पु•ना International School
Shree Swaminarayan Gurukul, Zundal

Grade –6
MATHS
Specimen copy
Year 21-22

INDEX

CHAPTER NO. – 5

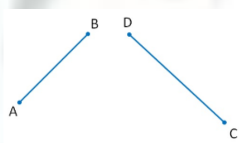
CHAPTER NAME – UNDERSTANDING ELEMENTARY SHAPES

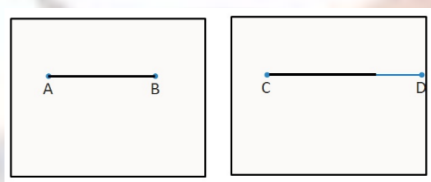
KEY POINTS TO REMEMBER –

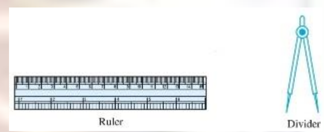
Measuring Line

A line segment is a fixed portion of a line. So, we can measure a line segment. The distance between the endpoints of a line segment is Called its length. The measure of a line segment is a unique number. Actually, the measure of a line segment is called its length. it helps us in comparing two line segments. This can be done in several ways:

- **Comparison by observation**
- **Comparison by tracing**
- **Comparison using a ruler and a divider.**







The turn from north to east is by a right angle. The turn from north to south is by two right angles. It is called a straight angle.

There are four main directions. They are North (N), South (S), East (E) and West (W)

If we turn by two straight angles or four right angles in the same direction, then it makes a full turn and we reach our original position. This one complete turn is called one revolution. The angle for one revolution is a complete angle.

We can see such revolutions on clock faces. When the hand of a clock moves from one position to another, it turns through an angle. Suppose the hand of a clock starts at 12 and goes around until it reaches 12 again. Clearly, it has made one revolution. It has turned through one complete angle or two straight angles or four right angles.

Angles – Acute, Obtuse, and Reflex

An angle is called an acute angle if it is smaller than a right angle. An angle is called an obtuse angle, if it is larger than a right angle, but less than a straight angle.
An angle is called a reflex angle if it is larger than a straight angle.

Acute angle: An angle smaller than a right angle is called an acute angle. An acute angle is less than one-fourth of a revolution.

Obtuse angle: An angle larger than a right angle but less than a straight angle is called an obtuse angle. An obtuse angle is greater than one-fourth of a revolution but less than half a revolution.

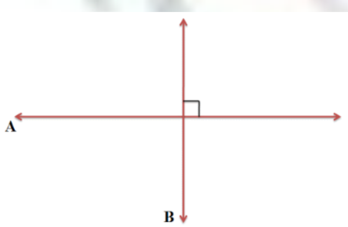
Reflex angle: A reflex angle is larger than a straight angle.

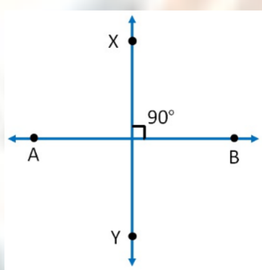
Measuring Angles

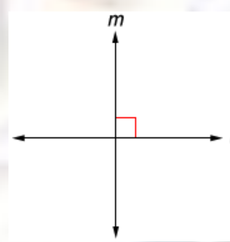
To compare two angles exactly, we need the measures of the angles. This is done with the help of a protractor. One complete revolution is divided into 360 parts. Each part is called a degree. The measure of the angle is called 'degree measure'. We write 360 degrees as 360°

Perpendicular Lines

If two lines intersect each other and the angle between them is a right angle, then they are called perpendicular lines. If a line AB is perpendicular to line CD, then we write AB ⊥ CD.







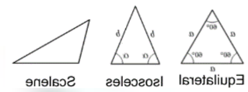
Classification of Triangles

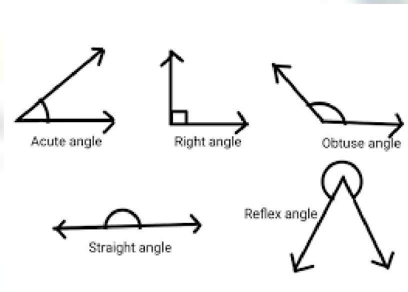
We know that a triangle is a polygon with the least number of sides. There are different types of triangle.

Triangles can be classified on the basis of their angles as follows:

If each angle of a triangle is acute, it is called an acute-angled triangle.
If anyone angle of a triangle is a right angle, it is called a right-angled triangle.

If anyone angle of a triangle is obtuse, it is called an obtuse-angled triangle.

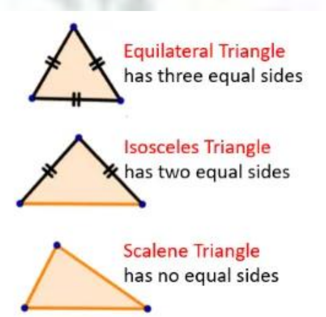


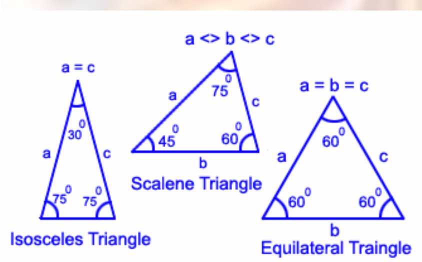


The triangles can also be classified on the basis of the lengths of their sides as follows:

If all the three sides of a triangle are of unequal length, it is called a scalene triangle.
If any two of the sides of a triangle are equal, it is called an isosceles triangle.

If all the three sides of a triangle are of equal length, it is called an equilateral triangle.





Quadrilaterals

We know that a quadrilateral is a four-sided polygon. A quadrilateral has four sides, four angles, and two diagonals. Quadrilaterals can be classified with reference to their properties as follows:

If the quadrilateral has only one pair of parallel sides, then the quadrilateral is called a trapezium.
If two pairs of sides are parallel, then the quadrilateral is called a parallelogram.

Polygons

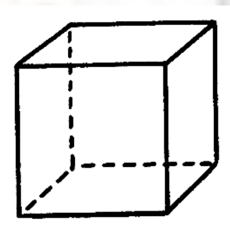
We know that a polygon of 3 sides is called a triangle and a polygon of 4 sides is called a quadrilateral. We may have polygons of still more number of sides. We may classify the polygons according to the number of their sides. A polygon of 5 sides is called a pentagon, a polygon of 6 sides is called a hexagon and a polygon of 8 sides is called an octagon.

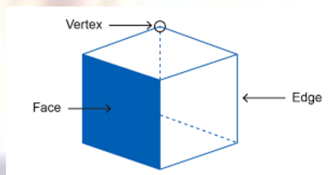
Three Dimensional Shapes

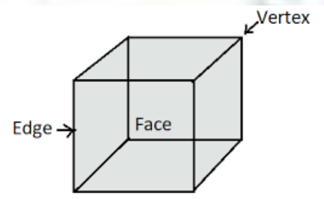
We see around us many three dimensional shapes. Cubes, cuboids, spheres, cylinders, cones and pyramids are some of them.

Cube

Each side is called a face, Two faces intersect in a line segment called an edge. Three edges meet at a point called a vertex.





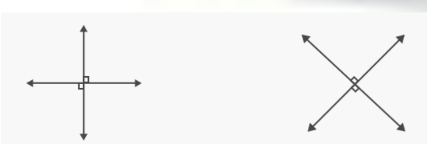


Prism

One of its faces is a triangle. So it is called a triangular prism. The triangular face is known as its base. A prism has two identical bases. Its other faces are parallelograms. If the prism has a rectangular base, it is called a rectangular prism, (or cuboid).

Pyramid

It is a shape with a single base. The other faces are triangles. If the base face is a triangle, it is called a triangular pyramid. If the base face is a square, it is called a square pyramid.

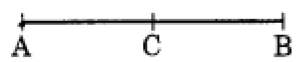


EXERCISE 5.1

Q.1.What is the disadvantage in comparing line segment by mere observation?
Solution:
Comparing the lengths of two line segments simply by 'observation' may not be accurate. So we use divider to compare the length of the given line segments.

Q.2. Why is it better to use a divider than a ruler, while measuring the length of a line segment?
Solution:
Measuring the length of a line segment using a ruler, we may have the following errors:
(i) Thickness of the ruler
(ii) Angular viewing
These errors can be eradicated by using the divider. So, it is better to use a divider than a ruler, while measuring the length of a line segment.

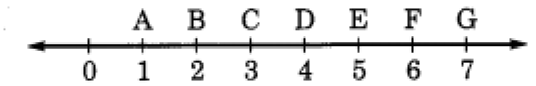
Q.3. Draw any line segment, say $\overline{AB}$. Take any point C lying in between A and B. Measure the lengths of AB, BC and AC. Is AB = AC + CB?
[Note: If A, B, C are any three points on a line such AC + CB = AB, then we can be sure that C lies between A and B]
Solution:
Let us consider



A, B and C such that C lies between A and B and AB = 7 cm.
AC = 3 cm, CB = 4 cm.
∴ AC + CB = 3 cm + 4 cm = 7 cm.
But, AB = 7 cm.
So, AB = AC + CB.

Q.4. If A, B, C are three points on a line such that AB = 5 cm, BC = 3 cm and AC = 8 cm, which one of them lies between the other two?
Solution:
We have, AB = 5 cm; BC = 3 cm
∴ AB + BC = 5 + 3 = 8 cm
But, AC = 8 cm
Hence, B lies between A and C.

Q.5. Verify, whether D is the mid point of $\overline{AG}$



Solution:
From the given figure, we have
AG = 7 cm – 1 cm = 6 cm
AD = 4 cm – 1 cm = 3 cm
and DG = 7 cm – 4 cm = 3 cm
∴ AG = AD + DG.

Hence, D is the mid point of $\overline{AG}$.

Q.6. If B is the mid point of $\overline{AC}$ and C is the mid point of $\overline{BD}$, where A, B, C, D lie on a straight line, say why AB = CD?

Solution:

We have

B is the mid point of $\overline{AC}$.

∴ AB = BC …(i)

C is the mid-point of $\overline{BD}$.

BC = CD

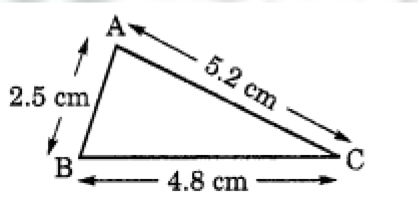
From Eq.(i) and (ii), We have

AB = CD

Q.7. Draw five triangles and measure their sides. Check in each case, if the sum of the length of any two sides is always less than the third side.

Solution:

Case I. In ∆ABC



Let AB = 2.5 cm

BC = 4.8 cm

and AC = 5.2 cm

AB + BC = 2.5 cm + 4.8 cm

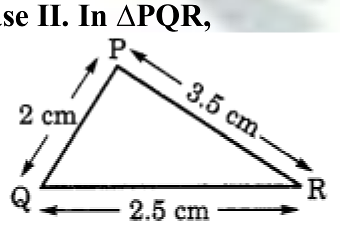
= 7.3 cm

Since, 7.3 > 5.2

So, AB + BC > AC

Hence, sum of any two sides of a triangle is greater than the third side.

