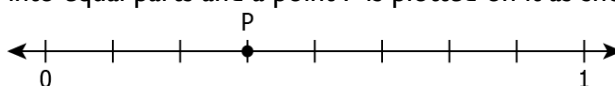
What fraction does the point P represent?

> **Option 1:** $\frac{3}{7}$
> **Option 2:** $\frac{3}{8}$
> **Option 3:** $\frac{4}{8}$
> **Option 4:** $\frac{4}{9}$

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Applying

2. Akriti followed the given steps to represent a fraction on a number line.
Step 1: Using tick marks, she divided the number line between 0 and 1 into 5 equal parts.
Step 2: She plotted a point at the 4th tick mark to the right of 0.
What fraction does the point show?

> **Option 1:** $\frac{1}{5}$
> **Option 2:** $\frac{3}{5}$
> **Option 3:** $\frac{4}{5}$
> **Option 4:** $\frac{4}{9}$

Correct Answer: Option 3

LG: Write proper fractions in order to deduce that they are always less than 1/numerator is less than denominator.

Level of difficulty: Medium
Bloom's Level: Understanding

1. If $\frac{m}{4}$ is a proper fraction, which option shows the possible values of m?

> **Option 1:** 1, 2 and 3
> **Option 2:** 1, 2, 3 and 4
> **Option 3:** 5, 6 and 7
> **Option 4:** 4, 5, 6 and 7

Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Analysing

2. Which of these will always be a proper fraction for any natural number $m > 1$?

91

Option 1: $\frac{m}{m+1}$

Option 2: $\frac{m+1}{m}$

Option 3: $\frac{m}{m}$

Option 4: $\frac{m}{m-1}$

Correct Answer: Option 1

LG: Write fractions where numerator is greater than denominator in order to determine improper fractions.

Level of difficulty: Medium
Bloom's Level: Understanding

1. For what value of s and t, $\frac{s}{t}$ will be an improper fraction?

Option 1: $s = 3$, $t = 3$
Option 2: $s = 3$, $t = 5$
Option 3: $s = 0$, $t = 5$
Option 4: $s = 5$, $t = 3$

Correct Answer: Option 4

Level of difficulty: Medium
Bloom's Level: Understanding

2. If the fraction $\frac{6}{y}$ is an improper fraction, which of these could be the value of y?

Option 1: 4
Option 2: 6
Option 3: 9
Option 4: 12

Correct Answer: Option 1

LG: Write the improper fraction in the form of mixed fraction in order to represent it as a combination of whole and a part.

Level of difficulty: Medium
Bloom's Level: Understanding

1. If the fraction $\frac{119}{19}$ is represented in the form of $j\frac{k}{19}$, what is the value of j and k?

Option 1: $j = 10$, $k = 0$
Option 2: $j = 5$, $k = 6$
Option 3: $j = 6$, $k = 5$
Option 4: $j = 6$, $k = 6$

Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Applying

2. If $4\frac{k}{13}$ can also be written as $\frac{59}{13}$, what is the value of k?

Option 1: 4
Option 2: 5
Option 3: 6
Option 4: 7

Correct Answer: Option 4

LG: Multiply/Divide the numerator and denominator with the same number in order to find equivalent fractions.

Level of difficulty: Medium
Bloom's Level: Understanding

1. If $\frac{3}{t}$ and $\frac{51}{119}$ are equivalent fractions, what is the value of t?

Option 1: 3

92

Option 2: 7
Option 3: 8
Option 4: 17
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Applying

2. A teacher creates an assignment consisting of 19 questions. Of these 19 questions, 7 were easy. The teacher now needs to create another assignment and wants the fraction of easy questions in this assignment to be the same as in the previous one. If the new assignment will have a total of 76 questions, how many easy questions will be there in the assignment?

    Option 1: 7
    Option 2: 11
    Option 3: 19
    Option 4: 28
Correct Answer: Option 4

LG: Perform cross multiplication among two fractions in order to verify their equivalence.

Level of difficulty: Medium
Bloom's Level: Applying

1. Which of the following must be true for fractions $\frac{x}{6}$ and $\frac{12}{y}$ to be equivalent?

    Option 1: The sum of x and y is equal to 18.
    Option 2: The sum of x and y is equal to 72.
    Option 3: The product of x and y is equal to 18.
    Option 4: The product of x and y is equal to 72.
Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Analysing

2. Consider the fractions $\frac{a}{b}, \frac{c}{d}$ and $\frac{p}{q}$ and the following relationships.

Relation 1: $a \times d = a \times q = c \times q = 12$
Relation 2: $b \times c = b \times p = d \times p = 12$
Which of the given relations verify that the fractions are equivalent?

    Option 1: Both relations together are sufficient, but neither relation is sufficient alone
    Option 2: Relation 2 is sufficient alone, but not Relation 1
    Option 3: Relation 1 is sufficient alone, but not Relation 2
    Option 4: Relations 1 and 2 together are not sufficient
Correct Answer: Option 1

LG: Reduce the fraction in order to determine its simplest form.

Level of difficulty: Medium
Bloom's Level: Understanding

1. Which of these shows the way to express $\frac{16}{24}$ in its simplest form?

    Option 1: Divide 16 and 24 by their HCF
    Option 2: Divide 16 and 24 by their LCM
    Option 3: Multiply 16 and 24 by their LCM
    Option 4: Multiply 16 and 24 by their HCF
Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Applying

2. The HCF of numbers a and b is 5. If the simplest form of fraction $\frac{a}{b}$ is $\frac{8}{19}$, what could be the fraction?

    Option 1: $\frac{3}{14}$

Option 2: $\frac{8}{19}$
Option 3: $\frac{13}{24}$
Option 4: $\frac{40}{95}$
Correct Answer: Option 4

LG: Check the denominators of the fractions in order distinguish between like and unlike fractions.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Amrita writes a fraction which is the simplest form of $\frac{5}{15}$. If the fraction she writes and $\frac{2}{b}$ are like fractions, which of these can be the value of b?
    Option 1: 1
    Option 2: 2
    Option 3: 3
    Option 4: 5
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing
2. If the fractions $\frac{3}{5}$ and $\frac{m}{n}$ are unlike fractions ($n \neq 0$), which of these shows the possible values of m and n?
    Option 1: $m = 3; n = 5$
    Option 2: m can take any value except 3; $n = 5$
    Option 3: $m = 3$, n can take any value except 5
    Option 4: m can take any value, n can take any value except 5
Correct Answer: Option 4

LG: Inspect the numerators of the like fractions in order to determine larger and smaller fraction(s).

Level of difficulty: Medium
Bloom's Level: Applying
1. If the fraction $\frac{m}{9}$ is greater than $\frac{6}{9}$, which of these shows the value of m?
    Option 1: $0 < m < 3$
    Option 2: $0 < m < 6$
    Option 3: $3 < m < 9$
    Option 4: $6 < m < 9$
Correct Answer: Option 4

Level of difficulty: Medium
Bloom's Level: Applying
2. If the fraction $\frac{9}{m}$ is less than $\frac{k}{m}$, which of these can be the value of k?
    Option 1: 1
    Option 2: 4
    Option 3: 9
    Option 4: 15
Correct Answer: Option 4

LG: Determine the LCM of the unlike fractions in order to compare them.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Which option correctly arranges the fractions $\frac{2}{5}, \frac{2}{6}$ and $\frac{7}{15}$ in increasing order?
    Option 1: $\frac{2}{5} < \frac{2}{6} < \frac{7}{15}$

94

Option 2: $\frac{2}{6} < \frac{2}{5} < \frac{7}{15}$
Option 3: $\frac{7}{15} < \frac{2}{5} < \frac{2}{6}$
Option 4: $\frac{7}{15} < \frac{2}{6} < \frac{2}{5}$
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Applying

2. Which of the following is true about the fractions M and N shown below?

$$M = 2\frac{5}{8}$$

$$N = 2\frac{4}{5}$$

Option 1: $M < N$, because $\frac{5}{8} < \frac{4}{5}$
Option 2: $M = N$, because their whole parts are equal
Option 3: $M > N$, because $\frac{5}{8} > \frac{4}{5}$
Option 4: M and N can't be compared because they are mixed numbers
Correct Answer: Option 1

LG: Solve (addition/subtraction) the numerator and retain the denominator of the like fractions in order to perform addition and subtraction on the given fraction.

Level of difficulty: Medium
Bloom's Level: Understanding

1. If the difference of like fractions $\frac{7}{m}$ and $\frac{3}{n}$ is $\frac{4}{11}$, which of the following is true about m and n?
 Option 1: $m - n = 11$
 Option 2: $m + n = 11$
 Option 3: $m = n = 4$
 Option 4: $m = n = 11$
Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Analysing

2. Which of these shows the sum of like fractions $\frac{3}{7}$ and $\frac{p}{q}$?
 Option 1: $\frac{3p}{7}$
 Option 2: $\frac{3+p}{7}$
 Option 3: $\frac{3}{7+q}$
 Option 4: $\frac{3+p}{7+q}$
Correct Answer: Option 2

LG: Convert the given fractions into its equivalent fractions in order to perform addition and subtraction on them.

Level of difficulty: Medium
Bloom's Level: Applying

1. The total distance between Ajay's home and his office is $3\frac{1}{6}$ km. He covered first $\frac{1}{2}$ km walking and then took a bus. He again walks for $\frac{2}{3}$ km to reach his office. What is the distance that Ajay covered by bus?
 Option 1: $1\frac{2}{3}$ km
 Option 2: 2 km
 Option 3: $2\frac{1}{2}$ km
 Option 4: 4 km

95

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing

2. The steps followed by a student to subtract $1\frac{7}{8}$ from $3\frac{3}{4}$ are shown below:

Step 1: $3\frac{3}{4} - 1\frac{7}{8}$

Step 2: $(3 - 1) + \left(\frac{3}{4} - \frac{7}{8}\right)$

Step 3: $2 + \left(\frac{6}{8} - \frac{7}{8}\right)$

Step 4: $2 + \left(\frac{7-6}{8}\right)$

Step 5: $2\frac{1}{8}$

In which step did the student make her first error? What is the correct step?

      Option 1: Step 2; $\left(\frac{15}{4} - \frac{15}{8}\right)$

      Option 2: Step 2; $(3 - 1) + \left(\frac{3}{4} + \frac{7}{8}\right)$

      Option 3: Step 3; $2 + \left(\frac{7}{8} - \frac{6}{8}\right)$

      Option 4: Step 3; $2 + \left(\frac{3}{8} - \frac{6}{8}\right)$
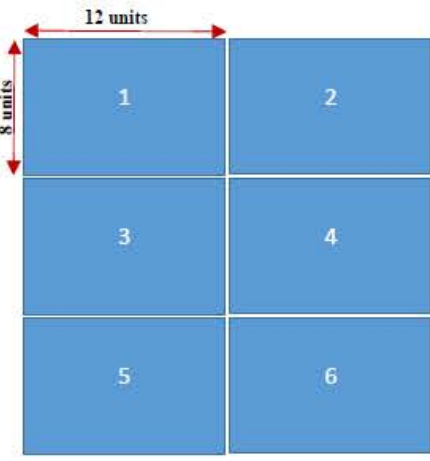
Correct Answer: Option 1

Suggested Teacher Resources

Lesson Plan

Objective	Convert the given fractions into its equivalent fractions in order to perform addition on them.
Material Required	Coloured chalks, worksheets, coloured sheets, graph paper
Previous Knowledge	Multiplication and division of whole numbers, like and unlike fractions
Procedure	Teacher will divide 1 coloured sheet per pair of students. Students will be working with their peers starting with rough idea on the paper and them moving to the cutting of sheet part. Use sheet wisely and not waste it. Start with 2 number 8 and 12. Teacher will try to make student understand what LCM of 8 and 12 really mean. Say: Consider a rectangle with length 12 units and breadth 8 units as shown. FIGURE 1: Rectangle of size 12 x 8 Puzzle: Students needs to use one or more of the above rectangular pieces to make a perfect square. But they need to use least number of pieces to do it. Students can try to cut out the rectangle and try to solve it by changing the position of the pieces. Ans: They will need 6 of such rectangles to make a perfect square. FIGURE 2: A Square of size 24 x 24 made up of 6 rectangles of size 12 x 8 Q) What is the length of such square? Ans: 24. Say: 24 is in fact LCM of 8 and 12. The puzzle was a way to make students understand the visual meaning and concept of LCM.

97

Define LCM?

Ans: The LCM of two given numbers is the length of the smallest square that can be constructed using one or more rectangular pieces whose length and breadth are the two given numbers.

Using this method Teacher will try to visually explain the addition of unlike fractions.

Teacher will start with like fractions.

Addition of two like fractions

Take addition of two like fractions ¼ + 2/4

Consider a square of length 4 units.
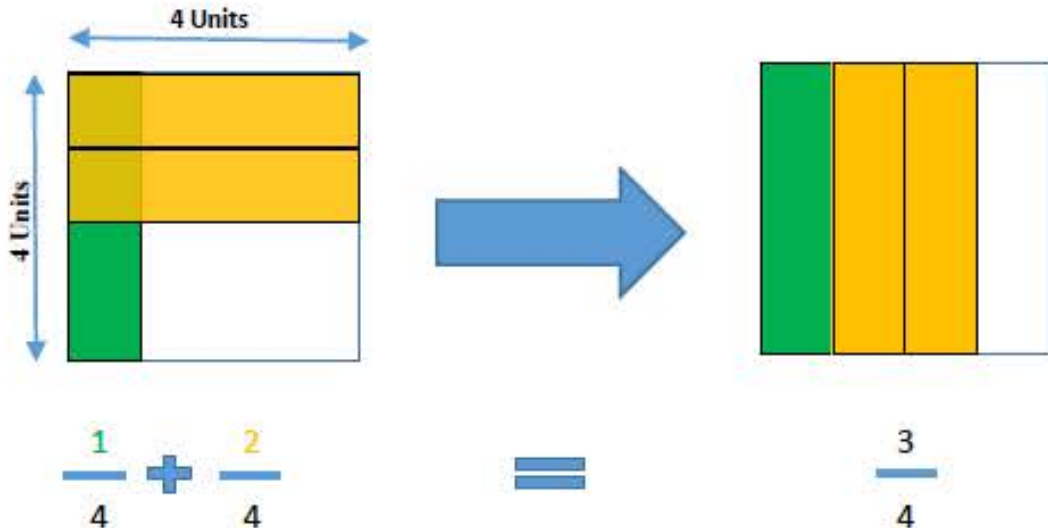
Note: The green bar represents the fraction ¼ (since 4 green bars of width 1 unit can fit vertically in this rectangle). The yellow bars represent the fraction 2/4 (since 4 yellow bars of width 1 unit can fit horizontally in this rectangle).

Since the green bar and the yellow bars are of the same size, numbers can be added to get 3 bars in the square of length 4 units. Thus ¼ + 2/4 is equal to ¾.

Addition of two unlike fractions

Take addition of two unlike fractions 2/4 + 1/6

Consider a rectangle of length 4 units and breadth 6 units.

The green bar represents the fraction 1/6 (since 6 green bars of width 1 unit can fit vertically in this rectangle). The yellow bars represent the fraction 2/4 (since 4 yellow bars of width 1 unit can fit horizontally in this rectangle).

Since the green bar and yellow bars are of different sizes, they cannot add numbers directly.

Observation of the addition of "like fractions", the green and yellow bars have to be of the same size to quickly add them. And that's only possible in square. Here there is a rectangle.

Taking the concept of LCM, find smallest numbers of such rectangles that will make a perfect square. Students will discuss with their peers and use the sheets to cut out required triangles.

Ans: Figure 5
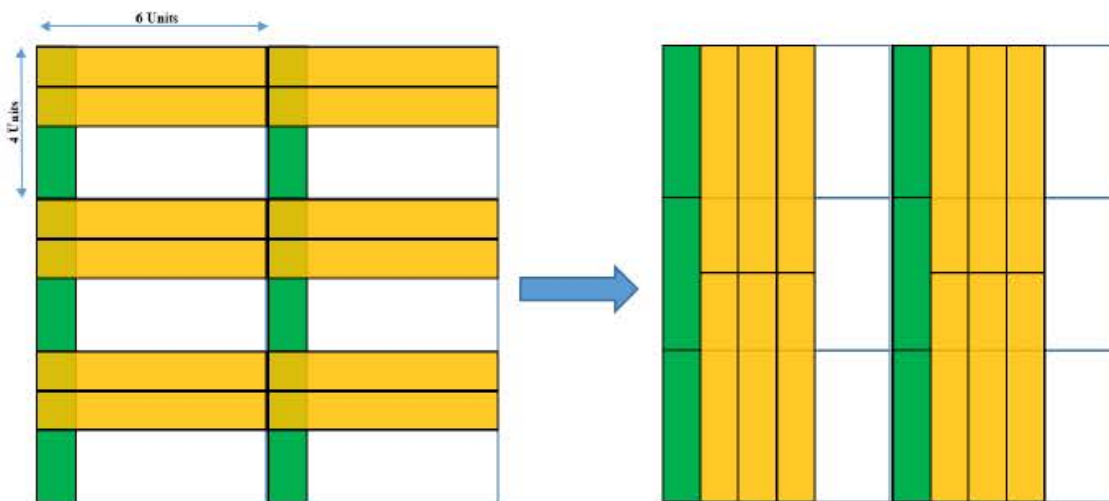
FIGURE 5: Making a square using 6 rectangles of size 6 by 4 units.

By using 6 such rectangular pieces, perfect square can be made as shown in figure 5.

The length of the square is 12 units.

Observe there are 6 yellow bars and 2 green bars. Since all the bars are of the same size, direct addition is possible. The answer would be (6+2)/12 = 8/12.

Thus 2/4 + 1/6 is equal to 8/12.

Extra puzzle: You have a brick of length 1 unit, breadth 2 units and height 3 units. How many bricks would you need to make the smallest possible cube? Do you see any similarity here compared with the puzzles we talked about in this article? Can you solve this puzzle using the concept of LCM?

| Source | http://www.teachersofindia.org/en/article/lcm-visualization-and-fractions |

2

Activity

Objective: Multiply the numerator and denominator with the same number in order to find equivalent fractions

Materials required: Coloured sheet, scale

Setup: Divide students into pairs and provide them the coloured sheets to work with.

Steps:

Getting equivalent fraction:

a. Fold a square according to the denominator q of the given fraction p/q

Example: A folding of anu fraction with denominator 4 will have paper folded 4 times.

b. Shade p parts to get the fraction – use more squares if it's an improper fraction – e.g. ¼ will look like the image below

c. Fold the square other way (i.e. the new fold lines will be perpendicular to the previous ones) in n parts.
d. Now the square is divided into nq parts of which np is shaded indicating a fraction np/nq – if improper, fold each square in the same way – e.g. following image shows n = 3, p=1, q=4
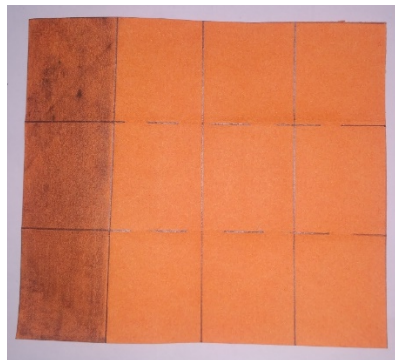
e. Notice how the numerator and denominator both got multiplied with the same number – e.g. by 3 in the given case.

