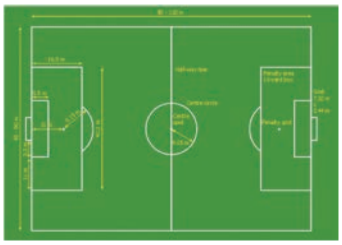
Chapter 4

GEOMETRY

Learning Objectives

- To know about lines, line segments and rays.
- To know angles and its types.
- To know the usage of ruler and protractor.
- To identify parallel and intersecting lines.
- To identify pairs of complementary and supplementary angles.
- To know collinear points and point of concurrency.

4.1 Introduction



Geometry means the measurement of the earth. It includes the study of the properties of shapes and its measures. In ancient days, geometry was developed for the practical purpose of construction, surveying and various crafts.

Nature evolves out of simple geometrical shapes and patterns from tiny atoms to huge galaxies. The objects that you see in your environment have an impact of geometrical ideas. An appealing appearance of houses and buildings are made possible by geometrical thinking. Vehicles like cycle, car, bus are designed using geometrical concepts. The toys that you play with, the tools like pencil, scale and book that you use with, give rise to geometrical ideas and shapes.

In this chapter, we will learn about the geometrical concepts such as lines, line segments, rays and angles.

MATHEMATICS ALIVE – NATURE'S GEOMETRIC MASTERPIECES

Hexagon in Honey Comb

Art of Geometric Patterns

4.1.1 Fun with lines

What shapes can you draw with 3 lines or 4 lines or 5 lines?

We have already seen some shapes with names like triangles, rectangles and squares.

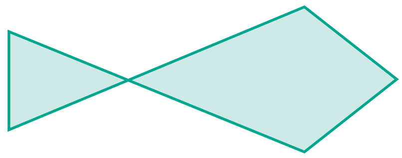


Fig. 4.1

Here is a shape which is in the form of a fish (see Fig. 4.1).

It has 5 lines. Can you draw a fish with 4 lines or with 3 lines? Think!

4.1.2 Only two lines

What shapes can you draw with only TWO lines?

The following forms are possible with 2 lines. Isn't it?

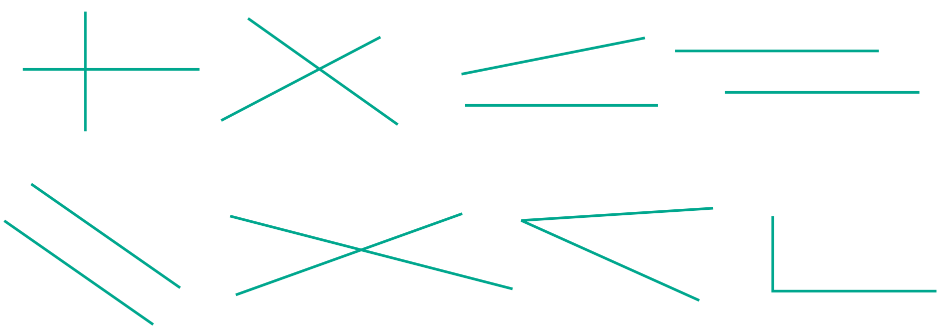


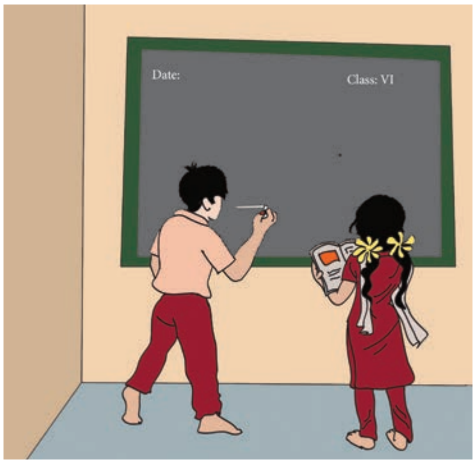
Fig. 4.2

Is there something you notice in all these shapes?

4.1.3 Only one line

What shapes can be drawn with only ONE line? The line may be standing upright, lying flat, or slanting. Perhaps it can be, slant left or slant right. It may be long or short.

Now, consider the following situation.



The teacher gives Yazhini a paper with a line drawn on it and asks Akilan to draw the same line on the black board, as instructed by Yazhini. Then they shall reverse the process. They do the same with other shapes using 2 lines and 3 lines. Try doing this and say, whether this is easy to do!

Observe the following conversation.

Teacher : Sakthi, can you say how to draw lines?

Sakthi : Yes Teacher! Why only lines? I may like to draw curves and circles too!

Teacher : Sakthi, you can do all the shapes you like. But you see, there is enough difficulty in describing shapes made only of lines. So, we will get to curves and circles later.

Sakthi : Teacher, Why should we describe shapes? We can just draw and show them when we want.

Is Sakthi right?

In Mathematics, every thinking is interesting and unlimited. Remember numbers; it is not stopped with adding 2 – digits. Numbers go on endlessly and it is possible to add any two numbers, however large. We know that even a 37- digit number ending in 0 is divisible by 5.

It is the same with shapes too. We are interested in lines, triangles, rectangles and in whatever the shapes may be and the size however large or small. We need to give them names not only to describe them but also to explore a lot with them.

4.2 Describing lines

A line can be long or short. A line can be flat or slant or vertical. If a line is rotated in any direction, it remains to be a line. So, given below (Fig. 4.3) are lines in different positions.

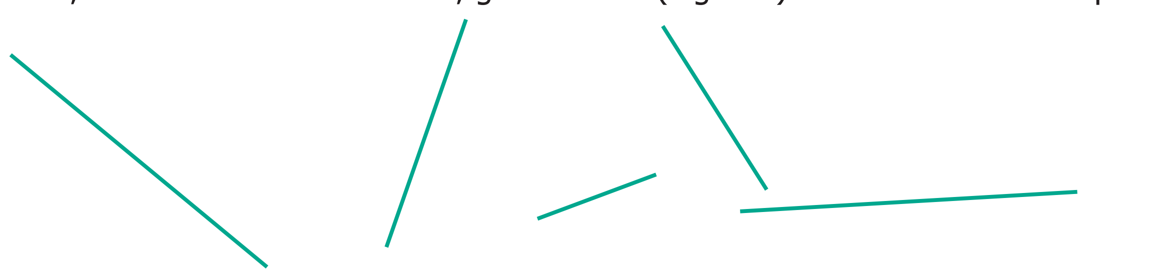


Fig. 4.3

But the following (Fig.4.4) are not lines.

Fig. 4.4

If the length of a line is ignored, then it can be extended in both the directions without ending as in (Fig. 4.5) given below. A line through two points A and B is written as $\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$. Also it is denoted by a letter ' l '.

Fig. 4.5

4.2.1 Line segment

What do we call a line that is short and ends on both sides? That we call it as a line segment and name both of its ends with letters as shown in fig. 4.6.

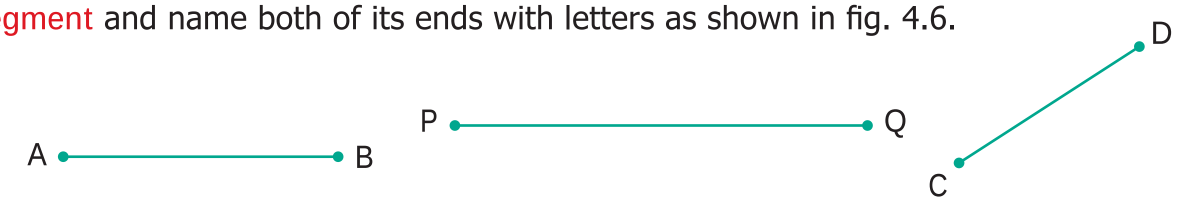


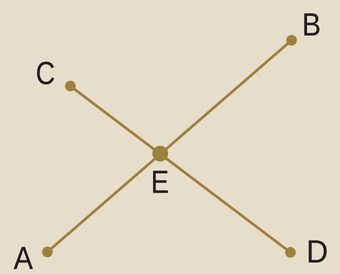
Fig. 4.6

We usually use CAPITAL LETTERS to denote the ends of the line segments. A line segment is denoted by $\overline{AB}$. What can we do with a line segment? We can measure its length. Given two line segments, we can compare their lengths and say which is shorter and which is longer.

Even if we measure length as a number, we get lots of line segments, each with a definite length. Using a ruler, we can draw the following line segments.

TRY THIS

Name all the line segments.



1 cm A ―― B

2 cm A ―――― B

3 cm A ―――――― B

...

10 cm A ―――――――――――――――――――― B

What about a line segment of length 17 cm or 20 cm or 30 cm or 378 cm? Like, numbers never end, line segments get longer and longer forever!

4.2.2 Construction of line segment

Learn to measure line segments using the ruler.

Correct way of viewing the scale.