Case II. In ∆PQR,



Let PQ = 2 cm

QR = 2.5 cm

and PR = 3.5 cm

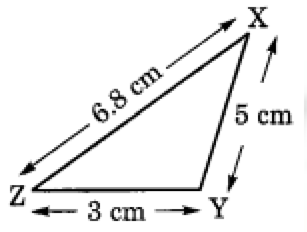
PQ + QR = 2 cm + 2.5 cm = 4.5 cm

Since, 4.5 > 3.5

So, PQ + QR > PR

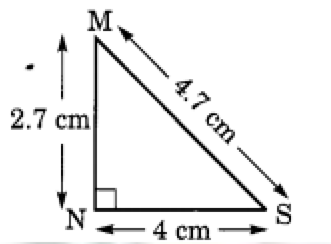
Hence, sum of any two sides of a triangle is greater than the third side.

Case III. In ΔXYZ,



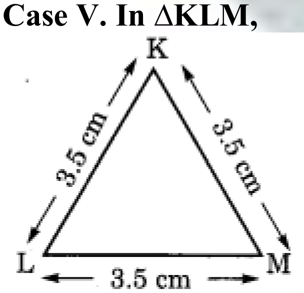
Let XY = 5 cm
YZ = 3 cm
and ZX = 6.8 cm
XY + YZ = 5 cm + 3 cm
= 8 cm
Since, 8 > 6.8
So, XY + YZ > ZX
Hence, the sum of any two sides of a triangle is greater than the third side.

Case IV. In ΔMNS,



Let MN = 2.7 cm
NS = 4 cm
MS = 4.7 cm
and MN + NS = 2.7 cm + 4 cm = 6.7 cm
Since, 6.7 >4.7
So, MN + NS > MS
Hence, the sum of any two sides of a triangle is greater than the third side.

Case V. In ΔKLM,



Let KL = 3.5 cm
LM = 3.5 cm
KM = 3.5 cm
and KL + LM = 3.5 cm + 3.5 cm = 7 cm

7 cm > 3.5 cm
Solution:
(i) For one-fourth revolution, we have
So, KL + LM > KM
Hence, the sum of any two sides of a triangle is greater than the third side.
Hence, we conclude that the sum of any two sides of a triangle is never less than the third side.

EXERCISE 5.2

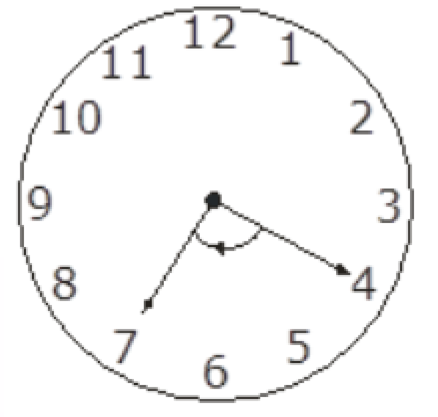
1(1). What fraction of a clockwise revolution does the hour hand of a clock turn through, when it goes from 3 to 9

Sol.
By looking at the clock we can see when the hour hand goes from 3 to 9 it complete half of a single revolution which is 180° out of 360°.
So, the Fraction = 180 / 360 = 1/2
As we know 180° is the half of the 360°, so it covers 1 / 2.

1(2). What fraction of a clockwise revolution does the hour hand of a clock turn through, when it goes from 4 to 7

Sol.
By looking at the clock we can see when the hour hand goes from 4 to 7 it makes a right angle which is of 90°.

So, the required Fraction = 90 / 360 = 1/ 4



1(3). What fraction of a clockwise revolution does the hour hand of a clock turn through, when it goes from 7 to 10

Sol.
By looking at the clock we can see when the hour hand goes from 7 to 10 it makes a right angle which is of 90°.
So, the fraction = 90/ 360=1 /4

1(4). What fraction of a clockwise revolution does the hour hand of a clock turn through, when it goes from 12 to 9

Sol.
By looking at the clock we can see when the hour hand goes from 12 to 9 it basically covers three right angles which is of = 90 + 90 + 90 = 270°.

Therefore, required Fraction = 270 / 360 = 3/ 4

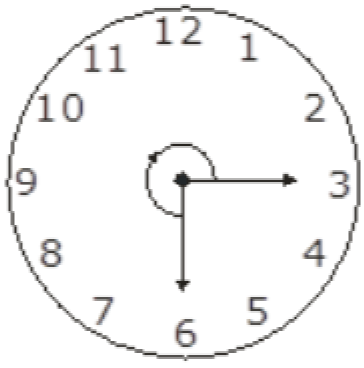
1(5). What fraction of a clockwise revolution does the hour hand of a clock turn through, when it goes from 1 to 10

Sol.
By looking at the clock we can see when the hour hand goes from 1 to 10 it basically covers three right angles which is of 270°.
So, required Fraction = 270/ 360 = 3 / 4

1(6). What fraction of a clockwise revolution does the hour hand of a clock turn through, when it goes from 6 to 3

Sol.
By looking at the clock we can see when the hour hand goes from 6 to 3 it basically covers three right angles which is of 270°.

Therefore, required Fraction = 270 / 360 = 3 / 4



2(1). Where will the hand of a clock stop if it starts at 12 and makes 1/ 2 of a revolution, clockwise?

Sol.
In one complete revolution the hand of clock covers the 360°.
When the hand of the clock starts from 12 and makes half of the revolution clockwise, so it will stop at 6 because half of the revolution is 180°, which it covers upto 6.

2(2). Where will the hand of a clock stop if it starts at 2 and makes 1 / 2 of a revolution, clockwise?

Sol.
In one complete revolution the hand of clock covers the 360°.
When the hand of the clock starts from 2 and makes half of the one single revolution clockwise which is of 180°, it will stop at 8.

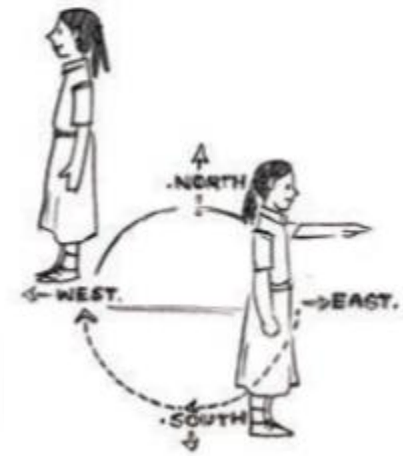
2(3). Where will the hand of a clock stop if it starts at 5 and makes 1 / 4 of a revolution, clockwise?
/

Sol.
In one complete revolution the hand of clock covers the 360°.
When hand of the clock starts from 5 and makes one fourth of a revolution clockwise, which is a right angle (90°), It will stop at 8.

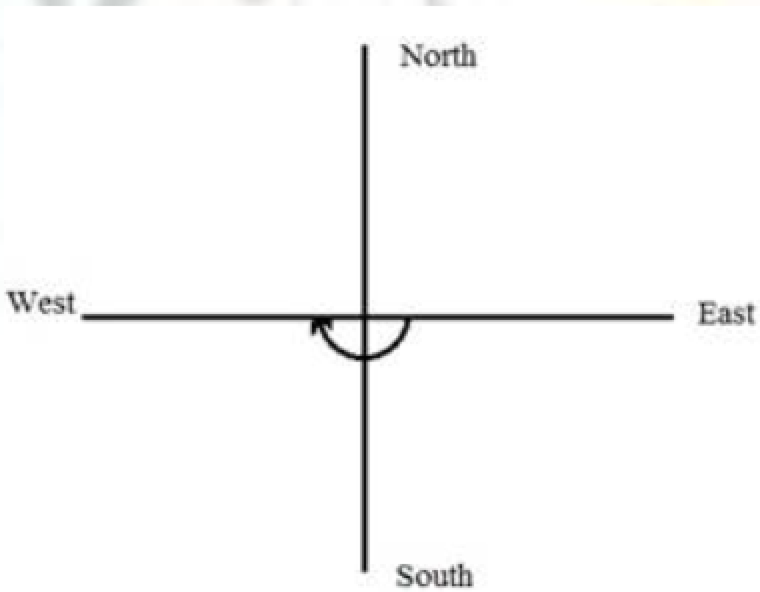
2(4). Where will the hand of a clock stop if it starts at 5 and makes 3434 of a revolution, clockwise?

Sol.
In one complete revolution the hand of clock covers the 360°.
When the hand of a clock starts from 5 and makes 34th34th of the revolution clockwise which is of 120°, so it will stop at 2.

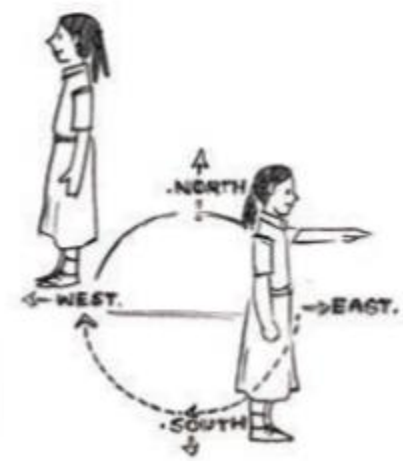
3(1). Which direction will you face if you start facing east and make 1212 of a revolution clockwise?



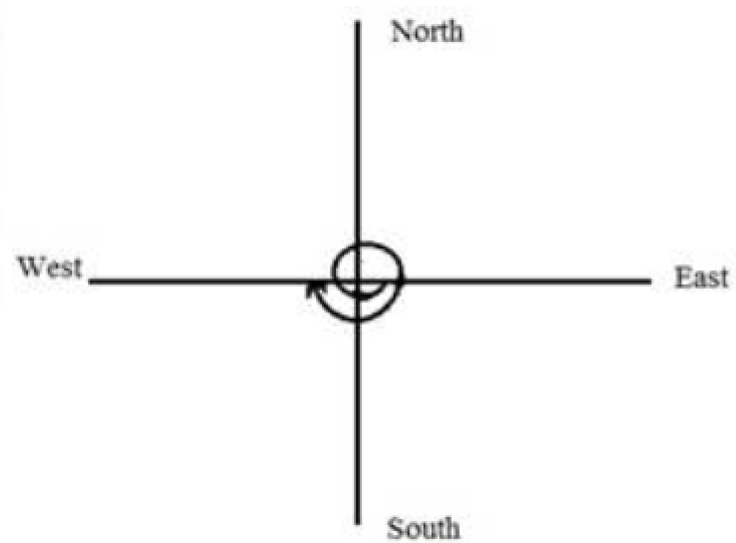
Sol.
When one revolve one complete round in either clockwise or anti-clockwise direction he complete an angle of 360° and the two adjacent directions will be at 90°.
Therefore, If one starts from East and makes half of the complete revolution clockwise, he will be facing the west direction.