Limitation: this can't be used to get an equivalent fraction with smaller denominator
Variation in the activity for group
1: Unit fractions
      a. Roll the coloured dice and write the unit fraction with the given denominator
      b. Roll the regular dice and write the 2nd fraction with this numerator and equivalent to the 1st
2: Any fractions: in groups of 3
      a. 1st player rolls both the die and writes the 1st fraction
      b. 2nd player rolls the coloured dice and tries to get a fraction with this 2nd denominator and equivalent to the 1st – if it is not possible 2nd player writes a fraction equivalent to the 1st one and with denominator multiple of the 2nd denominator but different from the 1st one.
      c. 3rd player rolls the regular dice and tries to get a fraction with this 3rd numerator and equivalent to the 1st – if it is not possible 3rd player writes a fraction equivalent to the 1st one and with numerator multiple of the 3rd numerator but different from the 1st one

Features:
1. Automatize equivalent fractions of unit fractions in variation 1
2. Paves the way for addition-subtraction (and comparison) of unlike fraction in variation 2
3. Identifies when one number is a multiple of the other

Reference: http://teachersofindia.org/en/article/fractions-a4-sheets-and-paper-folding

100

8. DECIMALS

QR Code:

G5H6U4

Learning Objectives and Learning Outcomes:

Content area / Concepts	Sub-concepts	Learning Objectives	Learning Outcome
Introduction		Write rupees paisa in decimal form in order to know the meaning and relevance of dot point.	Calculates fractions and decimals in different real-life situations in order to identify the appropriate quantity of money, length, temperature etc. For example, 7½ metres of cloth. Distance between two places is 112.5 km etc.
Tenths		Represent number in its unit and tenth part in order to write it in decimal form.	
		Determine the place value of decimal numbers up to tenth in order to write the number in expanded form.	
		Divide the numbers into ten equal parts in order to represent decimal numbers up to tenth place	
Hundredths		Represent number in its unit and hundredth part in order to write it in decimal form.	
		Determine the place value of decimal numbers up to hundredth in order to write the number in expanded form.	
		Determine the part and whole of a given decimal number in order to represent it in the form of fractions.	
		Determine the place of the digits of a decimal number in order to write it in words	
		Compare the units and parts of the decimal numbers in order to compare them as a whole	
Using Decimals	Money	Represent/Convert the money, length and weight into smaller units in order to represent it into decimal form	
	Length		
	Weight		
Addition of Numbers with Decimals		Add and subtract the whole and parts of decimal numbers in order to find their sum and difference	Calculates addition and subtraction of fractions and decimals in order to solve daily life problems involving quantities that measure between two integers
Subtraction of Decimals			

Test items

101

LG: Write rupees paisa in decimal form in order to know the meaning and relevance of dot point.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Which is the correct way to represent the amount "8 rupees and 3 paise"?
   Option 1: 3.08
   Option 2: 3.80
   Option 3: 8.03
   Option 4: 8.30
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Understanding
2. Radha has one coin each of all the denominations listed in the table below.

Denominations
5 paise
10 paise
20 paise
25 paise
50 paise
Rs 1
Rs 2

Which option correctly represents the total amount she has?
   Option 1: 3.110
   Option 2: 3.011
   Option 3: 4.10
   Option 4: 4.01
Correct Answer: Option 3

LG: Represent number in its unit and tenth part in order to write it in decimal form.

Level of difficulty: Medium
Bloom's Level: Analysing/Applying
1. Akash measured the length of his comic book as 25 cm 5 mm. What will be the length of the book, in cm?
   Option 1: 25.0 cm
   Option 2: 25.05 cm
   Option 3: 25.5 cm
   Option 4: 25.55 cm
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing/Applying
2. Arvind has two wooden blocks of 1 m and 10 cm as shown below.
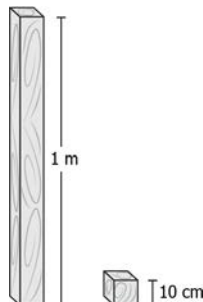
If Arvind added the smaller block to the above of longer block, what will be the total height of the resulting block?
   Option 1: 11.0 m
   Option 2: 1.001 m

Option 3: 1.01 m
Option 4: 1.1 m
Correct Answer: Option 4

LG: Determine the place value of decimal numbers up to tenth in order to write the number in expanded form.

Level of difficulty: Medium
Bloom's Level: Applying
1. Which of the following tables shows the correct place value of the given numbers?
    Option 1:

	Hundreds	Tens	Ones	Tenth
193.5	1	9	3	5

    Option 2:

	Hundreds	Tens	Ones	Tenth
45.6	4	5	0	6

    Option 3:

	Hundreds	Tens	Ones	Tenth
489.4	0	4	8	9

    Option 4:

	Hundreds	Tens	Ones	Tenth
16.1	1	6	1	0

Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Analysing
2. Consider the relation below. 24.5 <*ab.c*
    Given that *ab.c* is the smallest possible number that satisfies the condition.
    Which option correctly represents the place value table for the number *ab.c*?
    Option 1:

	Tens	Ones	Tenth
24.6	2	4	6

    Option 2:

	Tens	Ones	Tenth
26.4	2	6	0

    Option 3:

	Tens	Ones	Tenth
46.2	4	2	6

    Option 4:

	Tens	Ones	Tenth
64.2	0	6	4

Correct Answer: Option 1

LG: Divide the numbers into ten equal parts in order to represent decimal numbers up to tenth place.

Level of difficulty: Medium
Bloom's Level: Applying
1. If a student divided the number 616 by 10, which of the following options represent the answer?
    Option 1: 616.0
    Option 2: 61.6
    Option 3: 6.16
    Option 4: 0.616
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Applying
2. A group of 13 people went for a lunch. They ordered a meal for Rs 809. If 10 of them shared the bill, how much amount did each person pay?
    Option 1: Rs. 8.0
    Option 2: Rs. 62.2

103

Option 3: Rs. 80.9
Option 4: Rs. 269.7
Correct Answer: Option 3

LG: Represent number in its unit and hundredth part in order to write it in decimal form.

Level of difficulty: Medium
Bloom's Level: Analysing/Applying
1. Which of the following is true?
  Option 1: $(19 + 5 + \frac{8}{100})$ m = 24.008 m
  Option 2: $(2 + 22 + \frac{8}{100})$ m = 24.08 m
  Option 3: $(9 + 15 + \frac{8}{100})$ m = 24.8 m
  Option 4: $(18 + 6 + \frac{8}{100})$ m = 24.88 m
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing/Applying
2. An electrician requires 12 m 65 cm of wire to install a ceiling fan. He has a wire of length 18 m. After installing the fan, how much wire will be left?
  Option 1: 18.00 m
  Option 2: 12.65 m
  Option 3: 6.35 m
  Option 4: 5.35 m
Correct Answer: Option 4

LG: Determine the place value of decimal numbers up to hundredth in order to write the number in expanded form.

Level of difficulty: Medium
Bloom's Level: Applying
1. Consider the place value table below.

		Hundreds	Tens	Ones	Tenth	Hundredth
A	456.45	4	5	6	4	5
B	12.25	1	2	2	5	0

Which numbers has/have been correctly expanded?
  Option 1: Only A
  Option 2: Only B
  Option 3: Both A and B
  Option 4: Neither A nor B
Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Understanding
2. Which of the following expressions represents the number shown below?
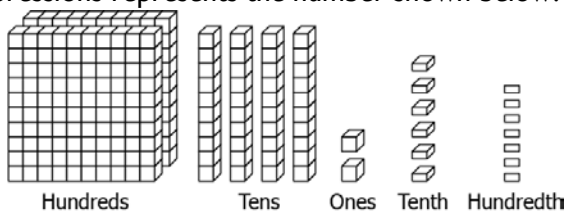
  Option 1: $200 + 40 + 2 + \frac{6}{10} + \frac{7}{100}$
  Option 2: $100 + 40 + 2 + \frac{6}{10} + \frac{7}{100}$
  Option 3: $700 + 60 + 2 + \frac{4}{10} + \frac{2}{100}$
  Option 4: $100 + 60 + 2 + \frac{4}{10} + \frac{2}{100}$
Correct Answer: Option 1

LG: Determine the part and whole of a given decimal number in order to represent it in the form of fractions.

Level of difficulty: Medium
Bloom's Level: Analysing
1. Consider the number 20.26. Which part of this number represents the fractional part?
    Option 1: 20
    Option 2: 26
    Option 3: 0.26
    Option 4: 0.20
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing
2. Consider the following claims about the decimal numbers.
Claim I: 0.60 represents fractional part of the decimal number 195.60.
Claim II: 0.85 represents fractional part of the decimal number 85.52.
Which of the claim(s) is/are correct?
    Option 1: Only Claim I
    Option 2: Only Claim II
    Option 3: Both Claim I and Claim II
    Option 4: Neither Claim I nor Claim II
Correct Answer: Option 1

LG: Determine the place of the digits of a decimal number in order to write it in words.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Consider the number 87.16. What is the place value of the underlined digits in the given decimal number?
    Option 1:

7	Tens
6	Hundredths

    Option 2:

7	Ones
6	Hundredths

    Option 3:

7	Tens
6	Tenth

    Option 4:

7	Ones
6	Tenth

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Understanding
2. Refer the two statements below about the place value.
Statement 1: The number 848.98 can be expressed in words as 'Eight hundred forty-eight and ninety-eight hundredth'.
Statement 2: The number 6221.12 can be expressed in words as 'Six thousand two hundred twenty-one and twelve hundredth'.
Which of the following statement(s) is/are correct?
    Option 1: Statement 1 is correct
    Option 2: Statement 2 is correct
    Option 3: Both Statement 1 and Statement 2 are correct
    Option 4: Neither Statement 1 nor Statement 2 is correct
Correct Answer: Option 3

LG: Compare the units and parts of the decimal numbers in order to compare them as a whole.

     Level of difficulty: Medium

     Bloom's Level: Understanding

     1. Which of the following decimal numbers is the smallest?

          Option 1: 25.81

          Option 2: 25.18

          Option 3: 25.87

          Option 4: 25.78

     Correct Answer: Option 2

     Level of difficulty: Hard

     Bloom's Level: Applying

     2. In a white bag, there are 800 g radish, 250 g tomato and 1,400 g onion. In a blue bag, there are 1,250 g guava, 200 g cherry 250 g strawberry and 300 g oranges. Which of the following statements is true about the two bags?

          Option 1: Weight of white bag is more than the blue bag as 24.50 kg > 20.00 kg

          Option 2: Weight of white bag is less than the blue bag as 24.50 kg > 17.00 kg

          Option 3: Weight of white bag is more than the blue bag as 2.450 kg > 2.000 kg

          Option 4: Weight of white bag is less than the blue bag as 2.450 kg > 17.000 kg

     Correct Answer: Option 3

LG: Represent/Convert the money, length and weight into smaller units in order to represent it into decimal form.

     Level of difficulty: Medium

     Bloom's Level: Understanding

     1. Consider the following claims.

     Claim 1: 190 paise can be expressed as 1.90 rupees.

     Claim 2: 1562 cm can be expressed as 15.62 m.

     Which of the claim(s) is/are correct?

          Option 1: Only Claim 1

          Option 2: Only Claim 2

          Option 3: Both Claim 1 and Claim 2

          Option 4: Neither Claim 1 nor Claim 2

     Correct Answer: Option 3

     Level of difficulty: Hard

     Bloom's Level: Applying

     2. If Andy takes 850 seconds to take a shower and he spends an additional 590 seconds to eating breakfast, how many minutes does it take Andy to do both tasks?

          Option 1: 24 minutes

          Option 2: 23 minutes

          Option 3: 14.1 minutes

          Option 4:9.8 minutes

     Correct Answer: Option 1

LG: Add and subtract the whole and parts of decimal numbers in order to find their sum and difference.

     Level of difficulty: Medium

     Bloom's Level: Applying/Understanding

     1. The length of a copper wire is 15.8 m. If a steel wire is 6.7 m longer than the copper wire, what is the length of the steel wire?

          Option 1: 9.1 m

          Option 2: 15.80 m

          Option 3: 21.15 m

          Option 4: 22.5 m

     Correct Answer: Option 4

     Level of difficulty: Hard

     Bloom's Level: Analysing

106

2. Raju had 105 rupees 45 paise and spent 75 rupees 12 paise at a shop. Adnan had 54 rupees 50 paise and spent 22 rupees 10 paise at a store. Which of the following options correctly compares the money left with them?

    Option 1: Raju has 2.07 rupees more than Adnan
    Option 2: Adnan has 2.07 rupees more than Raju
    Option 3: Raju has 103.97 rupees more than Adnan
    Option 4: Adnan has 103.97 rupees more than Raju

Correct Answer: Option 2

Suggested Teacher Resources

Lesson Plan

I

Objective- Students will be able to read, write, add and subtract decimals in order to solve decimals related problems.
Material Required- Activity Sheet.
Procedure-

1. Read and Write

- Teacher will quickly revise place value and reading numbers including decimals. To make this quicker, Teacher will fill in the names of the place values and families (billions, millions, etc.) so that students spend their time practicing rather than copying.

- A common mistake is for students to forget to put zeros in their numbers. For example, a student may incorrectly write .9 to represent nine hundredths. Or a student may write 50,250 instead of 50,025. When teacher see these mistakes, the teacher can read the number the student has written and ask them if it matches the problem. Students can usually quickly identify and resolve their mistake.

- Some English-language learners' students may struggle differentiating between whole number and decimal place values (i.e. thousands vs. thousandths). Teacher try to exaggerate the "ths" when I read a number that includes a decimal. If a student has made a mistake involving the place value then teacher go back to the visual and review the difference.

Use the Digits to write the following numbers-:
    i)   Twenty-four thousand, Nine hundred sixty-eight and nine hundredth _____
    ii)   Fifty thousand twenty-five and one tenth _____
    iii)   One thousand, seven and thirty-two thousandths_____ .

2.Sum and Difference-:

- Teacher will create Homogeneous Groups for this part of the lesson. Teacher will determine which groups need which problems and create a set of index cards with problems that are written in the same color.
- Then students get into groups and work on their first addition problem. Teacher will walk around to ensure that students are estimating and explaining their process. Some students may struggle here, since teacher have not given them a short cut. It is important that student's reason together as to how they can find an exact sum. A common mistake is that students line up the digits, not taking the decimal point into account, and then add.
- Once most groups have finished their first problem, we come back together as a class. Teacher ask students to share out how their group worked to find an exact sum.

- Here, teacher push students to use specific and accurate language. Some students will have added zeros to serve as place holders and then added each place value. For example, a group with the problem 6.5 + 10.09 may have adjusted the problem to add 6.50 + 10.09. This is great, but Teacher want to make sure that students understand *why* they do this.

107

- Teacher will ask students why this works. How can you change the number like that? Won't that change the problem and the answer? Teacher want students to explain that .5 is the same as .50, so the answer will not change. Teacher make the connection to creating common denominators when we add fractions.

- Then students complete the second problem. Once most groups are finished, we come back together as a class to reflect on how our strategies worked.
- Teacher will also present an example where Teacher line up the digits, and do not pay attention to the decimal points. For instance, for 15.06 + 4.1 I line up the 4.1 directly underneath the .06. Teacher add and declare that the answer is 15.47. Teacher want students to correct my mistake. Teacher stress that if I had made an estimate, Teacher would probably have realized that something went wrong.
- Then move onto exact differences and repeat the same process. Students work and develop strategies, we come together to share what happened, and then students practice with another problem. The common mistakes are the same for subtraction. If Teacher see students see a common mistake among groups, Teacher keep it in mind and address it in the closure.
- If groups successfully complete their problems, they can move onto the Word Problem Sheet.

Sum Problems-:
i) 6.5+10.09
ii)15.06+4.1
iii)22.53+9.4
iv)46.023+6.7
 v)12.235+0.79
vi)3.915+17.2+0.582

Difference Problems-:
i)12.1-1.97
ii)28.8-9.56
iii)44.09-18.276
iv)107.8-28.132
v)229.3-41.038

Words Problems-:
Q1. In January Seema saves 542.90 Rs. In February she saves 209.87 Rs. in march she saves 103 Rs. What is the total amount she saves in January, February and March?
Q2. Rahul pays 4550.3 Rs as rent per month. Vivek pays 6800 Rs as rent per month. how much more does Vivek pay each month.

2   **Activity**

In this hands-on lesson, students participate in a tactile activity as a way to grasp the connections among fractions and decimals. In this introductory lesson, students use what they know about fractions to begin their exploration of decimals. By connecting fractions to decimals, students will build a deeper understanding of decimals. They explore decimals using Base Ten Blocks and 10x10 grids.

Color	Number	Fraction	Decimal

TOTAL = 100

- Note: In preparing for the lesson, Teacher should use a grid of 100 squares on tan graph paper so that students could clearly visualize and determine the decimal form (0.01 for each square) for the amount of each color used. Students could then calculate their fraction and decimal equivalents. Each student was required to use at least three colors of squares. Squares left blank could be counted as white or tan. Teacher asked students to choose from a total of six different colors but ultimately left the design of the artwork to them.

- Teacher instruct students to glue squares onto a 10 x 10 grid to create a mosaic design. They must use between 3 and 6 colors to fill their grid. Teacher set the timer for 30 minutes for students to create and glue their designs. This helps keep chatting to a minimum and students focused on the task.

- After the 30 minutes, Teacher then direct students to look at their design and calculate the fraction of each color they used.

- Students record the fraction for each color they used on the back of their mosaic grid. Next, tell students that there are many ways to represent numbers. Then display a 10 x 10 grid under the document camera and shade in 10 squares. Ask the students how many squares make the whole. (100) Then ask the students what part of the whole is shaded. (10/100) then tell students that another name for this number is one tenth or 0.10. Tell students that this second number is a decimal and invite them to list where they have seen decimals before.

- Next, show students different grids and we practice together naming the fraction and the decimal together. (i.e. 62/100 = 0.62 = sixty-two hundredths.) Show students that 0.62 is 6/10 + 2/100 = 62/100

- Finding the number of a certain color of square is one way to give students an opportunity to think about pairs that make 100. As students make their decimal designs on the 10 x 10 grid, ask them if they have more of particular colors. If they have more of a color, ask them to count the number of squares that are not that color and subtract that number from 100 (i.e. think about what number added to the number of unshaded squares would equal 100). This is a great opportunity to review numbers that add up to 100 and practice mental math and for students to explain how they know how many squares are shaded.

Place Value Chart (decimals to hundredths)

Thousands	Hundreds	Tens	Ones	Tenths	Hundredths

Source-:https://betterlesson.com/lesson/459367/adding-and-subtracting-decimals?from=search
https://betterlesson.com/lesson/585524/coloring-tiles-decimal-designs?from=search

9. DATA HANDLING

QR Code:

NCERT Learning outcome:

Content area / Concepts	Sub-concept	Learning Objectives	Learning Outcome
Introduction		Observe different tables in order to gather the information recorded in the table	Arranges given/collected information such as expenditure on different items in a family in the last six months, in the form of table, pictograph and bar graph in order to interpret them.
Recording Data		Group and compare raw data systematically in order to infer the relevant information quickly	
Organization of data		Organise raw data into a table using tally marks in order to organize the given data	
Pictograph		Observe and understand pictograph representation of data in order to answer the question on data at a glance	
Interpretation of a Pictograph		Analyze pictograph in order to reason the information presented	
Drawing a Pictograph		Draw a pictograph in order to represent the given information using appropriate symbols	
A Bar Graph	Interpretation of a bar graph	Observe bar graph in order to reason the information presented	
	Drawing a bar graph	Choose an appropriate scale in order to represent a given information in the form of a bar graph	
		Interpret bar graph in order to find the relevant information represented by the bar graph	

111

Test items

LG: Observe different tables in order to gather the information recorded in the table

Level of difficulty: Medium
Bloom's Level: Understanding
1. The table below shows the marks obtained by 5 students in Science exam.

Name of student	Attendance (Marks)	Assignment (Marks)	Theory (Marks)	Total Marks
Abhi	5	10	45	60
Rajeev	4	8	58	70
Simran	5	6	38	49
Karuna	5	9	57	71
Jatin	4	10	65	79

Which student scored the highest marks in theory?
>   **Option 1:** Karuna
>   **Option 2:** Jatin
>   **Option 3:** Abhi
>   **Option 4:** Simran

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing
2. The table below shows the monthly expenditure of five factories:

Factories	Salaries of employees, in thousands	Electricity and water bills, in thousands	Transportation, in thousands	Other Expenses, in thousands	Total, in thousands
A	1200	45	75	34	1354
B	1350	52	62	28	1492
C	950	38	50	42	1080
D	1050	48	48	25	1171
E	880	40	42	32	994

Which of the following statements is correct?
>   **Option 1:** The amount spent by factor A on transportation and other expenses is more than the amount spent by factory C.
>   **Option 2:** The amount spent by factory E on electricity and transportation is the same.
>   **Option 3:** Factory A spent an extra of Rs. 260 thousand than factory E.
>   **Option 4:** On transportation, Factory B spent the highest amount.

