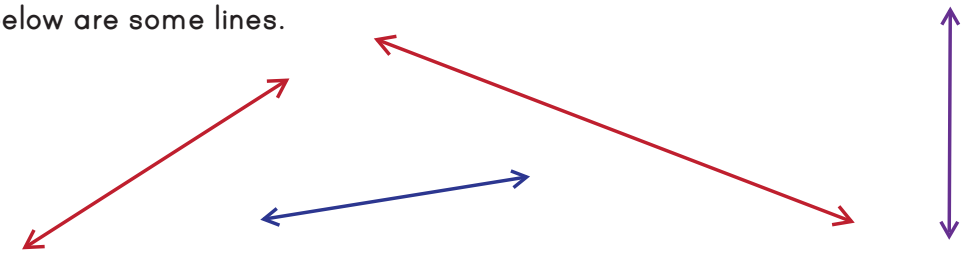
CHAPTER 8: GEOMETRY

8.1 Line

A line is a straight path without thickness.

It can be a straight path in any direction.

Below are some lines.



The arrows show that the lines can be extended in any direction.

We can also name the lines. Let's call one end of the line A and the other end B.

AB is a line. We write it as $\overleftrightarrow{AB}$.

Let's draw another line CD.

You can see that $\overleftrightarrow{CD}$ is smaller than $\overleftrightarrow{AB}$.

A line segment is a part of a line and it has two endpoints.

PQ is a line segment. We write it as $\overline{PQ}$.

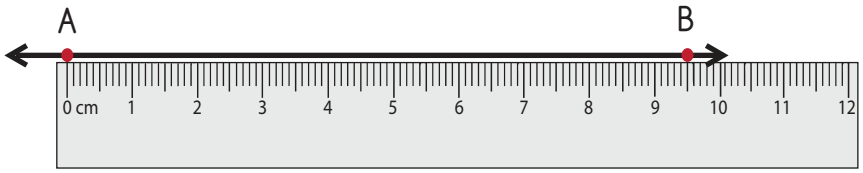
A ray is a part of a line that has one endpoint and extends in one direction without ending.

XY is a ray. We write it as $\overrightarrow{XY}$.

Let's measure the length of the line AB.

We can use a ruler to measure the length of the line.

Put your ruler over the line such that 0 of your ruler is at A. Mark the point where B is.



Point B reads 9 cm 5 mm.

The length of the line is 9 cm and 5 mm

Measure the length of the following lines.

☐ cm ☐ mm

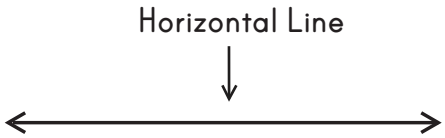
☐ cm ☐ mm

Which line is bigger, $\overleftrightarrow{MN}$ or $\overleftrightarrow{RS}$? _____

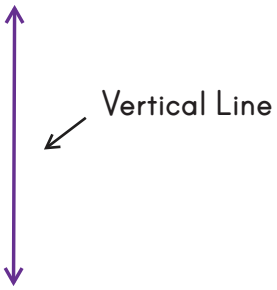
Draw a line in the given space and find its length.

Horizontal and vertical lines

Look at this line.
It goes from side to side or left and right.
We call such line horizontal line.



Now, look at this line.
It goes up and down.
We call such line vertical line.



Look at the picture of the house.
There are many vertical and horizontal line segments. Can you identify them?

We will mark the vertical line segments with red and horizontal line segments with green.
There are 7 horizontal line segments and 9 vertical line segments.

Look at the water bottle.

The red line segment shows its position from the ground.
It is a vertical line segment.

Parallel and non-parallel lines

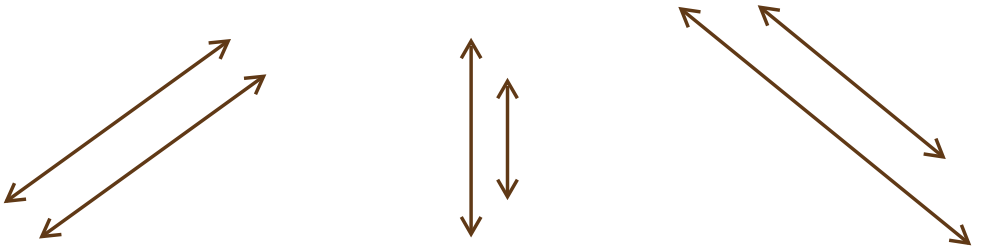
Look at these two lines.

