

**Let's pave the way for learning and  
Move Forward**

**Standard - 10  
Mathematics**



**State Council of Educational Research and Training (SCERT), Kerala  
2022**

Dear students,

The evaluation of the answer scripts of the First Terminal Examination 2022 and the classroom experiences shared by the teachers concerned, have brought to light the fact that our children have suffered some serious learning gap due to the non-availability of proper learning experiences as a result of the unprecedented situation created by the Covid Pandemic from 2019 to 2022. An activity book has been designed to assist children internalize the concepts which they ought to have mastered in the previous classes and with the intention to facilitate further learning. Necessary explanations and activities are included in the booklet to help children bridge the gap. It is hoped that this package will facilitate the learners for self-study or for studying with the help of their teachers and I wish them success in their endeavors to move forward with confidence.

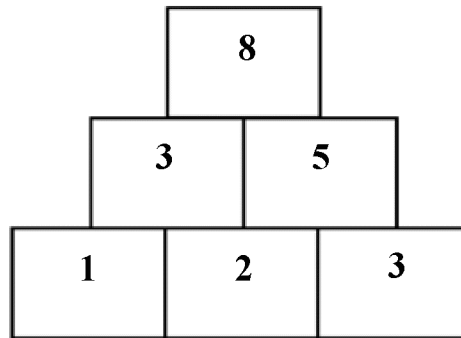
**Director**  
SCERT, Kerala

# 1. Arithmetic Sequences

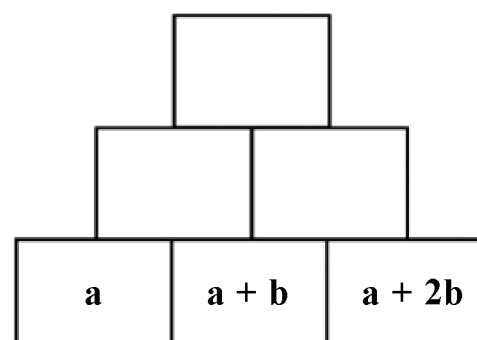
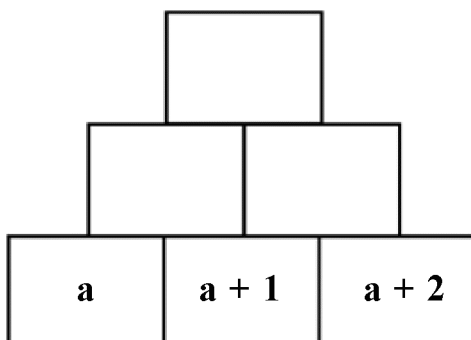
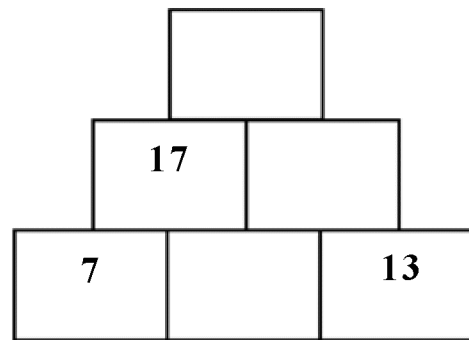
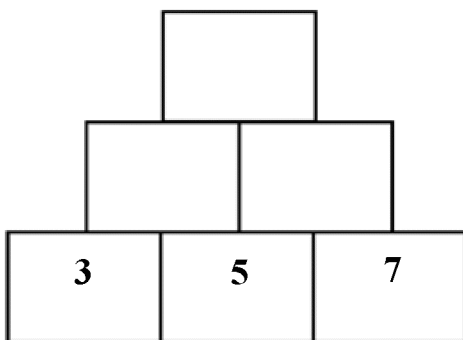
## Activity 1