Correct Answer: Option 1

LG: Group and compare raw data systematically in order to infer the relevant information quickly

Level of difficulty: Medium
Bloom's Level: Applying
1. A teacher wants to know the favourite ice-cream flavor of his students. How should the teacher record the data to know the number of students whose favourite flavour is chocolate?
>   **Option 1:** List of students and their choice of flavour written against each name.
>   **Option 2:** Writing the number of students who prefer each flavour.
>   **Option 3:** List of students whose favourite flavour is chocolate.
>   **Option 4:** Writing the flavours preferred one by one.

Correct answer: 2

Level of difficulty: Hard
Bloom's Level: Applying
2. A bakery owner wants to record the sale of four items over the past hour. The owner thinks of two ways to record the data as shown.

112

Method I: Recording the number of each item sold.
Method II: Taking 4 jars and putting a coin for each item sold.
Which of these method(s) is correct?
> **Option 1:** Only method I
> **Option 2:** Only method II
> **Option 3:** Both method I and method II
> **Option 4:** Neither method I nor method II

Correct answer: 3

LG: Organise raw data into a table using tally marks in order to organize the given data

Level of difficulty: Medium
Bloom's Level: Understanding

1. A teacher asked students about the choice for their favorite past time. She recorded the data as:
Reading, Playing, Drawing, Reading, Playing, Playing, Painting, Drawing, Drawing, Watching, Drawing, Drawing, Playing, Watching, Drawing.
Which of the following option shows the representation of the information in the table using tally marks?

Option 1:

Choice	Tally Marks	Number of Students
Reading	||	2
Playing	||||	4
Drawing	ⅢⅠ	6
Painting	|	1
Watching	||	2

Option 2:

Choice	Tally Marks	Number of Students
Reading	||	2
Playing	||||	4
Drawing	Ⅲ	5
Painting	|	1
Watching	||	2

Option 3:

Choice	Tally Marks	Number of Students
Reading	|	1
Playing	Ⅲ	5
Drawing	ⅢⅠ	6
Painting	|	1
Watching	||	2

Option 4:

Choice	Tally Marks	Number of Students
Reading	||	2
Playing	||||	4
Drawing	Ⅲ	5
Painting	|	1
Watching	|||	3

Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Understanding

2. A bakery owner records the sales of its items over an hour as shown below.

Items	Tally Marks
Burger	𝍷𝍷 𝍷𝍷 ‖
Muffin	𝍷𝍷 ‖‖
Pizza	𝍷𝍷	
Cupcake	‖‖
Pancake	𝍷𝍷 𝍷𝍷 𝍷𝍷

After 2 hours, the bakery sold a total 74 items, such that the highest number of muffins were sold and least number of pizzas were sold. Which of the following table represents the data after 2 hours?

Option 1:

Items	Tally Marks
Burger	𝍷𝍷 𝍷𝍷 𝍷𝍷
Muffin	𝍷𝍷 𝍷𝍷 𝍷𝍷 ‖‖
Pizza	𝍷𝍷 𝍷𝍷 ‖‖
Cupcake	𝍷𝍷 ‖‖
Pancake	𝍷𝍷 𝍷𝍷 𝍷𝍷	

Option 2:

Items	Tally Marks
Burger	𝍷𝍷 𝍷𝍷 𝍷𝍷
Muffin	𝍷𝍷 𝍷𝍷 𝍷𝍷 ‖‖
Pizza	𝍷𝍷 ‖‖
Cupcake	𝍷𝍷 𝍷𝍷 ‖‖
Pancake	𝍷𝍷 𝍷𝍷 𝍷𝍷 ‖

Option 3:

Items	Tally Marks
Burger	𝍷𝍷 𝍷𝍷 𝍷𝍷 ‖‖
Muffin	𝍷𝍷 𝍷𝍷
Pizza	𝍷𝍷 ‖
Cupcake	𝍷𝍷
Pancake	𝍷𝍷 𝍷𝍷 𝍷𝍷 ‖‖

Option 4:

Items	Tally Marks
Burger	𝍷𝍷 𝍷𝍷 ‖‖
Muffin	𝍷𝍷 𝍷𝍷 𝍷𝍷 𝍷𝍷
Pizza	𝍷𝍷 ‖‖
Cupcake	𝍷𝍷 𝍷𝍷	
Pancake	𝍷𝍷 𝍷𝍷 𝍷𝍷 ‖‖

Correct answer: 2

LG: Observe and understand pictograph representation of data in order to answer the question on data at a glance

Level of difficulty: Medium
Bloom's Level: Understanding
1. The given pictograph shows the number of books sold at a bookshop over a week.

114

Days	Number of Books Sold
Monday	📘 📘 📘 📘 📘 📘
Tuesday	📘 📘
Wednesday	📘
Thursday	📘 📘 📘 📘
Friday	📘 📘 📘
Saturday	📘 📘 📘 📘 📘 📘 📘

📘 = 1 book sold

On which day, the minimum number of books were sold?

Option 1: Saturday
Option 2: Tuesday
Option 3: Monday
Option 4: Wednesday
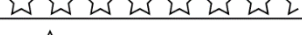
Correct answer: 4

Level of difficulty: Hard
Bloom's Level: Analysing

2. A teacher made a pictograph which shows the marks obtained by 5 students in Math test out of 100. She represents following information in the pictograph.
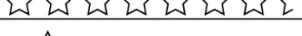
- Raj scored the maximum marks and Ankita scored the minimum marks.
- Ankur scored 15 marks more than Ankita.
- Arti scored 5 marks less than Aman.

Which of these pictographs could she have drawn?

Test	Marks Obtained
Raj	☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ⛥
Ankita	☆ ☆ ☆
Ankur	☆ ☆ ☆ ☆ ⛥
Arti	☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆
Aman	☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ⛥
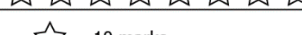
Option 1: ☆ = 10 marks

Test	Marks Obtained
Raj	☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ⛥
Ankita	☆ ☆ ☆
Ankur	☆ ⛥
Arti	☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆
Aman	☆ ☆ ☆ ☆ ☆ ☆ ☆ ⛥

Option 2: ☆ = 10 marks

Test	Marks Obtained
Raj	☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ⛥
Ankita	☆ ☆ ☆
Ankur	☆ ☆ ☆ ☆ ⛥
Arti	☆ ☆ ☆ ☆ ☆ ☆ ☆ ⛥
Aman	☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆

Option 3: ☆ = 10 marks

Test	Marks Obtained
Raj	☆ ☆ ☆
Ankita	☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆
Ankur	☆ ☆ ☆ ☆ ☆
Arti	☆ ☆ ☆ ☆ ☆ ☆ ☆
Aman	☆ ☆ ☆ ☆ ☆ ☆

Option 4:   ☆ = 10 marks

Correct answer: 3

LG: Analyze pictograph in order to reason the information presented

Level of difficulty: Medium
Bloom's Level: Applying
1. The pictograph shows the number of bouquets sold by a flower shop in the past 4 days.

Day	Number of Bouquets
Monday	🌷 🌷 🌷 🌷 🌷
Tuesday	🌷 🌷 🌷 🌷 🌷 🌷
Wednesday	🌷 🌷 🌷
Thursday	🌷 🌷 🌷 🌷 🌷 🌷 🌷

🌷 = 3 bouquets

What is the difference between the greatest number of bouquets sold and the least number of bouquets sold?
> **Option 1:** 5
> **Option 2:** 9
> **Option 3:** 15
> **Option 4:** 33

Correct answer: 3

Level of difficulty: Hard
Bloom's Level: Analysing
2. A group of students were asked about their favourite instrument. A teacher represents the information in the pictograph shown.

Instrument	Number of Students
Guitar	◆ ◆ ◆ ◆ ◆ ◆ ◆
Tabla	◆ ◆ ◀
Keyboard	◆ ◆ ◆ ◆ ◀
Drums	◆ ◆ ◆ ◆ ◆
Piano	◆ ◆

◆ = 16 students

The teacher makes a mistake while representing the information:
- More number of students prefer piano than Tabla
- Less number of students prefer Keyboard than Tabla

If the total number of students showing preference for the 3 instruments remains the same, which of these could be the number of students who prefer Piano, Tabla and Keyboard?
> **Option 1:** Piano = 4, Tabla= 3 and Keyboard = 2
> **Option 2:** Piano = 64, Tabla= 48 and Keyboard = 32
> **Option 3:** Piano = 48, Tabla= 64 and Keyboard = 32
> **Option 4:** Piano = 68, Tabla= 48 and Keyboard = 36

Correct answer: 2

116

LG: Draw a pictograph in order to represent the given information using appropriate symbols

Level of difficulty: Medium
Bloom's Level: Applying
1. The number of sea animals in a sea animal aquarium are as shown.
   - There are 40 star fish.
   - The number of sea horse is half the number of star fish.
   - There are 10 turtles.
   - The number of sting ray is 10 more than the number of star fish.

Which pictograph correctly represents the number of sea animals in the aquarium?

Sea Animals	Number of Sea Animals
Star fish	▲ ▲ ▲ ▲
Sea horse	▲ ▲
Turtle	▲
Sting ray	▲ ▲ ▲ ▲ ▲

Option 1: ▲ = 10 sea animals

Sea Animals	Number of Sea Animals
Star fish	▲ ▲ ▲ ▲
Sea horse	▲ ▲ ▲ ▲ ▲ ▲ ▲
Turtle	▲
Sting ray	▲ ▲ ▲ ▲ ▲

Option 2: ▲ = 10 sea animals

Sea Animals	Number of Sea Animals
Star fish	▲ ▲ ▲ ▲ ▲ ▲ ▲
Sea horse	▲ ▲ ▲ ▲
Turtle	▲ ▲
Sting ray	▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲

Option 3: ▲ = 10 sea animals

Sea Animals	Number of Sea Animals
Star fish	▲ ▲ ▲ ▲
Sea horse	▲ ▲
Turtle	▲
Sting ray	▲ ▲ ▲

Option 4: ▲ = 10 sea animals
Correct answer: 1

Level of difficulty: Hard
Bloom's Level: Applying
2. The number of customers who visited a restaurant in the past 5 days is as shown.
   - On Monday, 125 customers visited.
   - The number of customers on Tuesday and Thursday is the same.
   - On Wednesday, 100 more customers visited than on Monday.
   - On Friday, the maximum number of customers visited.

Which of these can be the pictograph correctly representing the number of customers?

Day	Number of Customers
Monday	● ● ●
Tuesday	● ●
Wednesday	● ● ● ●
Thursday	● ●
Friday	● ● ● ● ●

Option 1: ● = 50 customers

Day	Number of Customers
Monday	● ● ◖
Tuesday	● ●
Wednesday	● ● ● ● ◖
Thursday	● ●
Friday	● ● ● ● ●

Option 2:   ● = 50 customers

Day	Number of Customers
Monday	● ● ◖
Tuesday	● ●
Wednesday	● ● ● ● ◖
Thursday	● ● ◖
Friday	● ● ● ● ◖

Option 3:   ● = 50 customers

Day	Number of Customers
Monday	● ● ◖
Tuesday	● ◖
Wednesday	● ● ● ● ◖
Thursday	● ● ◖
Friday	● ● ● ● ● ●

Option 4:   ● = 50 customers
Correct answer: 2

LG: Observe bar graph in order to reason the information presented

Level of difficulty: Medium
Bloom's Level: Understanding
1. The given bar graph shows the number of fruits sold by the fruit vendor in the last two weeks.
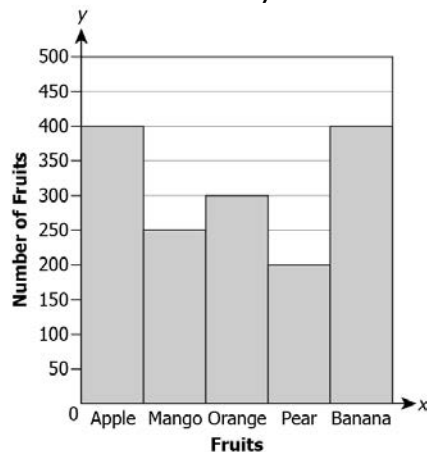
How many more apples were sold than mangoes in the last two weeks?
   Option 1: 150
   Option 2: 250
   Option 3: 400
   Option 4: 650
Correct answer: 1

Level of difficulty: Hard
Bloom's Level: Analysing
2. The bar graph shows the sales of candles in a fair in last five weeks.

118
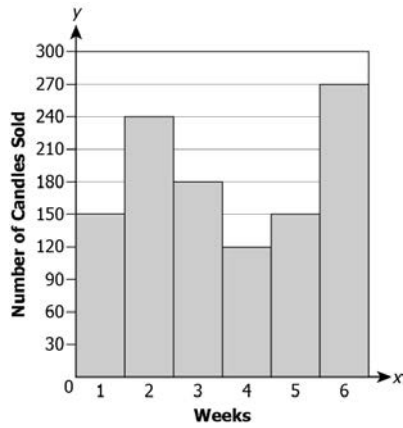
Which of these statements is correct?

> **Option 1:** In odd number of weeks 150 less candles were sold than in even number of weeks.
> **Option 2:** In the first three weeks 20 more candles were sold than in the last three weeks.
> **Option 3:** In week 1, 120 more candles were sold than in week 6.
> **Option 4:** A total of 1010 candles were sold in 6 weeks.

Correct answer: 1

LG: Choose an appropriate scale in order to represent a given information in the form of a bar graph

Level of difficulty: Medium
Bloom's Level: Applying

1. The table below shows the number of animals in a zoo.

Animal	Number of Animals
Deer	90
Horse	60
Zebra	40
Elephants	20

Which bar graph correctly represents the number of animals in the zoo?
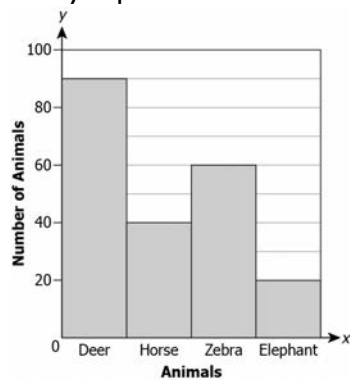
Option 1:
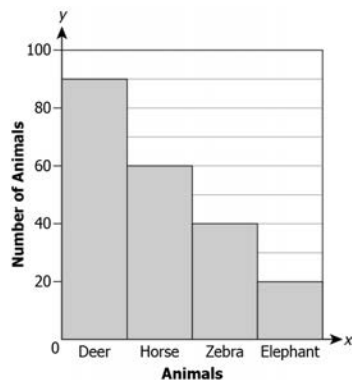
Option 2:
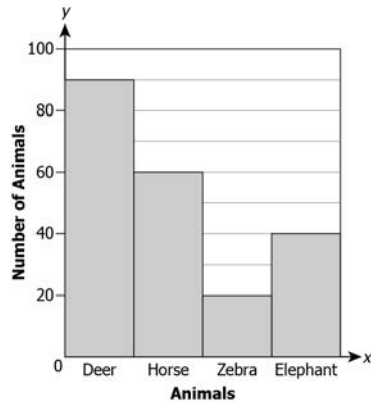
119
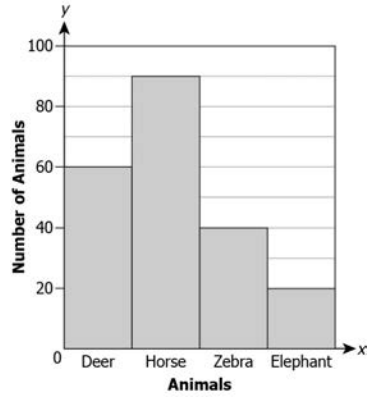
Option 3:

Option 4:

Correct answer: 2

Level of difficulty: Hard

Bloom's Level: Applying

2. The number of tractors sold in the past 5 months by a company is as shown.
   - The number of tractors sold in March was 300.
   - The number of tractors sold in May were the same as in March.
   - The number of tractors sold in April was more than that in June.
   - The maximum number of tractors were sold in July.

Given that the total number of tractors sold were 1800, which bar graph correctly represents the information?

Option 1:

Option 2:

120
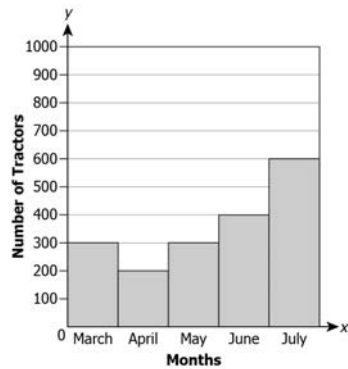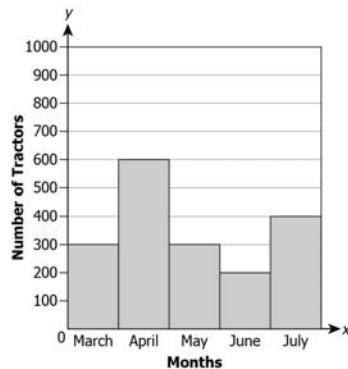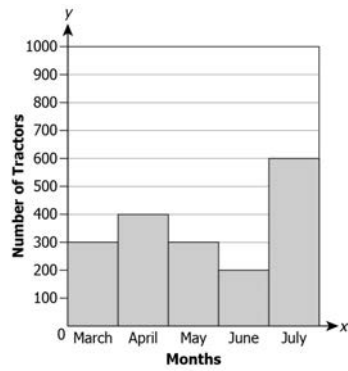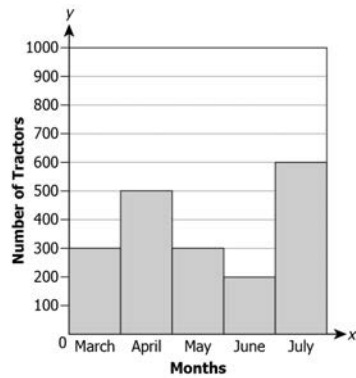
Option 3:

Option 4:
Correct answer: 3

LG: Interpret bar graph in order to find the relevant information represented by the bar graph

Level of difficulty: Medium
Bloom's Level: Applying
1. The bar graph below shows the genres of movies preferred by a group of students.

How many more students prefer drama than horror?
   Option 1: 1
   Option 2: 20
   Option 3: 40
   Option 4: 60
Correct answer: 2

Level of difficulty: Hard
Bloom's Level: Applying
2. Palak records the favourite fruit of a group of 330 students in the bar graph shown.

121
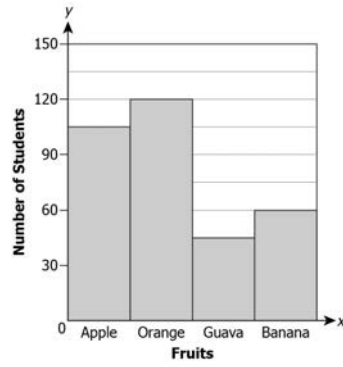
If Palak made a mistake in recording the data, and the number of students whose favourite fruit is apple and guava is the same, how could the bar graph change?
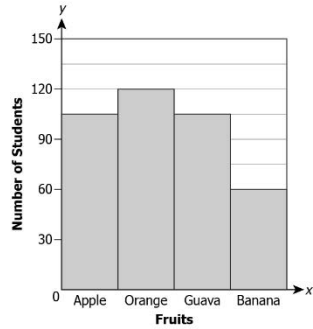
Option 1:
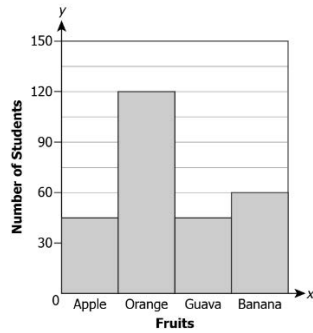
Option 2:
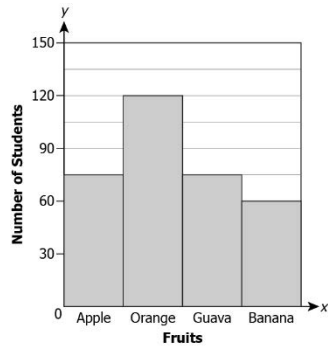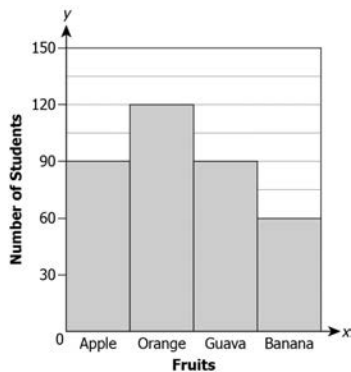
Option 3:

Option 4:

Correct answer: 3

122

Suggested Teacher Resources

I **Lesson Plan**

Objective	Students will Interpret bar graph in order to find the relevant information represented by the bar graph
Material Required	None
Prerequisite Knowledge	Knowledge of Bar graphs
Procedure	The teacher will start the class by showing the following Bar graph to students:

Shoes sizes 6th graders

And then would ask the following questions:
- How many data points are in the graph?
- Can you tell the mode?
- Is there a range of data values?
- When is a bar graph a good way to display data?