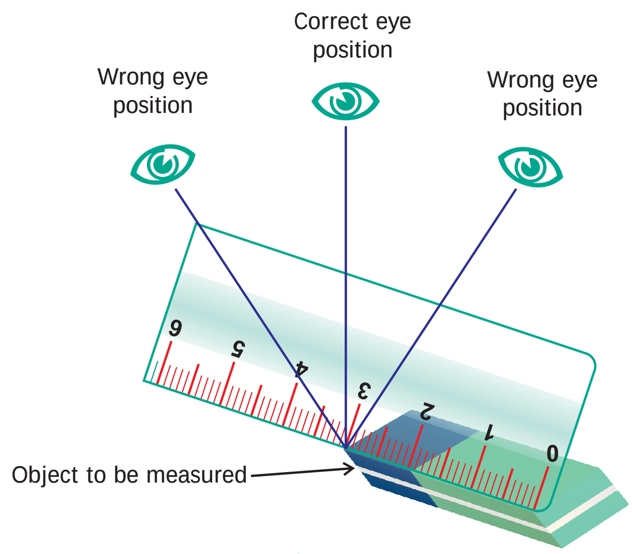


Fig. 4.7

Examples of Measuring Line Segments

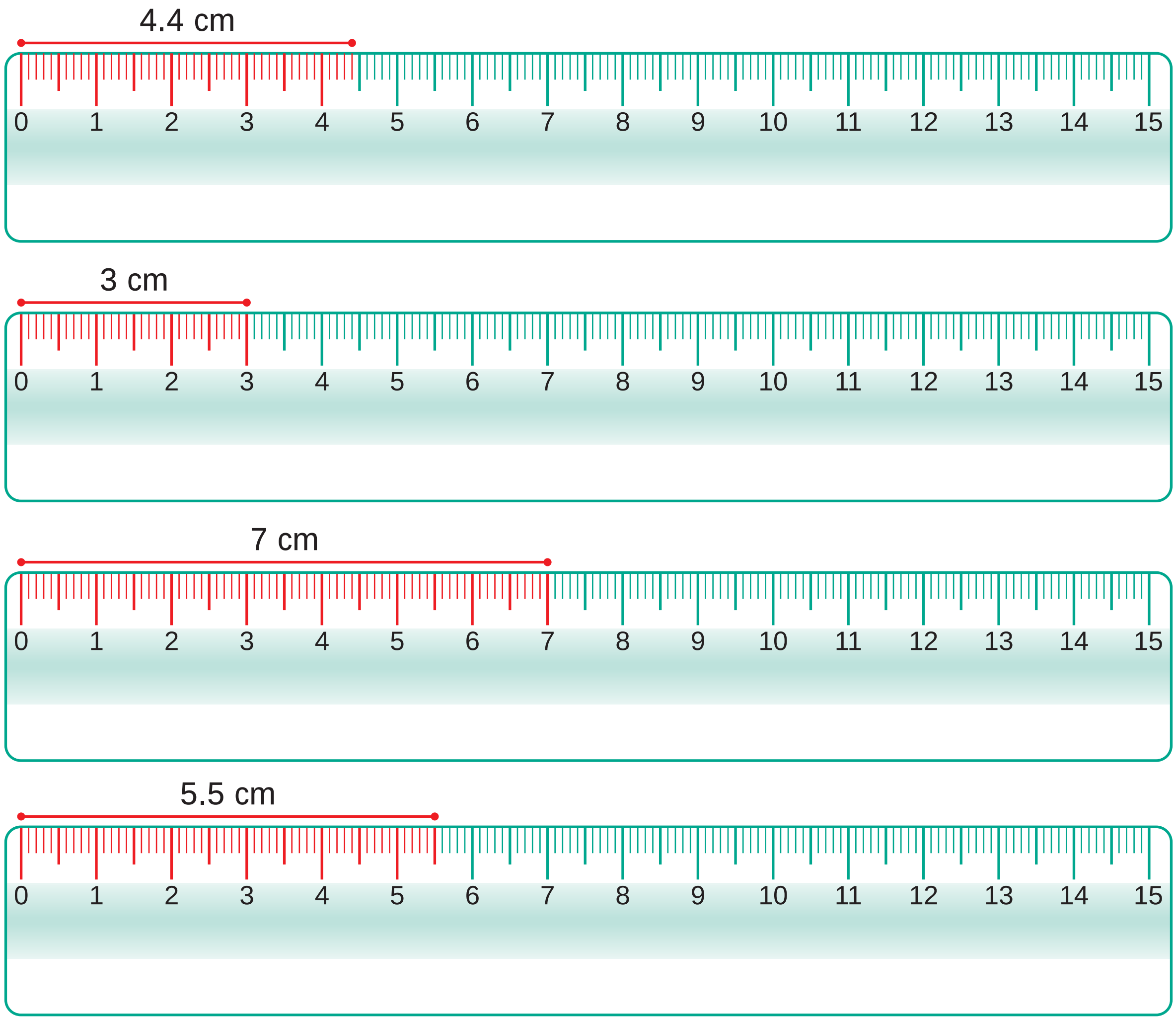


Fig. 4.8

TRY THIS

If AB = 5cm, say which of the measures are correct in fig. 4.9.

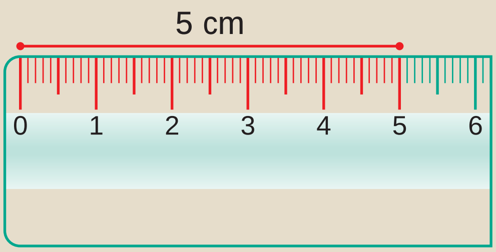


Fig. 4.9 (i)

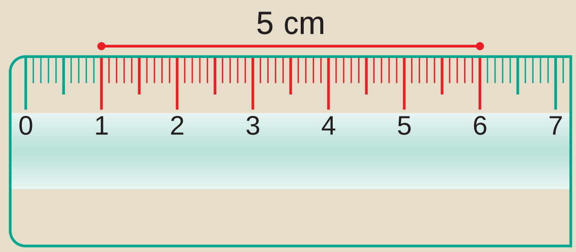


Fig. 4.9 (ii)

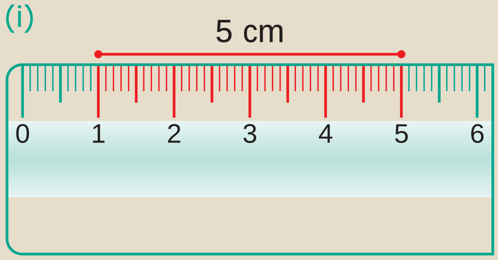


Fig. 4.9 (iii)

DO YOU KNOW?

Geometry originated from two Greek words, geo, meaning earth and metron meaning measure. Geometry means earth measure. Around 600 B.C.(BCE), Thales of Miletus was the first to use deductive methods to develop geometric concepts. The Greek Mathematician, Pythagoras continued the systematic development of Geometry.

Example 4.1

With the help of a ruler and compass, draw a line segment PQ = 5.5cm.

Solution

- Draw a line '*l*' and mark a point 'P' on it as shown in Fig. 4.10.

Fig. 4.10

- Measure 5.5 cm using compass as shown in Fig. 4.11 placing the pointer at '0' and the pencil pointer at 5.5 cm.

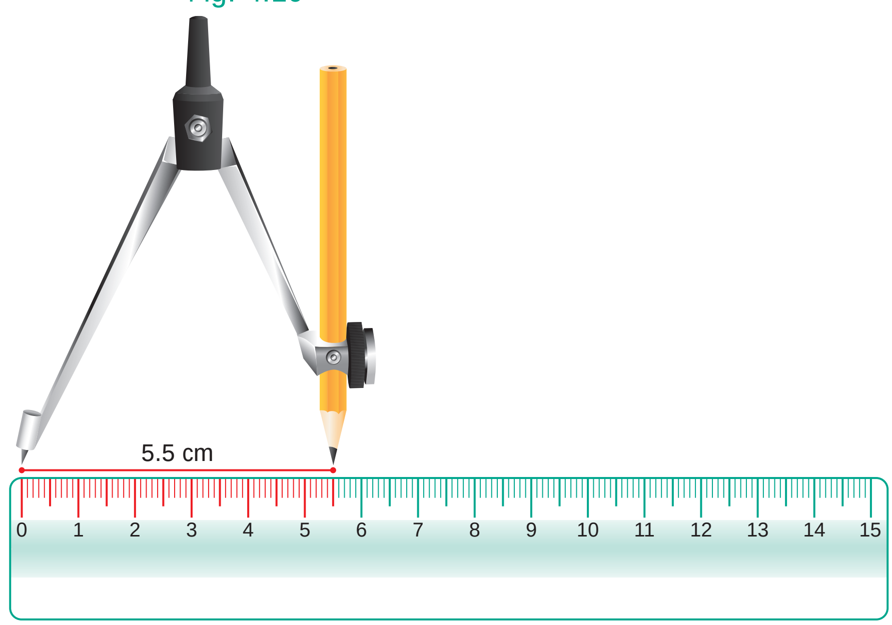


Fig. 4.11

- Place the pointer of the compass at ' P ' then draw a small arc on the line '*l*' with the pencil pointer (Fig. 4.12). It cuts the line '*l*' at a point and name that point as 'Q' (Fig. 4.13).

Fig. 4.12

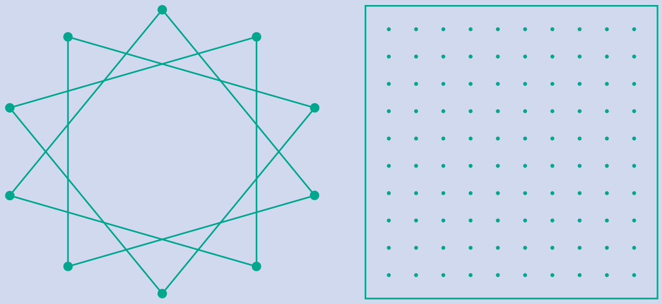
Fig. 4.13

- Now, PQ is the required line segment of length 5.5 cm.

ACTIVITY

This game can be played in small groups. Take 10 or more sticks of equal length. Join them as a bundle and put them on the floor in such a way that they fall one above the other. The challenge is to take one stick after other without disturbing the position of the other sticks.

ACTIVITY



Enjoy trying kolams using line segments!

4.2.3 Two lines

Now let us get back to two lines (Fig. 4.14). Lines that go on forever on either side without meeting each other (i.e. they have a constant distance in between) are called parallel lines.

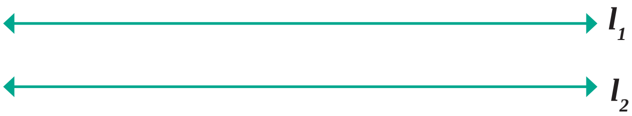


Fig. 4.14

Thus, parallel lines go forever without meeting.
What will happen if two lines are not parallel?
Then they must meet somewhere! Of course, they go their way after meeting too.

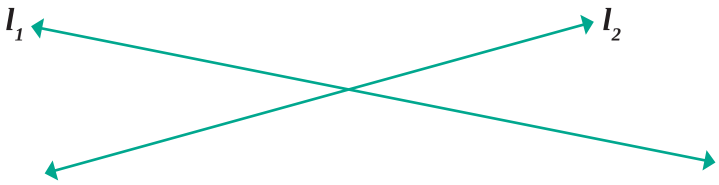


Fig. 4.15

Here, l_1 and l_2 are called intersecting lines.
Of course, we now have parallel line segments and intersecting line segments too.

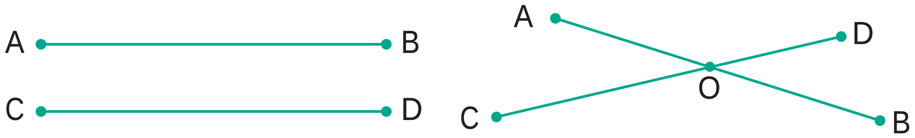


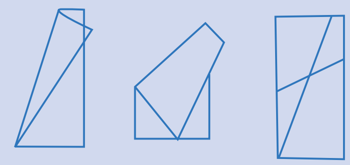
Fig. 4.16

The position 'O' at which the line segments $\overline{AB}$ and $\overline{CD}$ meet is called their point of intersection.

