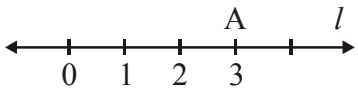
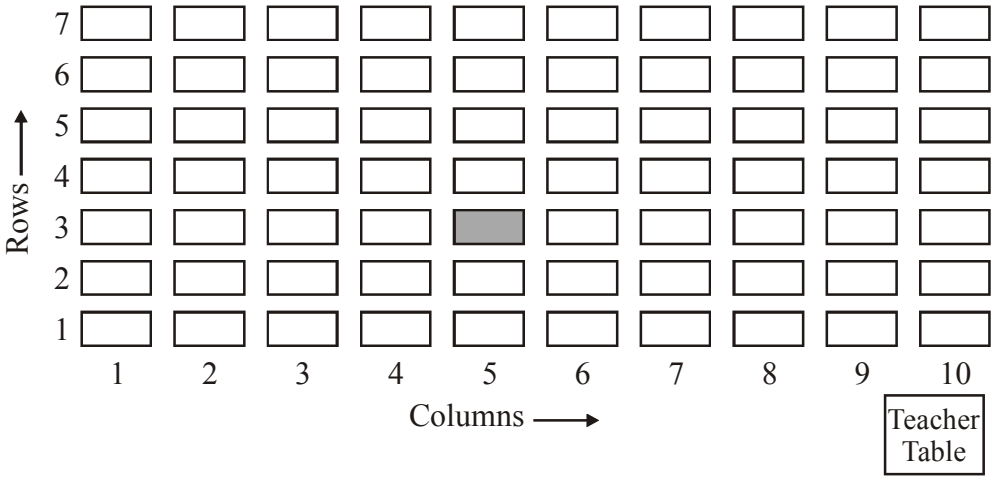
10 INTRODCTION TO GRAPH

10.1 INTRODUCTION



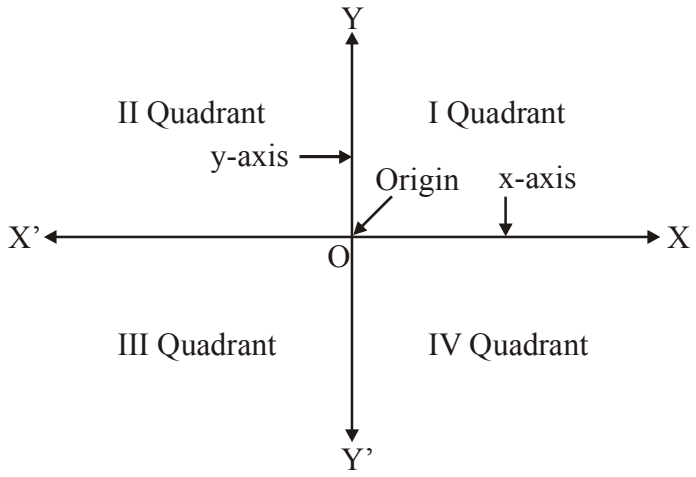
There are several occassions when you are asked the whereabouts of a certain things. For example, if you are asked the poistionof the point A on the line *l*, you would say, it is 3 units away on the right of 0 (zero).
But if your are asked the whereabout of your desk in your classroom, how would you answer ?



You might say that it is in the fifth column and the third row. We agree to write this as (5, 3) and this means 5 columns across from the left hand side and 3 rows back.
Does (3, 5) means the same position? **No**
It is clear that the order of the numbers inside the brackets is very important and so we call pairs like these as **ordered pairs.**

10.2 COORDINATES

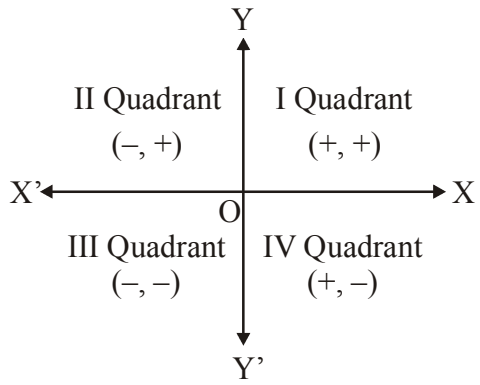
A great deal of what we have talked in the previous section of this chapter was developed by great French mathematician, Rene Descartes, who lived in the seventh century.
Let us consider a plane covered with a network of lines as shown in figure. A paper with this type of network of lines is called graph paper. Again consider two mutually perpendicular lines.
The horizontal line (across the page) XOX' is called x-axis or the axis of x. The vertical line (up the page) YOY' is called y-axis or axis of y. Together XOX' and YOY' are called **Coordinate axis**. The plane containing the coordinate axes is called **Cartesian plane** or **Coordinate plane**. the point where the two lines intersect is called Origin. Thus O is the origin. Each of these axes represents a number line.
The coordinate axes divide the coordinate palne into four quadrants. They are named as I quadrant, II quadrant, III quadrant and IV quadrant as shown in figure.