They are always at the same distance from each other.

We call such lines parallel lines.

> Parallel lines are the lines that are at same distance from each other. They never meet each other.

Following pairs of lines show parallel lines.



Look at these two lines.

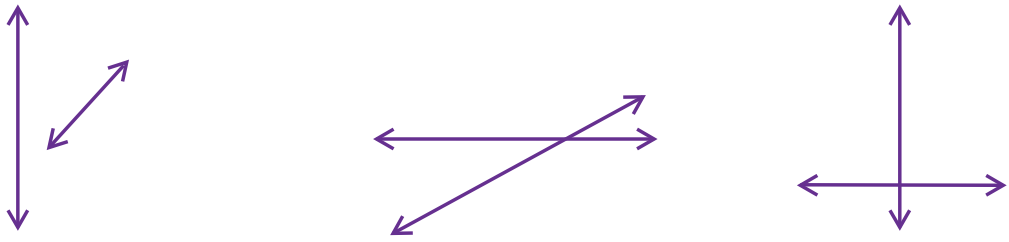
They are not always at the same distance from each other.

If we increase their length keeping same direction, they will meet.

We call such lines non-parallel lines.

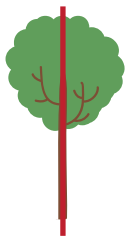
> Non-parallel lines are the lines in the same plane that are not at the same distance from each other. They cross each other.

Following pairs of lines show non-parallel lines.



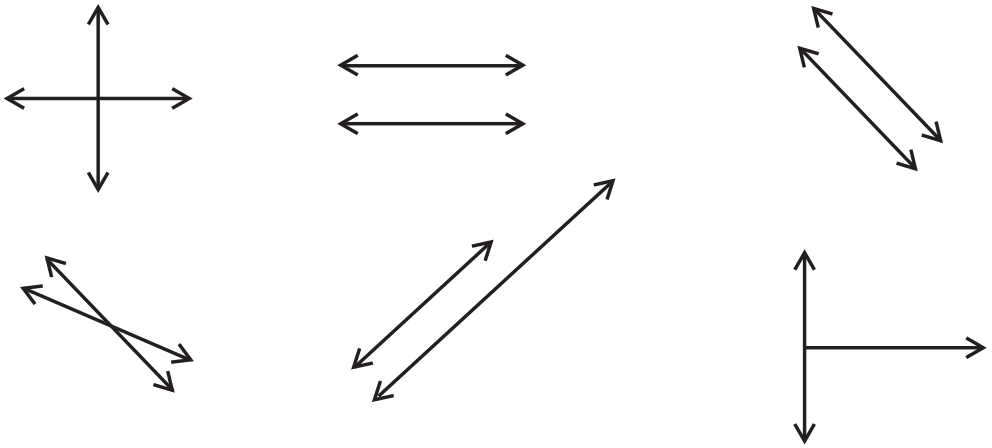
Exercise 8.1

1. The red line segments show position of different objects with respect to the ground. Identify horizontal and vertical line segment.

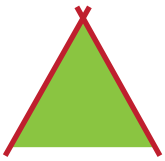


Vertical _____ _____ _____ _____

2. Circle the pairs of parallel lines from the following:



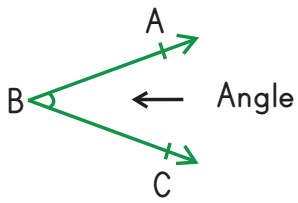
3. Decide whether the line segments marked red are parallel-or non parallel.

Parallel _____ _____ _____ _____

8.2 Identifying angles

When two non-parallel rays meet at a point, an angle is formed.



Two straight rays meet each other at point B.