ACTIVITY

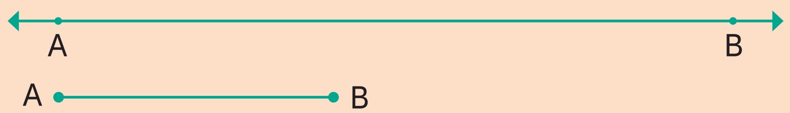
Take a piece of paper and fold in as many ways as you can, which generates parallel lines or intersecting lines.

A few examples are shown for you.



NOTE

A line has no end points, whereas a line segment has end points. We can measure the length of a line segment.



4.2.4 Rays

What about lines that end on one side but proceed indefinitely on the other side? We call them rays. They are denoted by $\overrightarrow{AB}, \overrightarrow{PQ}, \overrightarrow{MN}$..., etc. The fixed end point of a ray is called the starting point. (See fig.4.17)

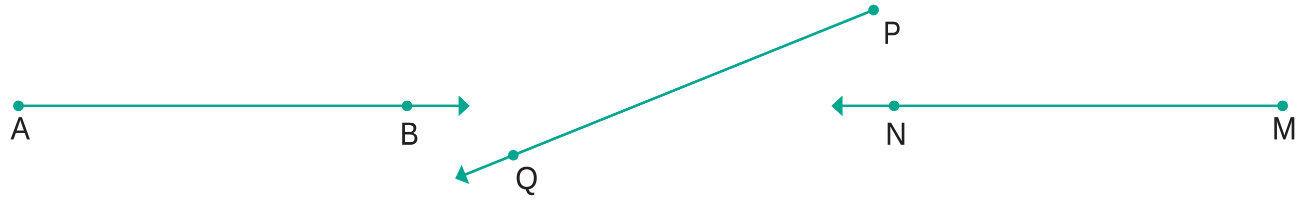


Fig. 4.17

4.2.5 Two rays

With two rays we have more to learn. They can be parallel or intersecting.

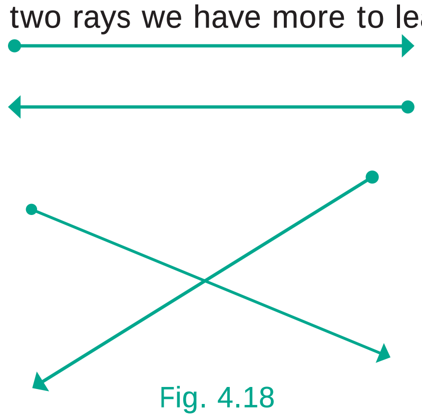


Fig. 4.18

Two rays may have the same starting point.

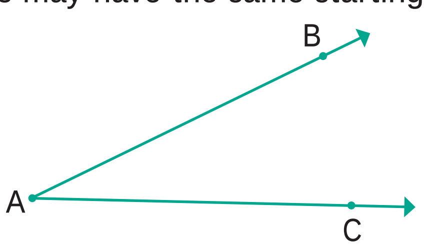


Fig. 4.19

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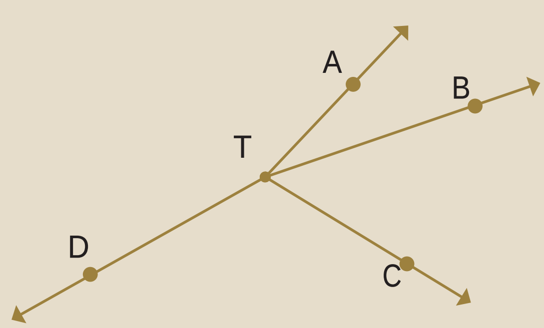
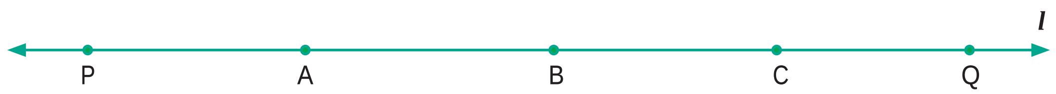


- Name the rays in the given figure.
- What is the common point of all these rays?

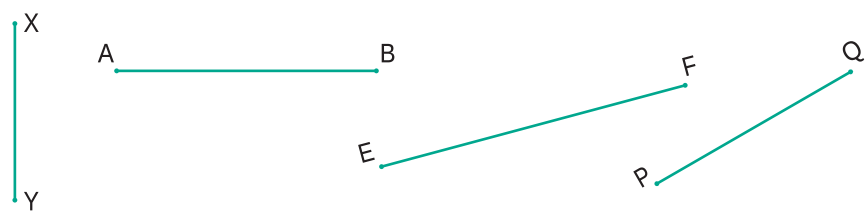
Exercise 4.1

1. Fill in the blanks.
   (i) A line through two end points 'A' and 'B' is denoted by ____________.
   (ii) A line segment from point 'B' to point 'A' is denoted by ____________.
   (iii) A ray has ____________ end point(s).

2. How many line segments are there in the given line? Name them.

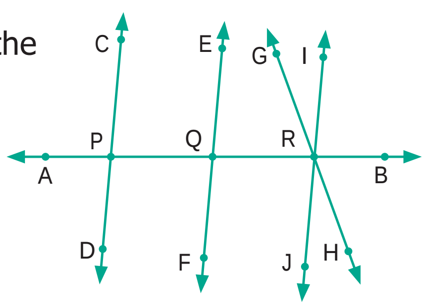


3. Measure the following line segments.



4. Construct a line segment using ruler and compass.
   (i) AB = 7.5 cm (ii) CD = 3.6 cm (iii) QR = 10 cm

5. From the given figure, name the
   (i) parallel lines
   (ii) intersecting lines
   (iii) points of intersection.



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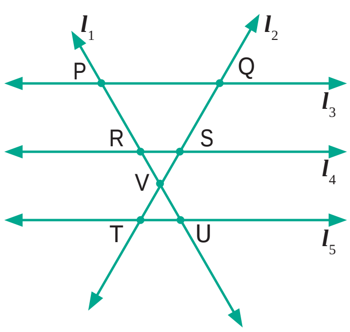
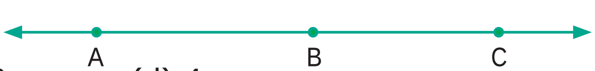
6. From the given figure, name
   (i) all pairs of parallel lines.
   (ii) all pairs of intersecting lines.
   (iii) pair of lines whose point of intersection is 'V'.
   (iv) point of intersection of the lines 'l_2' and 'l_3'.
   (v) point of intersection of the lines 'l_1' and 'l_5'.



Objective Type Questions

7. The number of line segments in  is

   (a) 1 (b) 2 (c) 3 (d) 4

8. A line is denoted as
   (a) AB (b) $\overrightarrow{AB}$ (c) $\overleftrightarrow{AB}$ (d) $\overline{AB}$

4.3 Angles

Can we find a way to describe all these shapes? (shown in fig. 4.20)

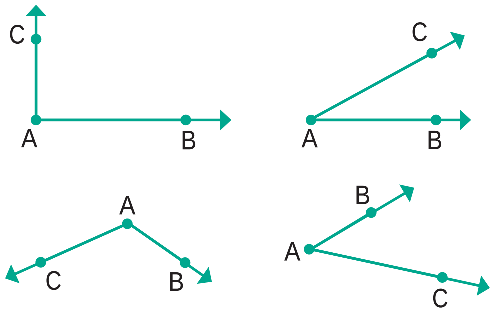
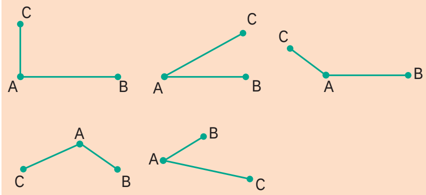


Fig. 4.20

NOTE

We can do the same with two line segments also. See the figures given below.



How would you describe whether a ray (or line segment) is vertical or slanting with respect to another ray (or line segment)?

DO YOU KNOW?

Carrom board involves many geometric concepts like line segments and angles. When the striker hits the coin, the coin moves in a straight line. When the striker or coins hit the board end they make angles with the board while returning.

When two rays or line segments meet at their end points, they form an angle at that point.

Fig. 4.21

In the Fig.4.21 rays $\overrightarrow{AB}$ and $\overrightarrow{AC}$ are the sides and 'A' is the vertex which is the meeting point of both the line segments.

4.3.1 Naming Angles

We name the angle as shown in the Fig.4.22 below.

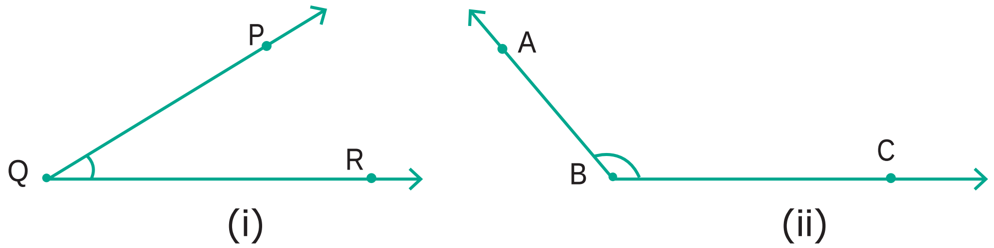


Fig. 4.22

Fig 4.22(i) shows the angle $\angle PQR$; $\overrightarrow{QP}$, $\overrightarrow{QR}$ are its sides. 'P' is on $\overrightarrow{QP}$; 'R' is on $\overrightarrow{QR}$.

Fig 4.22(ii) shows the angle $\angle ABC$; $\overrightarrow{BA}$, $\overrightarrow{BC}$ are its sides. 'A' is on $\overrightarrow{BA}$; 'C' is on $\overrightarrow{BC}$.

We name the angle in fig. 4.22 (i) as ∠Q or ∠PQR or ∠RQP . Similarly, in Fig. 4.22 (ii), we may write ∠B as ∠ABC or ∠CBA.