Note : The quadrants are fixed and don't change places.

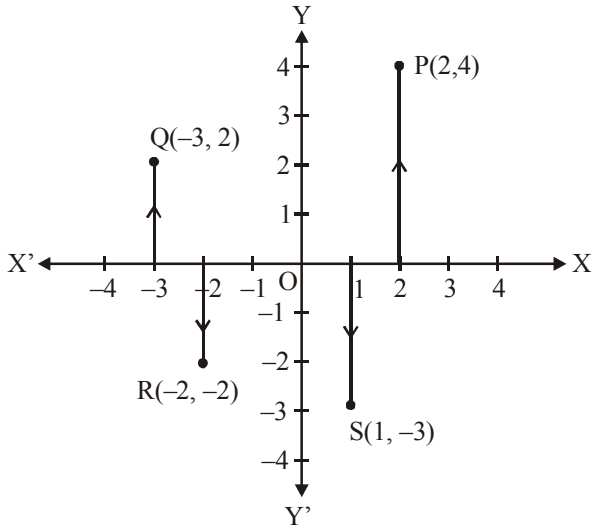
10.3 LOCATING POINT IN A COORDINATE PLANE

A x-coordinate is also called abscissa and the y-coordinate is called ordinate.



10.4 PLOTTING OF POINTS IN A CARTESIAN PLANE

to find the position of a point in a cartesian palne is called plotting a point.



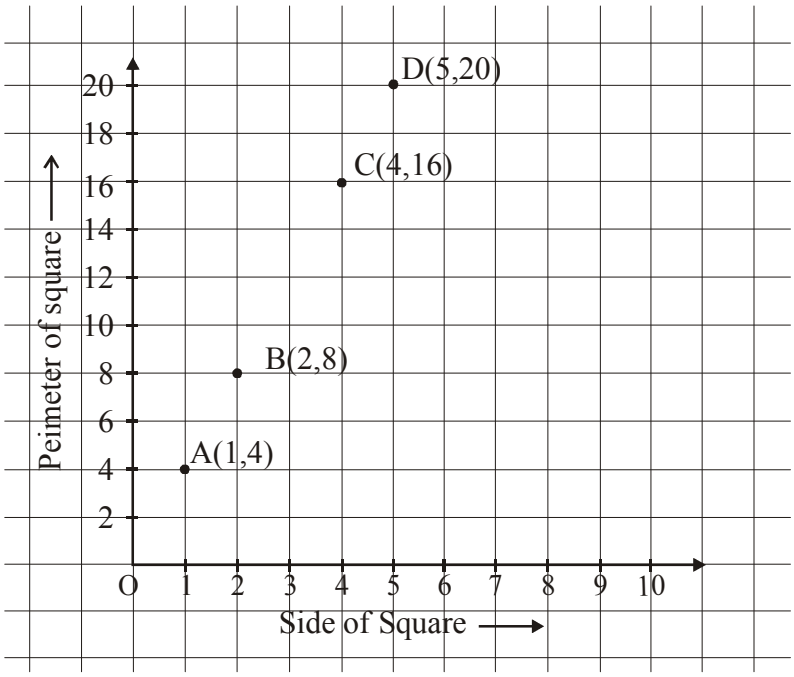
To plot P(2, 4), we starts from O and move 2 units along x-axis to the right of O and reach the point marked 2. then we move 4 units above x-axis. Make a point at that place and write P(2, 4).
To plot R(–2, –2), we move 2 units to the left of O on the x-axis and reach the point marked –2. Then we move 2 units below x-axis. mark a point at that place and write R (–2, –2).

10.5 PLOTTING OF POINTS IN DIFFFERENT SITUATIONS

(a) **Perimeter vs. side of a Square** : Let us find the perimeter of squares having sides 1 cm, 2cm, 4cm, 5cm and tabulate the result.

Side of the square (in cm)	Perimeter of the square (4 × side)cm	(Side, perimeter)
1	4	(1, 4)
2	8	(2, 8)
4	16	(4, 16)
5	20	(5, 20)