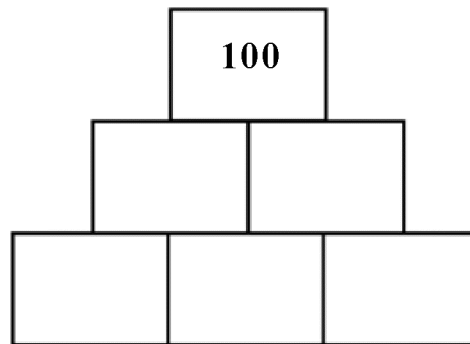
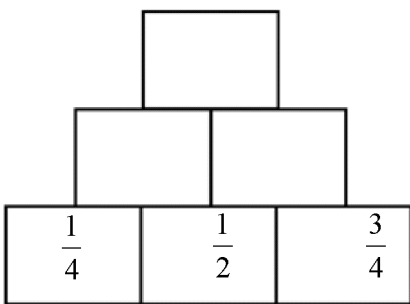
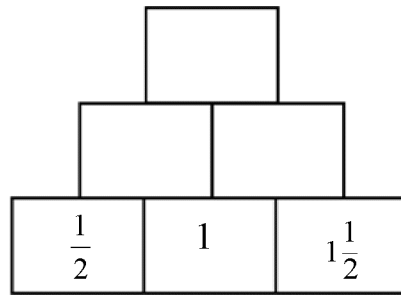
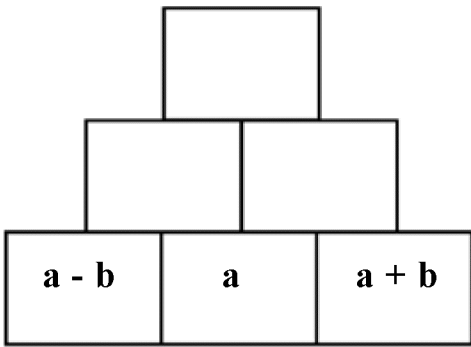
### Number Pyramid

Look at the number pyramids.



Fill the following number pyramids using the above example.





**Activity 2**

$$1 + 2 + 3 = 6$$

$$2 + 3 + 4 = 9$$

$$3 + 4 + 5 = 12$$

Write the next three lines of the above pattern. Various properties of the pattern are :

- The sum in each row is a multiple of 3.
- The sum is 3 times the middle number.
- .....

Explain the above properties using algebra.

Consider the numbers  $x, x + 1, x + 2$

Check another set of numbers  $x - 1, x, x + 1$

Consider another example. What about the sum of 5 consecutive natural numbers?

$$1 + 2 + 3 + 4 + 5 = 15$$

$$2 + 3 + 4 + 5 + 6 = 20$$

.....

Write the next three lines of the above pattern.

Here  $15 = 4 + 5 + 6 =$  sum of three consecutive natural numbers.

$15 = 1+2+ 3+4+ 5 =$  sum of five consecutive natural numbers.

Find the numbers which can be written as the sum of three consecutive natural numbers as well as the sum of five consecutive natural numbers?

### General form

1,2,3,..... are natural numbers. If we multiply the above natural numbers by 2, we get 2,4,6,..... which are even numbers. We see that if 'n' is a counting number, then '2n' is always even.

From the even numbers 2,4,6.... if we subtract 1 from each we get 1,3,5.... which represent odd numbers. Hence we can conclude that if natural numbers are multiplied by 2 and subtract 1 from each we always get odd natural numbers. Using algebra we can write this as  $2n-1$ .

3, 6, 9...

2, 5, 8..

1, 4, 7...

If we put all the above sequence together, we get all the natural numbers. Also the first set of numbers are multiples of three. The second set of numbers are one less than the multiples of three. The third set of numbers are two less than the multiples of three. The algebra of the sequences are  $3n, 3n - 1, 3n - 2$ .

### Activity 3

Write the following number sequence using algebra

4, 8, 12,...

3, 7, 11...

2, 6, 10,...

1, 5, 9...

### Activity 4

If n represents a natural number then write the sequence of numbers represented by  $11n + 1$

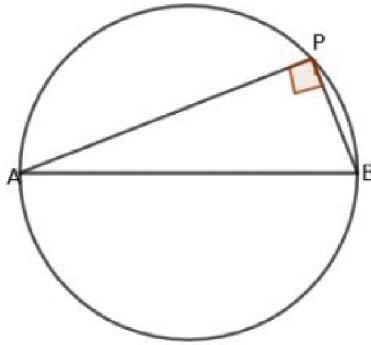
What is the remainder obtained when each number of the sequence is divided by 11?

Can we include the numbers 100, 1000, 10000 in the above number sequence?

## 2. Circles & 7. Tangents

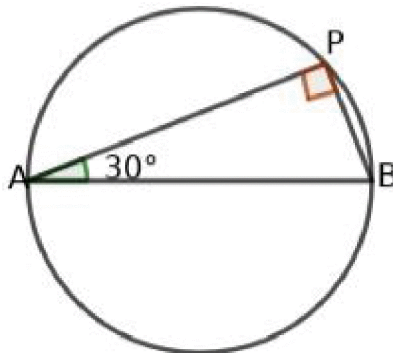
(Included previous knowledge of both the chapters)

- In any circle, if the ends of a diameter are joined to another point on a circle then the angle at that point is right angle.