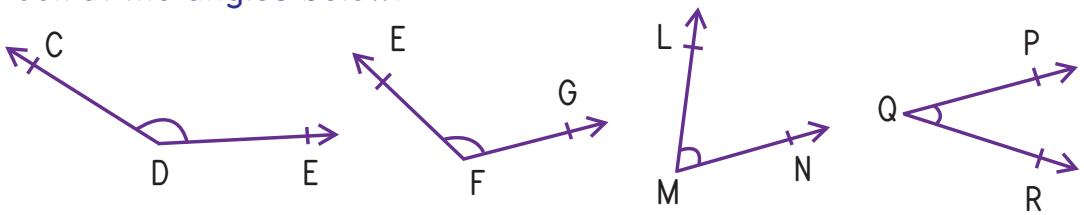
B is the vertex of the angle.

The symbol of the angle is ∠ .

We can name it ∠ABC or ∠CBA

Angle is marked with a curved line.

Look at the angles below.



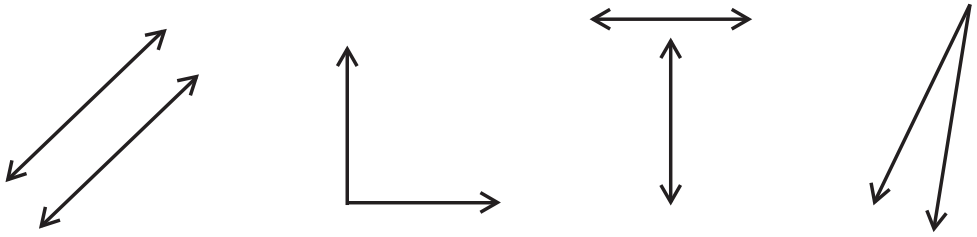
∠CDE is the greatest and ∠PQR is the smallest.

Let's try to find angles around us.

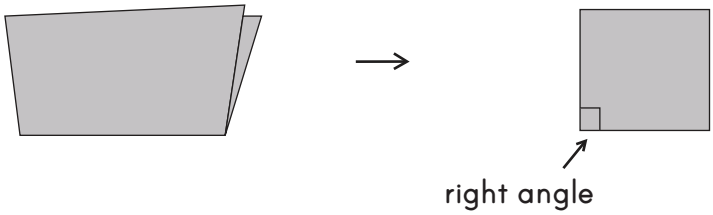
The minutes hand and the hours hand make an angle.

The blades of the scissors make an angle.

Which of these pairs of rays form an angle? Circle those pairs.

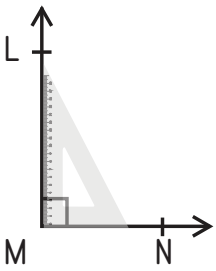


Take a piece of paper and fold it keeping the ends together.

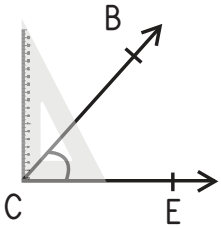


The angle at the corner of a piece of folded paper is a right angle.
It is marked as ⌞.

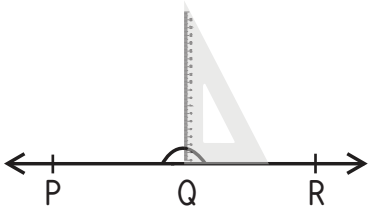
We can also use a set-square to check if an angle is right angle.



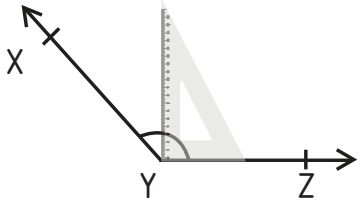
∠LMN is right angle



∠BCE is not a right angle.
It is smaller than a right angle.
We call it acute angle.

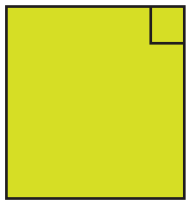


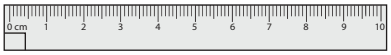
∠PQR is not a right angle.
It is double than a right angle.
We call it a straight angle.