Then, the teacher begins by asking students to write down their full names (first and last). Once their names are written down, the teacher then asks them to count the number of letters in their name and collect the data on the board based upon the number of letters in the name. Once the data is on the board, have the students create a bar graph based upon the information collected. At this time, the teacher will move about the classroom making sure students are correctly representing the data. Key parts to look for: title, labelled x and y axis, scale is equal and starts at zero, correct bar heights, bars not connected. When students are done creating the first graph, have them change the format of the graph (vertically or

123

horizontally) based on their first graph. As the students finish their bar graphs, the teacher then asks the following questions:

- How many students have names longer than 10 letters?
- How many students have names less than 10 letters?
- What is the largest number of letters?
- What is the least number of letters?
- What number of letters occurs the most?
- What is called when a data value occurs the most?
- What is it called when we find the difference between highest and lowest values?
- What is the range of this data?

Then the teacher asks the following question:

A class recorded the amount of sugar in some cereal boxes and recorded them in a bar graph:
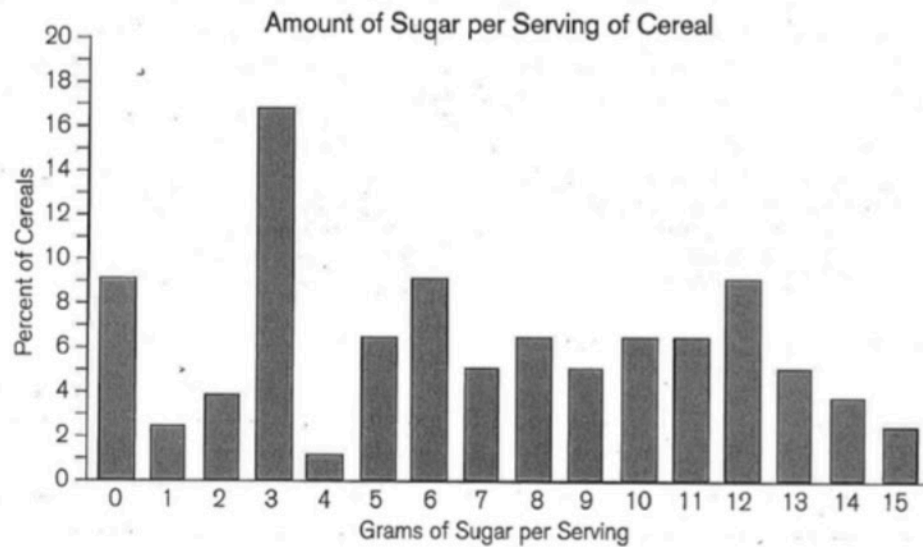
Then the teacher asks the following questions:

- What percent of cereals contain 3 or less grams of sugar per serving?
- What percent of cereals contain more than 9 grams of sugar per serving?
- How many different cereals did the students observe?
- What is the median amount of sugar?
- Did more cereals have less than 8 grams of sugar per serving or did more cereals have 8 grams or more of sugar per serving?

| Source | https://betterlesson.com/lesson/resource/1920225/cereal-worksheet-docx |

2

Activity

Activity 1:

124

The teacher will ask the students if they know how tall they are?

Then the teacher will distribute measuring tapes in groups and would ask students to find out how tall each of the children in the group are.

The teacher will ask the students to:

1. Decide how they are going to measure their height.

2. Record the information in a table.

3. Use block paper to draw a bar graph showing the heights of all the children and to label the axes of the graph. Students will have to decide on the scale they are going to use.

4. Use the graph to describe the data collected.

5. What is the average height of the children in the group? Show how a group got their answer and discuss with the whole class

6. Now look at the heights of all the children in your class and calculate the average height. How does this compare to the average height for your group?

Activity 2:

The teacher will start with the following introduction:

The number of people who live in a household can differ. For example:

Raj lives with his mother and his sister, so there are three people in his household.

Rahul lives with his mother and father, two brothers, and his grandmother, so there are six people in his household.

Then the teacher asks:

1. How many people live in your household?

2. Find out how many people live in your classmates' households. Use a tally chart to record the data.

3. Fill in all the information on the table below:

Number of people in the household	Number of children with this number of people in their households
2	
3	
4	
5 and so on.	

Then, the teacher would ask the students to depict the above information using a bar graph.

Then using the bar graph, the teacher would ask the following questions:

(a) What is the number of people in a household that occurs the most? What is the name we give to this number that occurs most often?

(b) How many children in your class have four people living in their household? Number of People in Household Number of children with this number of people in their household.

(c) What is the smallest number of people in a household? How many children have this number of people in their household?

(d) What is the largest number of people in a household? How many children have this number of people in their household?

(e) If you had to describe this information about the number of people that live in your classmates' households, what would you say?

Then, the teacher would pose the following problem:

The city planners need to know how many people there are in a household so that they can plan how much water, electricity and other services an area will be needing.

(a) They say that knowing the mode is not enough information for their planning. Can you explain why? What other information do they need?

(b) The city planners would like to use a number which is typical of the number of people in a household. They use the number obtained by finding the total number of people in all the households and divide this by the number of households Calculate the average number of people in a household for the children in your group.

(c) Use your data to calculate your class's average number of people in a household. Compare this number to the mode.

(d) Use a coloured pen to draw this number in on your bar graph.

Number of children with this number of people in their household.

Number of People in Household
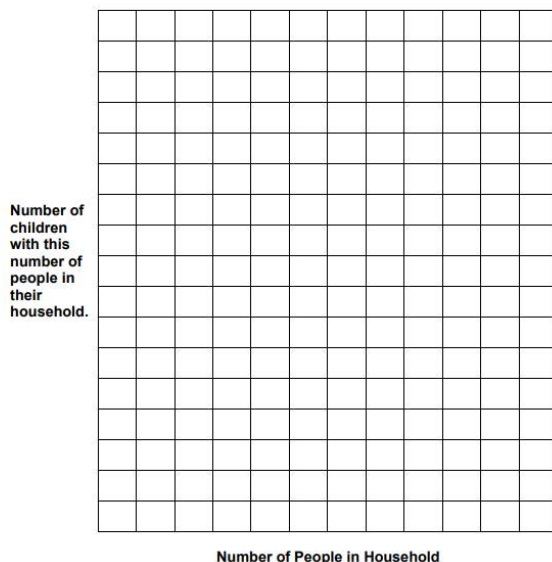
Activity 3: Car Colours

Car Colours!
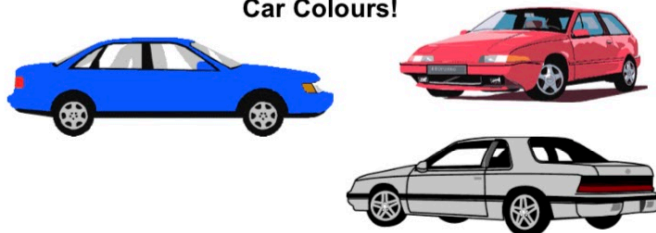
The teacher starts with the following questions:

1. What colour car do you think is the most popular?

2. Raj wanted to find out what is the most popular car colour so he stood outside his house and recorded the information about 50 cars going past. Raj used a tally chart like this to record the data:

Car colour	Number of cars
red	ⅢⅢ ⅢⅢ
white	ⅢⅢ ⅢⅢ Ⅱ
yellow	ⅢⅢ Ⅱ
blue	ⅢⅢ Ⅰ
green	ⅢⅢ ⅢⅢ
black	////
silver	///

(a) How many white cars did Raj count?

(b) How many green cars did Raj count?

126

(c) What is the most popular colour car that he counted?

Activity 4:

Stand on the pavement of a fairly busy street and look at the next 50 cars that come past. Record the data you collect in a tally chart like this:

Car Colour	No. of Cars

4. Make a graph like this for the wall or blackboard, and use stickers of pictures of cars or round stickers to represent the cars:
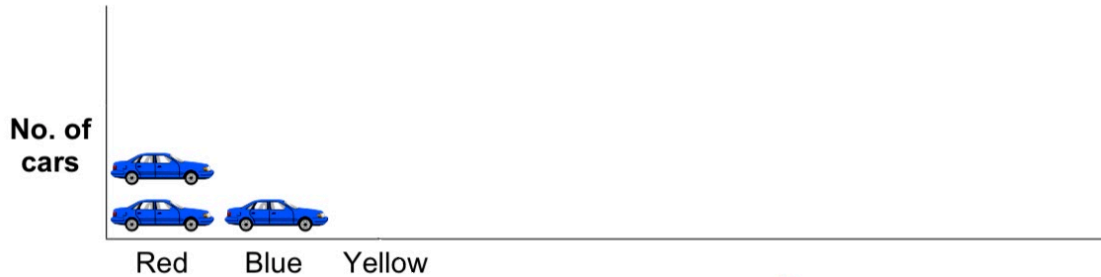
Use the pictogram to answer these questions:
(a) How many blue cars did you see?
(b) Which colour car is the most popular in your neighbourhood? How do you know?
(c) Which colour car did you see the least? How do you know?
(d) Compare the results of your survey with your answer in question 1 and Raj's results. Try to explain any differences.
(e) You have now represented the data in two different ways: a table and a pictogram. Which method do you prefer? Why?

10. MENSURATION

QR Code:

E4S6D7

NCERT Learning outcome:

Content area / Concepts	Sub-concept	Learning Objectives	Learning Outcome
Perimeter		Give example(s) in order to define perimeter of closed figures.	Calculates perimeter and area of rectangular 2-d and 3-d objects to measure them for real life objects
		Deduce and apply the formula to determine the perimeter of a rectangle.	
		Deduce and apply the formula to determine the perimeter of a square.	
		Deduce and generalize the formula to determine the perimeter of a regular polygon	
		Give examples in order to defend that different shapes can have the same perimeter	
Area		Count the squares in order to estimate the area of the given closed curve in the squares grid sheet	Finds out the perimeter and area of the rectangular objects in order to calculate them for commonly found objects from the surroundings like floor of the class room, surfaces of a chalk box etc.
	Area of a rectangle	Deduce and apply the formula in order to determine the area of a rectangle.	
	Area of a square	Deduce and apply the formula in order to determine the area of a square.	

Test items

LG: Give example(s) in order to define perimeter of closed figures.

Level of difficulty: Medium
Bloom's Level: Applying
1. Jatin is finding the perimeter of a figure. Which of these could be the figure?

Option 1:

Option 2:
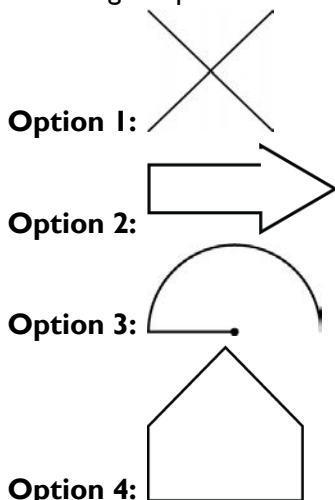
Option 3:

Option 4:

Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Applying
2. In which of these situations will perimeter be calculated?
> **Option 1:** Length of lace border needed to put around a rectangular table cover.
> **Option 2:** Length of rope required to fence three sides of a rectangular backyard.
> **Option 3:** Amount of water needed to fill a container.
> **Option 4:** Amount of paint required to paint a wall.

Correct Answer: Option 1

LG: Deduce and apply the formula to determine the perimeter of a rectangle.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Aditi wants to put decorative tape around the borders of a rectangular cardboard which is 50 cm long and 45 cm wide. Which of these expressions represents the length of tape, in cm, required to cover its borders?
> **Option 1:** (50×45)
> **Option 2:** $(50 + 45)$
> **Option 3:** $2(50 \times 45)$
> **Option 4:** $2(50 + 45)$

Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Apply
2. A student has to form distinct rectangles by using coloured ribbon and paste it on a sheet. If she uses 20 centimetres of ribbon for each rectangle, how many distinct rectangles she can form of dimensions of positive integers?
> **Option 1:** 1
> **Option 2:** 5

Option 3: 6
Option 4: 10
Correct Answer: Option 2

LG: Deduce and apply the formula to determine the perimeter of a square.

Level of difficulty: Medium
Bloom's Level: Applying

1. Arjun wants to fence his square backyard of side length 11 m using rope. He makes 3 complete rounds using the rope to fence. What is the total length of rope used?
    Option 1: 44 m
    Option 2: 66 m
    Option 3: 132 m
    Option 4: 363 m
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing

2. The perimeter of a square is $2k$ cm. If the perimeter of square becomes $\frac{1}{2}k$ cm, how will the side length of the square change?
    Option 1: It will become 4 times
    Option 2: It will become 8 times
    Option 3: It will become one-fourth
    Option 4: It will become one-eighth
Correct Answer: Option 3

LG: Deduce and generalize the formula to determine the perimeter of a regular polygon

Level of difficulty: Medium
Bloom's Level: Understanding

1. A wire of length 56 cm is made into the shape of a heptagon. What is the side length of the heptagon?
    Option 1: 7 cm
    Option 2: 8 cm
    Option 3: 14 cm
    Option 4: 49 cm
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Evaluating

2. The perimeter of a regular hexagon is 14 cm less than the perimeter of a regular octagon. If the side length of the hexagon is $(2k + 3)$ cm, what is the side length of the octagon?
    Option 1: $(2k + 5)$ cm
    Option 2: $(2k - 13)$ cm
    Option 3: $\frac{1}{2}(3k + 1)$ cm
    Option 4: $(\frac{3}{2}k + 4)$ cm
Correct Answer: Option 4

LG: Give examples in order to defend that different shapes can have the same perimeter

Level of difficulty: Medium
Bloom's Level: Applying

1. Consider two shapes shown.

130

Given that the perimeter of the two shapes is equal, what is the value of *x*?

Option 1: 5
Option 2: 8
Option 3: 10
Option 4: 16

Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Analysing

2. Consider a figure below.

Which of these has the same perimeter as figure A?

Option 1: A rectangle of length 12 cm and breadth 6 cm.
Option 2: An equilateral triangle of side length 24 cm.
Option 3: A regular pentagon of side length 9 cm.
Option 4: A square of side length 36 cm.

Correct Answer: Option 2

LG: Count the squares in order to estimate the area of the given closed curve in the squares grid sheet

Level of difficulty: Medium
Bloom's Level: Applying

1. What is the area of the following figure?

Option 1: 13 square units
Option 2: 15 square units
Option 3: 16 square units
Option 4: 17 square units

Correct Answer: Option 2

Level of difficulty: Medium
Bloom's Level: Applying

2. A farmer needs to buy seeds for a piece of agricultural land represented on a rectangular grid as shown below.

131

He requires 4 bags of seeds for each square unit. What is the total number of bags required for the land?

      Option 1: 18.5
      Option 2: 22.5
      Option 3: 74
      Option 4: 78

Correct Answer: Option 3

LG: Deduce and apply the formula in order to determine the area of a rectangle.

    Level of difficulty: Medium
    Bloom's Level: Applying

1. The length of a rectangle is twice its breadth. Given that the length of the rectangle is 8 cm, what is the area of the rectangle?

      Option 1: 24 cm^2
      Option 2: 32 cm^2
      Option 3: 48 cm^2
      Option 4: 128 cm^2

Correct Answer: Option 2

    Level of difficulty: Hard
    Bloom's Level: Analysing

2. The length and breadth of a rectangle are changed such that the area of the rectangle changes from 2k to k. If the length and breadth of the original rectangle are l and b respectively, which of these could be the length and breadth of the new rectangle?

      Option 1: $\frac{l}{4}$ and 2b
      Option 2: $\frac{l}{2}$ and $\frac{b}{2}$
      Option 3: $\frac{l}{2}$ and 4b
      Option 4: $\frac{l}{4}$ and 4b

Correct Answer: Option 1

LG: Deduce and apply the formula in order to determine the area of a square.

    Level of difficulty: Medium
    Bloom's Level: Understanding

1. Observe the figure below:
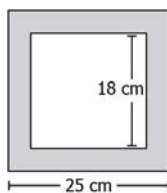
What is the area of the shaded region?

      Option 1: 14 cm^2
      Option 2: 28 cm^2
      Option 3: 301 cm^2
      Option 4: 949 cm^2

Correct Answer: Option 3

    Level of difficulty: Hard
    Bloom's Level: Applying

2. If the side length of a square becomes one-third of the original side length, what is the ratio of the area of the original square to the area of square with changed side length?

      Option 1: 1:3
      Option 2: 1:9

Option 3: 3:1
Option 4: 9:1
Correct Answer: Option 4

Suggested Teacher Resources

I

Lesson Plan

Objective	Deduce and apply the formula in order to determine the area of a rectangle. Deduce and apply the formula in order to determine the area of a square.
Material Required	Coloured chalks, graph paper, coloured paper, bangle, cut-outs, Square grid paper of A4 size, two dice
Previous Knowledge	multiplication
Procedure	Teacher will take a bangle and a cut-out of a circle and ask students to identify the difference between the two. Any answer is accepted but teacher will try to push students thinking towards cut-out circle being able to occupy a region. Teacher will put bangle on the board and mark the whole area enclosed with in it. Teacher will explain both the things occupy some region over space in their own way. The region occupied by such shapes is called area. Definition: The amount of surface enclosed by a closed figure is called its area. Ask students to take an outline of their palm and shade the area on their graph papers. **Area of hand print:** 1. Here the area of 1 full square is taken 1 sq. unit. If it is cm square sheet, then the area of 1 full square will be 1 sq. cm. 2. Ask students to find the area of their hand print. Ask them to ignore the portions of the area that are less than half a square. 3. If more than half a square is in a region, just count it as one square. 4. If exactly half a square is counted, take its area as ½ sq. unit. Take few answers from the class and ask 1 student to demonstrate their answer. Ask students to calculate the area of composite shapes by counting the squares.

22 wholesquares
+ 10 halvesquares = 32 squares

Area of square and rectangle:

Teacher will pass graphs with some shapes drawn on it as follows.

Students have to identify the relationship between sides and area of the respective shape.

Students need to use the following table to write down their observations:

Shape	Side/s	Area
1.rectangle	2-unit, 1 unit	2 sq. unit
2.		
3.		
4.		