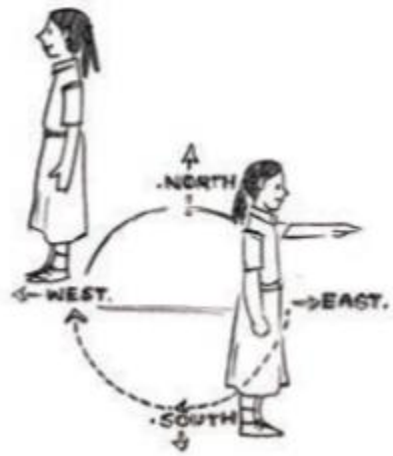
3(2). Which direction will you face if you start facing east and make 112112 of a revolution clockwise?



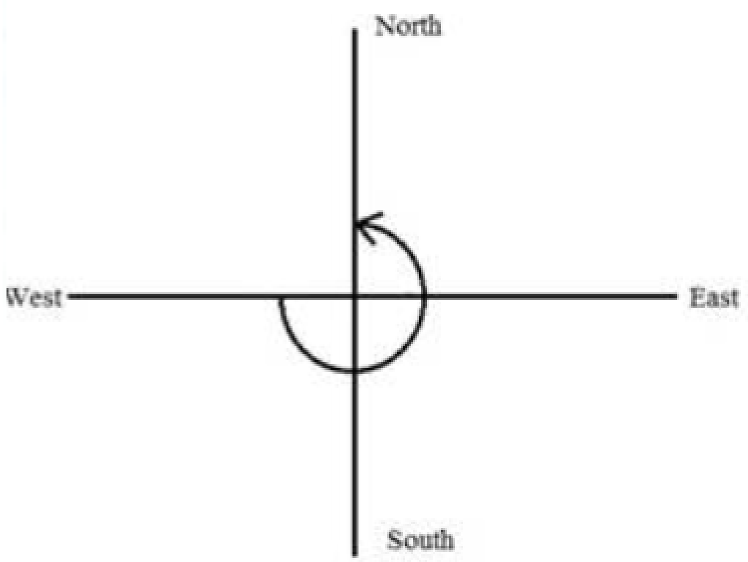
Sol.
When we revolve one complete round in either clockwise or anti-clockwise direction we complete an angle of 360° and the two adjacent directions will be at 90°.
Therefore, If we start from East and make one and half of the complete revolution clockwise, we will be facing the west direction as shown below.



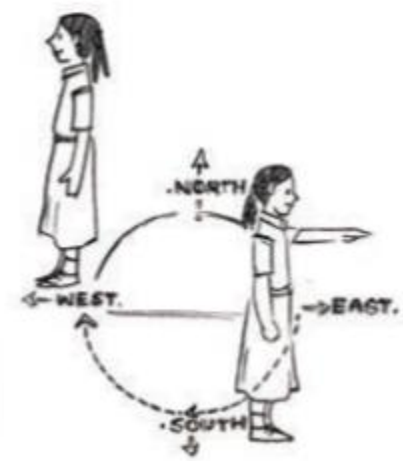
3(3). Which direction will you face if you start facing west and make 3434 of a revolution anti-clockwise?



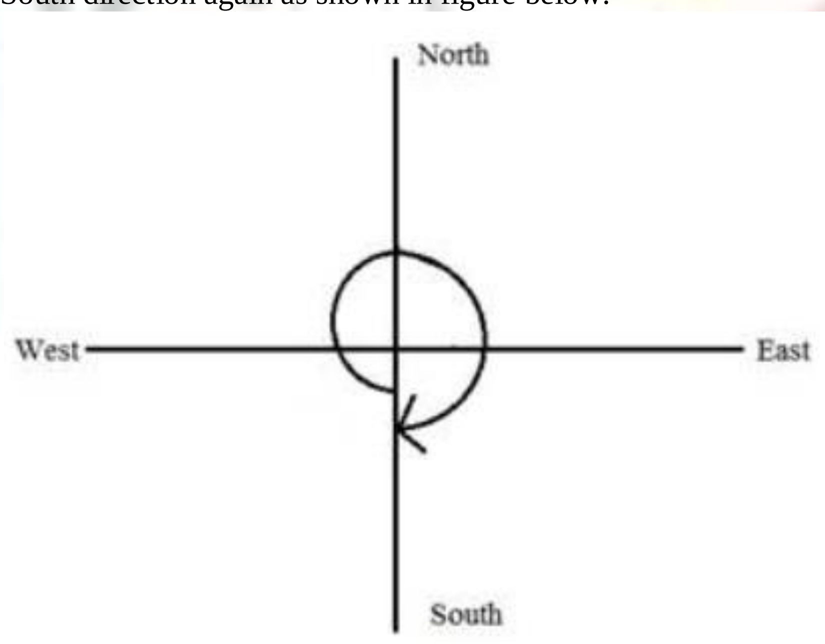
Sol.
When we revolve one complete round in either clockwise or anti-clockwise direction we complete an angle of 360° and the two adjacent directions will be at 90°.
If we start from West and make three fourth of the complete revolution anti-clockwise, we will be facing the north direction as shown in figure.



3(4). Which direction will you face if you start facing south and make one full revolution? (Should we specify clockwise or anti-clockwise? Why not?)



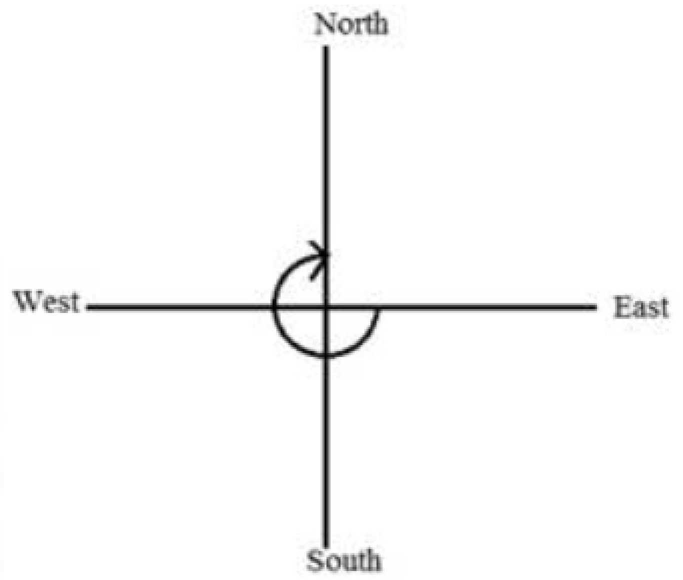
Sol.
When we revolve one complete round in either clockwise or anti-clockwise direction we complete an angle of 360° and the two adjacent directions will be at 90°.
If we start from South and make a complete revolution clockwise or anti-clockwise, we will be facing the South direction again as shown in figure below.



4(1). What part of a revolution have you turned through if you stand facing east and turn clockwise to face north?

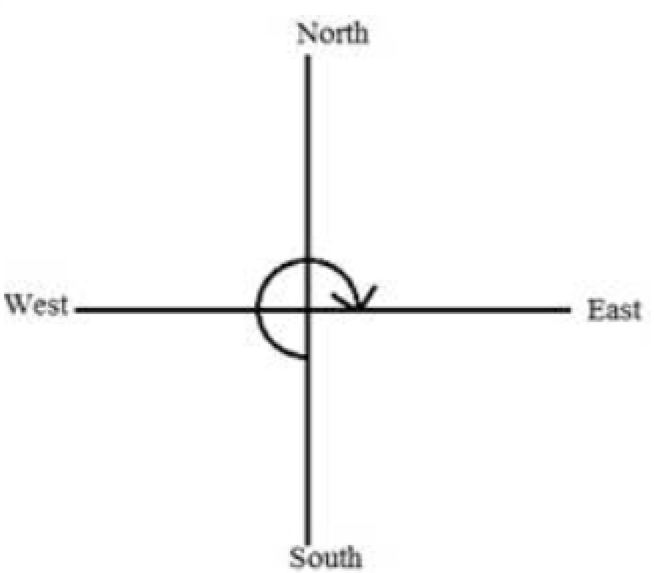
Sol.
As we know that if we complete one revolution whether clockwise or anti-clockwise we will be making an angle of 360°.
If we start from East and turn clockwise to face north then we will be completing the three fourth of the

revolution which is of 270° as shown in figure below.



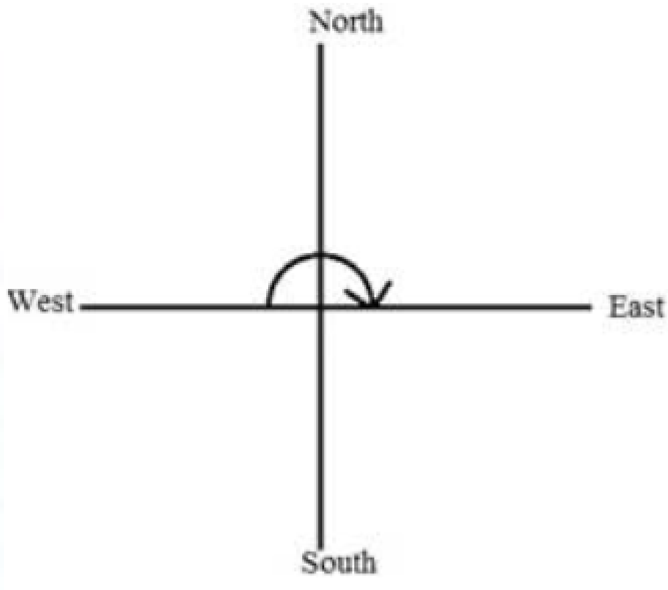
4(2). What part of a revolution have you turned through if you stand facing south and turn clockwise to face east?

Sol.
As we know that if we complete one revolution whether clockwise or anti-clockwise we will be making an angle of 360°.
If we start from South and turn clockwise to face East then we will be completing the three fourth of the revolution which is of 270° as shown in figure below.



4(3). What part of a revolution have you turned through if you stand facing west and turn clockwise to face east?

Sol.
As we know that if we complete one revolution whether clockwise or anti-clockwise we will be making an angle of 360°.
If we start from West and turn clockwise to face east then we will be completing the half of the revolution which is of 180° as shown in figure below.



5(1). Find the number of right angle turned through by the hour hand of a clock when it goes from 3 to 6.

Sol.
A clock hand makes an angle of 360° in one complete round which also makes of 4 right angles.
When a clock hand moves from 3 to 6 it covers only one right angle as it covers only one fourth of one complete revolution.

5(2). Find the number of right angles turned through by the hour hand of a clock when it goes from 2 to 8

Sol.
We know that a clock hand makes an angle of 360° in on complete round which is also made of 4 right angles.
When a clock hand goes from 2 to 8, it makes 2 right angles as it covers half of the complete revolution which is 180°.