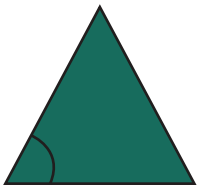
∠XYZ is not a right angle.
It is greater than a right angle
and smaller than a straight angle.
We call it obtuse angle.

We can see right angles around us.

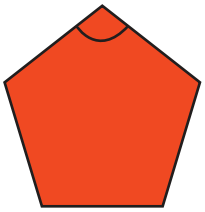


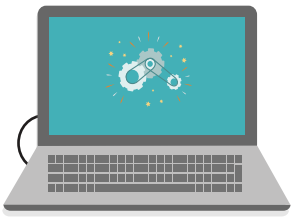


We can see acute angles around us.

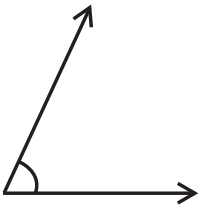


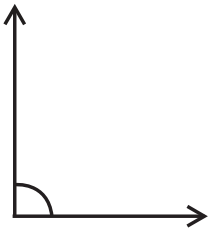
We can see obtuse angles around us.

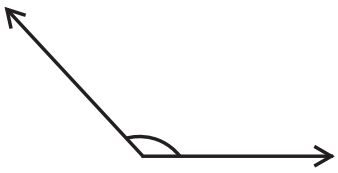




Identify right angle, acute angle and obtuse angle from below and write in the given space.



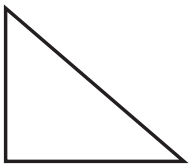


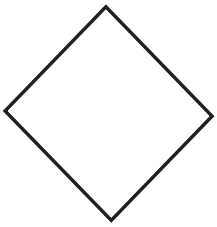


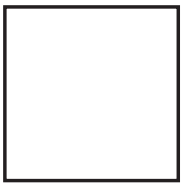
Exercise 8.2

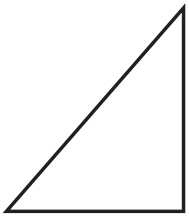
1. Mark right angles in the given shapes.

a) 

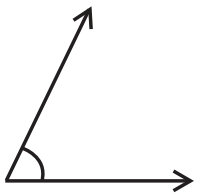
b) 

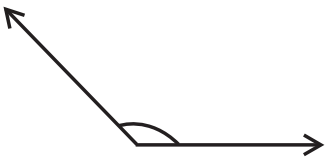
c) 

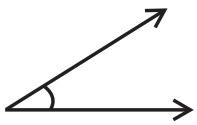
d) 

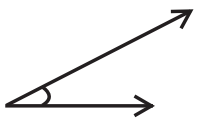
e) 

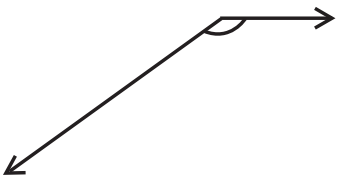
2. Identify right angles, acute angles and obtuse angles from below.

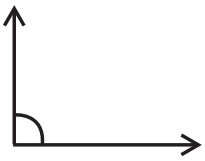
a) 

b) 

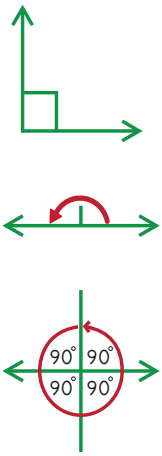
c) 

d) 

e) 

f) 

8.3 Measuring and drawing angles



We measure angles in degrees (°).

There are 90° in a right angle.

There are two right angles in a straight line.

A straight line is 180°.

$$90^\circ + 90^\circ = 180^\circ$$

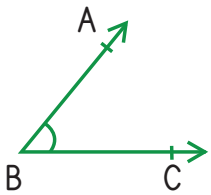
A complete circle is the same as four right angles or 360°.

$$90^\circ + 90^\circ + 90^\circ + 90^\circ = 360^\circ$$

We can say that $\frac{1}{360}$ th part of complete circle is equal to one degree.