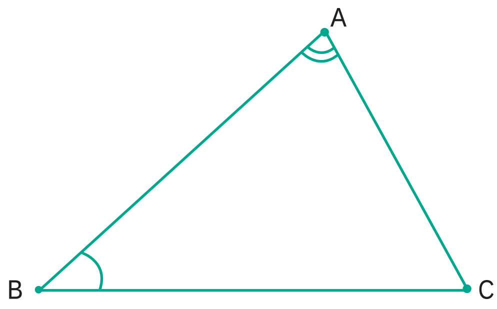


Fig. 4.23

In the Fig. 4.23, two angles are marked.

Note that ∠BAC is not the same as ∠ABC,

as they have different vertices and different sides

4.3.2 Measuring Angles

Can we measure angles too? Yes, using protractor they are measured in degrees which are denoted by the symbol ‘ º ’. This has to be marked at top right of a number. We write angles as 35°, 78°, 90°, 110°, 145° and so on.

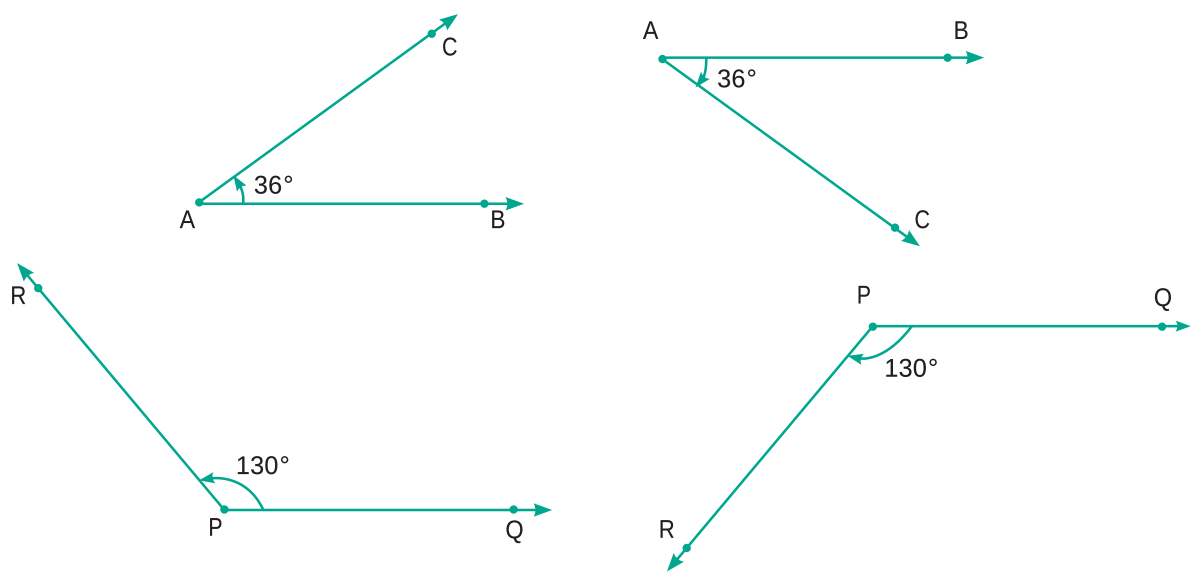


Fig. 4.24

See that angles can be equal even if they are positioned differently.

4.3.3 Special Angles

Some angles are special. 90° is one such. We call it as the right angle.

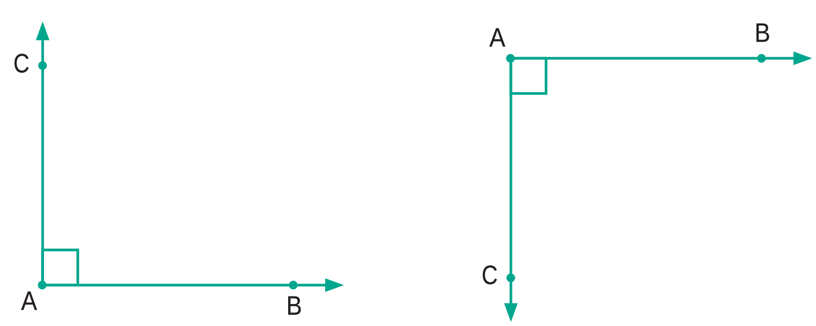


Fig. 4.25

Right angle is most common in life. Examples can be seen at cross-roads, chess board, TV, etc.

Acute Angles

Fig. 4.26

Each of the angles in the above Fig. 4.26 is less than a right angle. Angles smaller than 90º are called Acute angles.

Obtuse Angles

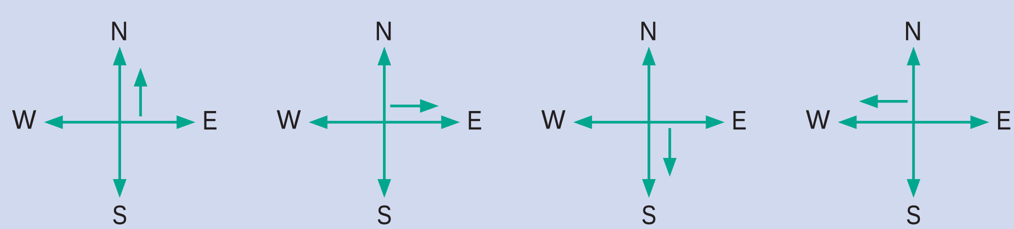
$\overrightarrow{AB}$ $\overrightarrow{AC}$

Fig. 4.27

Each of the angles in the above Fig. 4.27 is greater than right angle. If an angle is more than 90° and less than 180° is called an obtuse angle.

ACTIVITY

Stand facing the north side. Take a ‘right angle turn’ clockwise; you now face east. Again take another ‘right angle turn’ in the same direction. You now face south. Once again take another ‘right angle turn’ in the same direction. You now face west. Then follow the same you will come to the original position. Thus the complete turn is called one revolution. The turn from north to south will be two right angles. It is also called a straight angle. Two straight angles make one complete revolution. This is illustrated in the following figures.

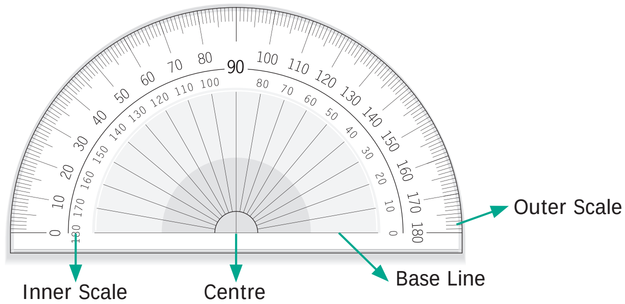


TRY THESE

1. Which direction will you face if you start facing West and take three right turns clockwise?
2. Which direction will you face if you start facing North and take two right turns anti-clockwise?

4.3.4 Angle measurement using Protractor

How do we measure an angle? Using a PROTRACTOR we can measure an angle.



A protractor has one centre and a base line. It has two scales namely, inner scale from 0° to 180° in anti clockwise direction and outer scale from 0° to 180° in the clockwise direction. Why does the protractor stop with 180°? We can rotate the protractor and measure, so 180° is enough.

Steps To Measure an angle

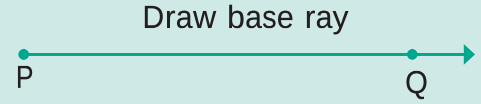
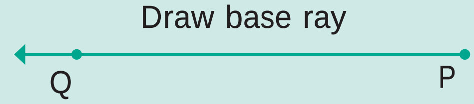
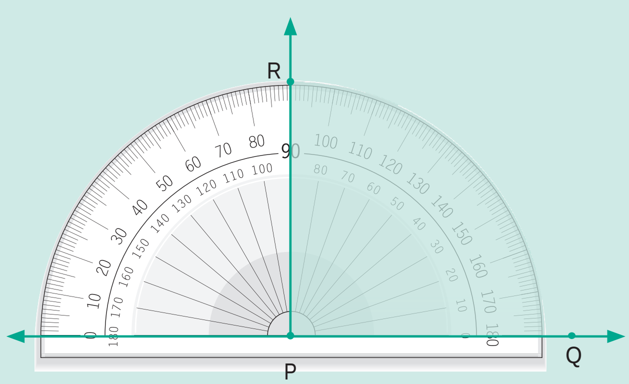
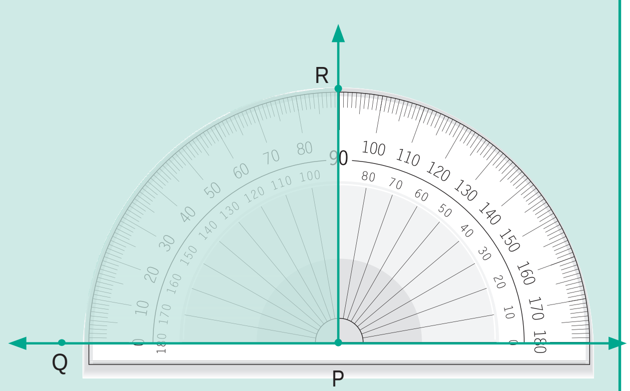
Step 1: Place the centre of the protractor on the vertex of the angle and line up the base line with 0°.

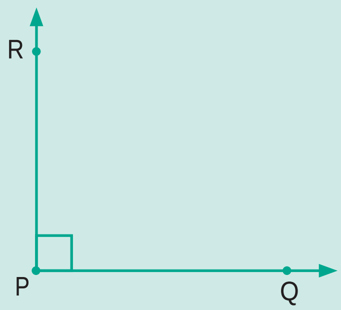
Step 2: Read the measure where the other ray crosses the protractor.

4.3.5 Using Protractor to draw Right Angle (90°)

Example 4.2

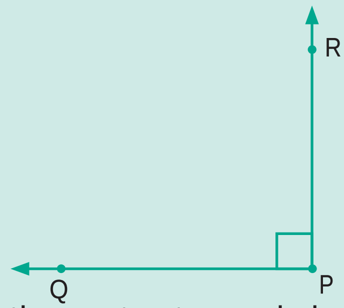
Use a Protractor to draw an angle 90º.

Draw base ray 	Draw base ray 
 Place the center of the protractor at the vertex P. Line up the ray $\overrightarrow{PQ}$ with the 0° line. Then draw and label a point (R) at the 90° mark on the inner scale (anticlockwise)	 Place the center of the protractor at the vertex P. Line up the ray $\overrightarrow{PQ}$ with the 0° line. Then draw and label a point (R) at the 90° mark on the outer scale (clockwise)



Remove the protractor and draw $\overrightarrow{PR}$ to complete the angle.