Teacher can take following examples:
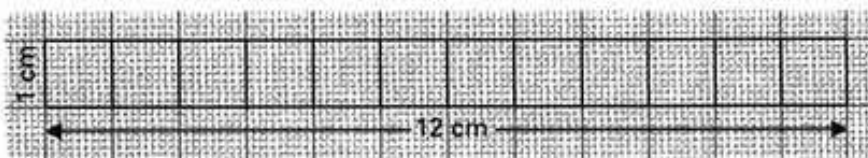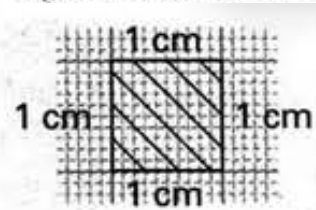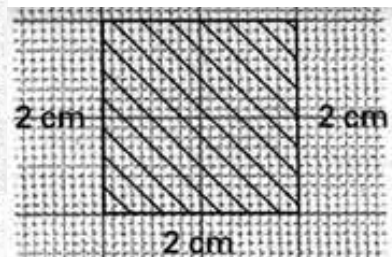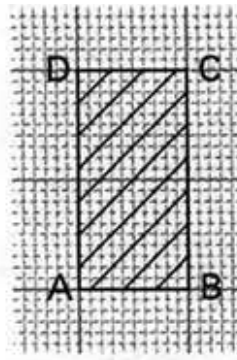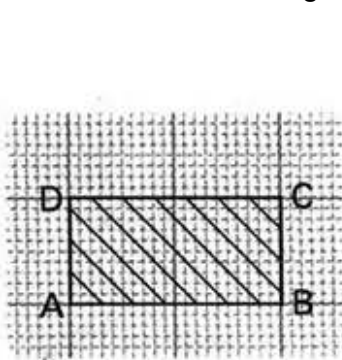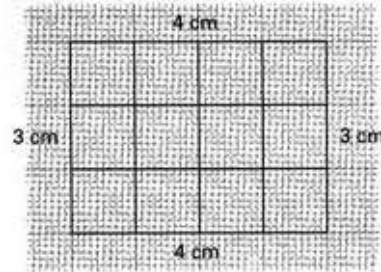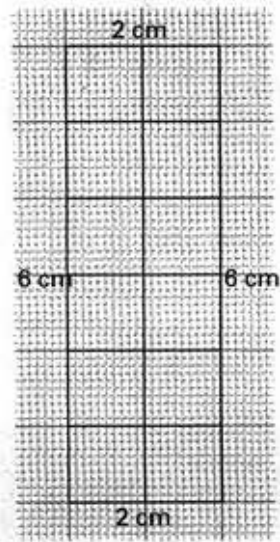
Teacher will take few responses from the class.
Teacher will explain the relationship between sides and area of a square and a rectangle.
Area of a rectangle is length × breadth
Area of a square is side × side

Game: Area with dice
Materials: Square grid paper of A4 size, two dice

Objective: To develop a sense of area and minimise wastage of space between shapes.

Steps:
1. Each child starts from one end of the sheet as shown.
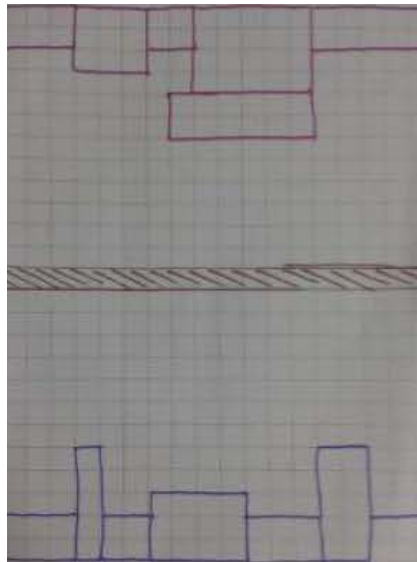
2. A line is drawn separating the sheet into two equal parts. Each child throws the two dice and draws a rectangle or square with the numbers that appear.
3. They continue to take turns in throwing dice and building more and more rectangles attached to the previously drawn ones.
4. Each child continues to throw the dice and build rectangles as long as there is space on their side even if the other has stopped.
5. At the end they sum the areas of the gaps that arise. The one with the smallest gap area is the winner.

| Source | 1. http://www.teachersofindia.org/en/article/teaching-area-through-graphs |

| | 2. http://www.teachersofindia.org/en/ebook/teaching-area-and-perimeter |

2 **Activity**

Objective: Calculate skin surface area

Setup:

Skin is an insulator, keeps human body cool, holds the internal organs, and is the body's largest and fastest growing organ. In this activity, you'll guess out the approximate surface area of the skin.

Material Required:

- Newspaper
- Masking tape
- Measuring tape or meter stick
- Lots of open floor space
- A partner

Steps:

1. Choose one person to be the subject.
2. Carefully wrap each of the subject's body parts in newspaper, taping the pieces together. Totally cover the subject's body—head, feet, hands, everything! Try to tailor the paper suit to the shape of the person's body. It's okay to overlap the newspaper sheets, but be sure to leave a breathing hole for the person's mouth.

137

3. Remove all the paper from the person's body by carefully tearing the paper down each limb, leaving all overlapping paper intact. Do not use scissors, as you might cut the person's skin or clothing.

4. Lay all of the paper pieces on the floor, moving them around to form a square or rectangular shape (you can rip some of the larger pieces of paper to fit into this shape). Remember to keep all multiple layers of paper stacked together.

5. Measure the length and width of the arranged paper on the floor and calculate the total surface area: *length x width = surface area.*

Observations:

The number calculated is a reasonable approximation of the person's skin surface area.
length x width = surface area

11. ALGEBRA

QR Code:

Z3A6F2

NCERT Learning outcome:

Content area / Concepts	Learning Objectives	Learning Outcome
Introduction	Describe algebraic expressions in order to distinguish them from arithmetic expressions.	Involves use of variables with different operations to generalise a given situation in order to find a solution to a given problem e.g., perimeter of a rectangle with sides x units and 3 units is 2(x+3) units
Matchstick Patterns	Examine patterns in order to identify relationship in patterns	
More Matchstick Patterns	Introduce a variable in order to form a rule for the given pattern.	
More Examples of Variable	Use variable with different operations in order to generalise a given situation.	
Use of Variables in Common Rules	Use variable(s) in order to express some mathematical rules and formulae.	
Expressions with Variables	Use variable with different operations in order to form an algebraic expression.	
Using Expressions Practically	Change the given algebraic expression in statements in order to describe the situation in ordinary language.	Uses unitary method in problem solving to calculate the quantity for one unit in order to calculate the total quantity for larger quantities. For example, if the cost of a dozen notebooks is given, she finds the cost of 7 notebooks by first finding the cost of 1 notebook
What is an Equation?	Explain the meaning of an equation in order to identify equations from the given options.	
Solution of an Equation	Use trial and error in order to find the solution of the given equation.	
	Evaluate for the given values of variable in order to identify the solution of the equation.	

Test items

LG: Describe algebraic expressions in order to distinguish them from arithmetic expressions.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Sakshi wrote an algebraic expression. Which of these could she have written?
   Option 1: $15 + 20 - 18$
   Option 2: $(5 \times 3) + 10$
   Option 3: $\left(\frac{18}{2} \times 6\right)$
   Option 4: $8m + 2$
Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Analysing
2. Which option correctly describes why $(7u - 7)$ is an algebraic expression?
   Option 1: Because both the terms have the same numbers.
   Option 2: Because it involves a variable under an operation.
   Option 3: Because it involves multiplication and subtraction operation.
   Option 4: Because it involves a variable under multiplication and subtraction operation.
Correct Answer: Option 2

LG: Examine patterns in order to identify relationship in patterns

Level of difficulty: Medium
Bloom's Level: Understanding
1. What is the general rule for the given pattern?

   Option 1: m
   Option 2: $m + 1$
   Option 3: $m + 2$
   Option 4: $m + 3$
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Applying
2. Consider the pattern of shapes made using matchsticks.

Another matchstick is added to the first shape of the pattern to get:

If similarly, matchsticks are added to each shape, how will the relationship in the pattern change?
   Option 1: It will decrease by n matchsticks
   Option 2: It will increase by n matchsticks
   Option 3: It will decrease by $n + 1$ matchsticks
   Option 4: It will increase by $n + 1$ matchsticks
Correct Answer: Option 2

LG: Introduce a variable in order to form a rule for the given pattern.

Level of difficulty: Medium
Bloom's Level: Understanding
1. The number of matchsticks required to form a pattern are given in the table.

140

Number of L's formed	1	2	3	4	…
Number of matchsticks required	4	8	12	16	…

How many matchsticks will be required to form nL's?

    Option 1:n

    Option 2:$\frac{n}{4}$
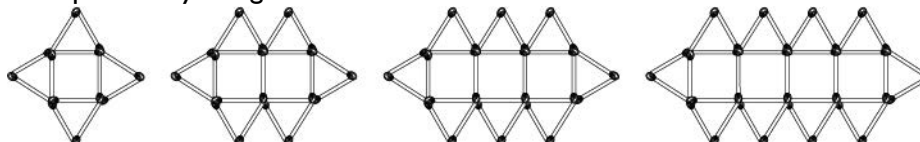
    Option 3:$4n$

    Option 4:$n + 4$

Correct Answer: Option 3

Level of difficulty: Hard

Bloom's Level: Analysing

2. Abhinav makes a pattern by using matchsticks as shown:

What is the general rule for the given pattern?

    Option 1: $12n$

    Option 2:$16n$

    Option 3: $7n + 5$

    Option 4:$5n + 7$

Correct Answer: Option 3

LG: Use variable with different operations in order to generalise a given situation.

Level of difficulty: Medium

Bloom's Level: Applying

1. Kartik is packing juice packs in cartons such that each carton has 40 juice packs. After packing *j* cartons, he is left with 25 juice packs. Which of these expressions represents the total number of juice packs?

    Option 1: 40*j* + 25

    Option 2: 40*j* – 25

    Option 3: 25*j* + 40

    Option 4: 25*j* – 40

Correct Answer: Option 1

Level of difficulty: Hard

Bloom's Level: Applying

2. The cost of a closet is Rs. 19 less than 4 times the cost of a table. The cost of a sofa is Rs. 5 more than 2 times the cost of a table. If the cost of the sofa is *s*, which expression gives the cost of the closet?

    Option 1: 2*s* + 29

    Option 2: 8*s* + 1

    Option 3: 2*s* – 29

    Option 4: 8*s* - 1

Correct Answer: Option 3

LG: Use variable(s) in order to express some mathematical rules and formulae.

Level of difficulty: Medium

Bloom's Level: Understanding

1. The side length of an equilateral triangle is x metres. Which of the following option represents the perimeter of the triangle?

    Option 1: $3 + x$ metres

    Option 2: $3 \times x$ metres

    Option 3: $3 - x$ metres

    Option 4: $\frac{3}{x}$ metres

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing
2. There are 7 jars with 43 marbles in each jar. Which of these properties can be used to calculate the total number of marbles in the jars?
     Option 1: $u \times (v + w) = u \times v + w$, distributive property of addition over multiplication.
     Option 2: $u + v = v + u$, commutative property of addition.
     Option 3: $u \times (v + w) = u + v + w$, commutative property of addition.
     Option 4: $u \times (v + w) = u \times v + u \times w$, distributive property of addition over multiplication.
Correct Answer: Option D

LG: Use variable with different operations in order to form an algebraic expression.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Anjali thinks of a number z. She multiplies the number by –9 and subtracts it from 14. Which of these algebraic expressions she could have formed?
     Option 1: $14 - 9z$
     Option 2: $-9z - 14$
     Option 3: $14 + 9z$
     Option 4: $-9z + 14$
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing
2. The digit at hundreds place of a three-digit number is five more than the digit at its ones place and digit at tens place is three less than the digit at its ones place. If the digit at ones place is u, which of the following expressions represents the three-digit number?
     Option 1: $100(5 + u) + 10(u - 3) + u$
     Option 2: $100(5 + u) + 10(3 - u) + u$
     Option 3: $(5 + u) + (u - 3) + u$
     Option 4: $(5 + u) + (3 - u) + u$
Correct Answer: Option 1

LG: Change the given algebraic expression in statements in order to describe the situation in ordinary language.

Level of difficulty: Medium
Bloom's Level: Applying
1. Consider the following. The cost of a crayon pack is Rs. $(2c - 5)$, where c is the cost of a paint brush. Which of these describes the situation?
     Option 1: The cost of a crayon pack is Rs. 5 less than twice the cost of a paint brush.
     Option 2: The cost of a crayon pack is Rs. 2 less than five times the cost of a paint brush.
     Option 3: The cost of a crayon pack is Rs. 2 less than five more than the cost of a paint brush.
     Option 4: The cost of a crayon pack is Rs. 5 less than two more than the cost of a paint brush.
Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Applying
2. Ria's age is x years. Jai's age is $\frac{x}{2} + 5$. If Jai is elder than Amit, which of these could be the possible relation between Amit's and Ria's age?
     Option 1: Amit's age is 5 years more than half of Ria's age
     Option 2: Amit's age is 5 years more than twice of Ria's age.
     Option 3: Amit's age is 5 years more than thrice of Ria's age.
     Option 4: Amit's age is 5 years more than one-third of Ria's age.
Correct Answer: Option 4

LG: Explain the meaning of an equation in order to identify equations from the given options.

142

Level of difficulty: Medium
Bloom's Level: Applying
1. Which of the following is an equation?
   Option 1: $\frac{2}{3} - 5x$
   Option 2: $3y - 25 > 9$
   Option 3: $\frac{1}{5}z + 23 = 38$
   Option 4: $9w < 72$
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing
2. Rishabh identified that there is an error in a book. The error is in the following statement.
"$7p - 27$ is an example of an equation"
Which of these is a way to fix the error?
   Option 1: replace 27 with 7
   Option 2: replace 27 with 1
   Option 3: replace minus sign with plus sign
   Option 4: replace minus sign with equal sign
Correct Answer: Option 4

LG: Use trial and error in order to find the solution of the given equation.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Which of the following option shows the solution of the equation $4 - 3s = -2$?
   Option 1:

s	1	2	3	4	5	6
$4 - 3s$	1	-2	-5	-8	-11	-14

   Option 2:

s	1	2	3	4	5	6
$4 - 3s$	0	-1	-2	-3	-4	-5

   Option 3:

s	-1	-2	-3	-4	-5	-6
$4 - 3s$	1	-2	-5	-8	-11	-14

   Option 4:

s	-1	-2	-3	-4	-5	-6
$4 - 3s$	0	-1	-2	-3	-4	-5

Correct Answer: Option 1

Level of difficulty: Hard
Bloom's Level: Evaluating
2. Observe the table below.

v	-4	-5	-6	-7
$\frac{v}{2} - 7$				

Which of these is the solution to the equation $\frac{v}{2} - 7 = -9\frac{1}{2}$?
   Option 1: -4
   Option 2: -5
   Option 3: -6
   Option 4: -7
Correct Answer: Option 2

LG: Evaluate for the given values of variable in order to identify the solution of the equation.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Which of the following is the solution of the equation $r - 6 = -2$?
    Option 1: 8
    Option 2: 4
    Option 3: –4
    Option 4: –8
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing
2. A bookcase has 9 shelves and each shelf has *m* books in it. Harsh arranges 4 books in the bookcase and takes out 9 books. If 58 books are left in the bookcase, how many books are in each shelf?
    Option 1: 5
    Option 2: 7
    Option 3: 36
    Option 4: 54
Correct Answer: Option 2

Suggested Teacher Resources

(I)   **Lesson Plan**

Objective-: Students will be able to identify and apply the steps in evaluating Algebraic expressions in order to help the students in problem solving, logic, patterns, and reasoning.

Material Required-: Activity Sheet

Procedure-:

Teacher's Activity	Student's Activity
Teacher will start the class by giving them some multi operation mathematical expression by connecting the expression in column A to corresponding answer in column B	

• **Review** How do we solve multi operation mathematical expression? Very Good! That is correct we solve multi operation order of parenthesis, exponent, multiplication, division, addition and subtraction. • **Lesson Development** Class where do we usually hear the word substitution? And how do we substitute in Hockey? That's Right	 We solve it by the rule of PEDMAS. Students will state the answer parenthesis, exponent, multiplication, division, addition and subtraction. Students will answer, we hear substitution in hockey, football etc.

145

Class we will start an activity called "sub me in ".
Let A=1   H=8   O=15   V=22
    B=2   I=9   P=16   W=23
    C=3   J=10   Q=17   X=24
        D=4   K=11   R=18   Y=25
        E=5   L=12   S=19   Z=26
        F=6   M=13   T=20
        G=7   N=14   U=21
	Player is replaced by another player.

Find the equivalent value of the given words by substituting the numerical value above to each letter of the word and adding all the numerical digits. For example H U M B L E 8 + 21 +13 +2 + 12 + 5 = 61 Your first word is *Knowledge*.	K N O W L E D G E 11+14+15+23+12+ 5 + 4 + 7 + 5=96
Now the second word is *Hardwork.*	H A R D W O R K 8 + 1 +18+4 + 23 +15 +18+ 11= 98
And the last word is *Attitude.*	A T T I T U D E 1 + 20 +20+9+ 20+ 21 +4 + 5 =100
• **Analysis** What did we do in our activity? Correct. And how did we find the value of the given words? And then what's next?	We find the numerical value of the given words. We substitute the corresponding value in each letter. We perform the indicated operation; we add all the value.
Class when a number is substituted or replace for the variable in a given algebraic expression, the expression takes a numerical value, and finding the value is what we call "Evaluating the Algebraic Expression". Let's do this example. Evaluate 6 x^2+3 when a. x=0 b. x=-2 c. x=1/2 For letter a, how do we evaluate? What should we do first?	We substitute given value x in the equation

146

| Can someone show us how to substitute the value of x in our equation?

Since we got here a multi operation equation, what should we do?

Can someone demonstrate on how to apply the rules of PEDMAS in our equation?

Correct
Now do the same for option b and c. | A student will be called to substitute the value of x
$6(0)^2 + 3 =$

We will perform the rule of PEDMAS

$6(0)^2 + 3 =$
$6(0)\ \ + 3 =$
$0\ \ \ \ \ + 3 = 3$

b. $6x^2 + 3 =$
$\ \ 6(-2)^2 + 3 =$
$\ \ 6(4) + 3\ \ =$
$\ \ 24+3\ \ = 27$

c. $6(x)^2 + 3 =$
$\ \ 6(1/2)^2 + 3 =$
$\ \ 6(1/4)^2 + 3 =$
$\ \ 6/4 + 3\ \ =$
Following the rules in adding dissimilar fractions.

18/4 or 9/2 |

- **Evaluation-:**

Class will get a sheet of paper and complete the table by evaluating the given expressions.

x	x^2-7x+12
0	
1	
-2	
3	
-4	

x	x^2-7x+12
0	12
1	20
-2	2
3	32
-4	0

- **Assignment**

For your assignment evaluate
x^2+xy+y^2 . when
1. x=2, y=3
2. x=4, y =1

---

(2) **Activity**

Objective- To show the identity

$$(a + b)^2$$

All the students to take a square paper and fold them along the two indicated lines.
The two different length can be labelled as a and b as shown in figure.
What is the side of the original square? a+b
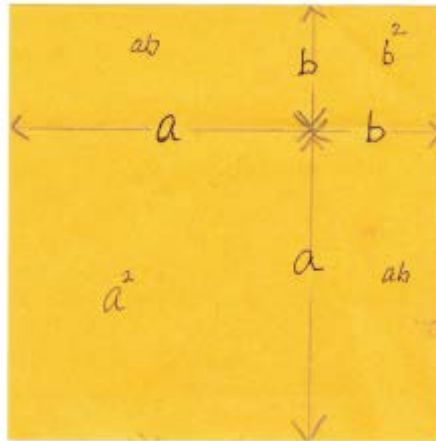What is the area of original square?

147

$$(a + b)^2$$

What is the area of big square? a^2
What is the area of small square? b^2
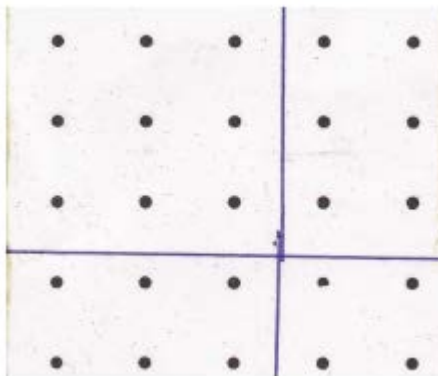What is the area of each rectangle, ab?

Hence
$(a + b)^2 = a^2$+2ab+b^2

Demonstration

The teacher can also show this on a square dot paper as shown in figure
(3+2)(3+2)=3×3+3×2+3×2+2×2

Which is $(3 + 2)^2$=3^2+2×3×2+2^2
Again, if a=3 and b=2 then
$(a + b)^2$=a^2+2ab+b^2

148

12. RATIO AND PROPORION

QR Code:

NCERT Learning outcome:

Content area / Concepts	Learning Objectives	Learning Outcome
Introduction	Represent two quantities in same unit in order to compare them	Represents the measurement as ratios in order to compare two quantities in real life e.g., the ratio of girls to boys in a particular class in 3:2
Ratio	Compare two quantities in order to find their ratio	
Ratio	Multiply/divide numerator and denominator by same number in order to find equivalent ratio.	
Proportion	Compare ratio in order to determine whether they are in proportion	
Proportion	Solve the proportion in order to find out the missing term	
Unitary Method	Solve the problems with the help of Unitary method in order to compute the value of one article, given the value of many.	