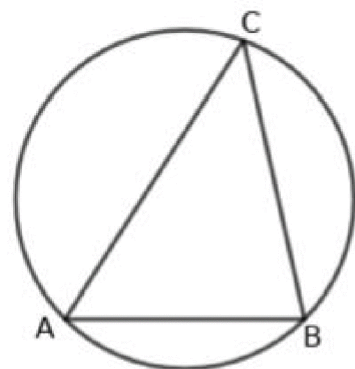
### Activity 1

- a) In triangle ABP  $\angle A = 30^\circ$ , then  $\angle B = \text{----}$



- The circle passing through all the three vertices of a triangle is called its circumcircle.

We can draw the circumcircle of any triangle by choosing the point of intersection of perpendicular bisectors of any two sides as centre and the distance of centre from any vertex as radius.



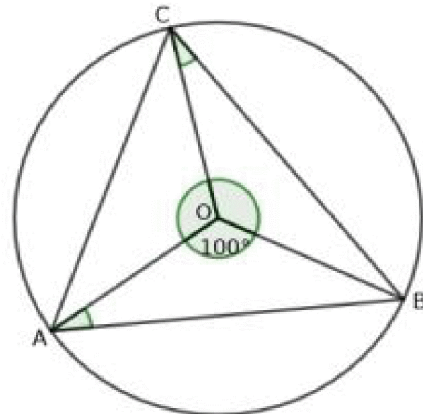
### Activity 2

- Draw a triangle with sides 3cm, 4cm and 5cm .
- Draw the circumcircle of this triangle.

**Activity 3**

Angle around a point is  $360^\circ$ .

In the figure,  $\angle AOB$  is formed by joining the ends of the chord AB with the centre of the circle.  $\angle AOB = 100^\circ$  then,



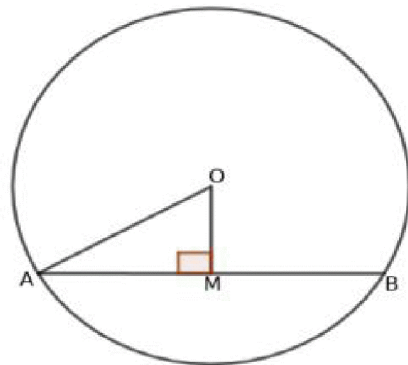
- a)  $\angle OAB = \text{-----}$
- b) If  $\angle OCB = 30^\circ$  then,  $\angle COB = \text{----}$
- c)  $\angle COA = \text{-----}$

**Activity 4**

Perpendicular from the centre of a circle to a chord bisects the chord.

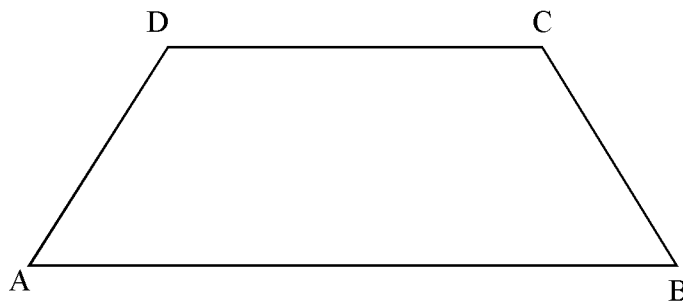
In the figure,  $AB = 8\text{cm}$ ,

$OM = 3\text{cm}$ , then find the radius of the circle.

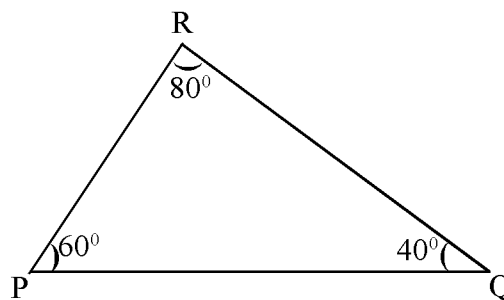
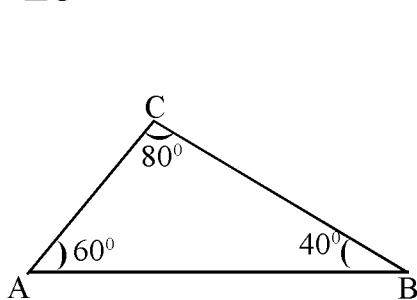