Now, ∠P = ∠QPR = ∠RPQ =90°



Remove the protractor and draw $\overrightarrow{PR}$ to complete the angle.

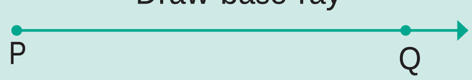
Now, ∠P = ∠QPR = ∠RPQ =90°

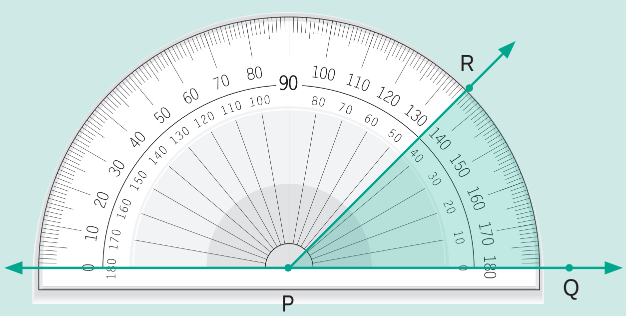
4.3.6 Using Protractor to draw an Acute Angle

Example 4.3

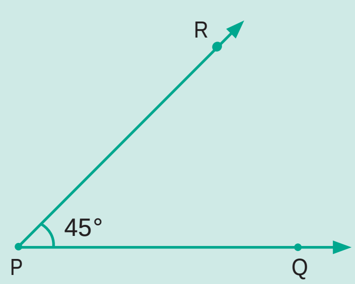
Use a Protractor to draw an angle 45°.

Draw base ray





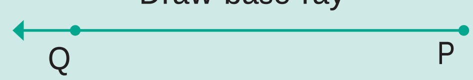
Place the centre of the protractor at the vertex P. Line up the ray $\overrightarrow{PQ}$ with the 0° line. Then draw and label a point (R) at the 45° mark on the inner scale (anticlock wise)

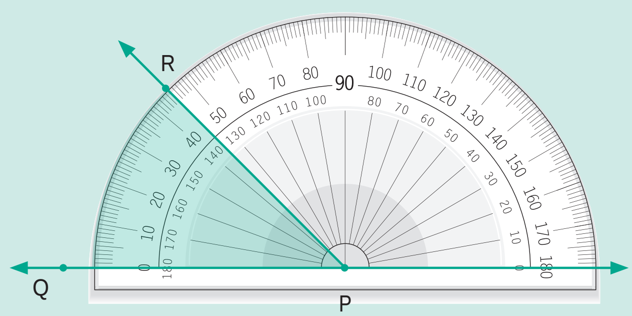


Remove the protractor and draw $\overrightarrow{PR}$ to complete the angle.

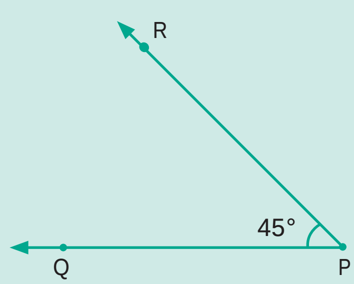
Now, ∠P = ∠QPR = ∠RPQ =45°

Draw base ray





Place the centre of the protractor at the vertex P. Line up the ray $\overrightarrow{PQ}$ with the 0° line. Then draw and label a point (R) at the 45° mark on the outer scale (clock wise)



Remove the protractor and draw $\overrightarrow{PR}$ to complete the angle.

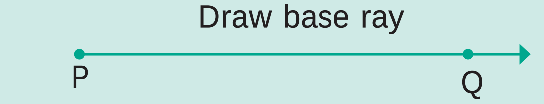
Now, ∠P = ∠QPR = ∠RPQ =45°

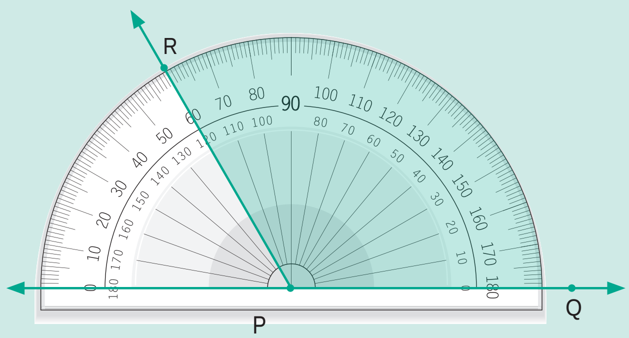
4.3.7 Using Protractor to draw an Obtuse Angle

Example 4.4

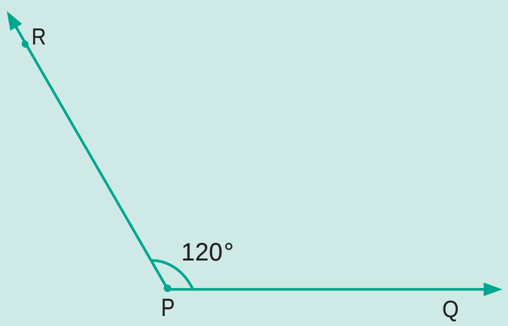
Use a protractor to draw an obtuse angle 120°.

Draw base ray





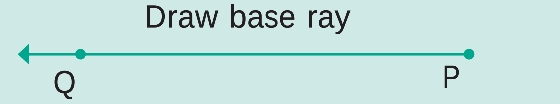
Place the centre of the protractor at the vertex P. Line up the ray $\overrightarrow{PQ}$ with the 0° line. Then draw and label a point (R) at the 120° mark on the inner scale (anti clock wise)

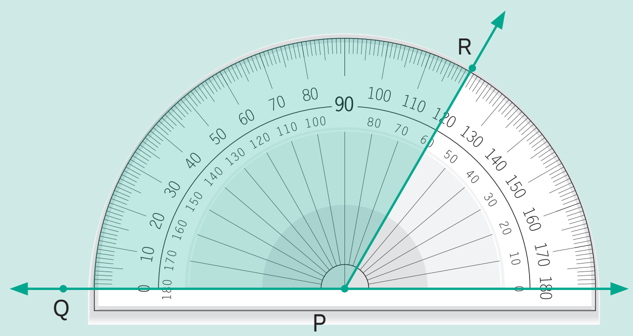


Remove the protractor and draw $\overrightarrow{PR}$ to complete the angle.

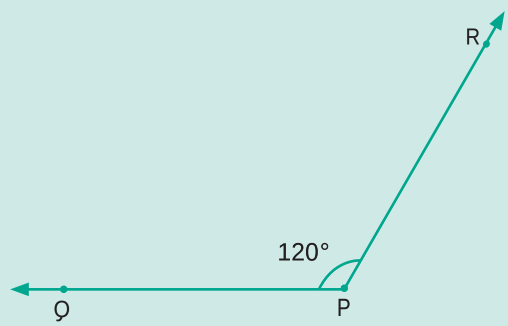
Now, ∠P = ∠QPR = ∠RPQ =120°

Draw base ray





Place the centre of the protractor at the vertex P. Line up the ray $\overrightarrow{PQ}$ with the 0° line. Then draw and label a point (R) at the 120° mark on the outer scale (clock wise)

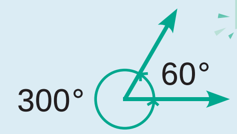


Remove the protractor and draw $\overrightarrow{PR}$ to complete the angle.

Now, ∠P = ∠QPR = ∠RPQ =120°

DO YOU KNOW?

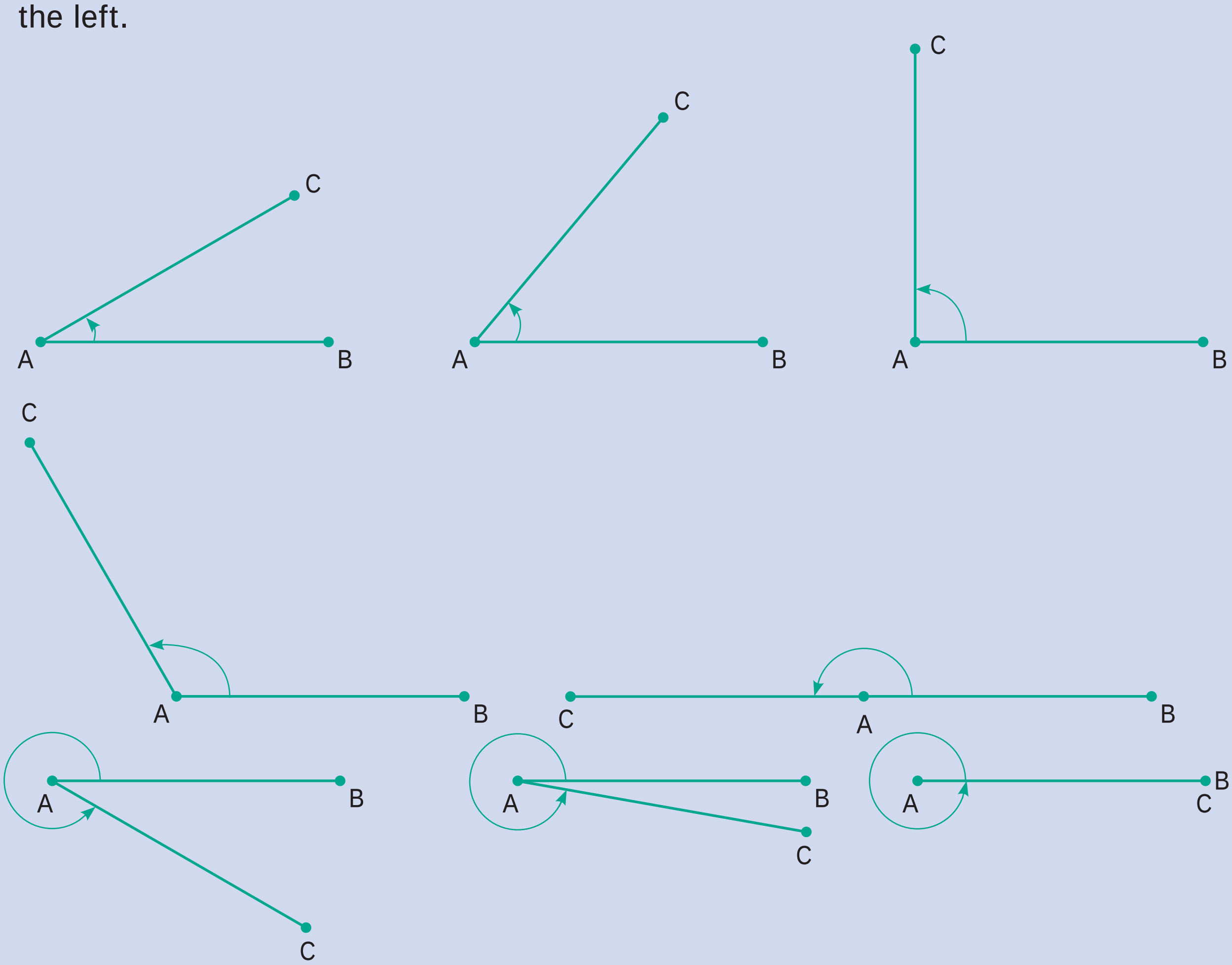
Reflex angles are bigger than 180°. Always subtract the given angle from 360° to get the reflex angle.