5(3). Find the number of right angles turned through by the hour hand of a clock when it goes from 5 to 11

Sol.
We know that a clock hand makes an angle of 360° in on complete round which is also made of 4 right angles.
When a clock hand goes from 5 to 11, it makes 2 right angles as it covers half of one complete revolution which is 180°.

5(4). Find the number of right angle turned through by the hour hand of a clock when it goes from 10 to 1

Sol.
We know that clock hand makes an angle of 360° in on complete round which is also made of 4 right angles. When a clock hand goes from 10 to 1 it makes only 1 right angle as it covers only one-fourth of the complete revolution.

5(5). Find the number of right angle turned through by the hour hand of a clock when it goes from 12 to 9.

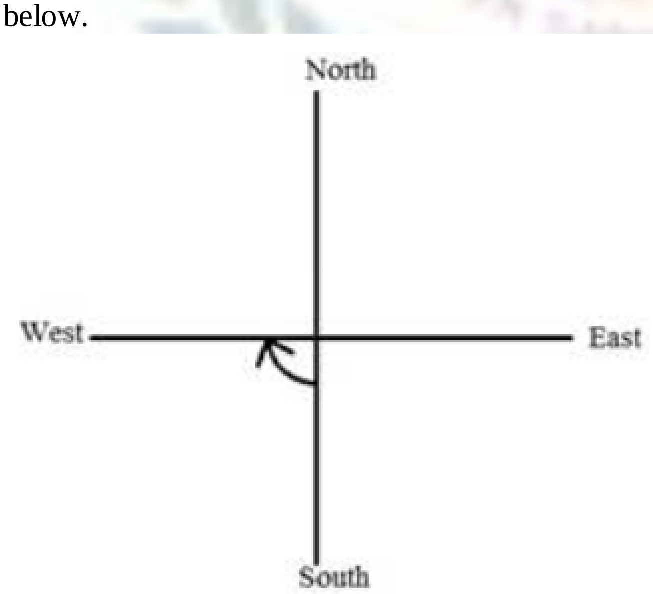
Sol.
We know that clock hand makes an angle of 360° in one complete round which is also made of 4 right angles. When a clock hand moves from 12 to 9, it makes 3 right angles as it covers three fourth of the complete revolution which is of 270°.

5(6). Find the number of right angles turned through by the hour hand of a clock when it goes from 12 to 6.

Sol.
We know that clock hand makes an angle of 360° in on complete round which is also made of 4 right angles. When a clock hand goes from 12 to 6, it makes 2 right angles as it covers half of the complete revolution which is of 180°.

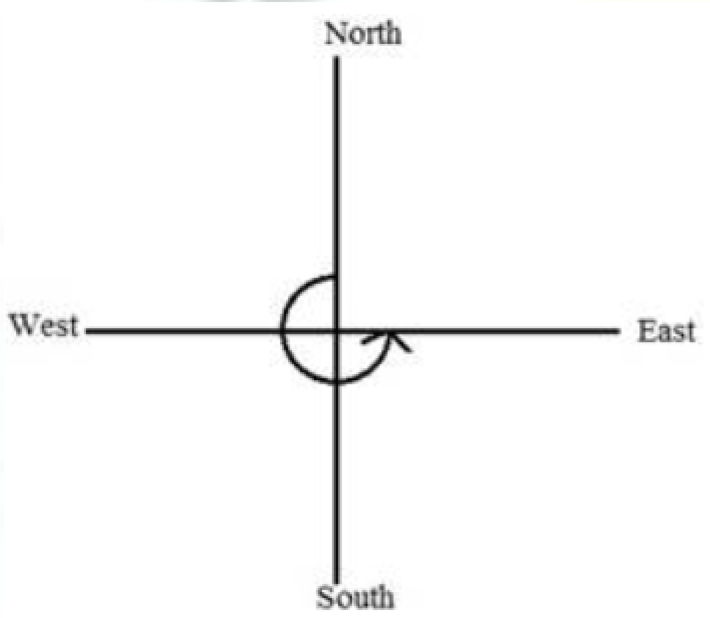
6(1). How many right angle do you make if you start facing south and turn clockwise to west?

Sol.
One complete revolution is of 360° or we can say 4 right angles.
If you start from South and turn clockwise to west then you are making 1 right angle as shown in figure below.



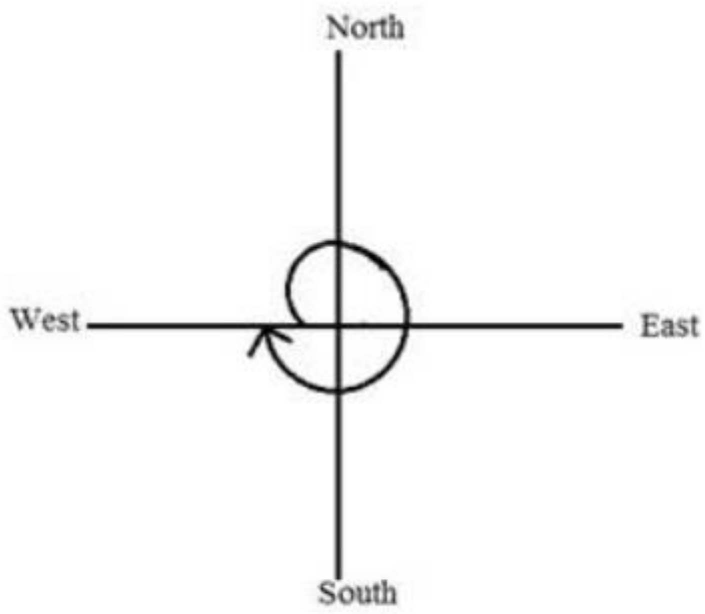
6(2). How many right angle do you make if you start facing north and turn anti-clockwise to east?

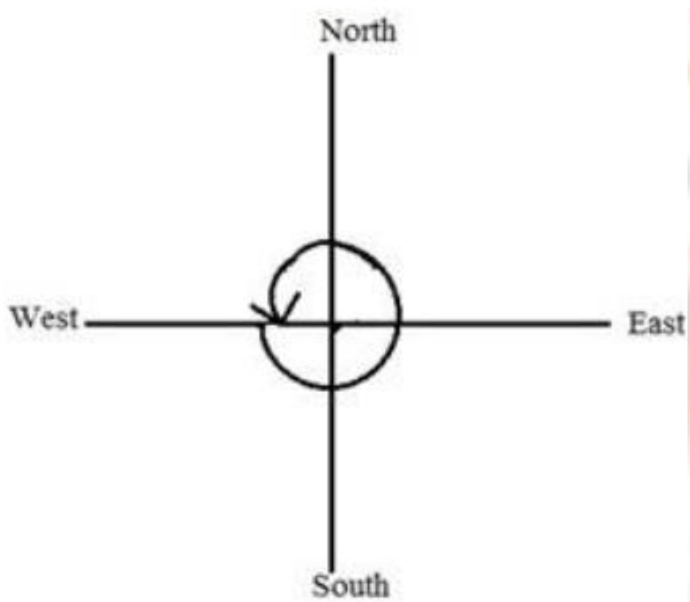
Sol.
One complete revolution is of 360° or we can say 4 right angles.
If you start from North and turn anti-clockwise to east then you are making 3 right angles as shown in figure below.



6(3). How many right angle do you make if you start facing west and turn to west?

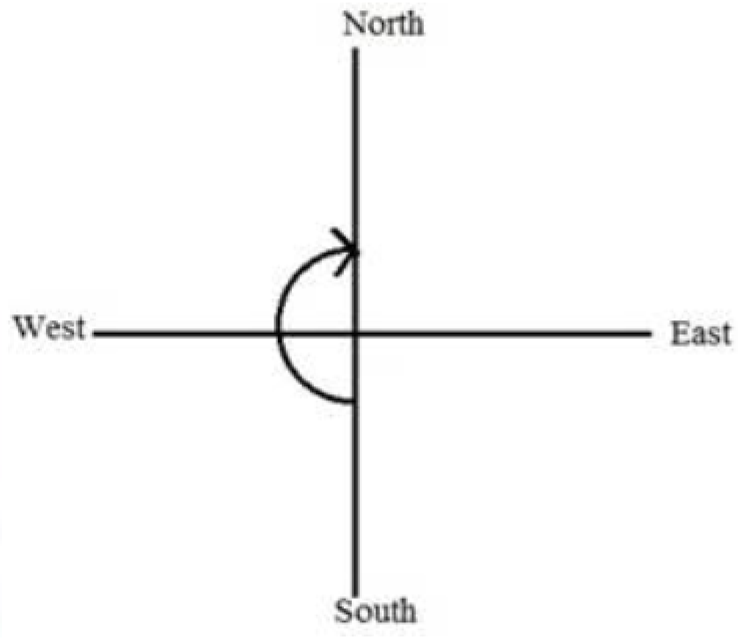
Sol.
One complete revolution is of 360° or we can say 4 right angles.
If you start from west and turn to west again then you are completing one revolution which is of 4 right angles,
as shown in figure below.

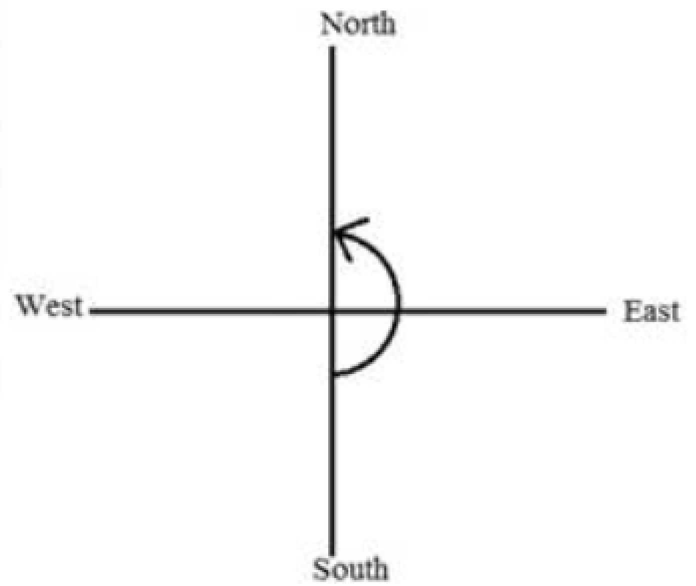




6(4). How many right angles do you make if you start facing south and turn to north?

Sol.
One complete revolution is of 360° or we can say 4 right angles.
If you start from South and turn clockwise to north then you are making 2 right angles as shown in figure below.





7(1). Where will the hour hand of a clock stop if it starts from 6 and turns through 1 right angle?

Sol.
As we know that one complete revolution is of 360° which consists of 4 right angles. By looking at the clock we can say that If the hour hand of the clock start from 6 and make 1 right angle then it will stop at 9.

7(2). Where will the hour hand of a clock stop if it start from 8 and turns through 2 right angles?

Sol.

As we know one complete revolution is of 360° which consists of 4 right angles.
By looking at the clock we can say that If the hour hand of the clock start from 8 and make 2 right angles then it will stop at 2.