**Activity 5**

In the figure, ABCD is an isosceles trapezium



- a) Write the equal sides.
- b) If  $\angle A = 50^\circ$ , then  $\angle B = \text{-----}$
- c)  $\angle A + \angle D = \text{-----}$
- d)  $\angle C = \text{-----}$



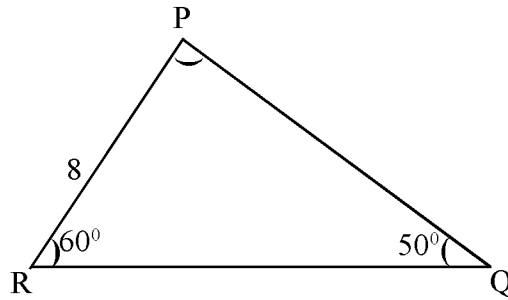
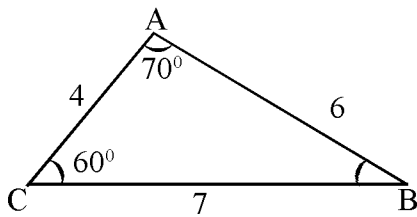
In triangles of the same angles, pairs of sides opposite to equal angles are in the same ratio. In the given triangles ABC and PQR,  $\angle A = \angle P$ ,  $\angle B = \angle Q$ ,  $\angle C = \angle R$ .

Then the sides opposite to equal angles are proportional (ie, scaled by the same factor).

That is,  $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{RP}$

### Activity 6

In the figure,  $\angle A = 70^\circ$ ,  $\angle C = 60^\circ$ ,  $\angle Q = 50^\circ$ ,  $\angle R = 60^\circ$  then,



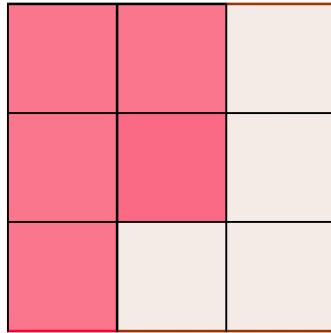
- a)  $\angle B = \underline{\hspace{2cm}}$ ,  $\angle P = \underline{\hspace{2cm}}$   
 b)  $PQ = \underline{\hspace{2cm}}$ ,  $RQ = \underline{\hspace{2cm}}$



### 3. Mathematics of chance

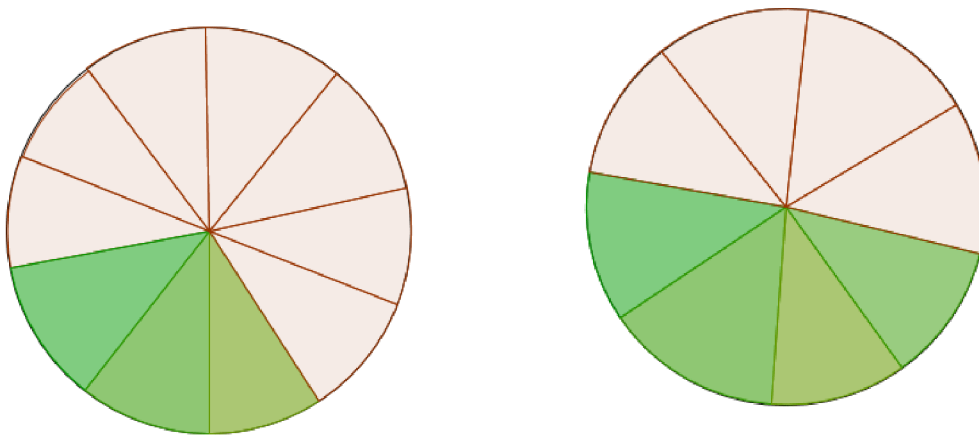
#### Activity 1

In the figure a square is divided in to small squares.



- How many small squares are there in the figure ?
- How many small squares are shaded ?
- What fraction of number of small squares is the number of shaded squares?

#### Activity 2



- Write the fraction which represents shaded sectors as the part of number of all sectors in each figure.
- Which fraction is larger ?

#### Activity 3

Which of the following fraction is larger ?