Test items

LG: Represent two quantities in same unit in order to compare them.

> **Level of difficulty:** Hard
> **Bloom's Level:** Analysing
> 1. If Rahul walks 9km in a week and Vansh walks 900 m daily, which of these is true about the distances they cover in a week?
>   > **Option 1:** Vansh walks 7.2 km more than Rahul.
>   > **Option 2:** Vansh walks 2 km more than Rahul.
>   > **Option 3:** Rahul and Vansh both cover the same distance.
>   > **Option 4:** Rahul walks 2.7 km more than Vansh.
> **Correct Answer:** Option 4

> **Level of difficulty:** Medium
> **Bloom's Level:** Understanding
> 2. Rajat bought 750g of onions and 1.5 kg of tomatoes. Which option correctly compares the quantities of vegetables Rajat bought?
>   > **Option 1:** Tomatoes were twice the quantity of onions
>   > **Option 2:** There was equal quantity of tomatoes and onions
>   > **Option 3:** Onions were twice the quantity of tomatoes
>   > **Option 4:** Tomatoes were three times the quantity of onions
> **Correct Answer:** Option 1

LG: Compare two quantities in order to find their ratio

> **Level of difficulty:** Hard
> **Bloom's Level:** Analysing
> 1. A jar contains 1 rupee, 50 paise and 25 paise coins. There is a total of 10 coins in the jar such that number of 50 paise coins < number of 25 paise coins < number of 1-rupee coins
>
> If one-fifth of the coins are of 50 paise, which of these is the ratio of 1-rupee coins to the total number of coins?
>   > **Option 1:** 1:2
>   > **Option 2:** 2:5
>   > **Option 3:** 1:5
>   > **Option 4:** 4:5
> **Correct Answer:** Option 1

> **Level of difficulty:** Medium
> **Bloom's Level:** Understanding
> 2. Every month a person earns Rs. a, saves Rs. b and spends the rest. What is the ratio of expenditure to the earnings per month?
>   > **Option 1:** $(a+b):a$
>   > **Option 2:** $(a-b):(a+b)$
>   > **Option 3:** $(a-b):b$
>   > **Option 4:** $(a-b):a$
> **Correct Answer:** Option 4

LG: Multiply/divide numerator and denominator by same number in order to find equivalent ratio.

> **Level of difficulty:** Easy
> **Bloom's Level:** Understanding
> 1. The ratio 16 is to 44 is the same as _.
>   > **Option 1:** 2 is to 11
>   > **Option 2:** 1 is to 2

Option 3: 4 is to 11
Option 4: 11 is to 4
Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Applying
2. If 8:10 is equivalent to $(1.2m):(2m-5)$, which of these is equivalent to $(m+5):(2m+5)$?
Option 1:1:1
Option 2:3:5
Option 3:25:15
Option 4:4:5
Correct Answer: Option 2

LG: Compare ratio in order to determine whether they are in proportion

Level of difficulty: Medium
Bloom's Level: Understanding
1. In which order should the numbers 6, 12, 18 and 36 be placed such that they are in proportion?
Option 1: 36:12:: 6:18
Option 2: 36:18:: 6:12
Option 3: 18:12:: 36:6
Option 4: 18:36:: 6:12
Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Applying
2. For what value of t, the numbers $9, 15, t, (2t-1)$will be in proportion where t is a number greater than 1?
Option 1:$\frac{1}{3}$
Option 2:3
Option 3:$\frac{5}{7}$
Option 4:6
Correct Answer: Option 2

LG: Solve the proportion in order to find out the missing term

Level of difficulty: Easy
Bloom's Level: Understanding
1. If 9:15:: 27:m are in proportion, what is the value of m?
Option 1: 5
Option 2: 45
Option 3: 33
Option 4: 16.2
Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Understanding
2. All the numbers in the proportion $p:q::r:s$ are integers greater than 1. The product of means in the proportion is 30. If s is the smallest integer possible, what is the value of p?
Option 1:60
Option 2:10
Option 3:15
Option 4:28
Correct Answer: Option 3

LG: Solve the problems with the help of Unitary method in order to compute the value of one article, given the value of many.

Level of difficulty: Medium
Bloom's Level: Understanding
1. If the cost of 4 handcrafted baskets is Rs. 800, how much is the cost of 7 such baskets?
   Option 1: Rs. 2800
   Option 2: Rs. 2100
   Option 3: Rs. 1200
   Option 4: Rs. 1400
Correct Answer: Option 4

Level of difficulty: Hard
Bloom's Level: Applying
2. At an exhibition, a man can purchase 5 tickets for Rs. 675. To purchase 7 tickets in total, how much more money is needed?
   Option 1: Rs. 270
   Option 2: Rs. 370
   Option 3: Rs. 945
   Option 4: Rs. 1620
Correct Answer: Option 1
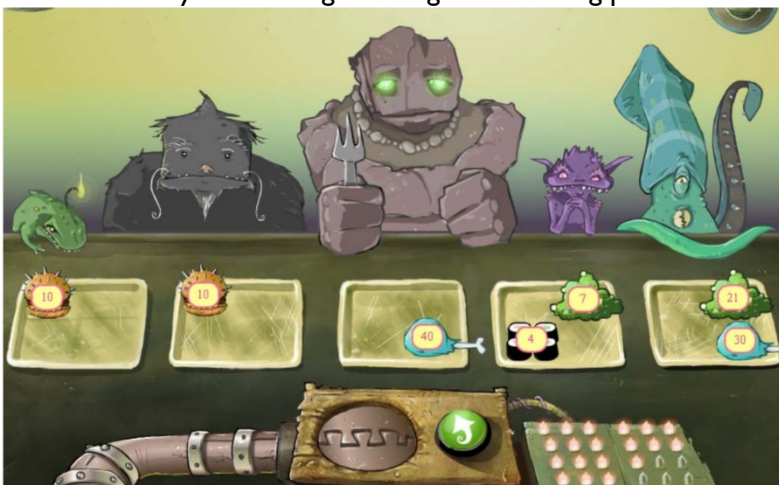
Suggested Teacher Resources

I **Lesson Plan**

Objective	To compare two quantities in order to find their ratio and proportion
Material Required	None
Prerequisite Knowledge	Equivalent ratio, proportion, similar triangles
Procedure	The teacher will start the class by distributing/showing the following picture:

. Then the teacher would explain that the trays that the students can see will be referred to as 1st, 2nd, 3rd, 4th, 5th.

Then, the teacher would ask students

- Which tray on screen 1 they could use to write a ratio (4th and 5th) Why?
- Write the ratio for the 4th tray.
- Write the ratio for the 5th tray.
- Write two equivalent ratios for the 4th and the 5th tray.
- Write proportions using 4th and 5th trays.
- Ask students if any other trays can be used to set up a proportion?

Then the teacher would draw the following diagram on the board:

153
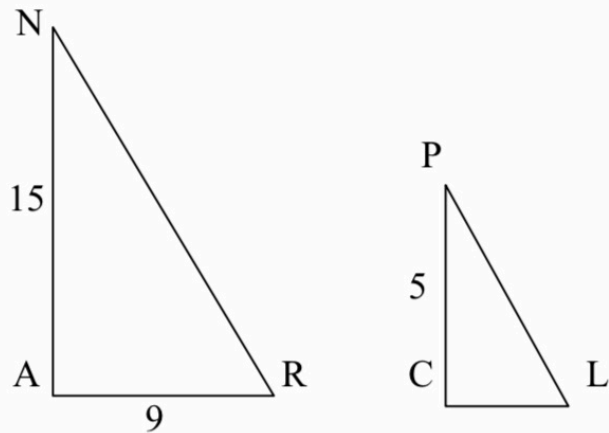
The teacher would ask the students work in pairs to complete the following proportions using the line segments from the two triangles (triangle ANR is similar to triangle CPL)

- AR/ AN = CP/( )
- LP/ LC = RN/ ( )
- ( )/ NA = PC/ PL
- The teacher would then ask the students to continue in pairs to rewrite the first proportion using the actual side lengths and then solve.

Then the teacher would pose the following problem:
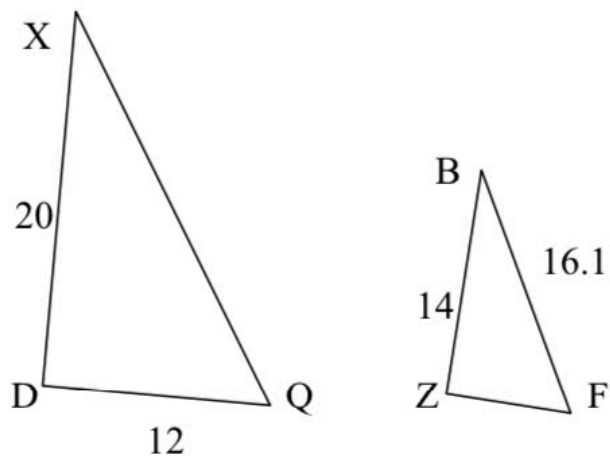
And would ask the following questions to students:
(triangle XDQ is similar to triangle BZF)
 1. Complete the following proportions:
- XD/ BZ= DQ/( )
- XD/ BZ=( )/ BF
 2. Rewrite and solve the proportions above using the actual side lengths and write two ratios for the same.
Closure:
The teacher asks the students to:

- Circle each ratio in the list that is equivalent to the given fraction:
15/12 = 3/ 2 ; 5/ 4 ; 10/ 8 ; 30/ 24 ; 50/ 30 ; 65/ 48 ; 75/ 60
- Write 3 ratios that are equivalent to 6/ 4 .

| Source | https://labyrinth.thinkport.org/www/educators/resources/lessons/cafeteria_grade7c.pdf |

2

Activity

Objective: Meeting real life ratio challenges (recipes)
Materials: Actual recipes

Activity 1:
Strong coffee? Weak coffee?
Teacher can distribute four recipes for making coffee. The students have to arrange them according to the strength of the decoction. If coffee is not welcome, we can substitute it with orange juice! Ordering four recipes requires comparison of four different strengths. However, we may also make comparisons within a recipe. Here is one such example. Comparison within one recipe between the quantity of juice and water. To make a jug of orange juice, I use two glasses of orange juice and five glasses of water. What happens to the strength of the mixture if I add an extra glass of water? What happens if I add an extra glass of orange juice? What happens if I add one of each, two of each, etc.?
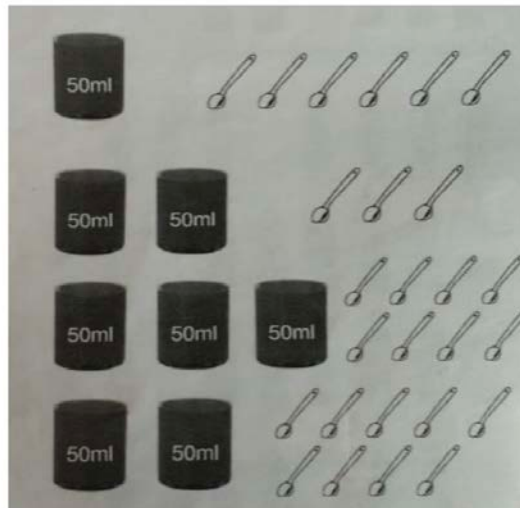
Activity 2:
The teacher can prepare these using square grid papers and mount them on a plain card sheet. Each shape can be labelled using alphabets. We must take care in selecting the sizes, so that spotting similarity is neither too easy nor too difficult. Divide the students into three groups. Give the sets one at a time to the groups so that they can discuss and select the pair that looks similar to them. They can use either the plain side of the shapes or the side with square grid in deciding about similarity. By rotation, each group looks at the three sets and notes down the similar pairs in each set. At the end of the activity, all groups share their findings and present their reasoning. Now verify the answer using a ruler. You could keep the challenge level high by insisting that they use only the plain side of the shapes. Follow this up by a worksheet that requires testing for similarity. Are the figures in each set similar?
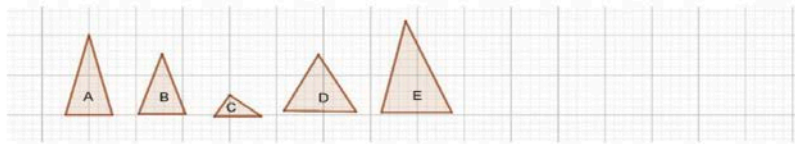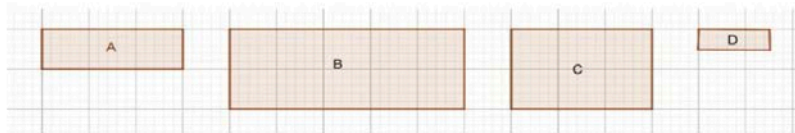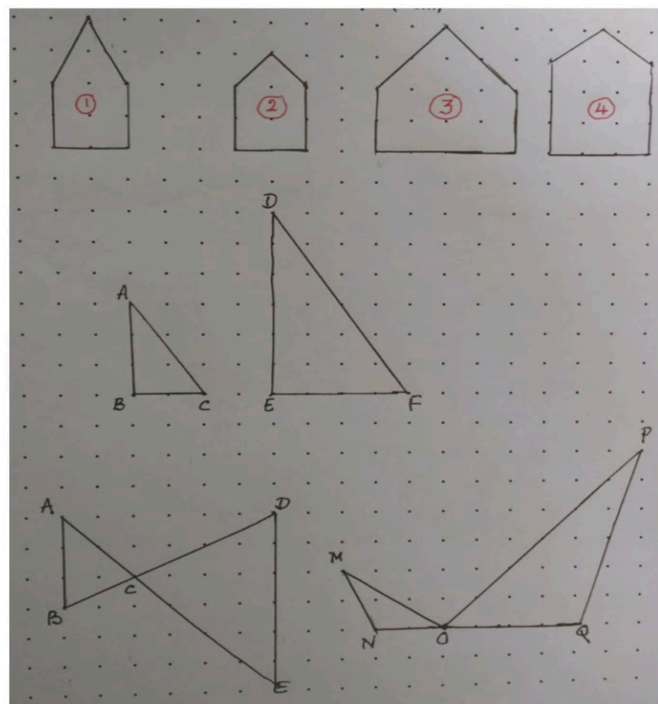
Figure 6

Figure 7

Figure 8

156

13. SYMMETRY

QR Code:

NCERT Learning outcome:

Content area / Concepts	Learning Objectives	Learning Outcome
Introduction	Explain the meaning of symmetry in order to identify symmetric figures in our surrounding.	In order to demonstrate an understanding of line symmetry a) Identifies symmetrical 2-dimensional (2-D) shapes which are symmetrical along one or more lines b) Creates symmetrical 2-D shapes
Making Symmetric Figures: Ink-blot Devils	Identify symmetrical 2-Dimensional shapes which are symmetrical along one line in order to demonstrate an understanding of the same.	
Figures with Multiple (more than two) Lines of Symmetry	Draw line(s) of symmetry in order to classify the given shapes as shapes with no symmetry, one line of symmetry, two lines of symmetry or multiple lines of symmetry	
Reflection and Symmetry	Draw the mirror image of the given 2D shapes or objects in order to identify objects with reflection symmetry.	
	Give example(s) in order to discuss the applications of reflection symmetry in real life.	

Test items
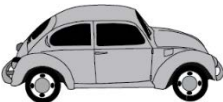
LG: Explain the meaning of symmetry in order to identify symmetric figures in our surrounding.

Level of difficulty: Medium
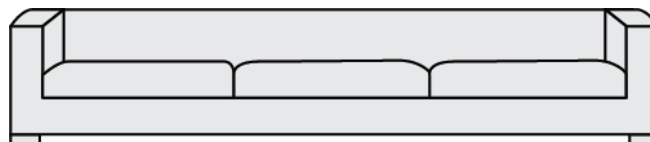**Bloom's Level:** Applying
1. Which of these objects is symmetrical?

Option 1:

Option 2:

Option 3:

Option 4:
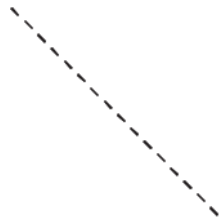**Correct Answer:** Option 4

Level of difficulty: Hard
Bloom's Level: Applying
2. Consider the object shown.

Which of these could be the line of symmetry of the object?
Option 1:
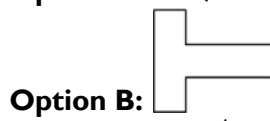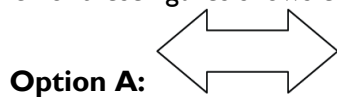
Option 2:

Option 3:

158

Option 4:

Correct Answer: Option 2

LG: Identify symmetrical 2-Dimensional shapes which are symmetrical along one line in order to demonstrate an understanding of the same.

Level of difficulty: Medium
Bloom's Level: Understanding
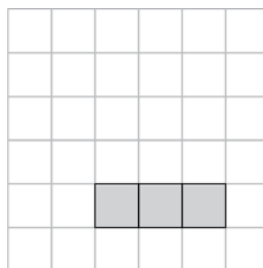1. Which of these figures shows exactly one line of symmetry?

Option A:

Option B:

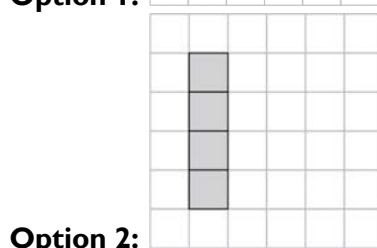
Option C:

Option D:
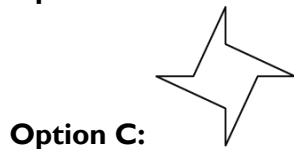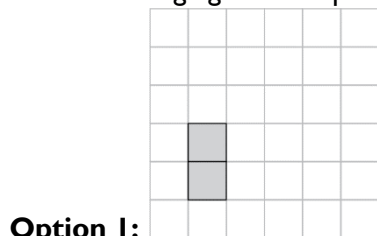

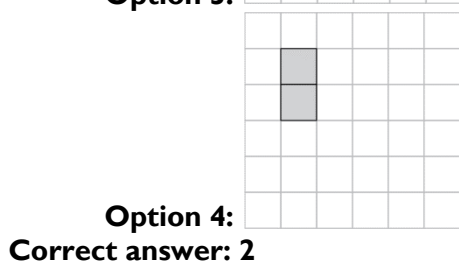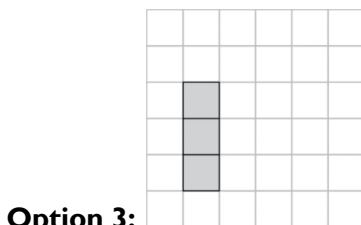**Correct answer:** b

Level of difficulty: Hard
Bloom's Level:
2. Observe an incomplete figure shown:

Which of the following figures completes the given figure to have exactly one line of symmetry?

Option 1:

Option 2:

159

Option 3:

Option 4:
Correct answer: 2

LG: Draw line(s) of symmetry in order to classify the given shapes as shapes with no symmetry, one line of symmetry, two lines of symmetry or multiple lines of symmetry

Level of difficulty: Medium
Bloom's Level: Understanding
1.   Observe the figures below and choose the correct option.

        Figure A   **Figure B**   **Figure C**

Option 1:

Figures	Line(s) of symmetry
A	3
B	2
C	2

Option 2:

Figures	Line(s) of symmetry
A	1
B	2
C	2

Option 3:

Figures	Line(s) of symmetry
A	3
B	4
C	2

Option 4:

Figures	Line(s) of symmetry
A	1
B	4
C	2

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing
2.   Consider the figure below:

160
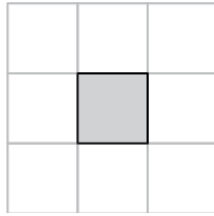
How should the figure be changed so that it has exactly two line(s) of symmetry?

Option 1: Shading all the corners of the figure.

Option 2: Shading two corners of the first row of the figure.

Option 3: Shading second row and second column of the figure.