7(3). Where will the hour hand of a clock stop if it start from 10 and turns through 3 right angles?

Sol.
As we know one complete revolution is of 360° which consists of 4 right angles.
By looking at the clock we can say that if the hour hand of the clock start from 10 and make 3 right angles then it will stop at 7.

7(4). Where will the hour hand of a clock stop if it starts from 7 and turns through 2 straight angles?

Sol.
As we know one complete revolution is 360° which is consists of 4 right angles. By looking at the clock we can say that if the hour hand of the clock starts from 7 and make 2 straight angles then it will surely stop at 7.

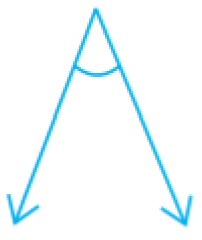
EX : 5.3

1. Match the following:

(a) Straight angle	(i) Less than one-fourth a revolution
(b) Right angle	(ii) More than half a revolution
(c) Acute angle	(iii) Half of a revolution
(d) Obtuse angle	(iv) One-fourth a revolution
(v)Reflex angle	(v)Between 1414 and 1212 of a revolution
	(vi)One complete revolution

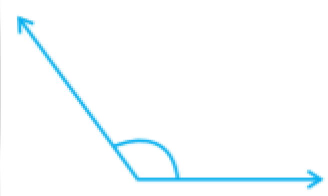
Sol.
(a) - (iv); (b) - (v); (c) - (i); (d) - (vi); (e) - (ii)

2(1). Classify the angle as right, straight, acute, obtuse or reflex:



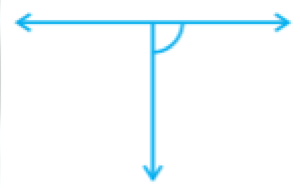
Sol.
Since the measure is less than 90^{o}, it is an acute angle.

2(2). Classify the angle as right, straight, acute, obtuse or reflex :



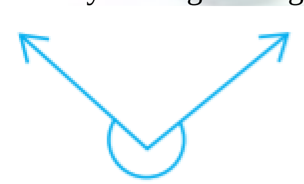
Sol.
It is an obtuse angle because its measure lies between 90^{o} and 180^{o}.

2(3). Classify the angle as right, straight, acute, obtuse or reflex:



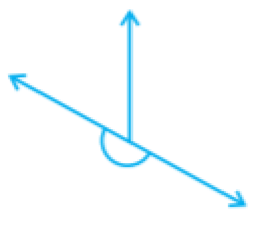
Sol.
Since its measure is 90^{o} . It is a Right angle.

2(4). Classify the angle as right, straight, acute, obtuse or reflex:



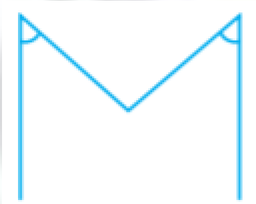
Sol.
It is a Reflex angle as its measure is more than 180^{o} but less 360^{o}.

2(5). Classify the angle given below as right, straight, acute, obtuse or reflex:



Sol.
It is a Straight angle as its measure is 180°.

2(6). Classify the angle as right, straight, acute, obtuse or reflex:



Sol.
It is an Acute angle as its measure is less than 90°.

EX : 5.4

1(1). What is the measure of a right angle?

Sol.
The measure of a right angle is always of 90°

1(2). What is the measure of a straight angle?

Sol.
A straight angle always measures 180°

2(1). The measure of an acute angle < 90°.
1) True
2) False

Sol. 1) True

True

2(2). The measure of an obtuse angle < 90°.
1) True
2) False

Sol. 2) False

False

2(3). The measure of a reflex angle > 180°.
1) True
2) False

Sol. 1) True

True

2(4). The measure of one complete revolution = 360°.
1) True
2) False

Sol. 1) True

True

2(5). If $m\angle\angle A = 53^{o}$ and $m\angle\angle B = 35^{o}$, then $m\angle\angle A > m\angle\angle B$.
1) True
2) False

Sol. 1) True

True

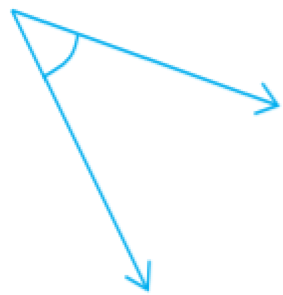
3(1). Write down the measures of some acute angles. Give at least two examples.

Sol.
Acute angle is the angle whose measure is less than 90° so the examples are; 30°, 45°, 60° and 70°.

3(2). Write down the measures of some obtuse angles. Give at least two examples.

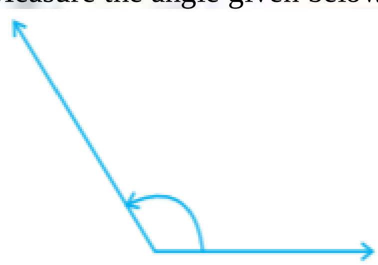
Sol.
Obtuse angle is the angle which is greater than 90° but less than 180°. The examples are: 110°, 120°, 135° and 170°.

4(1). Measure the angle given below using the Protractor and write down the measure.



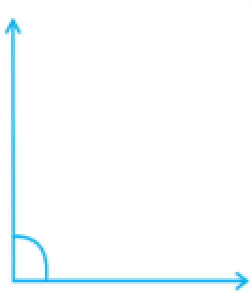
Sol.
On measuring the angle we get its value as 45°

4(2). Measure the angle given below using the protractor and write down the measure.



Sol.
Using protractor the measure comes out to be 120°

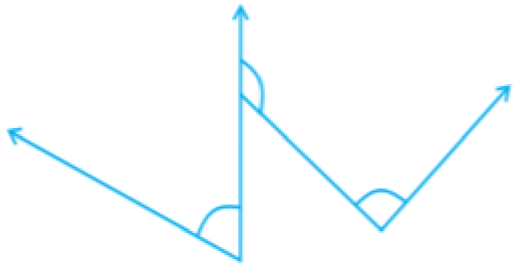
4(3). Measure the angle given below using the Protractor and write down the measure.



Sol.

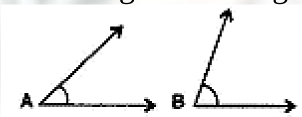
The measure of the angle comes out to be 90^o

4(4). Measure the angle given below using a Protractor and write down the measure.



Sol.
On measuring with a protractor the measures of the required angles are 60^o, 130^o and 90^o

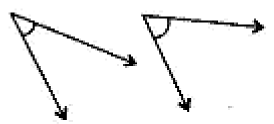
5. Which angle has a large measure? First estimate and then measure.



Measure of Angle A, Measure of Angle B.

Sol.
Measure of Angle A = 40°.
Measure of Angle B = 65°.
The angle B has a larger measure.

6. From these two angles which has larger measure? Estimate and then confirm by the measuring them.



Sol.
Measure of first angle = 45°
Measure of second angle = 60°.
The second angle has larger measure.

7(1). An angle whose measure is less than that of the right angle is ________angle.

Sol 1.
Acute

7(2). An angle whose measure is greater than that of a right angle is ________ angle.

Sol 1.
Obtuse

7(3). An angle whose measure is the sum of the measures of two right angles is ________angle.

Sol 1.
Straight

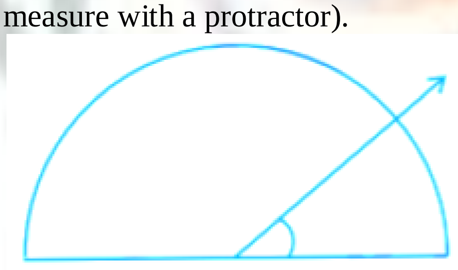
7(4). When the sum of the measures of two angles is that of a right angle, then each one of them is ________.

Sol 1.
Acute angle

7(5). When the sum of the measures of two angles is that of a straight angle and if one of them is acute then the other should be ________.

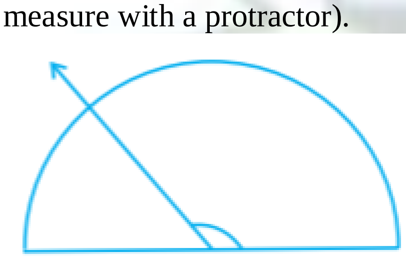
Sol 1.
Obtuse angle

8(1). Find the measure of the angle shown in figure. (First estimate with your eyes and then find the actual measure with a protractor).



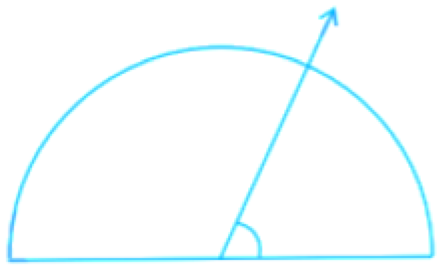
Sol.
By measuring the figure with the help of protractor, we get that the measure of the angle as 40^o.

8(2). Find the measure of the angle shown in figure. (First estimate with your eyes and then find the actual measure with a protractor).



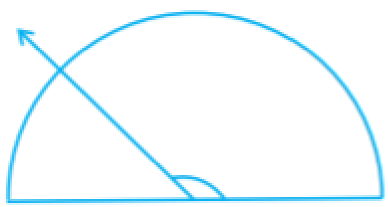
Sol.
By measuring the angle with the help of protractor we find that the angle is 130°

8(3). Find the measure of the angle shown in figure. (First estimate with your eyes and then find the actual measure with a protractor).



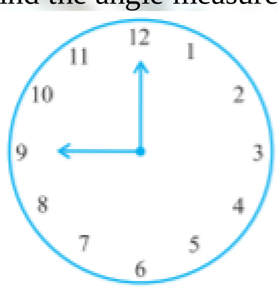
Sol.
By measuring the angle with the help of protractor we see that the angle is 65 degree.

8(4). Find the measure of the angle shown in figure. (First estimate with your eyes and then find the actual measure with a protractor).



Sol.
By measuring the angle with the help of protractor we get the angle as 135° in the figure.

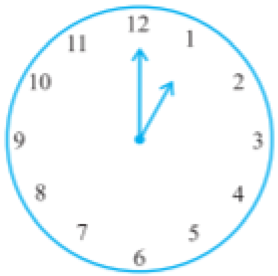
9(1). Find the angle measure between the hands of the clock in a figure:



9.00 a.m.

Sol.
Clearly, the angle is 90°

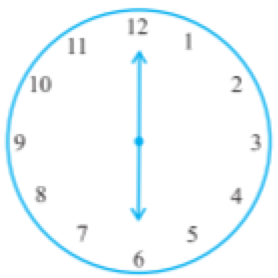
9(2). Find the angle measure between the hands of the clock in a figure:



1.00 p.m.

Sol.
Required angle = 3601236012 = 30°

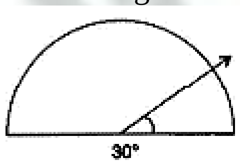
9(3). Find the angle measure between the hands of the clock in a figure:



6.00 p.m.