- $\frac{3}{7}, \frac{5}{7}$  Since the denominators are equal, fraction with large numerator is large. Using cross multiplication.

$$3 \times 7 = 21$$

$$5 \times 7 = 35$$

So  $\frac{5}{7} > \frac{3}{7}$

b)  $\frac{5}{8}, \frac{5}{7}$

Since the numerators are equal, fraction with small denominator is large.  
Using cross multiplication.

$$5 \times 7 = 35$$

$$5 \times 8 = 40$$

$$\frac{5}{7} > \frac{5}{8}$$

c)  $\frac{3}{5}, \frac{4}{7}$

$$3 \times 7 = \dots\dots$$

$$4 \times 5 = \dots\dots$$

$$\dots\dots > \dots\dots$$

#### Activity 4

Write the missing numbers of the sequence given below.

a) Odd numbers

$$1, 3, 5, \text{---}, \text{---}, \text{---}, \text{---}, \text{---}, \text{---}$$

b) Even numbers

$$2, 4, 6, \text{---}, \text{---}, \text{---}, \text{---}, \text{---}, \text{---}$$

c) Perfect squares

$$1, 4, 9, 16, \text{---}, \text{---}, \text{---}, \text{---}, \text{---}, \text{---}$$

d) Prime numbers

$$2, 3, 5, 7, \text{---}, \text{---}, \text{---}, \text{---}, \text{---}, \text{---}$$

## 4. Second Degree Equations

### Activity 1

Consider the table given below. Select algebraic expressions from column B suitable for verbal phrases in column A

Verbal phrases	Algebraic expressions
1. Three times a number	$x^2 + 3$
2. Five times a number	$x, x + 1$
3. 2 added to five times a number	$x, x + 2$
4. 2 subtracted from five times a number	$5x + 2$
5. Square of a number.	$5x - 2$
6. 3 added to square of a number	$x^2$
7. 3 subtracted from square of a number	$x, 4 - x$
8. Two consecutive natural numbers.	$x^2 + 3$
9. Two consecutive even numbers.	$x^2 - 3$
10. Two consecutive odd numbers.	$5x$
11. Two numbers having sum 4.	$x, x + 2$
	$3x$

### Activity 2

Write the relations given below as algebraic expressions.

- 10 added to 4 times a number gives 130.
- 1000 added to 2 times a number gives 4500.
- Sum of a number and its square is 42.
- Three times a number added to its square gives 88.

### Activity 3

Perimeter of rectangle is 24 cm.

length + breadth = .....

If the length is  $x$ , then breadth = .....

Area = .....  $\times$  .....

**Activity 4**

$$(x + y)^2 = x^2 + y^2 + 2xy$$

$$(x - y)^2 = x^2 + y^2 - 2xy$$

$$(x + 5)^2 = x^2 + 5^2 + (2 \times x \times 5)$$

$$= x^2 + 5^2 + 10x$$

$$= x^2 + 10x + 5^2$$

$$(x + 5)^2 = x^2 + 10x + 5^2$$

- Which number added to  $x^2 + 10x$  to get a perfect square?
- Which number added to  $x^2 + 12x$  to get a perfect square ?
- Which number added to  $x^2 + 6x$  to get a perfect square ?
- Which number added to  $x^2 - 16x$  to get a perfect square ?

**Activity 5**

Complete the table

×

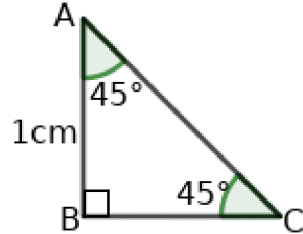
$p(x) = x^2 + 4x + 3$	$p(0) = \dots\dots\dots$
$q(x) = 4x + 3$	$q(1) = \dots\dots\dots$
$r(x) = x^2 - 3x + 2$	$r(2) = \dots\dots\dots$
$s(x) = x^2 - x + 1$	$s(-1) = \dots\dots\dots$

## 5. Trigonometry

### Activity 1

Consider the figures given below

(i)



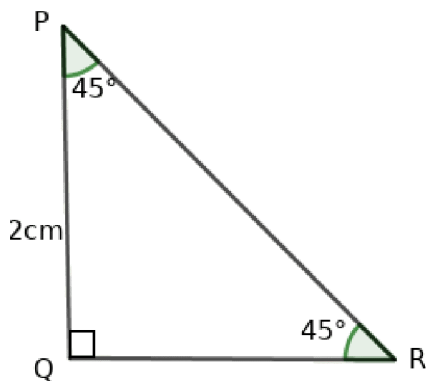
In right triangle ABC,  $AB = 1\text{ cm}$ . then,

- What is the length of BC ?
- What is the length of AC ?