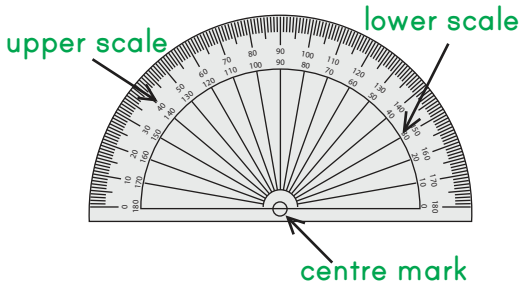
> An angle less than 90° is an acute angle.
> An angle greater than 90° but smaller than 180° is an obtuse angle.

Look at the angle ABC.



Let's measure ∠ ABC.

We can use a protractor to measure the angle.



A protractor has a centre mark, an upper scale and a lower scale.

Upper scale reads the measure of angles from left to right.

Lower scale reads the measure of angles from right to left.

Each small marking on the scales shows 1 degree (1°).

To measure ∠ABC, place the protractor on the ray BC such that the vertex is at the centre mark of the protractor. If the ray lies on the 0° of the lower scale, we read the lower scale of the protractor. If the ray lies on the 0° of the upper scale, we read the upper scale of the protractor.

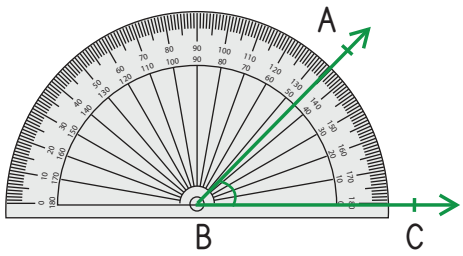
$\overrightarrow{BC}$ lies on the 0 of the lower scale.

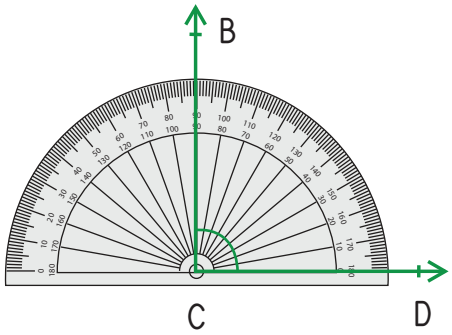
So, we will read the lower scale.

$\overrightarrow{BA}$ falls on the marking that is 2 after 45.

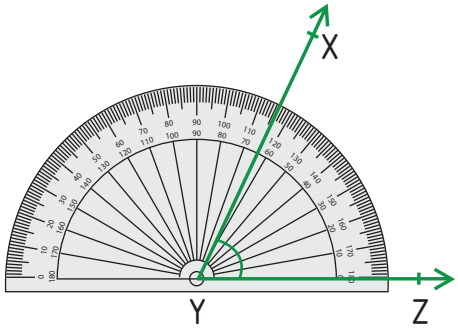
So, ∠ABC measures 47 degrees.

We can also write it as, m ∠ABC = 47°

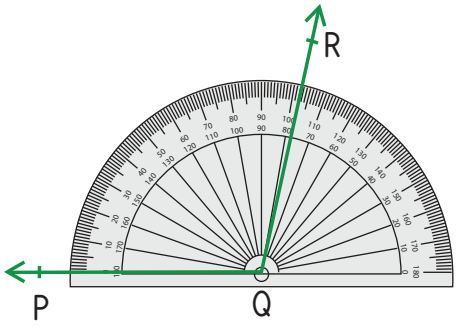




$\overrightarrow{CD}$ lies on 0° of the lower scale. So, we read the lower scale. $\overrightarrow{BC}$ meets on 90°.
m ∠BCD = 90°
∠BCD is a right angle.

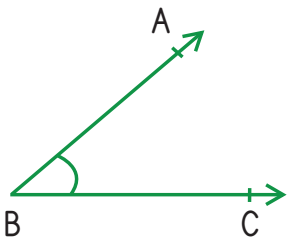


$\overrightarrow{YZ}$ lies on 0° of the lower scale. So, we read the lower scale. $\overrightarrow{XY}$ meets on 65°.
m∠ XYZ = 65°
∠XYZ is an acute angle.