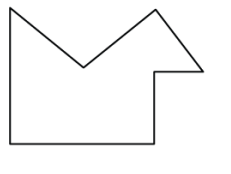**Option 4:** Shading all the boxes in the first and last row of the figure.

Correct answer: 4

LG: Draw the mirror image of the given 2D shapes or objects in order to identify objects with reflection symmetry.
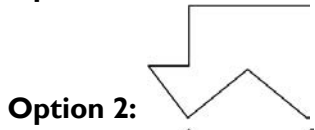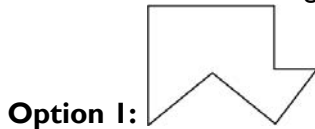
Level of difficulty: Medium

Bloom's Level: Applying

1. Consider the figure shown.

Which of these is the mirror image of the figure along the line *l*?

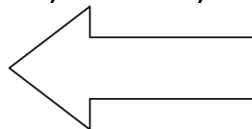**Option 1:**

Option 2:

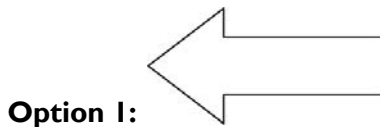**Option 3:**

Option 4:

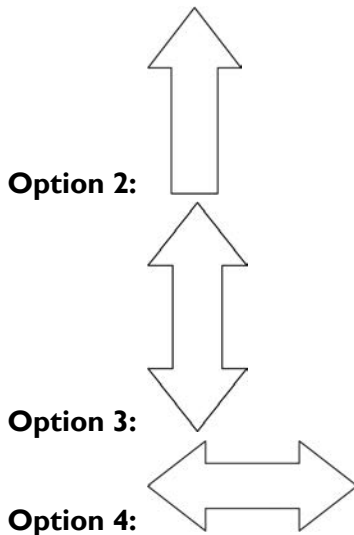**Correct Answer:** Option 3

Level of difficulty: Hard

Bloom's Level: Applying

2. Consider an incomplete figure having exactly 2 lines of symmetry shown.

Which of these will be the reflected mirror image of the complete figure along the vertical line?

Option 1:

161

Option 2:

Option 3:

Option 4:

Correct Answer: Option 4

LG: Give example(s) in order to discuss the applications of reflection symmetry in real life.

Level of difficulty: Medium
Bloom's Level: Applying

1. If an object is placed at a distance of 12 cm from the mirror, how far behind is the image from the mirror?

   Option 1: 0 cm
   Option 2: 12 cm
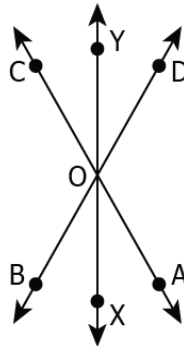   **Option 3:** 24 cm
   Option 4: 144 cm

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Applying

2. Consider the figure below.

If the length of OB is 6 cm, what is the length of AC?

   Option 1: 3 cm
   Option 2: 6 cm
   Option 3: 12 cm
   Option 4: 36 cm

Correct Answer: Option 3

Suggested Teacher Resources

I   Lesson Plan

Objective	1. Identify symmetrical 2-Dimensional shapes which are symmetrical along one line in order to demonstrate an understanding of the same. 2. Draw line(s) of symmetry in order to classify the given shapes as shapes with no symmetry, one line of symmetry, two lines of symmetry or multiple lines of symmetry.
Material Required	Squares cut out from construction paper or sticky notes.
Previous Knowledge	Definition of symmetry
Procedure	Teacher will start with writing Symmetry on the board and ask students what do they know about this word and note down all the answers on the board. Teacher will ask "What does it mean to fold something in half?" All acceptable answers are written on the board. Ask students to fold a square paper in half. Ask students to describe what they see. Students will say they see 2 parts on the paper. Make sure students don't fall into fractions. Ask students to open the paper again and ask them to fold in half in a different way from the one they just did. Encourage students to find multiple ways to fold the same paper in half. Connect their observation to symmetry by introducing line of symmetry. Line of symmetry: The *line of symmetry* can be defined as the imaginary *line* that passes through the centre of the shape or object and divides it into identical halves. Show students different pictures for them to identify lines of symmetry:
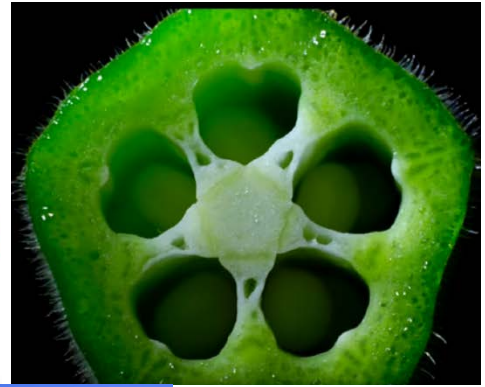
Discuss images with multiple lines of symmetry in depth.

Ask students to work in groups of 5 and identify different objects in the classroom with one or more lines of symmetry.

Object name	Diagram showing lines of symmetry
Face	

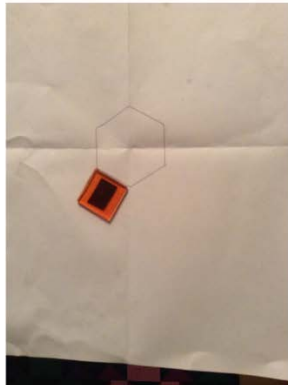Creating Symmetry with Polygon Shapes:

Divide students into groups of 3 and hand them coloured sheets and 3 Polygon Shapes of choice to work with.

Instructions:

1. Take a piece of coloured paper and fold it in half lengthwise. Then open it and fold it the width wise.
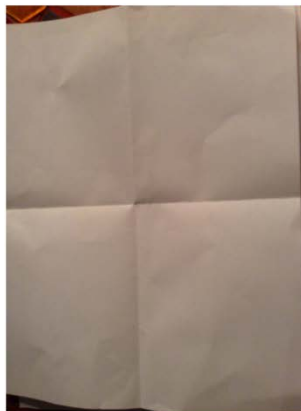
2. Open it up and find the centre intersection of the lines and place your first piece in the centre.

3. Then, trace around the first piece. From that piece you can build your design.
4. The pieces may not overlap, but butt up side to side or corner to corner.
5. Students may not draw a design beyond the edge of the paper.
6. Colour each shape one colour. For example, the square is one colour, the triangle another and the rectangle another. Students must adhere to these colours for these shapes.
7. Cut out the design when you are done. Do not cut out the individual pieces.
8. Fold the design to find as many lines of symmetry as possible. A design completed by a student.

Notes: This student folded this design to discover that there were no lines of symmetry. But the student added that if they had left off the rhombuses on the ends, there would have been six lines of symmetry. This is a good example of critical thinking
9. Write on the note card and describe how many lines of symmetry their design has.

Source	https://betterlesson.com/lesson/447867/discovering-the-meaning-of-line-symmetry

2 **Activity** 💡

Objective: Students would be able to find the symmetry/regularity of an object by using a piece of thread and no mirrors
Materials Needed: A bicycle, a long thread

Setup: The identification of patterns is central to mathematics. Starting with simple patterns of repeating shapes, the child can move on to more complex patterns involving shapes as well as numbers. Playing with patterns gives immense joy to the child. Understanding, visualizing, and predicting patterns is very much central to appreciating the beauty of mathematics. The National Curriculum Framework 2005 stresses on this fact.

Steps:
The game starts with a question:
Q) How many parts can you identify in a cycle that can be cut exactly into two equal halves?
1. Students can use a long thread to show that the parts on either side are mirror images of each other.

166

The cycle as a whole

The Handle

The Stand

The Pedal

The Carrier

2. Teacher can encourage the children to find ways of how best they can put the thread on various parts of the bicycle so that on either side of the thread lies an equal half of that part of the bicycle.

3. When they look at the handle, they realize there is only one way they can solve this puzzle.

4. They try the pedal and find only one way of getting it into two halves.

167
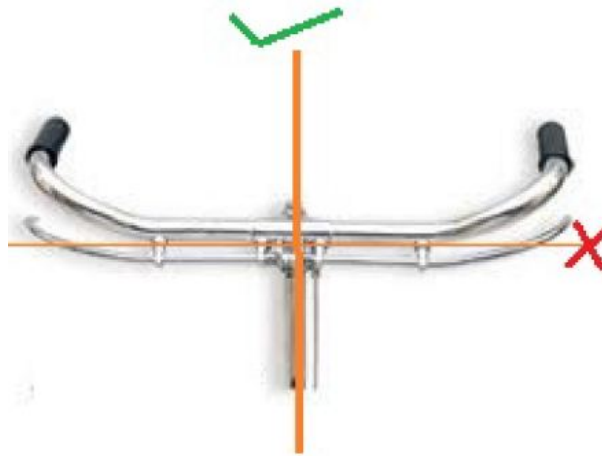
5. They try the cycle saddle and find only one way of getting it into two halves.
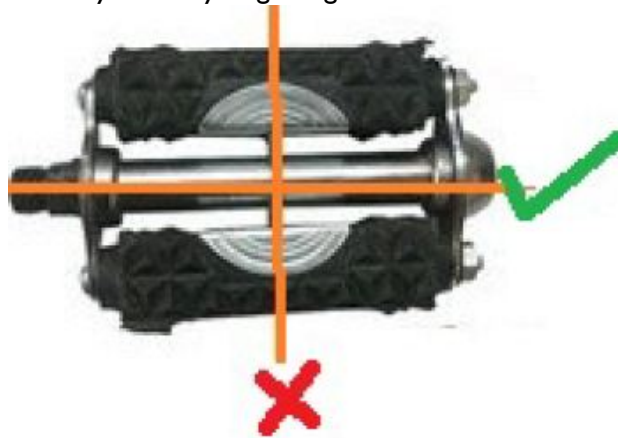
6. They take up the wheel and try.

They realize that there can be many ways of doing it, not just one. And there is no limit to this answer.

Ask the students to point to some parts of the bicycle that show this property where it can be cut into two equal parts in many ways.
The stainless-steel ball in the ball bearing would be the smallest such part in a bicycle, an observant student may say.

168

The Students can then examine a bell. At first, it may appear that a bell can be cut into two equal halves in more than one way. But they will soon realize that it is not the case.

When students take a side stand or a brake system, they find that in no way they can do this.

Let the children find more of such parts, which simply cannot be divided into equal halves.

Observation:
Once done with the activity, Teacher can help the students recall that
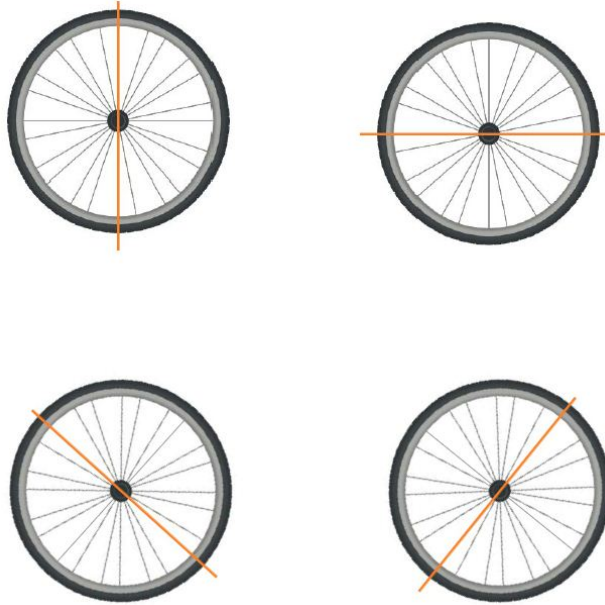- some objects depending on their shapes can be divided into two equal halves by cutting at one particular point only
- some objects depending on their shapes can be divided into two equal halves by cutting at more than one particular point and
- some objects cannot be cut into two equal halves, no matter how hard we try.

This knowledge will come in handy when the students go on to learn the organization of the living body, the concept of reflection and while studying advanced patterns in mathematics in subsequent classes.

Reference: http://teachersofindia.org/en/activity/play-symmetry-cycle-game-0

14. PRACTICAL GEOMETRY

QR Code:

K3V8V3

NCERT Learning outcome:

Content area / Concepts	Sub-concept	Learning Objectives	Learning Outcome
Introduction		Discuss the different tools of construction in order to describe their uses.	
The Circle	Construction of a circle when its radius is known	List and execute steps of construction in order to construct a circle when its radius is known.	
A line segment		List and execute steps of construction in order to construct a line segment when its length is known.	
	Constructing a copy of a given line segment	List and execute steps of construction in order to construct a copy of the given line segment.	
Perpendiculars	Perpendicular to a line through a point on it	List and execute steps of construction in order to construct a perpendicular to a line through a point on it.	-
	Perpendicular to a line through a point not on it	List down and execute steps of construction in order to construct a perpendicular to a line through a point not on it.	
Angles	Constructing an angle of a given measure	Use a protractor and ruler in order to construct an angle of the given measure.	
	Constructing a copy of an angle of unknown measure	List and execute steps of construction in order to construct a copy of the given angle of unknown measure using a compass.	
	Bisector of an angle	List and execute steps of construction in order to construct the bisector of an angle and construct angles of measures 30-degree, 45 degree and so on.	
	Angles of special measures	List and execute steps of construction in order to construct angles of measures 60-degree, 90 degree and 120 degree.	

Test items

LG: Discuss the different tools of construction in order to describe their uses.

> **Level of difficulty:** Medium
> **Bloom's Level:** Understanding
> 1. Which pair of angles can be drawn using set-squares?
>> **Option 1:** 15° and 30°
>> **Option 2:** 15° and 45°
>> **Option 3:** 30° and 45°
>> **Option 4:** 45° and 50°
> **Correct Answer:** Option 3

> **Level of difficulty:** Hard
> **Bloom's Level:** Analysing
> 2. A teacher asked his students to enlist the minimum tools required to draw a square inscribed in a circle. The responses of two of the students are as shown.
>> Student 1: Ruler and compasses
>> Student 2: Set-square and compasses
> Who among them is/are correct?
>> **Option 1:** Only Student 1
>> **Option 2:** Only Student 2
>> **Option 3:** Both Student 1 and Student 2
>> **Option 4:** Neither Student 1 nor Student 2
> **Correct Answer:** Option 3

LG: List and execute steps of construction in order to construct a circle when its radius is known.

> **Level of difficulty:** Medium
> **Bloom's Level:** Understanding
> 1. Rohit has to construct a circle of radius 4.8 cm. Which of the following steps should he follow?
>> **Option 1:**
>> Step 1: Open the compasses for 2.4 cm.
>> Step 2: Mark a point with a pencil as the centre of the circle. Name it as C.
>> Step 3: Place the pointer of the compasses on C.
>> Step 4: Turn the compasses to draw the circle.
>> **Option 2:**
>> Step 1: Draw a line segment $\overline{AB}$ of length 4.8 cm.
>> Step 2: Open the compasses for 4.8 cm.
>> Step 2: Place the pointer at the mid-point, say C, of the line segment $\overline{AB}$.
>> Step 4: Turn the compasses to draw the circle.
>> **Option 3:**
>> Step 1: Open the compasses for 4.8 cm.
>> Step 2: Mark a point with a pencil as the centre of the circle. Name it as C.
>> Step 3: Place the pointer of the compasses on C.
>> Step 4: Turn the compasses to draw the circle.
>> **Option 4:**
>> Step 1: Draw a line segment $\overline{AB}$ of length 2.4 cm.
>> Step 2: Open the compasses for 2.4 cm.
>> Step 2: Place the pointer at A.
>> Step 4: Turn the compasses to draw the circle.
> **Correct Answer:** Option 3

> **Level of difficulty:** Hard
> **Bloom's Level:** Analysing

171

2. To draw a circle of radius 6 cm, Anjali writes the following steps.

Step 1: Draw a line segment $\overline{EF}$ of 6 cm.

Step 2: Mark the mid-point of the line segment, say G.

Step 3: Taking G as the centre and GF as the arc, draw the required circle.

Are her steps for the required construction correct?

        Option 1: Yes, because EF = 2GF

        Option 2: No, because the centre of the circle should lie in between G and F.

        Option 3: Yes, because EF is the radius of the circle and its length is 6 cm.

        Option 4: No, because the centre of the circle should either be E or F.

Correct Answer: Option 4

LG: List and execute steps of construction in order to construct a line segment when its length is known.

Level of difficulty: Medium

Bloom's Level: Understanding

1. Kunal wrote the following steps to construct a line segment of 7 cm.

Step 1: Draw a line *k*. Mark a point M on the line *k*.

Step 2: Place the compasses pointer on the mark "1" of the ruler.

Step 3: Open the compasses to place the pencil point up to the mark "7" of the ruler.

Step 4: Taking caution that the opening of the compasses has not changed, place the pointer on M and draw an arc to cut *k* at N to get $\overline{MN}$ = 7 cm.

Kunal made an error while constructing the line segment. In which step did he make the error?

        Option 1: Step 1

        Option 2: Step 2

        Option 3: Step 3

        Option 4: Step 4

Correct Answer: Option 2

Level of difficulty: Hard

Bloom's Level: Analysing

2. Estimate the length of QR based on the given construction.

Step 1: Draw a line segment $\overline{MN}$ = 10.4 cm.

Step 2: Draw another line segment $\overline{OP}$ = 4.5 cm .

Step 3: Adjust the compasses up to the length of $\overline{OP}$ and put the pointer of compasses at M to draw an arc intersecting $\overline{MN}$ at K.

Step 4: Draw a line *l* and mark a point Q on it.

Step 5: Adjust the compasses up to the length $\overline{KN}$ and put the pointer of compasses at Q to draw an arc intersecting the line *l* at R.

        Option 1: 4.5 cm

        Option 2: 5.9 cm

        Option 3: 6.9 cm
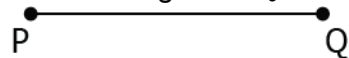
        Option 4: 14.9 cm

Correct Answer: Option 2

LG: List and execute steps of construction in order to construct a copy of the given line segment.

Level of difficulty: Medium

Bloom's Level: Understanding

1. A line segment $\overline{PQ}$ is shown.

P   Q

Which of these options shows the correct steps to construct a copy of the line segment $\overline{PQ}$?

        Option 1:

        Step 1: Fix the compasses pointer at the mid-point of $\overline{PQ}$, say T, and the pencil end on Q.

        Step 2: Draw any line *m*. Choose a point U on *m*. Without changing the compasses setting, place the pointer on U.

        Step 3: Draw an arc that cuts *m* at a point, say V. Now $\overline{UV}$ is the required line segment.

172

Option 2:
Step 1: Fix the compasses pointer on P and the pencil end on Q.
Step 2: Draw any line m. Choose a point U on m. Without changing the compasses setting, place the pointer on U.
Step 3: Draw an arc that cuts m at a point, say V. Now $\overline{UV}$ is the required line segment.

Option 3:
Step 1: Fix the compasses pointer at the mid-point of $\overline{PQ}$, say T, and the pencil end on P.
Step 2: Draw any line m. Choose a point U on m. Without changing the compasses setting, place the pointer on U.
Step 3: Draw an arc that cuts m at a point, say Y.
Step 4: Fix the compasses pointer at the mid-point of $\overline{UY}$, say S, draw an arc that cuts m at a point, say V. Now $\overline{UV}$ is the required line segment.

Option 4:
Step 1: Fix the compasses pointer on P and the pencil end on Q.
Step 2: Draw any line m. Choose a point U on m. Without changing the compasses setting, place the pointer on U.
Step 3: Draw an arc that cuts m at a point, say Y.
Step 4: Without changing the compasses setting, place the pointer on Y and draw an arc that cuts m at a point, say V. Now $\overline{UV}$ is the required line segment.

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing
2.   Richa constructs a line segment by following the given steps.
Step 1: Draw a line segment $\overline{EF}$.
Step 2: Draw a line l and mark a point G on it.
Step 3: Adjust the compasses up to the length of $\overline{EF}$ and put the pointer of compasses at G to draw an arc intersecting the line l at H.
Step 4: Without changing the compasses setting and H as centre, draw an arc intersecting the line l at J.
Based on the information, which relation holds true?