Since ABC is an isosceles right triangle,  $BC = AB = 1\text{ cm}$

According to Pythagoras theorem,  $AC = \sqrt{1^2 + 1^2} = \sqrt{2}$

(ii)



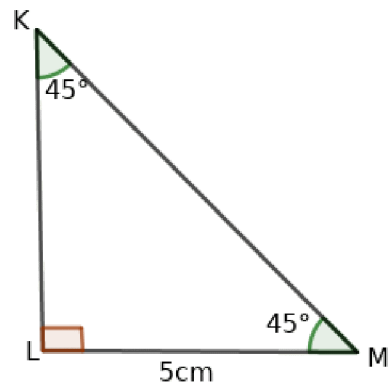
In right triangle PQR,  $PQ = 2\text{ cm}$ . Then,

- What is the length of QR ?
- What is the length of PR ?

(iii) In right triangle KLM,  $LM = 5\text{ cm}$ . Then,

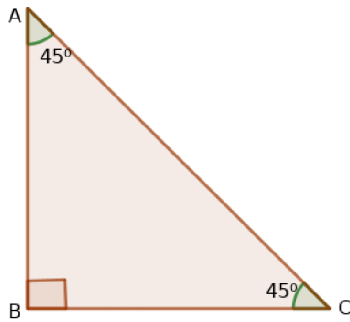
- What is the length of KL?
- What is the length of KM?

From the above activities, it is understood that in a triangle with angles  $45^\circ, 45^\circ$  and  $90^\circ$ , the length of hypotenuse is  $\sqrt{2}$  times the length of equal sides.



**Activity 2**

Complete the table by observing the picture given below.



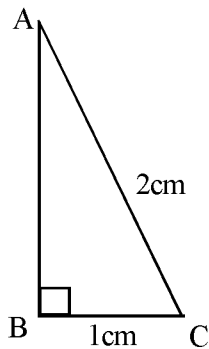
AB	BC	AC
6cm	_____	_____
_____	7cm	_____
_____	_____	$4\sqrt{2}$ cm

**Activity 3**

Consider the figures given below.

i) In right triangle ABC, BC = 1cm, AC = 2cm, then what is the length of AB ?

According to Pythagoras theorem,  $AB = \sqrt{AC^2 - BC^2}$

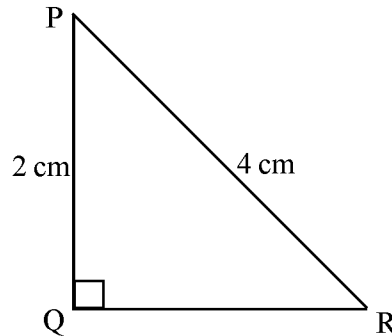


$$= \sqrt{2^2 - 1^2}$$

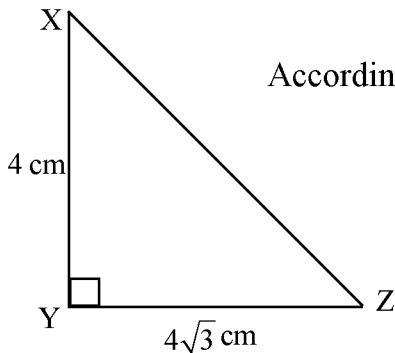
$$= \sqrt{4 - 1}$$

$$AB = \sqrt{3}$$

ii) In right triangle PQR, PQ = 2cm, PR = 4cm, then what is the length of QR ?



(iii) In right triangle XYZ, XY = 4cm, YZ =  $4\sqrt{3}$  cm then, what is the length of XZ?



According to Pythagoras theorem,  $XZ = \sqrt{4^2 + (4\sqrt{3})^2}$

$$= \sqrt{16 + 48}$$

$$= \sqrt{64}$$

$$XZ = 8 \text{ cm}$$

## 6. Coordinates & 9. Geometry and Algebra

(Included previous knowledge of both the chapters)

### Activity 1



All points on this line can be marked using real numbers. On the other hand, all real numbers can be seen as the points on this line. Such a line is called number line.

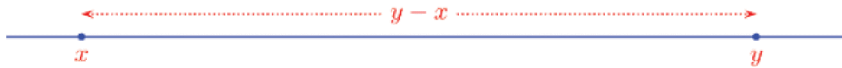
All positive numbers occupy the right side of the zero whereas negative numbers occupy the left side of zero on the number line. All real numbers can be marked on this number line.