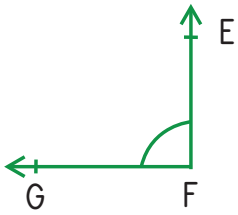


$\overrightarrow{QP}$ lies on 0° of the upper scale. So, we read the upper scale. $\overrightarrow{QR}$ meets on 102°.
m ∠ PQR = 102°
∠ PQR is an obtuse angle.

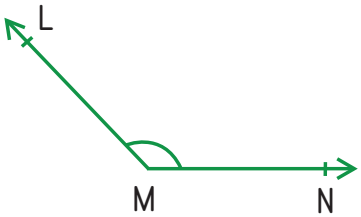
Measure the following angles:



m ∠ ABC = ☐



m ∠ EFG = ☐



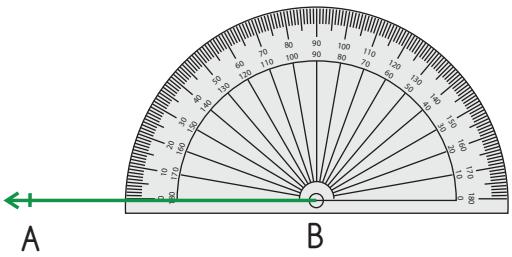
m ∠ LMN = ☐

We can also draw angles using a protractor.

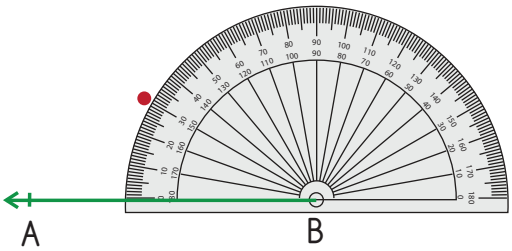
Let's draw m ∠ABC = 30°

Step 1 Draw a ray BA.

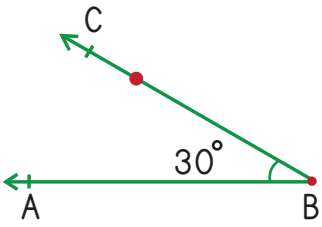
Step 2 Place the protractor on the ray BA. Make sure that the centre mark of the protractor falls on point B which is the vertex.



Step 3 Find the 30° mark on the upper scale of the protractor and mark the point as point C.



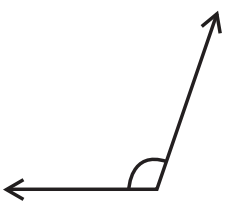
Step 4 Remove the protractor and draw a straight line joining point B and point C.

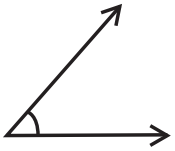


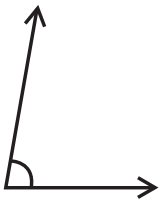
m ∠ABC = 30°

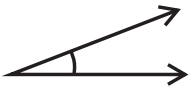
Exercise 8.3

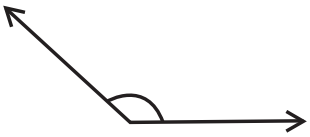
1. Use protractor to measure the following angles:

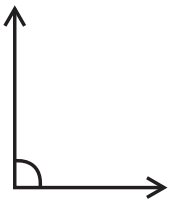
a) 

b) 

c) 

d) 

e) 

f) 

2. Use protractor to draw the following angles.

a) $m\angle ABC = 40^\circ$

b) $m\angle LMN = 90^\circ$

c) $m\angle MNO = 70^\circ$

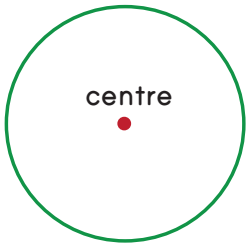
d) $m\angle ABC = 80^\circ$

e) $m\angle LMN = 120^\circ$

f) $m\angle MNO = 150^\circ$

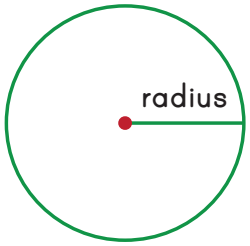
8.4 Circle

Look at the circle. It has no sides.
It has a centre.