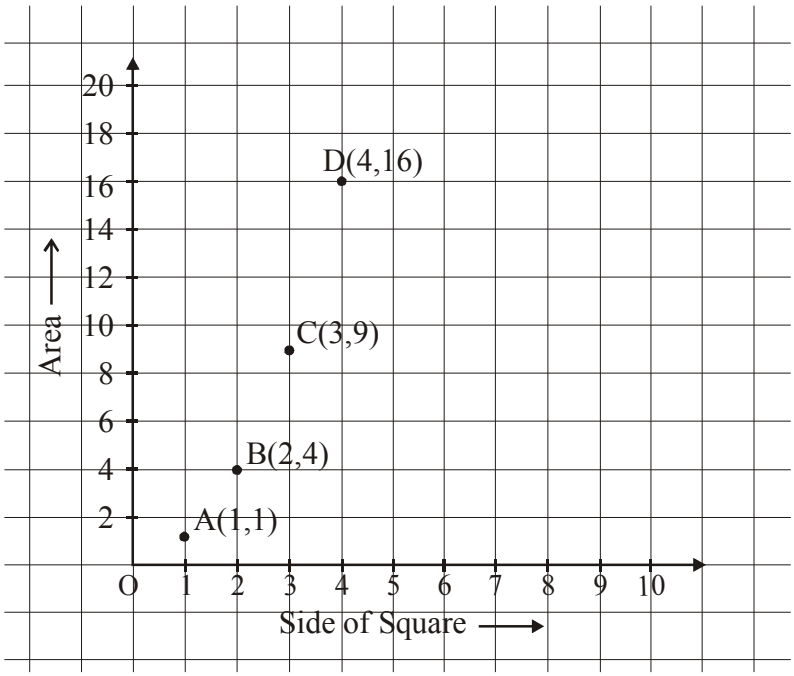
Draw coordinate axes. Take side of the square along x-axis and perimeter of square along y-axis. Then plot the points as shown in figure.



(b) **Area vs. Side of a square :** Let us find the area of squares having sides 1 cm, 2cm, 3cm, 4cm and tabulate the result.

Side of the square (in cm)	Area of the square (in cm^2)	(Side, area)
1	1	(1, 1)
2	4	(2, 4)
3	9	(3, 9)
4	16	(4, 16)

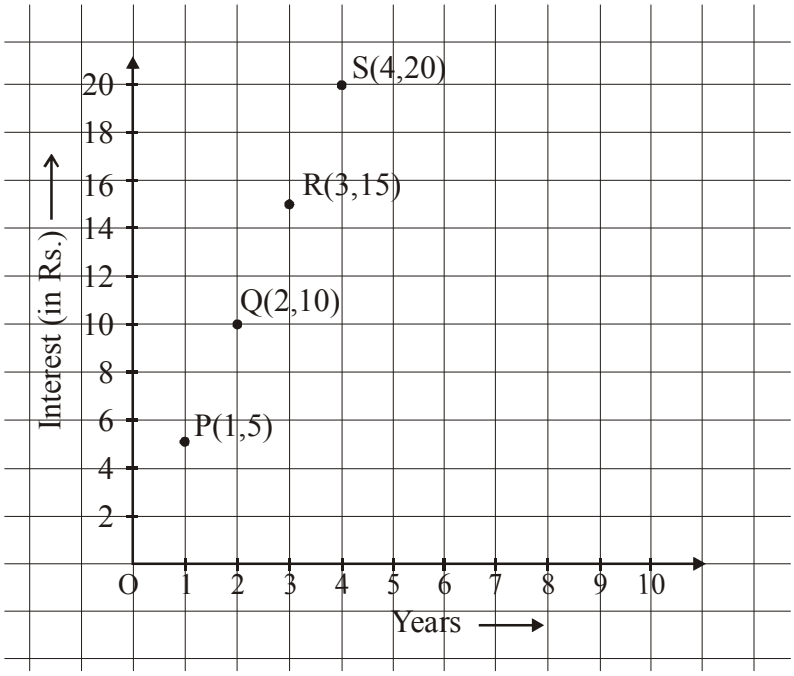
Draw coordinae axes. Take side of the square along x-axis and area along y-axis. Then plot the points as shown in figure.



(c) **Simple Interest vs. Numbr of Years :** Let us find the simple interest for 1 year, 2 years and 3 years and 4 years on Rs. 100 at 5% p.a. and tabulate the result.

No. of years	S.I.(in Rs.)	(Years, interest)
1	5	(1, 5)
2	10	(2, 10)
3	15	(3, 15)
4	20	(4, 20)

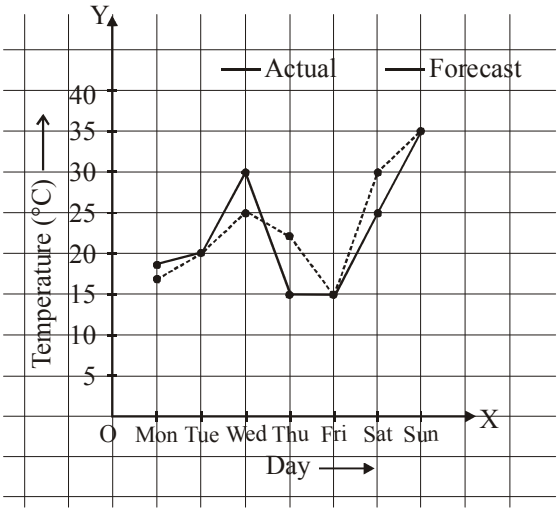
Draw coordinate axes. Take number of yars along x-axis and the interest along y-axis. Then plot the points as shwon in figure.