Draw a number line and mark these points.

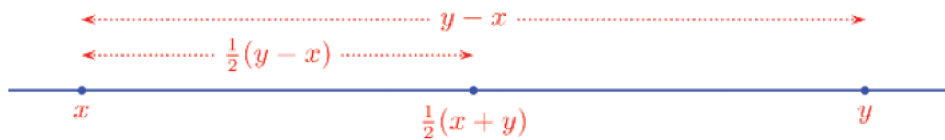
- (i) 5 (ii) -3 (iii) 3 (iv) -5 (v) -1

### Activity 2

The distance between any two points on the number line is obtained by subtracting the smaller number from the larger.



The midpoint of two points on the number line is that point denoted by half the sum of the number



(a) Find the distance between the two points on the number line, denoted by each pair of numbers given below:

- (i) 2, 7 (ii) -7, -5 (iii) 7, -7 (iv) -6, 9 (v) -3, -8

(b) Find the midpoint of each pair of points in question (a)

### Activity 3

The absolute value of a number is the distance from 0 to that number. The distance between a positive number and zero is the number itself. The distance between a negative number and zero is the number with the negative sign discarded.

If  $x$  is a positive number,  $|x| = x$

if  $x$  is a negative number,  $|x| = -(x)$

If  $x = 0$ ,  $|x| = 0$

For example,

$$|9| = 9$$

$$|-9| = -(-9) = 9$$

$$|\sqrt{2}| = \sqrt{2}$$

$$|-\sqrt{2}| = -(-\sqrt{2}) = \sqrt{2}$$

The distance between the points denoted by the numbers  $x$  and  $y$  on the number line is  $|x - y|$ .

For example,

The distance between the points 2 and 7 on the number line is  $|2 - 7| = |-5| = 5$ .

Then, what is the distance between 2 and  $-7$ ?

$$|2 - (-7)| = |2 + 7| = |9| = 9$$

Find the distance between the two points on the number line, denoted by each pair of numbers given below:

(i) 3, 8

(ii)  $-5, -9$

(iii)  $-5, 5$

(iv)  $-7, 10$

(v)  $-1, -7$

#### Activity 4

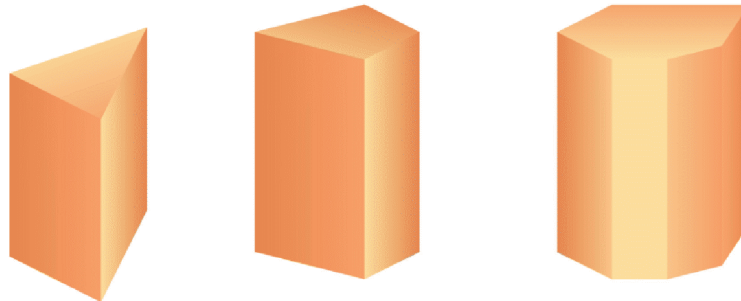
- Write the numbers which represent a distance of 4 units from the point 0 on the number line?
- Mark the points which are at a distance of 2 units from the point which denotes  $-2$ .



## 8. Solids

### Activity 1

Look at the pictures



Complete the following table:

Base	Lateral Surface	Name of the prism
Triangle	Rectangle	Triangular Prism
Quadrilateral		
Rectangle		
		Square Prism
Pentagon		
		Hexagonal Prism

### Activity 2

The perimeter of the base and height of a square prism are 20 cm and 8 cm respectively. Calculate its volume.

The volume of any prism is the product of its base area and height.

$$\text{Perimeter of the base} = 20 \text{ cm}$$

$$\text{Length of the base} = 20 \div 4 = 5 \text{ cm}$$

$$\text{Area of the base} = \underline{\hspace{2cm}} \text{ cm}^2$$

$$\text{Volume} = \text{Area of the base} \times \text{height} = \underline{\hspace{2cm}} \text{ cm}^3$$

### Activity 3

A hollow prism of base a square of side 25 cm and has height 32 cm. How much litres of water can the vessel contain? ( 1 litre = 1000 cubic centimetres)

### Activity 4

The base of a prism is an equilateral triangle of perimeter 30 cm and its height is 12 cm. What is its total surface area and volume?

The lateral surface area of any prism is the product of the base perimeter and height.