Sol.
Required angle is 180° as it is forming a straight line which is always of 180°.

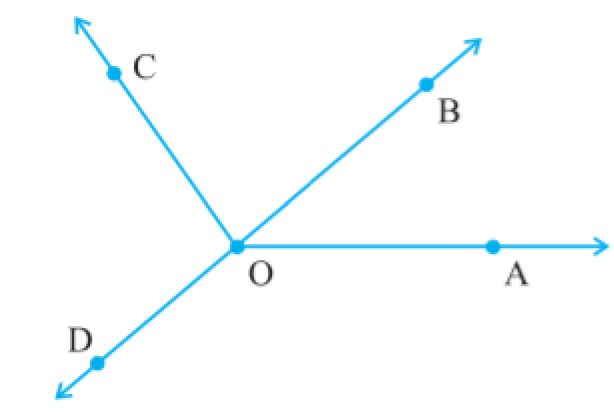
10. Investigate: In the given figure, protractor shows 30°. Look at the same figure through a magnifying glass. Does the angle becomes larger? Does the size of the angle change?



Sol.
No.

11. Measure and classify each angle:

Angle	Measure	Type
∠AOB		
∠AOC		
∠BOC		
∠DOC		
∠DOA		
∠DOB		



Sol.

Angle	Measure of the angle	Type of angle
∠AOB	40^o	Acute angle
∠AOC	125^o	Obtuse angle
∠BOC	85^o	Acute angle
∠DOC	95^o	Obtuse angle
∠DOA	140^o	Obtuse angle
∠DOB	180^o	Straight angle

EX : 5.5

1. Which of the following are models for perpendicular lines :

a. The adjacent edges of a table top.
b. The lines of a railway track.
c. The line segments forming the letter "L".
d. The letter V.

Sol.
(a) and (c) are models for perpendicular lines.

2. Let $\overline{PQ}$ PQ¯ be the perpendicular to the line segment $\overline{XY}$ XY¯ .
Let $\overrightarrow{PQ}$ PQ→ and $\overline{XY}$ XY¯ intersect in the point A. What is the measure of ∠PAY?

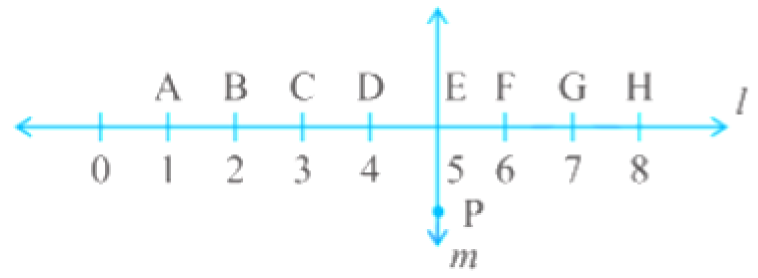
Sol.

The measure of ∠PAY is 90°.

3. There are two set-squares in your box. What are the measure of the angles that are formed at their corners? Do they have any angle measure that is common?

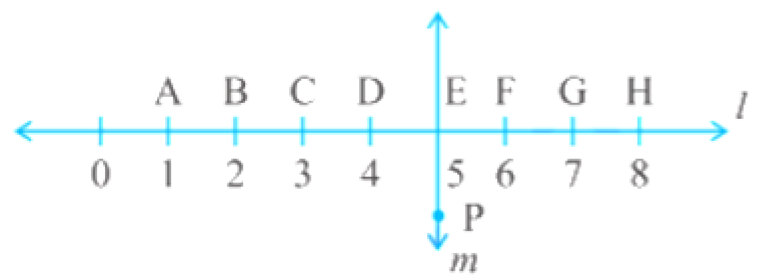
Sol.
One is a 30° - 60° - 90° set square; the other is a 45° - 45° - 90° set square. The angle of measure 90° (i.e. a right angle) is common between them.

4(1). Study the diagram. The line l is perpendicular to line m is CE = EG?



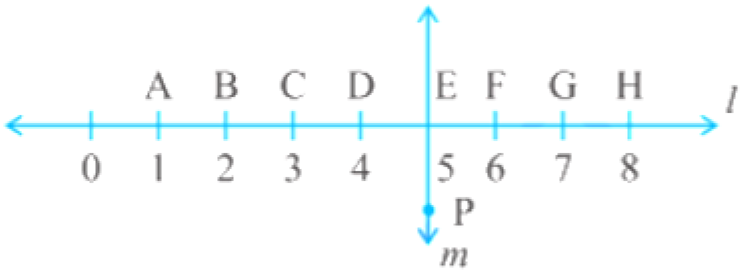
Sol.
Yes, CE = EG as both have same distance of 2 units from the point of intersection.

4(2). Study the diagram. The line l is perpendicular to line m does PE bisect CG?



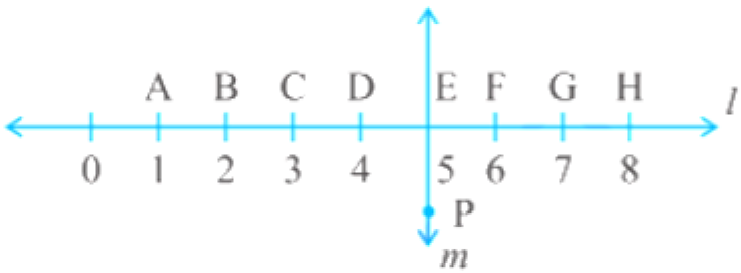
Sol.
Yes, PE bisect CG as E is the mid-point of CG and PE divides the line segment into two equal parts which is CE = EG

4(3). Study the diagram. The line l is perpendicular to line m identify any two line segments for which PE is the perpendicular bisector.



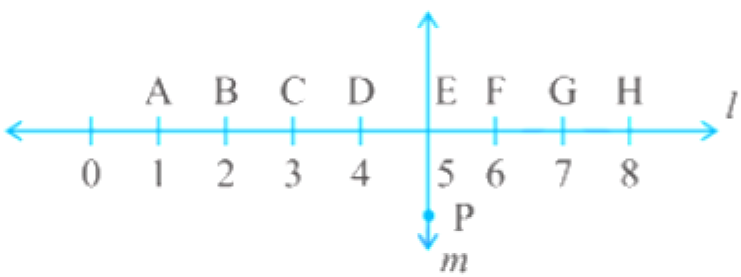
Sol.
The two line segments can be taken as BH and CG.

4(4). Study the diagram. The line l is perpendicular to line m, Is AC > FG?



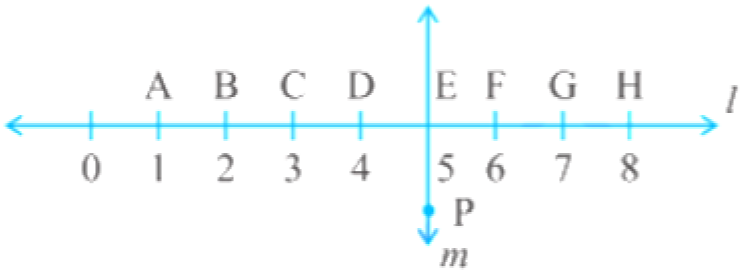
Sol.
Yes, AC > FG is True
As length of AC = 2 units
Length of FG = 1 units

4(5). Study the diagram. The line l is perpendicular to line m Is CD = GH?



Sol.
Yes, CD = GH
Since both are of the same length viz. 1 unit

4(6). Study the diagram. The line l is perpendicular to line m, Is BC < EH?



Sol.
Yes, BC < EH
Because, length of BC = 1 units
Length of EH = 3 units

EX : 5.6

1(1). Name the type of triangle: Triangle with lengths of sides 7 cm, 8 cm and 9 cm

Sol.
It is a scalene triangle as it has all unequal sides.

1(2). Name the type of triangle: △△ABC with AB = 8.7 cm, AC = 7 cm and BC = 6 cm

Sol.
△△ABC is a scalene triangle as it has three unequal sides.

1(3). Name the type of triangle: △△PQR such that PQ = QR = PR = 5 cm.

Sol.
△△ PQR is equilateral triangle as all sides of triangle are equal and according to the property of equilateral triangle has all equal sides.

1(4). Name the type of triangle: △△DEF with ∠∠D = 90°

Sol.
△△DEF is a Right-angled triangle as it has ∠∠ D = 90^o

1(5). Name the type of triangle: ∆∆XYZ with ∠∠Y = 90° and XY = YZ.

Sol.
∆∆XYZ Right-angled isosceles angle as it has one right angle of 90° and two equal sides.

1(6). Name the type of triangle: ∆∆LMN with ∠∠L = 30°, ∠∠M = 70° and ∠∠N = 80°.

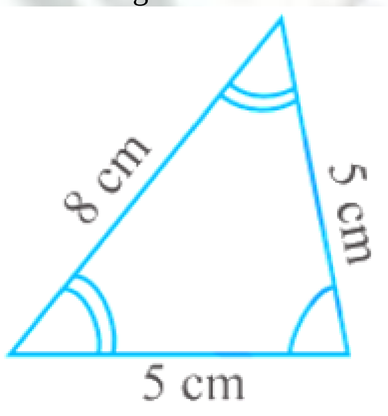
Sol.
∆∆ LMN is an acute angle as it has all angles less than 90° and according to property of acute angles it is a triangle with all three angles as acute (less than 90°).

2. Match the following:

Measures of Triangle	Type of Triangle
(a) 3 sides of equal length	(i) Scalene
(b) 2 sides of equal length	(ii) Isosceles right angled
(c) All sides are of different length	(iii) Obtuse angled
(d) 3 acute angles	(iv) Right angled
(e) 1 right angle	(v) Equilateral
(f) 1 obtuse angle	(vi) Acute angled
(g)1 right angle with two sides of equal length	(vii) Isosceles

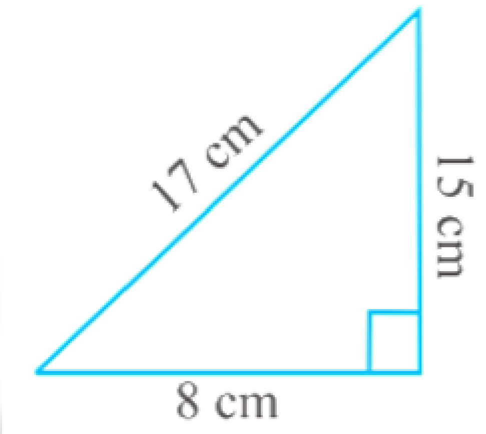
Sol.
We can match the above as follows:
(a) - (v), (b) - (vii), (c) - (i), (d) - (vi), (e) - (iv), (f) - (iii), (g) - (ii)

3(1). Name triangle in two different ways: (you may judge the nature of the angle by observation)



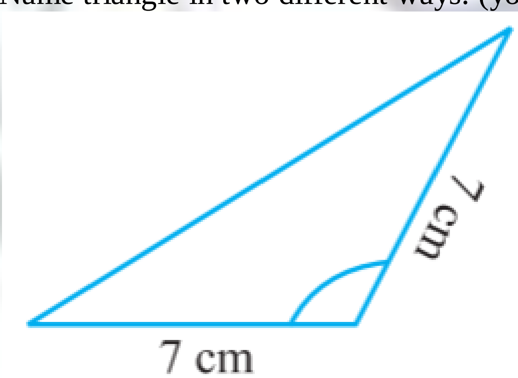
Sol.
It is an Acute-angled and isosceles triangle. As in this figure, we can see all angles are less than 90° and it has two equal sides which is the property isosceles triangle.

