




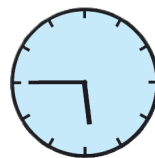


## 6. Angles

### Revision

		
This is a right angle.	This is an acute angle.	This is an obtuse angle.

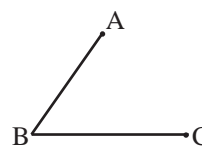
Look at the clocks given below. Write whether the hands make a right angle, an acute angle or an obtuse angle in the box below.



### Components of angles, naming an angle

**Teacher** : Monu, what does the diagram given here show?

**Monu** : The diagram shows an angle. Sir, do angles have names?



**Teacher** : Yes, angles have names. Can you see the lines in the diagram? Tell me their names.

**Monu** : This diagram has two lines, BA and BC.

**Teacher** : Which is the common point between the two lines?

**Monu** : The common point is B.

**Teacher** : These two lines join together to form an angle. The common point B is called the 'vertex'. BA and BC are the 'arms' of the angle.

**Monu** : Then, Sir, what is the name of the angle?

**Teacher** : An angle is named by three letters. The letter in the middle represents the vertex of the angle.

**Monu** : That means, the name of the angle is ABC. Is that right?

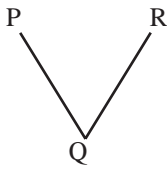
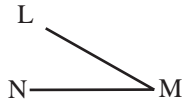
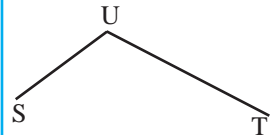
**Teacher** : Yes. While naming the angle, we say 'angle ABC'.

**Monu** : Sir, instead of 'angle ABC', can we say 'angle CBA'?

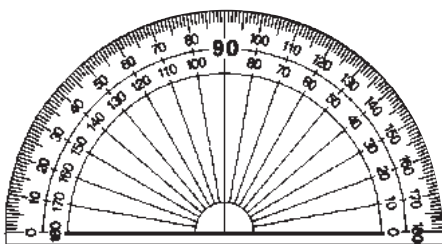
**Teacher** : Yes, we can call the angle ‘angle ABC’ or ‘angle CBA’. Both are correct. The symbol ‘ $\angle$ ’ represents the word ‘angle’. We use this symbol to write ‘angle ABC’ as ‘ $\angle ABC$ ’.

### Problem Set 24

Complete the following table.

Diagram	Name of the angle	Vertex	Arms of an angle
	‘ $\angle PQR$ ’ or ‘ $\angle RQP$ ’	Q	QP and QR
			
			

### □ The protractor



A protractor is used to measure an angle and also to draw an angle according to a given measure.

The picture opposite shows a protractor.

A protractor is semi-circular in shape.

The semi-circular edge of a protractor is divided into 180 equal parts. Each part is ‘one degree’. ‘One degree’ is written as ‘ $1^\circ$ ’.

The divisions on a protractor, i.e., the degrees can be marked in two ways. The divisions 0, 10, 20,

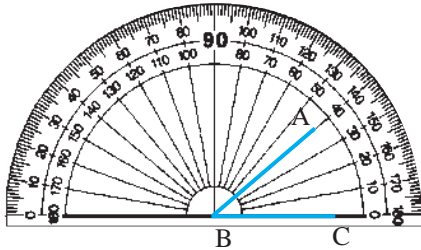
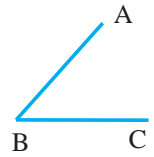
30,...180 are marked anticlockwise or from right to left; the divisions 0, 10, 20, 30,...180 are also marked clockwise, or serially from left to right.

The centre of the circle of which the protractor is a half part, is called the centre of the protractor. A diameter of that circle is the baseline or line of reference of the protractor.

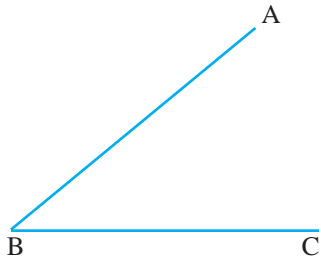


## □ Measuring angles

Observe how to measure  $\angle ABC$  given alongside, using a protractor.

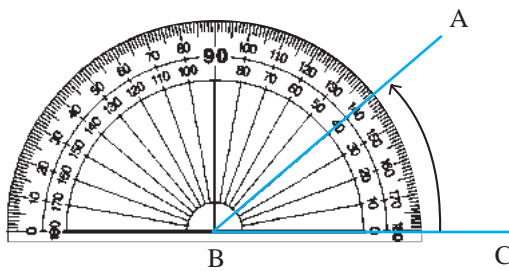


1. First, put the centre of the protractor on the vertex B of the angle. Place the baseline of the protractor exactly on arm BC. The arms of the angle do not reach the divisions on the protractor.