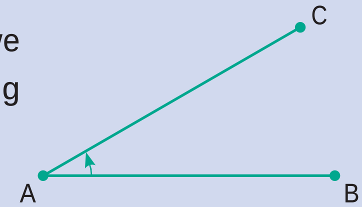
Reflex angle

ACTIVITY

Fix a line segment $\overline{AB}$ and let's have another line segment $\overline{AC}$, go on rotating $\overline{AC}$ to the left.



In this rotations, At some point $\overline{AC}$ overlap $\overline{AB}$ and then we are back to the same as before. So angle, keep on increasing and after some point, return to 0º.



Is this familiar? Yes, you can see this in a clock!

TRY THIS

Adjust the hands of the clock for the following time, note the angle made between the hour hand and the minute hand and write the type of angle.

12.10	12.40	3.25	9.40	5.55	1.25	4.25	7.05
Acute angle							

4.3.8 Very special angles

- Here you find $\overrightarrow{AC}$ is exactly on $\overrightarrow{AB}$; then the angle is 0°. It is called the Zero angle.

- If 'C' is exactly on the opposite side 'B', with vertex 'A' in the middle. Then the angle is 180°. It is called the Straight angle.

4.3.9 Special pairs of angles

Two angles are complementary to each other if they add upto 90° [See Fig. 4.28(i)]

Two angles are supplementary to each other if they add upto 180° [See Fig. 4.28(ii)]

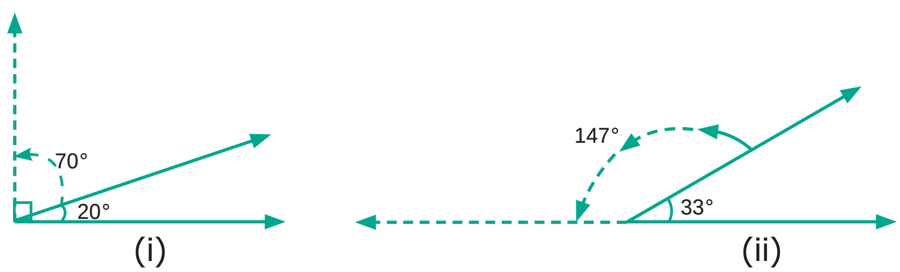


Fig. 4.28

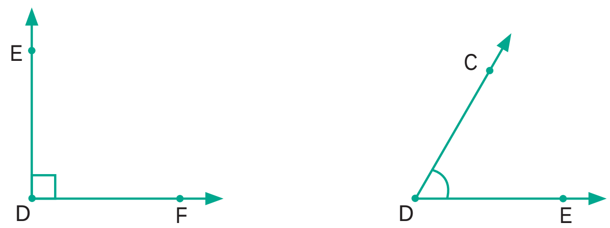
In the above figures, 20° and 70° are complementary angles and 147° and 33° are supplementary angles. But 35° and 75° are neither complementary nor supplementary.

Exercise 4.2

1. Use any number of the given dots to make different angles.

1) An Acute Angle	2) An Obtuse Angle . . . .
3) A Right Angle	4) A Straight Angle . . . .

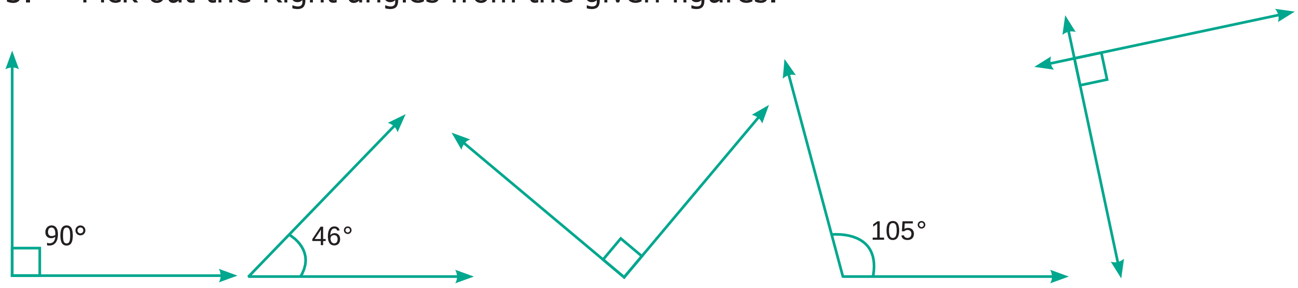
2. Name the vertex and sides that form each angle.



Vertex ______________ Vertex ______________

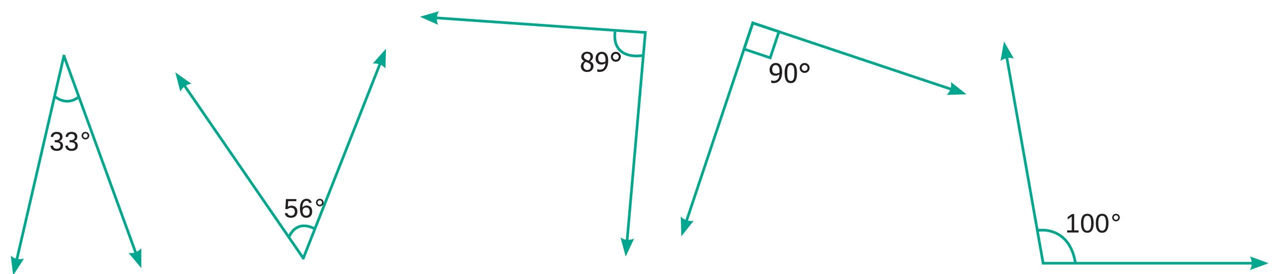
Sides ______________ Sides ______________

3. Pick out the Right angles from the given figures.



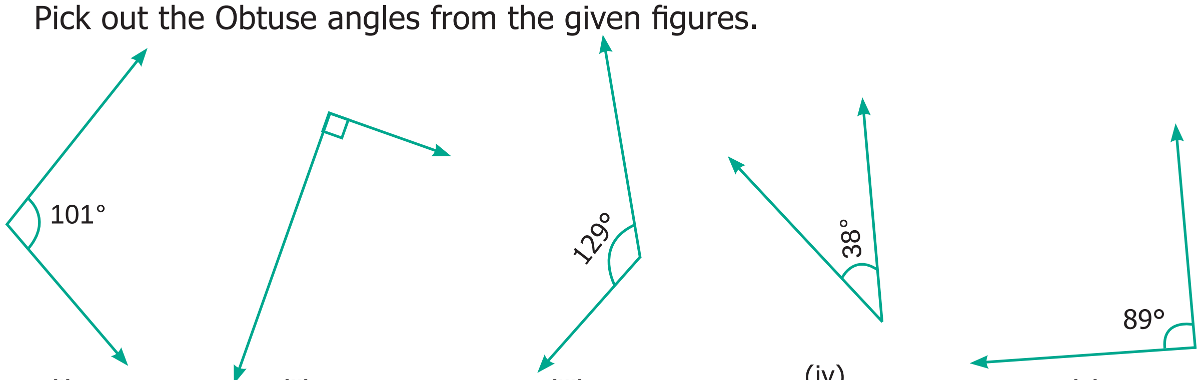
(i) (ii) (iii) (iv) (v)

4. Pick out the Acute angles from the given figures.



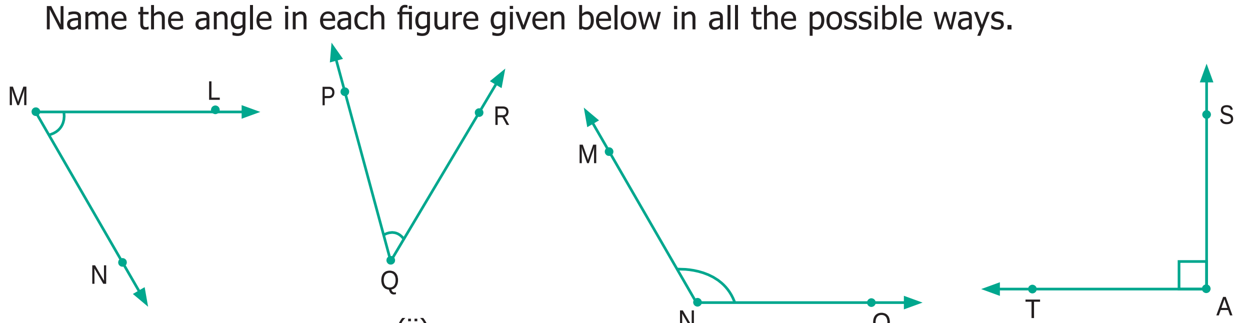
(i) (ii) (iii) (iv) (v)

5. Pick out the Obtuse angles from the given figures.



(i) (ii) (iii) (iv) (v)

6. Name the angle in each figure given below in all the possible ways.



(i) (ii) (iii) (iv)

7. Say True or False.

(i) 20° and 70° are complementary.

(ii) 88° and 12° are complementary.

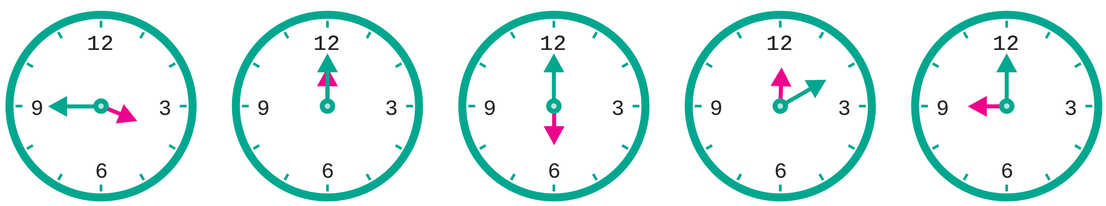
(iii) 80° and 180° are supplementary.