3(2). Name triangle in two different ways: (you may judge the nature of the angle by observation)



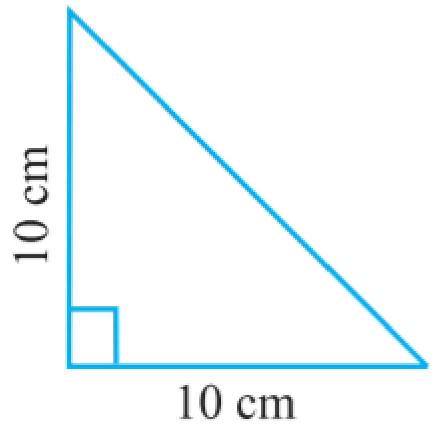
Sol.
It is a Right-angled scalene triangle. Since the triangle has one right angle and three unequal sides and these are the property of right-angled and scalene triangle.

3(3). Name triangle in two different ways: (you may judge the nature of the angle by observation)



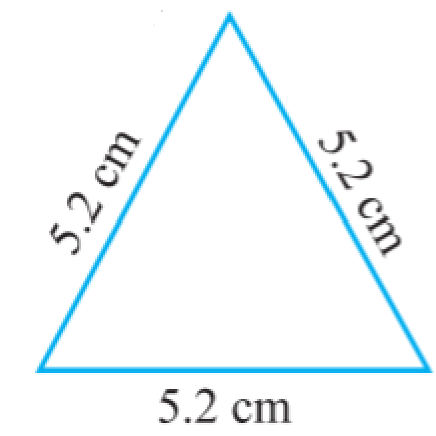
Sol.
It is an Obtuse-angled and isosceles triangle. Since we can see one angle is greater than 90^o and it has two equal sides which are the property of the isosceles triangle.

3(4). Name triangle in two different ways: (you may judge the nature of the angle by observation)



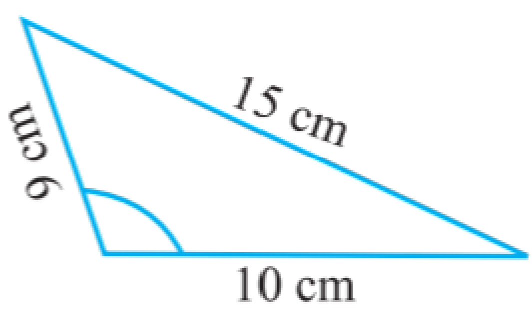
Sol.
It is a Right-angled and isosceles triangle. As it has one angle of 90° and two equal sides which is the property of an isosceles triangle.

3(5). Name triangle in two different ways: (you may judge the nature of the angle by observation)



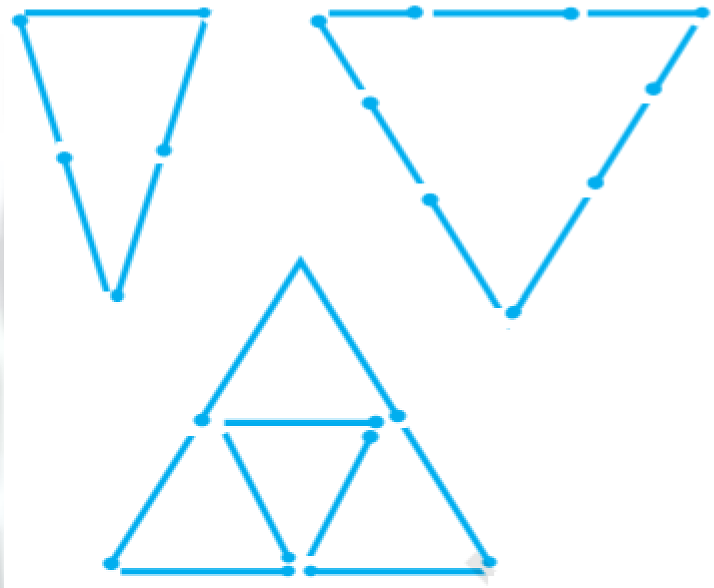
Sol.
It is an Acute-angled and equilateral triangle. As in the figure we can see all angles are less than 90° and it has all sides equal and this is the property of an equilateral triangle.

3(6). Name triangle in two different ways: (you may judge the nature of the angle by observation)



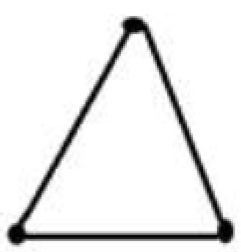
Sol.
It is an Obtuse-angled and scalene triangle.
As we can see one angle is greater than 90^o and three unequal sides and according to the property of triangles only scalene triangle has this property.

4(1). Try to construct triangle using 3 match sticks. Some are shown here.

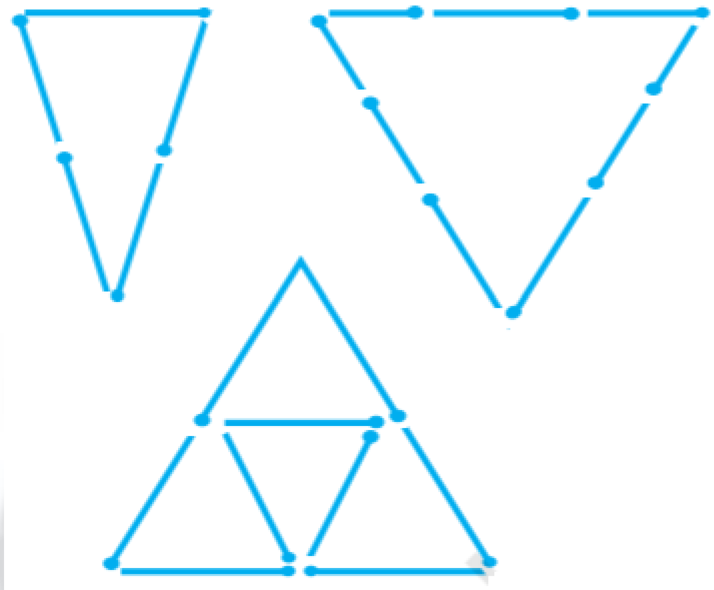


Name the type of triangle in given case. If you cannot make a triangle, think of reasons for it.

Sol.
Clearly, we can make a triangle by using 3 matchsticks. According to the property of a triangle, the sum of two sides is greater than the length of the remaining side. It is an equilateral triangle as it has all equal sides.



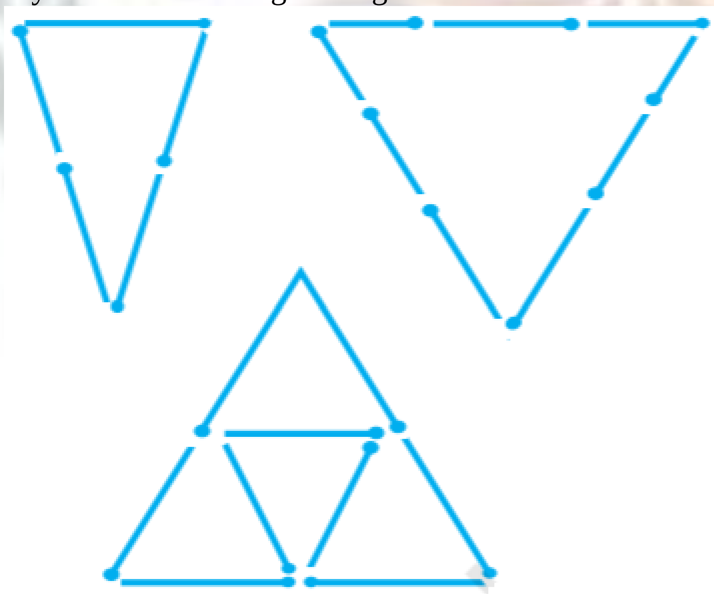
4(2). Try to construct triangle using 4 match sticks. Some are shown here.



Name the type of triangle in given case. If you cannot make a triangle, think of reasons for it.

Sol.
By using 4 matchsticks it is not possible to make a triangle as in a triangle, sum of the two sides is greater than the length of the remaining side.

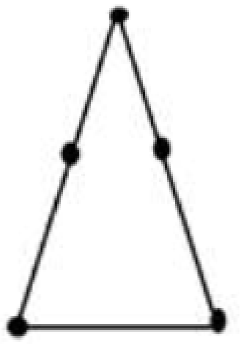
4(3). Try to construct triangle using 5 match sticks. Some are shown here.



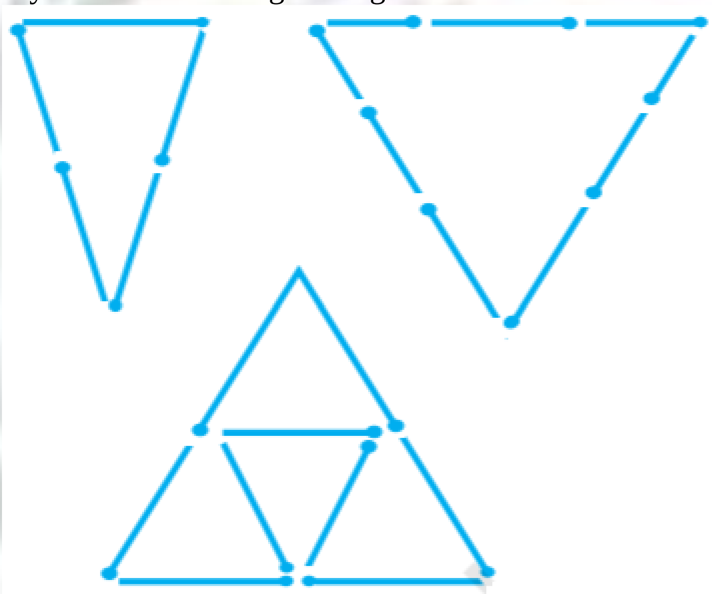
Name the type of triangle in given case. If you cannot make a triangle, think of reasons for it.

Sol.

Yes, we can form a triangle by using 5 matchsticks as shown in figure below.



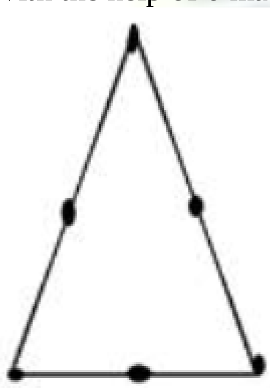
4(4). Try to construct triangle using 6 match sticks. Some are shown here.