2. At such times, set the protractor aside and extend the arms of the angle.

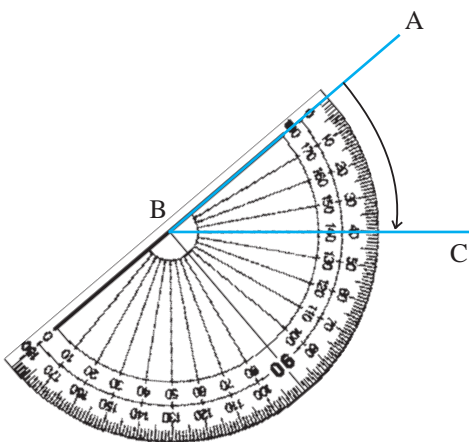
**Extending the arms of the angle does not change the measure of the angle.**



3. The angle is measured starting from the zero on that side of the vertex on which the arm of the angle lies. Here, the arm BC is on the right of the vertex B. Therefore, count the divisions starting from the 0 on the right. See which mark falls on arm BA. Read the number on that mark. This number is the measure of the angle.

The measure of  $\angle ABC$  is  $40^\circ$ .

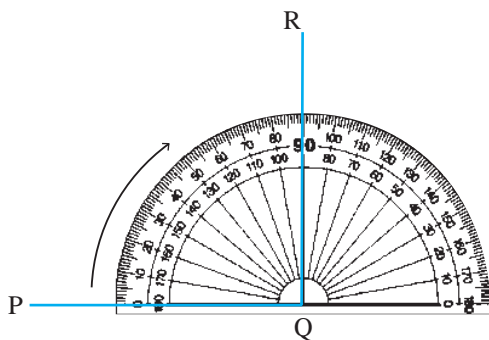
We can measure the same  $\angle ABC$  by positioning the protractor differently.



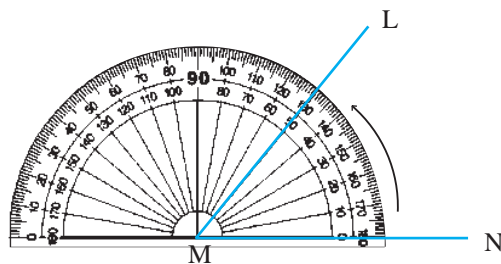
1. First put the centre point of the protractor on vertex B of the angle. Align the baseline of the protractor with arm BA.
2. Find the 0 mark on the side of BA. Count the marks starting from the 0 on the side of point A. See which mark falls on arm BC. Read the number at that point.

Observe that here, too, the measure of  $\angle ABC$  is  $40^\circ$ .

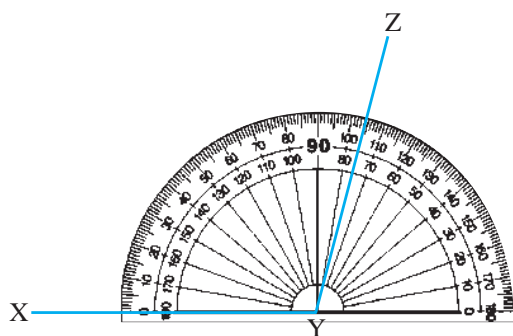
❖ See how the angles given below have been measured with the help of a protractor.



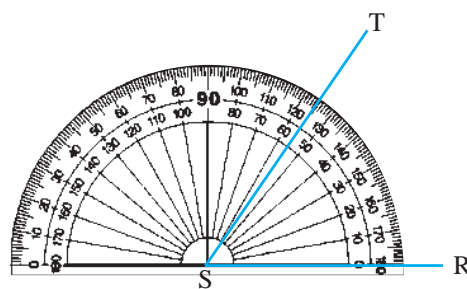
Measure of  $\angle PQR$  is:  $90^\circ$