(iv) 0° and 180° are supplementary.

8. Draw and label each of the angles.

(i) ∠NAS = 90° (ii) ∠BIG = 35° (iii) ∠SMC = 145° (iv) ∠ABC = 180°

9. Identify the types of angles shown by the hands of the given clock.



(i) (ii) (iii) (iv) (v)

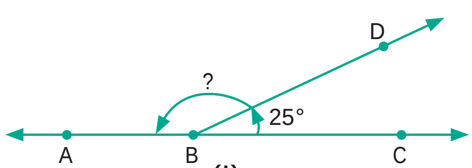
10. Find the complementary angle of

(i) 30º (ii) 26º (iii) 85º (iv) 0º (v) 90º

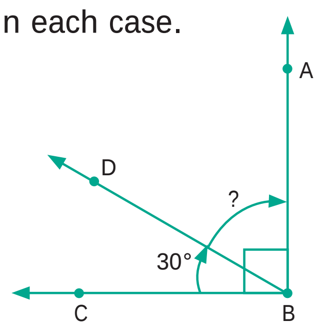
11. Find the supplementary angle of

(i) 70º (ii) 35º (iii) 165º (iv) 90º (v) 0º

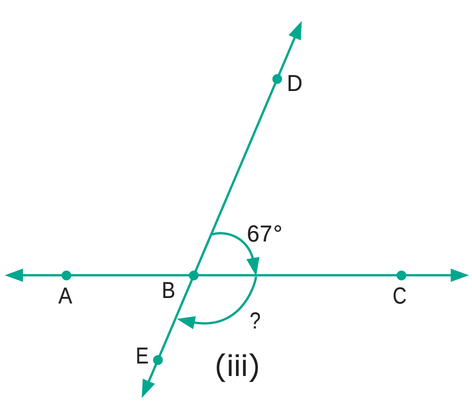
12. Find the supplementary / complementary angles in each case.



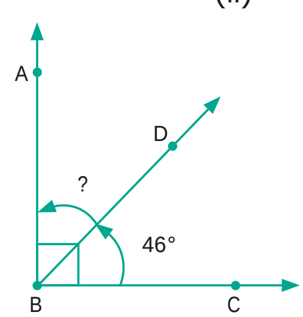
(i)



(ii)



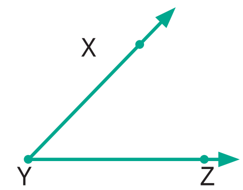
(iii)



(iv)

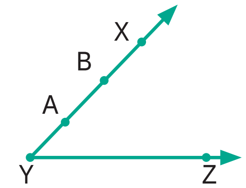
Objective Type Questions

13. In this Figure, which is not the correct way of naming an angle?



(a) ∠ Y (b) ∠ ZXY (c) ∠ ZYX (d) ∠ XYZ

14. In this Figure, ∠ AYZ = 45°. If point 'A' is shifted to point 'B' along the ray, then the measure of ∠ BYZ is ____________.



(a) more than 45° (b) 45° (c) Less than 45° (d) 90°

4.4 Points and lines

When we have a line, we can mark a point on the line or not on it.

Fig. 4.29

'A' is on 'l_1', 'B' is not on 'l_1' or 'l_2'. 'B' may be closer or far away, but not on the both of the lines 'l_1' and 'l_2'. However, when any two points are given, there is exactly ONE line passing through them! Take several pairs of points and verify if this is true.

What about 3 points and a line? Consider the following lines 'l_1' 'l_2' 'l_3' and 'l_4' and A,B,C be three points.

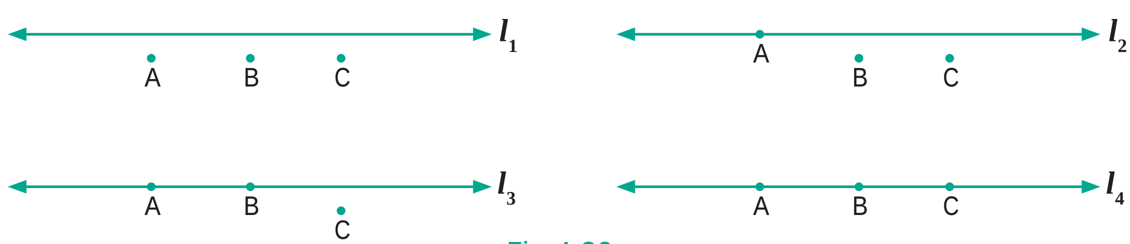


Fig 4.30

When all the three points are on a line, they are special; we call such points as collinear points.

When two lines intersect at right angles (90°), we call them as perpendicular lines. (Refer to 4.31)

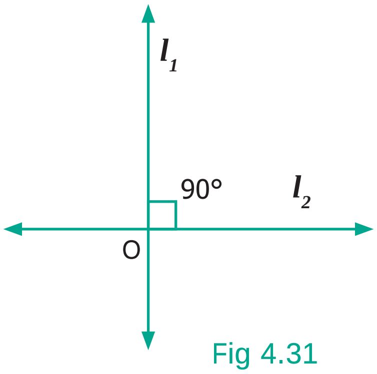
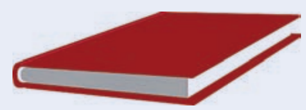


Fig 4.31

ACTIVITY

A book is an object where you can see parallel, perpendicular and intersecting lines.



Suggest atleast 2 more examples having parallel, perpendicular and intersecting lines.

Two intersecting lines cut at a point. Will three lines intersect at one point? Fig.4.32 will help you to answer this.

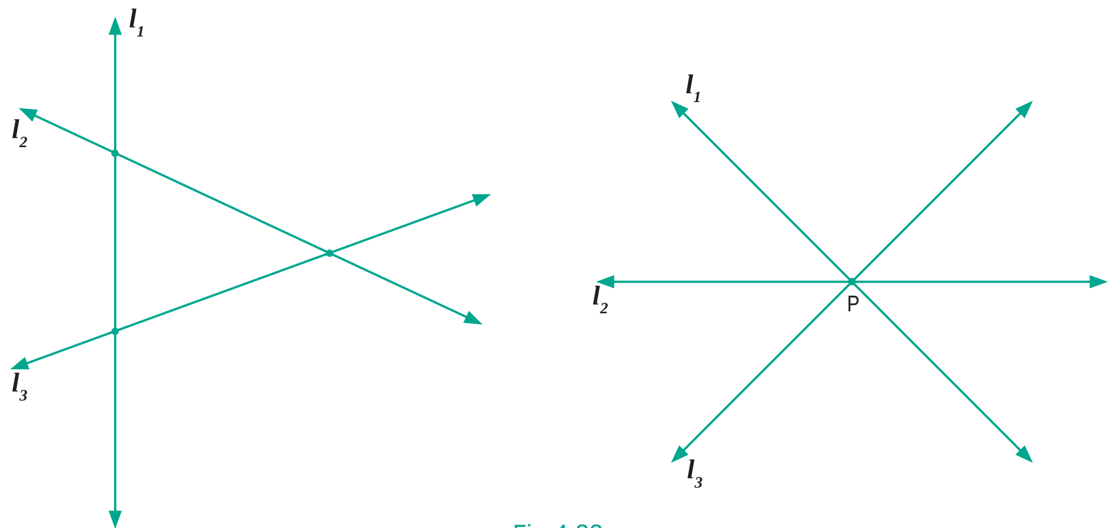
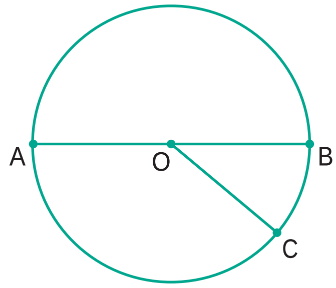


Fig 4.32

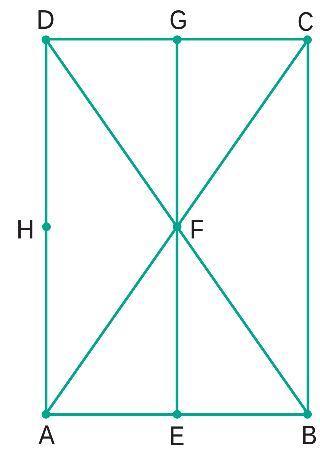
When many lines intersect at a single point, that is again special, we call that point P as a point of concurrency. The lines are called concurrent lines.

Exercise 4.3



1. Observe the diagram and fill in the blanks.
   (i) 'A', 'O' and 'B' are __________ points.
   (ii) 'A', 'O' and 'C' are __________ points.
   (iii) 'A', 'B' and 'C' are __________ points.
   (iv) __________ is the point of concurrency.
2. Draw any line and mark any 3 points that are collinear.
3. Draw any line and mark any 4 points that are not collinear.
4. Draw any 3 lines to have a point of concurrency.
5. Draw any 3 lines that are not concurrent. Find the number of points of intersection.

Objective Type Questions



6. A set of collinear points in the figure are __________.

   (a) A, B, C (b) A, F, C (c) B, C, D (d) A, C, D

7. A set of non-collinear points in the figure are __________.

   (a) A, F, C (b) B, F, D (c) E, F, G (d) A, D, C

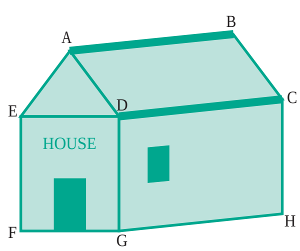
8. A point of concurrency in the figure is __________.

   (a) E (b) F (c) G (d) H

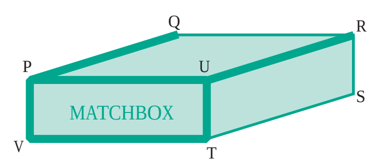
Exercise 4.4

Miscellaneous Practice Problems

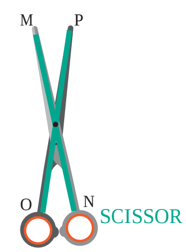
1. Find the type of lines marked in thick lines (Parallel, intersecting or perpendicular).