For a closed prism, the total surface area can be calculated by adding the base areas to the lateral surface area.

$$\text{Base perimeter} = 30 \text{ cm}$$

$$\text{Length of the base} = 30 \div 3 = 10 \text{ cm}$$

$$\text{Area of the base} = \frac{\sqrt{3}}{4} \times 10 \times 10 = \text{_____ cm}^2$$

$$\text{Lateral surface area} = \text{base perimeter} \times \text{height} = \text{_____ cm}^2$$

$$\text{Total surface area} = \text{_____} + \text{_____} = \text{_____ cm}^2$$

$$\text{Volume} = \text{base area} \times \text{height} = \text{_____ cm}^3$$

### Activity 5

The base of a prism is a square of area  $64 \text{ cm}^2$  and its volume is  $320 \text{ cm}^3$ .

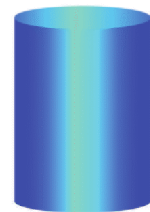
- What is the height of the prism?
- Find the lateral surface area of the prism.

### Activity 6

The base of a prism is an equilateral triangle of perimeter 15 cm and height 18 cm. What is its total surface area?

### Activity 7

The base radius of a cylinder is 5 cm and its height is 8 cm. What is the volume, curved surface area and total surface area of this cylinder?



The volume of a cylinder is the product of its base area and height.

The curved surface area of a cylinder is the product of base perimeter and height.

$$\text{Base radius} = 5 \text{ cm}$$

$$\text{Base Area} = \pi \times 5 \times 5 = \text{_____} \pi \text{ cm}^2$$

$$\text{Volume} = \text{base area} \times \text{height} = \text{_____} \pi \text{ cm}^3$$

$$\text{Base perimeter} = 2 \times \pi \times 5 = \text{_____} \pi \text{ cm}$$

$$\text{Curved surface area} = \text{base perimeter} \times \text{height} = \text{_____} \pi \text{ cm}^2$$

$$\begin{aligned} \text{Total surface area} &= \text{Curved surface area} + 2 \times \text{Base area} \\ &= \text{_____} \pi \text{ cm}^2 \end{aligned}$$

### Activity 8

The base radius of a cylinder is 8 cm and its height is 15 cm. What is the volume, curved surface area and total surface area of this cylinder?

## 10. Polynomials

### Activity 1

The relationship between some measures are given below . Write this relation in algebraic form. Identify which among them are polynomials.

- The sum of a number and its reciprocal.
- The sum of a number and its square
- In a rectangle with one side 1 metre less than the other, if we take the smaller side as 'x' . Find an expression for its perimeter.
- The natural numbers when divided by 3 leaves remainder 1
- In rectangle the measure of one side is 2 centimetres less than the other , the area of the rectangle is \_\_\_\_\_
- The sum of a natural number and its square root.
- The product of the sum and difference of a number and its square root.

### Activity 2

Fill in the following table.

Polynomial	Degree of polynomial
$2x^2 + x + 1$	
$1 - 2x$	
$3x^2 + 4x - 5$	
$7x^3 + 2x$	
$5x^3 - 5x^2 + 2x + 1$	

### Activity 3

Write few examples and complete the table.

First degree polynomial	<ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>• <math>ax + b</math></li> </ul>
Second degree polynomial	<ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> <li>• <math>ax^2 + bx + c</math></li> </ul>
Third degree polynomial	<ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>• <math>ax^3 + bx^2 + cx + d</math></li> </ul>

**Activity 4**

Complete the following table.

$p(x) = x + 1$	$p(0)$
$q(x) = x^2 - x + 1$	$q(1)$
$r(x) = 3x + 5$	$r(2)$
$s(x) = 3x^2 + 4x^2 + 5x + 7$	$s(1)$

**Activity 5**

- If  $p(x) = 3x^2 - 2x + 5$ , find  $p(1)$ ,  $p(-1)$ ,  $p(2)$ .

## 11. Statistics

### Activity 1

The score obtained by 5 students in a class for Mathematics examination are given below. Find the average of their scores .

24 , 40 , 36 , 28 , 50

### Mean

The number got on dividing the sum by the number, is called arithmetic mean or simply, mean.

### Activity 2

Runs scored by 5 Indian batsmen in a cricket match are given below. Find the mean.

32 , 48 , 5 , 15 , 75

### Activity 3

The table below shows the students in a class sorted according to the scores got in a class test.

Scores	Number of students
10	3
20	2
30	4
40	6

Find the mean score.