Name the type of triangle in given case. If you cannot make a triangle, think of reasons for it.

Sol.

With the help of 6 matchsticks we can form a triangle as shown in figure below.



EX : 5.7

1(1). Each angle of a rectangle is a right angle.
1) True
2) False

Sol. 1) True

True.
By definition, all the angles of a rectangle are 90 degree.

1(2). The opposite sides of a rectangle are equal in length.
1) True
2) False

Sol. 1) True

True
It is a property of a rectangle that its opposite sides are equal.

1(3). The diagonals of a square are perpendicular to one another.
1) True
2) False

Sol. 1) True.

Diagonals of a square are perpendicular to one another.

1(4). All the sides of a rhombus are of equal length.
1) True
2) False

Sol. 1) True

A rhombus is a quadrilateral in which all sides are of equal length.

1(5). All the sides of a parallelogram are of equal length.
1) True
2) False

Sol. 2) False

1(6). The opposite sides of a trapezium are parallel.
1) True

2) False

Sol. 2) False

False; as in general only one pair of opposite sides is parallel.

2(1). Give reason for a square can be thought of as a special rectangle.

Sol.
Yes, a square is a special rectangle, as a rectangle has its all angle of 90^o and opposite sides are equals to each other. In the case of a square, all the angles are also 90^o and it has all the sides equals to each other. So, it is a special rectangle.

2(2). Give reason that a rectangle can be thought of as a special parallelogram.

Sol.
A rectangle has all its angles of 90^o and opposite sides are equals and parallel to each other. A parallelogram also has opposite sides equal and parallel to each other. So we can say that a parallelogram with all of its angles as right angles becomes a rectangle and this rectangle can be thought of as a special parallelogram.

2(3). Give reason for a square can be thought of as a special rhombus.

Sol.
All side of a rhombus are equal and a square also has all of its sides equals to each other with all the interior angles of 90^o. A rhombus with each angle a right angle becomes a square. So, a square can be thought of as a special rhombus.

2(4). Give reason for squares, rectangles, parallelograms are all quadrilaterals.

Sol.
Squares, rectangles, parallelograms are all quadrilaterals because all of them have four line segments and all are closed figures.

2(5). Give reason for square is also a parallelogram.

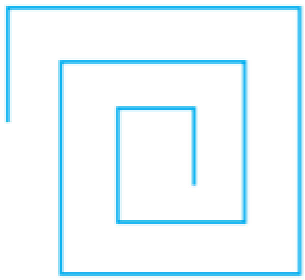
Sol.
In a parallelogram opposite sides are equal and parallel and in a square opposite side are equal and all the sides have same length. So, yes a square is a special parallelogram.

3. A figure is said to be regular, if its sides are equal in length and angles are equal in measure. Can you identify the regular quadrilateral?

Sol.
A square is a 'regular' quadrilateral.

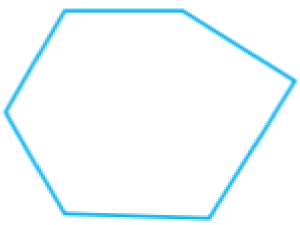
EX : 5.8

1(1). Examine whether the given figure is polygon and if not why?



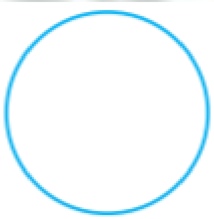
Sol.
No, it is not a polygon because it is not a closed figure.

1(2). Examine whether the given figure is polygon and if not why?



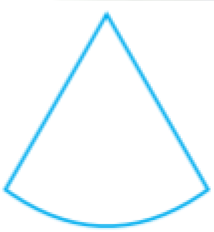
Sol.
Yes, it is a polygon as it is made of 6 line segments and is closed.

1(3). Examine whether the given figure is polygon and if not why?



Sol.
No, it is not a polygon. It's a circle and is not made of line segments.

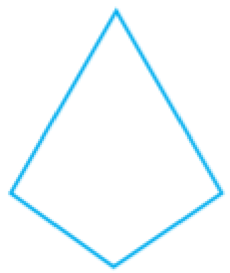
1(4). Examine whether the given figure is polygon and if not why?



Sol.

No, it’s not a polygon as it is not only made of line segments but has a circular part as well.

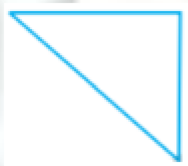
2(1). Name the given polygon.



Sol.

As the given figure is made of 4 line segments, therefore it is a quadrilateral.

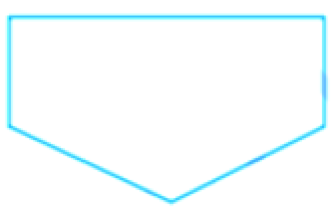
2(2). Name the below polygon.



Sol.

The given figure is a triangle as we can see it is made of 3 line segments and is closed.

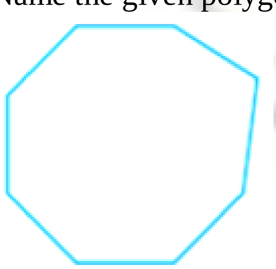
2(3). Name the polygon.



Sol.

The given figure is a pentagon because it is made up of 5 line segments.

2(4). Name the given polygon in the figure.

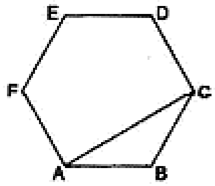


Sol.

The given figure is of octagon because it is made of 8 line segments.

3. Draw a rough sketch of a regular hexagon. Connecting any three of its vertices, draw a triangle. Identify the type of the triangle you have drawn.

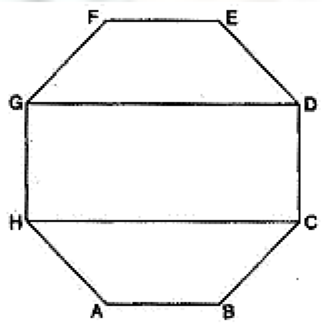
Sol.



The triangle drawn is an obtuse-angled and isosceles triangle.

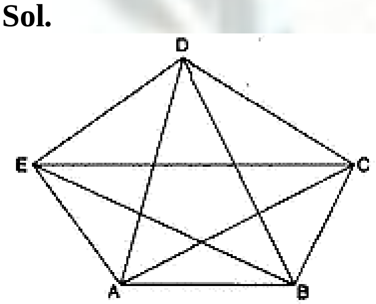
4. Draw a rough sketch of a regular octagon. (Use squared paper if you wish). Draw a rectangle by joining exactly four of the vertices of the octagon.

Sol.



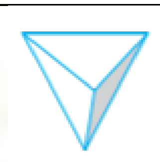
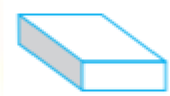
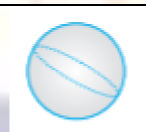
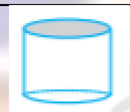
5. A diagonal is a line segment that joins any two vertices of the polygon and is not a side of the polygon. Draw a rough sketch of a pentagon and draw its diagonals.

Sol.



EX : 5.9

1. Match the following:

(a) Cone	(i) 
(b) Sphere	(ii) 
(c) Cylinder	(iii) 
(c) Cuboid	(iv) 
(e) Pyramid	(v) 

Give two new examples of each shape.

Sol.
We can match the above as follows:
(a) - (ii), (b) - (iv), (c) - (v), (d) - (iii), (e) - (i)

i. Cone – a cone is a three-dimensional geometric shape that has a circular base and a single vertex.
ii. Sphere – It is like a circle with the set of points that are all at the same distance from a given point.
iii. Cylinder- It is the curvilinear geometric shape formed by the points at a fixed distance from a given straight line called axis of the cylinder.
iv. Cuboid – A cuboid is a box-shaped solid object. It has six flat sides and all angles are right angles and all its faces are rectangles.
v. Pyramid – A polyhedron formed by connecting a polygonal base and a point called the apex.

2(1). What shape is your instrument box?

Sol.
It is a Cuboid.

2(2). What shape is a brick?

Sol.
It is a Cuboid.

2(3). What shape is a match box?

Sol.
It is of Cuboid shape.

2(4). What shape is a road-roller?

Sol.
Cylinderical shape

2(5). What shape is a sweet laddu?

Sol.
it is Spherical in shape.

Worksheet
Ch - 5 Understanding Elementary Shapes

1. How many right angles do you make if you start facing south and turn clockwise to west?
   a. 1
   b. 2
   c. 3
   d. 4
2. Find the number of right angles turned through by the hour hand of a clock when it goes from 3 to 6.
   a. 4
   b. 2
   c. 1
   d. 3
3. What fraction of a clockwise revolution does the hour hand of a clock turn through, when it goes from 12 to 3?
   a. 1313
   b. 1
   c. 1212
   d. 1414
4. What is the angle name for half a revolution?
   a. Right angle
   b. Straight angle
   c. Complete angle
   d. Reflex angle
5. How do we write "PQ−→−PQ→ is perpendicular to RS−→RS→" symbolically?
   a. PQ←→//RS←→PQ↔//RS↔
   b. PQ←→≠RS←→PQ↔≠RS↔
   c. PQ←→⊥RS←→PQ↔⊥RS↔
   d. PQ←→=RS←→PQ↔=RS↔

6. **Match the following 3D shape and its edges.**

Column A	Column B
1. Cube	(a) 6
2. Square pyramid	(b) 12
3. Triangular prism	(c) 8
4. Triangular pyramid	(d) 9

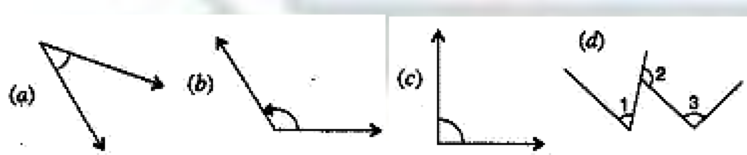
7. **Fill up the following:**

   a. Measure of a complete angle is ____________^{o}.
   b. The triangle in which ____________ sides are equal is called isosceles triangle.
   c. Each of its angles rectangle measures ____________^{o}.
   d. A cube has ____________ vertices.

8. **State true or false:**

   a. Sum of any two sides of a triangle is greater than the third side.
   b. An equilateral triangle is also considered as an isosceles triangle
   c. A polygon is regular if its all sides are equal.
   d. Opposite faces of a cuboid are equal in size.

9. How many faces a tetrahedron have?
10. What is the angle name for half a revolution?
11. Draw a hexagon and write its sides and diagonals?
12. If B is the mid point of AC $\overline{AC}$ and C is the point of BD $\overline{BD}$. where A, B, C, D lie on a straight line, say why AB = CD?
13. Draw a rough sketch of a regular octagon. Draw a rectangle by joining exactly four of the vertices of the octagon.
14. Measure the angles given below, using the Protractor and write down the measure.



15. All equilateral triangle are isosceles, but all isosceles triangle are not equilateral. Justify the statement.