        Option 1: $\overline{EF} = 2\overline{GH}$
        Option 2: $\overline{GH} = 2\overline{GJ}$
        Option 3: $2\overline{EF} = \overline{GJ}$
        Option 4: $2\overline{GH} = \overline{HJ}$

Correct Answer: Option 3

LG: List and execute steps of construction in order to construct a perpendicular to a line through a point on it.

Level of difficulty: Medium
Bloom's Level: Understanding
1.   A teacher gave a construction problem. Aarav followed the given steps for construction.

Step 1	Draw a line u.
Step 2	Mark point S on line u.
Step 3	Place a ruler with one of its edges along u.
Step 4	Place a set-square with one of its edges along the already aligned edge of the ruler such that the right-angled corner is in contact with the ruler.
Step 5	Slide the set-square along the edge of ruler until its right-angled corner coincides with S.
Step 6	Draw ST along the edge of the set-square.

What problem was given by the teacher for construction?
        Option 1: To construct an acute angle to a line through a point on it.
        Option 2: To construct a perpendicular to a line through a point on it.
        Option 3: To construct an obtuse angle to a line through a point on it.
        Option 4: To construct a perpendicular to a line through a point not on it.

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing

2. Rishabh writes the following steps to construct a perpendicular to a line through a point on it.
Step 1: Draw a line *l* and mark a point P on it.
Step 2: With P as the centre and a convenient radius, draw an arc intersecting the line *l* at two points A and B.
Step 3: With A as the centre and radius equal to AP, draw an arc.
Step 4: With B as the centre and radius equal to BP, draw an arc intersecting the arc drawn in Step 3 at Q.
Step 5: Join PQ. Then $\overleftrightarrow{PQ}$ is perpendicular to *l*.
Is his construction correct?
   Option 1: Yes, because the length of AP is equal to the length of BP.
   Option 2: No, because the radius used in Step 3 should be less than AP and the same radius should be used in Step 4.
   Option 3: Yes, because P and Q lie on a single straight line.
   Option 4: No, because the radius used in Step 3 should be greater than AP and the same radius should be used in Step 4.
Correct Answer: Option 4

LG: List down and execute steps of construction in order to construct a perpendicular to a line through a point not on it.

Level of difficulty: Medium
Bloom's Level: Understanding
1. The steps to construct a perpendicular to a line *w* through a point which does not lie on the line *w* are shown below.
Step 1: Mark point K outside the line *w*.
Step 2: Place a ruler along the edge opposite to the right angle of the set-square.
Step 3: Place a set-square on *w* such that one arm of its right angle aligns along *w*.
Step 4: Hold the ruler fixed. Slide the set-square along the ruler till the point K touches the other arm of the set-square.
Step 5: Join KL along the edge through K, meeting *w* at L.
Which two steps should be swapped so that the construction becomes possible?
   Option 1: Step 2 and Step 4
   Option 2: Step 3 and Step 4
   Option 3: Step 2 and Step 3
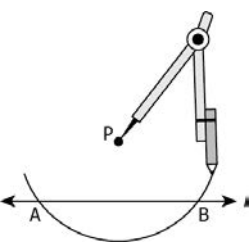   **Option 4:** Step 3 and step 5
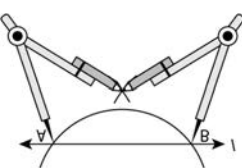**Correct Answer:** Option 3

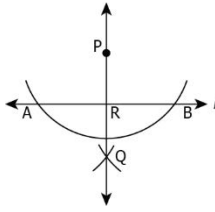**Level of difficulty:** Hard
Bloom's Level: Analysing
2. The correct steps to construct a perpendicular to a line through a point not on it are as shown.

Step 1:

Step 2:

Step 3:

174

Step 4:

Which of these conditions is sufficient to justify the construction?

Option 1: $\overline{PA} = \overline{PB}$
Option 2: $\overline{PA} = \overline{PB} = \overline{BQ}$
Option 3: $\overline{PA} = \overline{PB} = \overline{BQ} = \overline{AQ}$
Option 4: $\overline{PA} = \overline{PB} = \overline{BQ} = \overline{AQ} = \overline{PR}$

Correct Answer: Option 3

LG: Use a protractor and ruler in order to construct an angle of the given measure.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Consider the line segment.

Which of these options correctly shows the complete steps to construct an angle of measure 50° using protractor?
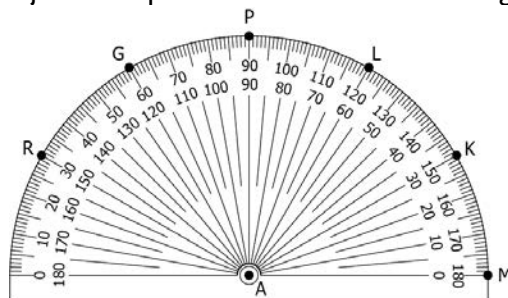

Correct Answer: Option 2

Level of difficulty: Hard
Bloom's Level: Analysing
2. A teacher asks her students to join the alphabets such that the resulting angle is 30°.

175

The responses of four of the students are recorded.
Ujjwal: Joins AR and AM
Satyam: Joins AM and AK
Abhishek: Joins AP and AL
Virendra: Joins AP and AG
How many of them responded correctly?

        Option 1: None
        Option 2: Only one student
        Option 3: Only two students
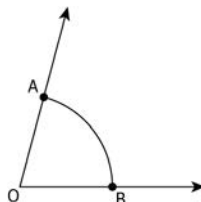   **Option 4:** Only three students
Correct Answer: Option 4

LG: List and execute steps of construction in order to construct a copy of the given angle of unknown measure using a compass.

    Level of difficulty: Medium
    Bloom's Level: Understanding
1. A teacher draws ∠AOB as shown and asks his students to write the steps in order to construct the copy of the given angle.

The responses of two of the students are as shown.
Student 1:
Step 1: Draw a line *l* and mark a point P on it.
Step 2: Place the compasses at O and set the compass to length OA.
Step 3: Using the same compasses setting and with P as centre, draw an arc cutting *l* in Q.
Step 4: Set the compasses to the length AB and with Q as centre, draw an arc intersecting the arc drawn in Step 3 at R.
Step 5: Join PR to get ∠O = ∠P.

Student 2:
Step 1: Draw a line *l* and mark a point P on it.
Step 2: Place the compasses at A and set the compass to length AB.
Step 3: Using the same compasses setting and with P as centre, draw an arc cutting *l* in Q.
Step 4: Set the compasses to the length OB and with Q as centre, draw an arc intersecting the arc drawn in Step 3 at R.
Step 5: Join PR to get ∠O = ∠P.
Who among them is/are correct?

        Option 1: Only Student 1
        Option 2: Only Student 2
        Option 3: Both Student 1 and Student 2
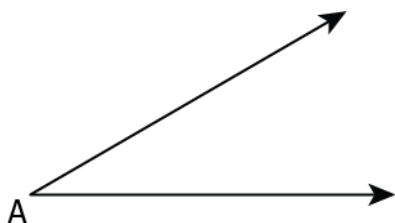   **Option 4:** Neither Student 1 nor Student 2
Correct Answer: Option 1

    Level of difficulty: Hard
    Bloom's Level: Analysing
2. Consider ∠A as shown.

In order to construct a copy of ∠A, a student wrote the following steps.
Step 1: Draw a line *l* and mark a point M on it.
Step 2: Place the compasses at A and draw an arc to cut the rays of ∠A at B and C.

Step 3: Using the same radius used in Step 2 and with M as centre, draw an arc cutting *l* in N.

Step 4: Taking radius equal to AB and N as the centre, draw an arc intersecting the arc drawn in Step 3 at P.

Step 5: Join M to P to get ∠A = ∠M.
In which step did the student make the first error and what should be the correct step?

Option 1: Step 3: Using the smaller radius than that of used in Step 2 and with M as centre, draw an arc cutting *l* in N.

Option 2: Step 3: Using the greater radius than that of used in Step 2 and with M as centre, draw an arc cutting *l* in N.

Option 3: Step 4: Taking radius equal to BC and N as the centre, draw an arc intersecting the arc drawn in Step 3 at P.

Option 4: Step 4: Taking radius equal to AC and N as the centre, draw an arc intersecting the arc drawn in Step 3 at P.
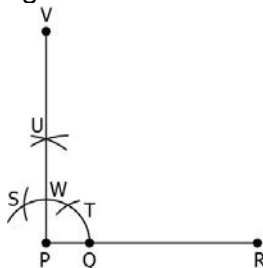
Correct Answer: Option 3

LG: List and execute steps of construction in order to construct the bisector of an angle and construct angles of measures 30-degree, 45 degree and so on.

Level of difficulty: Medium
Bloom's Level: Understanding
1. Part of construction of an angle measuring 45° is shown below.

Which option correctly lists the next steps in order to construct 45°?

Option 1: Step 1: Taking the radius greater than $\frac{WQ}{2}$ and with centres P and Q, draw two arcs which cut each other at a point X. Step 2: Join PX to get ∠RPX = 45°.

Option 2: Step 1: Taking the radius less than $\frac{WQ}{2}$ and with centres P and Q, draw two arcs which cut each other at a point X. Step 2: Join PX to get ∠RPX = 45°.

Option 3: Step 1: Taking the radius greater than $\frac{WQ}{2}$ and with centres W and Q, draw two arc which cuts each other at a point X. Step 2: Join PX to get ∠RPX = 45°.

Option 4: Step 1: Taking the radius less than $\frac{WQ}{2}$ and with centres W and Q, draw two arcs which cuts each other at a point X. Step 2: Join PX to get ∠RPX = 45°.

Correct Answer: Option 3

Level of difficulty: Hard
Bloom's Level: Analysing
2. Consider an angle shown below.

177
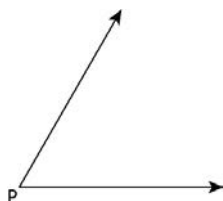
Below are the steps to construct the bisector of the given angle.

Step 1: With P as centre and a convenient radius, draw an arc that cuts both rays of ∠P. Label the points of intersection as Q and R.

Step 2: With Q as centre, draw (in the interior of ∠P) an arc with radius greater than half the length QR.

Step 3: With twice the radius used in Step 2 and with R as centre, draw another arc in the interior of ∠P. Let the two arcs intersect at S. Then PS is the required bisector of ∠P.

Which step in the given construction is incorrect and what should be the correct step?

> **Option 1: Step 2:** With Q as centre, draw (in the interior of ∠P) an arc whose radius is smaller than half the length $\overline{QR}$.
>
> **Option 2: Step 3:** With the same radius as used in Step 2 and with R as centre, draw another arc in the interior of ∠P. Let the two arcs intersect at S. Then $\overline{PS}$ is the required bisector of ∠P.
>
> **Option 3: Step 2:** With Q as centre, draw (in the interior of ∠P) an arc whose radius is equal to the length $\overline{QR}$.
>
> **Option 4: Step 3:** With the smaller radius than that used in Step 2 and with R as centre, draw another arc in the interior of ∠P. Let the two arcs intersect at S. Then $\overline{PS}$ is the required bisector of ∠P.
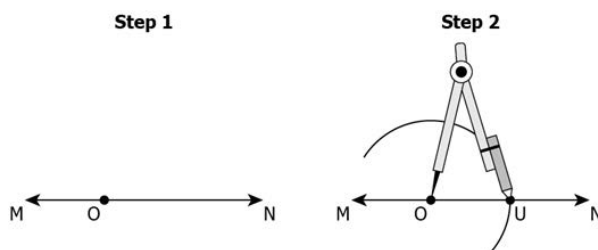
Correct Answer: Option 2

LG: List and execute steps of construction in order to construct angles of measures 60-degree, 90 degree and 120 degree.
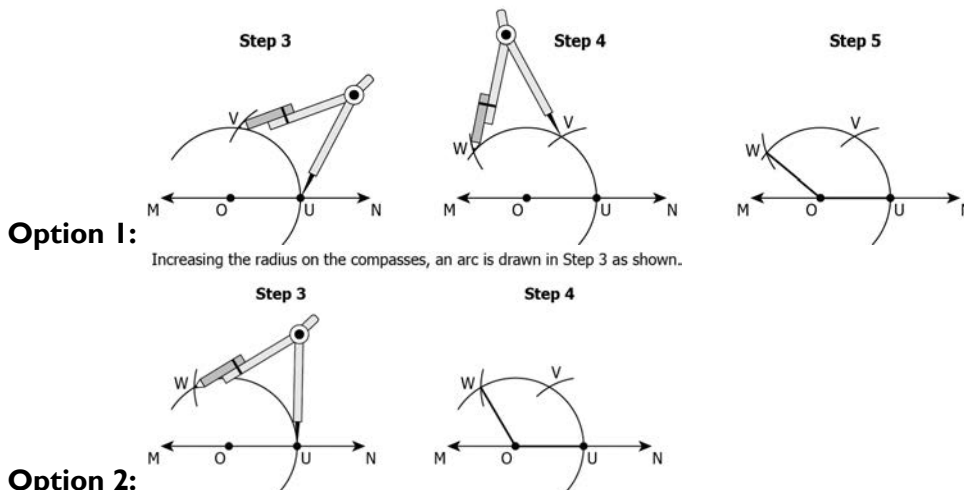
Level of difficulty: Medium

Bloom's Level: Understanding

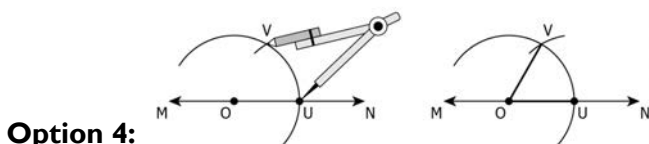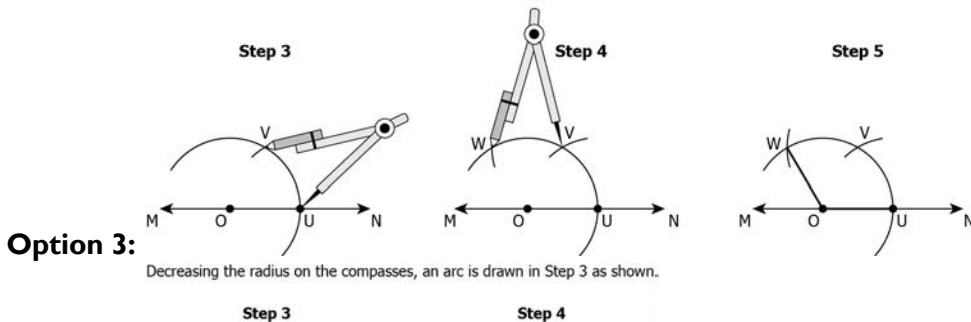1. The first two steps to construct an angle of measure 120° are as shown.

Which option shows the remaining steps?

Increasing the radius on the compasses, arcs are drawn in Step 3 and Step 4 as shown.

Option 1:

Increasing the radius on the compasses, an arc is drawn in Step 3 as shown.

Option 2:

Without disturbing the radius on the compasses, arcs are drawn in Step 3 and Step 4 as shown.

Option 3:

Decreasing the radius on the compasses, an arc is drawn in Step 3 as shown.

Option 4:

Correct Answer: Option 3

Level of difficulty: Hard

Bloom's Level: Analysing

2. A student wrote the following steps to construct an angle of measure 90°.

Step 1: Draw a line segment $\overline{OB}$.

Step 2: With O as centre, draw an arc intersecting $\overline{OB}$ at P.

Step 3: Taking the radius greater than that of used in Step 2 and with P as the centre, draw an arc intersecting the arc drawn in Step 2 at D.

Step 4: Taking the radius greater than that of used in Step 3and with D as the centre, draw an arc intersecting the arc drawn in Step 2 at E.

Step 5: Taking the same radius used in Step 4 and with D and E as centres, draw two arcs intersecting each other at a point, say F.

Step 6: Join OF to form ∠BOF = 90°.

In which step did the student make the first error and what should be the correct step?

    Option 1: Step 3: Taking the same radius used in Step 2 and with P as the centre, draw an arc intersecting the arc drawn in Step 2 at D.

    Option 2: Step 3: Taking the radius smaller than that of used in Step 2 and with P as the centre, draw an arc intersecting the arc drawn in Step 2 at D.

    Option 3: Step 4: Taking the same radius used in Step 3 and with D as the centre, draw an arc intersecting the arc drawn in Step 2 at E.

    Option 4: Step 4: Taking the smaller than that of used in Step 3 and with D as the centre, draw an arc intersecting the arc drawn in Step 2 at E.

Correct Answer: Option 1

Suggested Teacher Resources

I Lesson Plan

Objective- Understanding of solid figures in order to get the clarity while constructing geometry figures.
Material Required- Activity sheet.
Procedure-
- Teacher will start the class by telling students to identify the figures based on the given pictures.

- Teacher will conduct a review on similarities and difference between plane and solid figures.

Questions-
1. What is the difference between plane and solid figure?
2. Is there a relationship or similarities between the two?

- Show some solid figures to the students like matchbox, bottle, box of milk.

Then ask question to the students what will happen if you dismantle the solid figure?
Eliciting answer from the students until the word flat is mentioned.
Then again show the box of milk and ask student what solid figure does this box presents?
Unfold the box and then ask students what happened to the box?

Problem Opener
- Teacher will show class unfold box and a box.

Then Teacher will ask few questions to them
1.what is the difference between the two objects?
2.What do you called this 3-D objects?
3.How about this one?
4.What have you observed in this object?
5.What do you call this one?

- Start discussing the "Net" Say: Our lesson for today is about "Net". Based on your observation earlier how can you describe a net?

Students will answer a net is a 2-Dimensional shape. It can be folded to form a 3- dimensional shape or space figure.
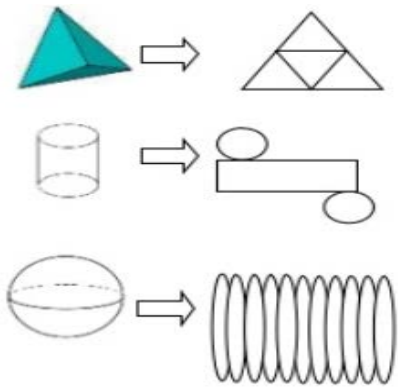
Show an example.
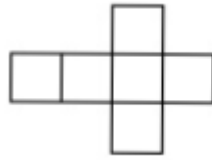
What faces are opposite to each other?

1. _____ & _____
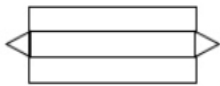2. _____ & _____
3. _____ & _____

Show students following pictures.

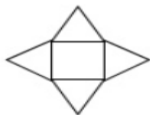**Group activity-:10 min**

Objective - Identify the solid figure
Divide the class in 3 groups and give them separate activity sheet

Group1:

Group2:

Group3:

2 **Activity**

Objective: The students will be able to use the formulas for the area of squares, rectangles, and triangles for real world applications.

Materials required:

• Various sizes of boxes

- scissors
- rulers
- paper
- pencil
- imaginary or actual advertisements showing cost of paint and carpet

Modeling
- Using the actual measurements of the classroom, help show students what they will be doing with their own rooms (boxes).
- Explain the procedure of subtracting windows and doorways from the total area of walls.
- Discuss the different costs of paints and carpets, per square foot or yard for coverage purposes.

Guided Practice
- Distribute a different size box to each student. Have them cut two or three "windows" and "doors" in each box.
- Students will then measure the windows and doors, using a set scale to turn the inches or centimeters into feet or meters to approximate the size of a room.
- Students will measure the sizes of the "rooms"- boxes.
- Students will subtract doorway and window sizes from total surface area of the "walls".
- Student will measure the "floor" of the room.
- The students will determine the amount of paint needed for the walls and the amount of carpet need for the floor.
- Using the advertisements, the students will estimate the cost of painting/carpeting the room.

Independent Practice
- The teacher will distribute a handout with several similar word problems and/or diagrams or blueprints of actual rooms for students to calculate the costs
- Assign students to calculate the cost of remodeling a room at their home
- The teacher will collect the completed page(s). This will be used as an assessment.

Source-: https://www.slideshare.net/AprilRoseAnin/nets-of-solid-figures-lesson-grade-vi-explicit-lesson-plan-k12
https://www.teacher.org/lesson-plan/box-geometry/