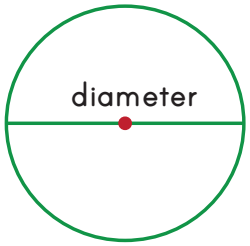


Centre is a point from which all points on the circle are at the same distance.

We can draw a line segment from the centre of the circle to any point on the circle.
This line is called radius of the circle.

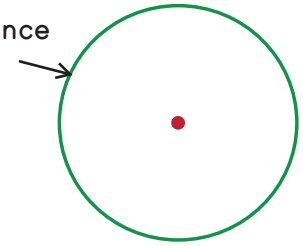


We can draw a line segment from one point of the circle to any other point of the circle, through the centre.
This line segment is called diameter of the circle.

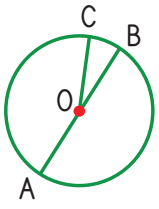


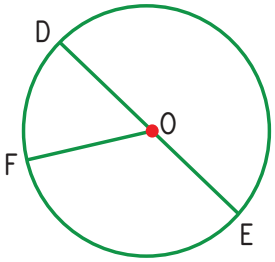
Remember that diameter is double of the radius.

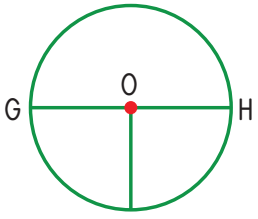
The distance around the circle is called circumference.



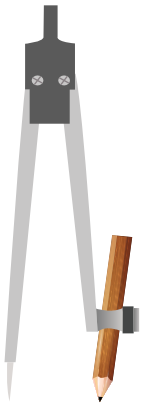
Identify the centre, radius, diameter and circumference of the following circles:







Here is a compasses.

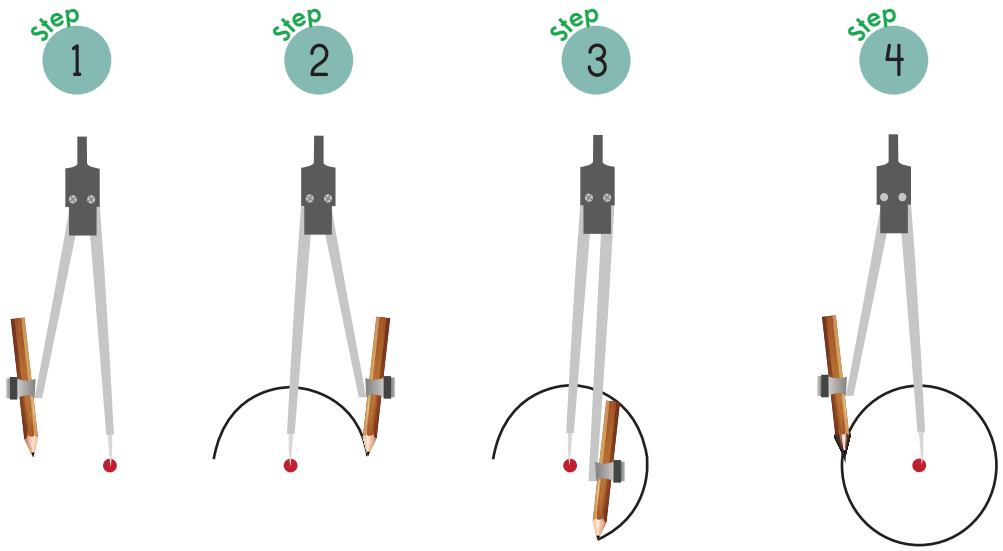


Before using it, make sure to

1. tighten the hold of the pencil so that it does not slip.
2. align the tip of the pencil with the needle.

Let's draw a circle.

Open the compasses. Press down the needle and turn the knob all the way around keeping the needle fixed. You will see a circle made.



Draw a circle in the given space.