Measure of  $\angle LMN$  is:  $50^\circ$



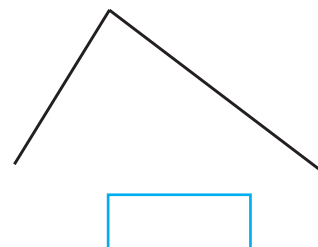
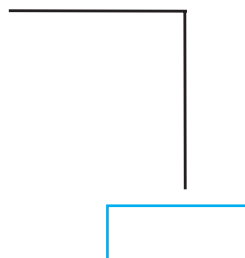
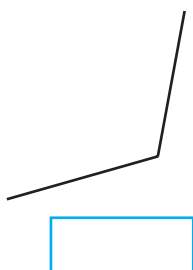
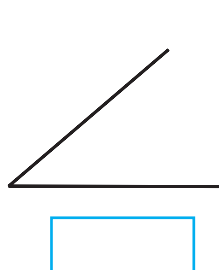
Measure of  $\angle XYZ$  is:  $105^\circ$



Measure of  $\angle RST$  is:  $55^\circ$

### Problem Set 25

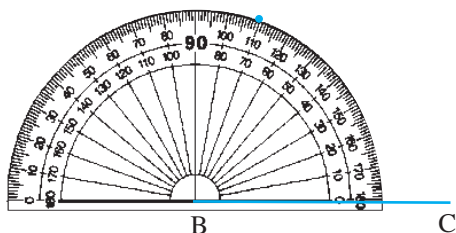
Measure the angles given below and write the measure in the given boxes.



### □ Drawing an angle of the given measure

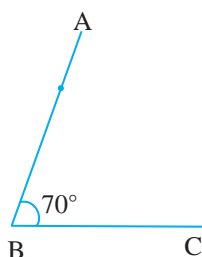
**Example** Draw  $\angle ABC$  of measure  $70^\circ$ .

B is the vertex of  $\angle ABC$  and BA and BC are its arms.



1. First draw arm BC with a ruler.
2. Since B is the vertex, we must draw a  $70^\circ$  angle at that point.

Put the centre of the protractor on B. Place the protractor so that the baseline lies on arm BC. Count the divisions starting from the 0 near point C. Mark a point with your pencil at the division that shows  $70^\circ$ . Lift the protractor.

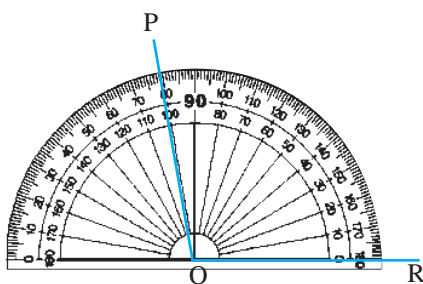


Draw a line from vertex B through the point marking the  $70^\circ$  angle. Name the other end of the line A.

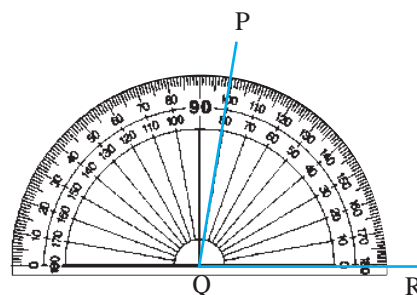
$\angle ABC$  is an angle of measure  $70^\circ$ .

❖ Rahul and Sayali drew  $\angle PQR$  of measure  $80^\circ$  as shown below.

Rahul's angle



Sayali's angle



**Teacher** : Have Rahul and Sayali drawn the angles correctly ?

**Shalaka** : Sir, Rahul's angle is wrong. Sayali's angle is correct.

**Teacher** : Why is Rahul's angle wrong ?

**Rahul** : I counted 10, 20, 30...from the left and drew the angle at 80.

**Teacher** : Rahul measured the angle from the left. Under the baseline on the left of Q, there is nothing. The arm of the angle is on the right of Q. Therefore, the point should have been marked  $80^\circ$  counting from the right side, that is, on the side on which point R lies.

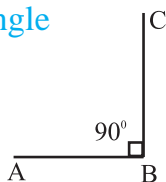
### Problem Set 26

Draw and name the following angles with the help of a protractor.

- (1)  $60^\circ$       (2)  $120^\circ$       (3)  $90^\circ$       (4)  $150^\circ$       (5)  $30^\circ$       (6)  $165^\circ$       (7)  $45^\circ$

#### Types of angles

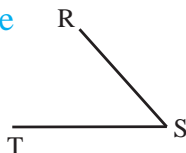
**Right angle**



$\angle ABC$  is a right angle.

Angles of measure  $90^\circ$  are called right angles.

**Acute angle**

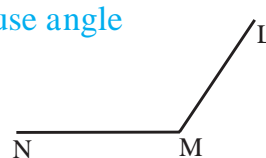


$\angle RST$  measures less than  $90^\circ$ , that is, less than a right angle.