(i)

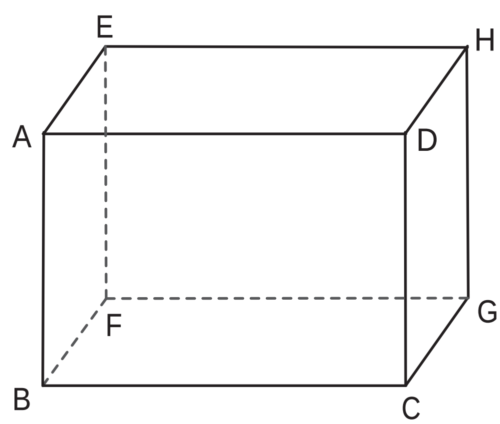


(ii)



(iii)

2. Find the parallel and intersecting line segments in the picture given below.



3. Name the following angles as shown in the figure.

   (i) $\angle 1$ =

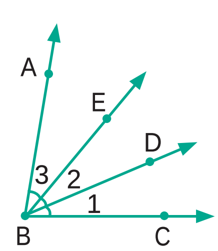
   (ii) $\angle 2$ =

   (iii) $\angle 3$ =

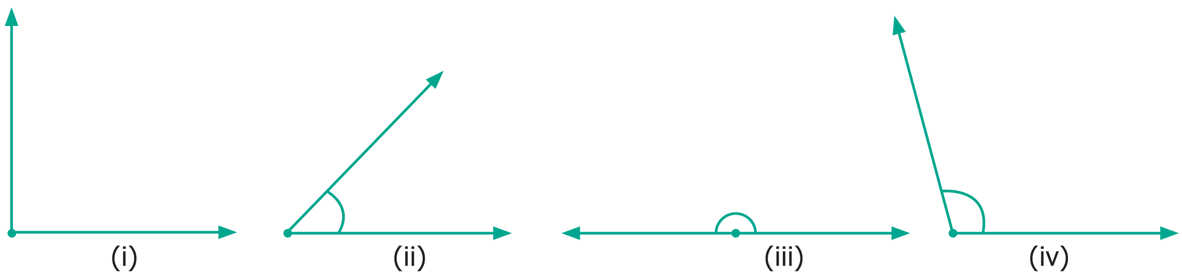
   (iv) $\angle 1 + \angle 2$ =

   (v) $\angle 2 + \angle 3$ =

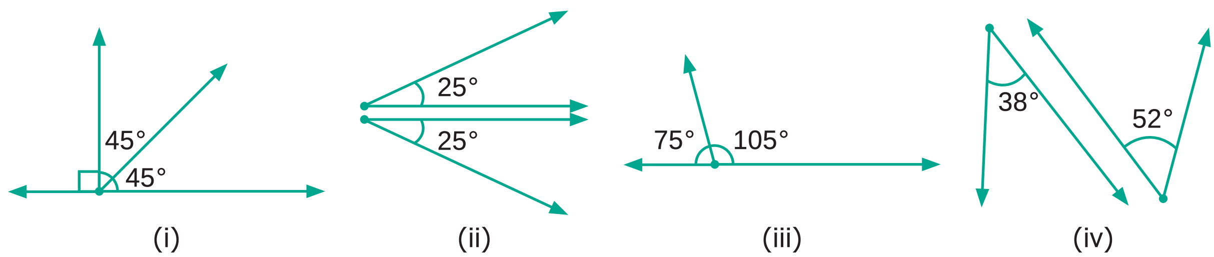
   (vi) $\angle 1 + \angle 2 + \angle 3$ =



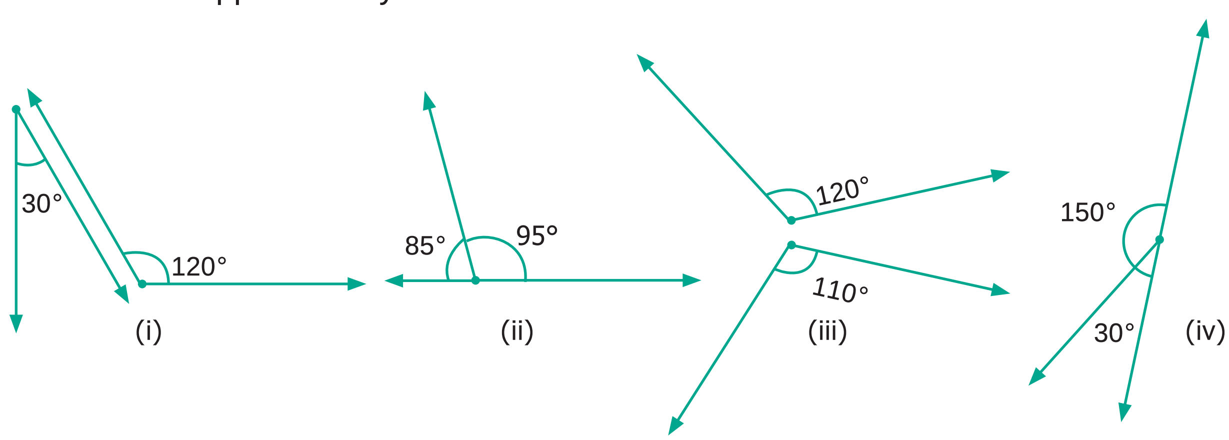
4. Measure the angles of the given figures using protractor and identify the type of angle as acute, obtuse, right or straight.



5. From the figures given below, classify the following pairs of angles into complementary and non complementary.



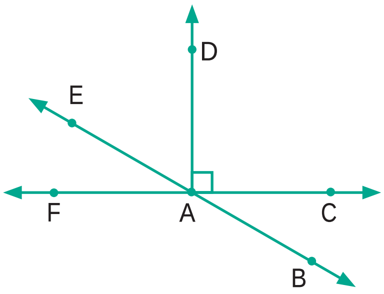
6. From the figures given below, classify the following pairs of angles into supplementary and non supplementary.



7. From the figure

(i) name a pair of complementary angles

(ii) name a pair of supplementary angles



Challenging Problems

8. Think and write an object having
   - Parallel lines (1) ________ (2) ________ (3) ________
   - Perpendicular lines (1) ________ (2) ________ (3) ________
   - Intersecting lines (1) ________ (2) ________ (3) ________
9. Which angle is equal to twice its complement?
10. Which angle is equal to two-third of its supplement?
11. Given two angles are supplementary and one angle is 20° more than other. Find the two angles.
12. Two complementary angles are in ratio 7:2. Find the angles.
13. Two supplementary angles are in ratio 5:4. Find the angles.

Summary

- A line extends along both directions without end.
- A line segment has two end points.
- Parallel lines never meet.
- When two lines meet they are called intersecting lines.
- When two rays have common starting point, they form an angle at that point.
- We measure angles using protractor.
- An angle whose measure is less than 90° is called an acute angle.
- An angle whose measure is exactly 90° is called a right angle.
- An angle whose measure is greater than 90° is called an obtuse angle.
- When the two rays or lines coincide, they are said to make angle zero, that is 0°.
- Two angles are complementary when they add up to 90°.
- Two angles are supplementary when they add up to 180°.
- Given any two points there is a unique line passing through them.
- When three points lie on a line, they are said to be collinear.
- When two lines meet each other at 90° at the point of intersection, they are called perpendicular lines.
- When three or more lines pass through the same point, they are said to be concurrent. That point is called the Point of Concurrency.

ICT Corner

GEOMETRY

Expected Result is shown in this picture

Step – 1

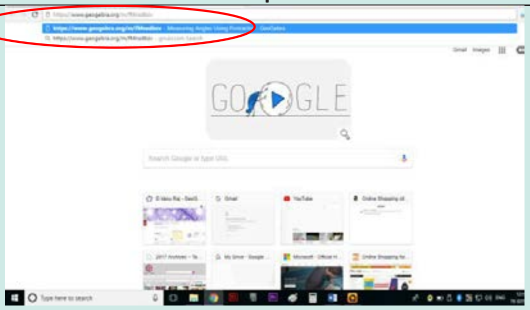
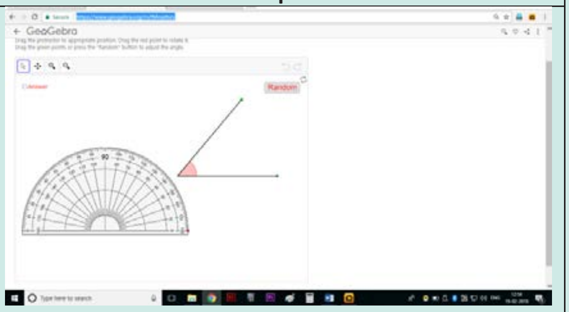
Open the Browser, copy and paste the link given below (or) by type the URL given (or) Scan the QR Code.

Step - 2

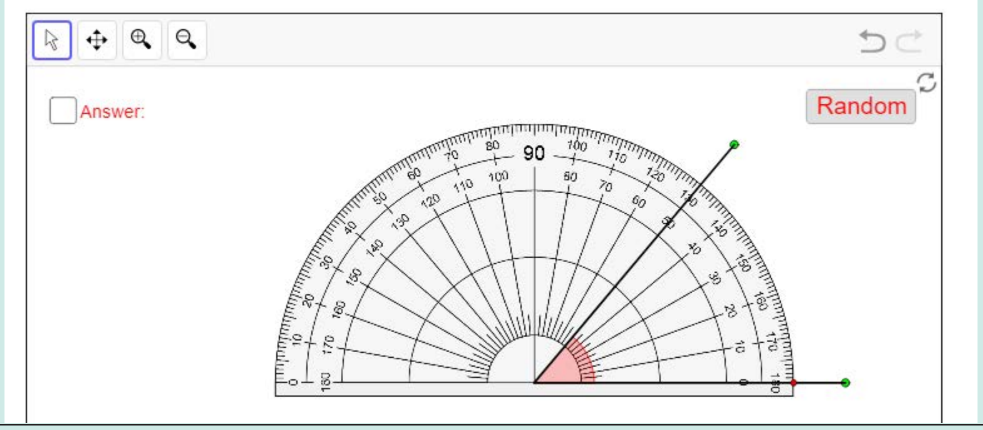
GeoGebra Work Book called "Measuring Angles Using Protractor" will appear. An angle and a Protractor will appear.

Step-3

Drag the protractor and place it on the angle and measure it. Now Click on the "**Answer**" Box to check whether your measurement is correct. Click on "**Random**" button to create new angle and continue till you understand how to measure the angle.

.Step-1	Step-2
	

Step-3



Browse in the link

Measuring Angles: https://www.geogebra.org/m/fMnsdbzv