An angle which measures less than a right angle is called an acute angle.

$\angle RST$  is an acute angle.

**Obtuse angle**

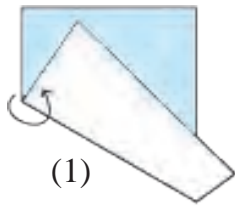


$\angle LMN$  measures more than  $90^\circ$ , that is, more than a right angle.

An angle which measures more than a right angle is called an obtuse angle.

$\angle LMN$  is an obtuse angle.

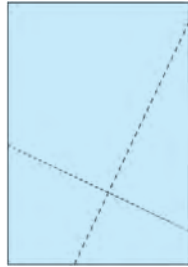
### Activity : Making a right angle by folding



(1)



(2)



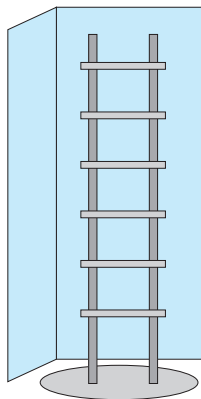
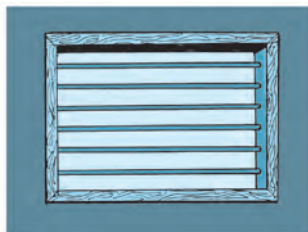
(3)

- (1) Fold a sheet of paper roughly in half.
- (2) Make another fold in the paper at any point on the first fold, as shown in the picture.
- (3) Now unfold the paper. You will find two lines. The angle between those two lines will be a right angle.

With the help of a protractor, verify that the measure of this angle is  $90^\circ$ .

### □ Parallel and perpendicular lines

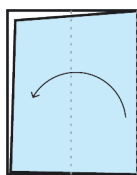
#### □ Parallel lines



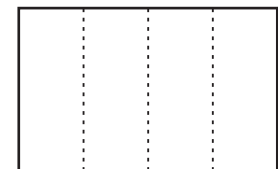
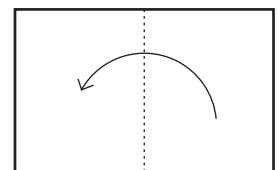
The **bars on the window** in the picture are parallel to each other.

The **steps on the ladder** in the picture are parallel to each other.

The **vertical legs of the ladder** are parallel to each other.



1. Take a rectangular piece of paper.
2. Fold it in such a way that one edge falls exactly on the opposite edge.
3. Make another fold in the same way.
4. Unfold the paper and trace the lines made by the folds, with a pencil.



**The lines traced with the pencil are parallel to each other.**

The lines shown alongside are not of equal length, yet they are **parallel** to each other.

**Parallel lines do not intersect, that is, they do not cut each other, no matter how far they are extended on either side.**



Take a ruler as shown in the picture.

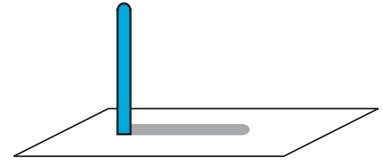
Using a pencil, draw lines along both sides of the ruler. Put the ruler aside. The two lines are parallel to each other.

In this way, we can use several rectangular objects to draw parallel lines.

## □ Perpendicular lines

We have seen many objects standing straight on the ground. These objects form a right angle with their shadows.

For example, the angle formed by a pole and its shadow on the ground is  $90^\circ$  or a right angle. Similarly, adjacent sides of wooden planks or books also form angles of  $90^\circ$ .

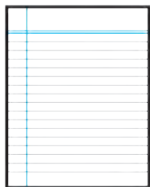


When two lines form an angle of  $90^\circ$  with each other, they are said to be **perpendicular** to each other. To show that two lines are perpendicular, a symbol as shown the figure is drawn between them.



Measure the angle between any two adjacent sides of your notebook.

Since it is a right angle, the two sides are perpendicular to each other.

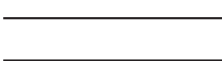


Look at this picture of a page of a notebook.

The horizontal lines on the paper are parallel to each other. However, the vertical margin line on the side forms a right angle with the horizontal lines, therefore, it is perpendicular to the horizontal lines.

## Problem Set 27

1. Give two examples of parallel lines you can see in your environment.
2. Give two examples of perpendicular lines you can see in your environment.
3. Look at the pictures given below. Decide whether the lines given in each picture are parallel or perpendicular to each other and write the answer in the box.



Parallel lines



Perpendicular lines