SOLVED EXAMPLE

Example 1 :

The following graph shows the temperature forecast and the actual teperature for each day of a week.



Read the above graph and answer the following questions :

(a) On which days was forecast temperature the same as the actual temperature ?

(b) What was the maximum forecast temperature during the week ?

(c) What was the minimum actual temperature during the week ?

(d) On which day the actual temperature differs the most from the forecast temperature ?

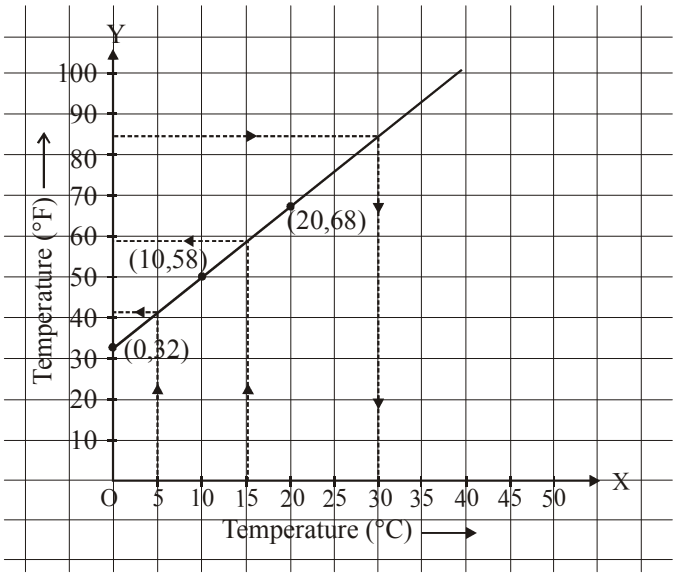
Solution :

(a) Tuesday, Firday and Sunday (b) 35ºC (c) 18ºC (d) Thursday

Example 2 :

The following table gives the body temperaure in ºF corresponding to ºC. Draw graph using this table and answer questions that follow :

Temperature (°C)	0	10	20
Temperature (°F)	32	50	68



(a) What will be the temperature in ºF when it is 15ºC ?
(b) What will be the temperature in ºC when it is 86ºF ?
(c) How many ºF is equivalent to 5ºC?

Solution :

Draw coordinate axes. Let 2 small divisions on x-axis represent 1ºC and 1 small division on y-axis represent 1ºF.

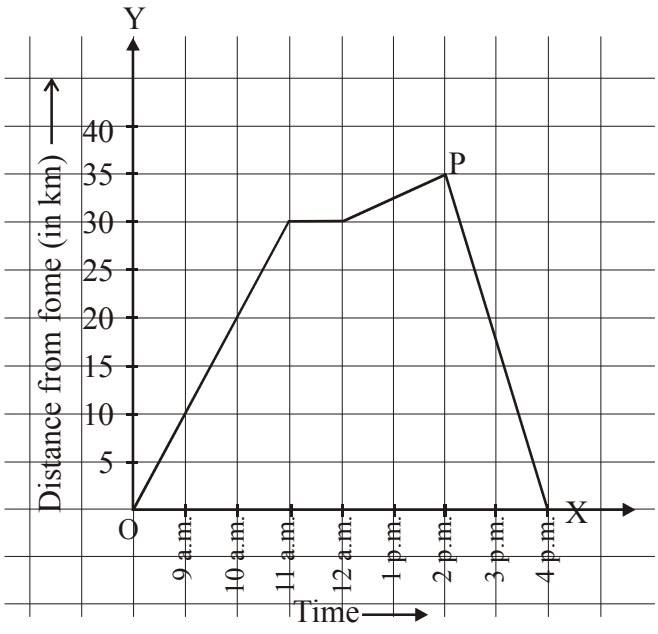
Pot the points (0, 32), (10, 50) and (20, 68) and join them. Produce the line (figure).

(a) When temperature is 15ºC, the corresponding temperature is 59ºF.
(b) Temperature corresponding to 86ºF is 30ºC.
(c) 5ºC = 41ºF.

Example 3 :

The journey of a cyclist is shown in figure. Read this graph and answer the following questions.

(a) What is the average speed of the cyclist between 9 a.m. and 11 a.m. ?
(b) During which hours the cyclist did take rest ?
(c) Why does the graph come downwards from the point P?
(d) At what time did the cyclist tart homeward journey ?
(e) What is his average speed on return journey ?



Solution :

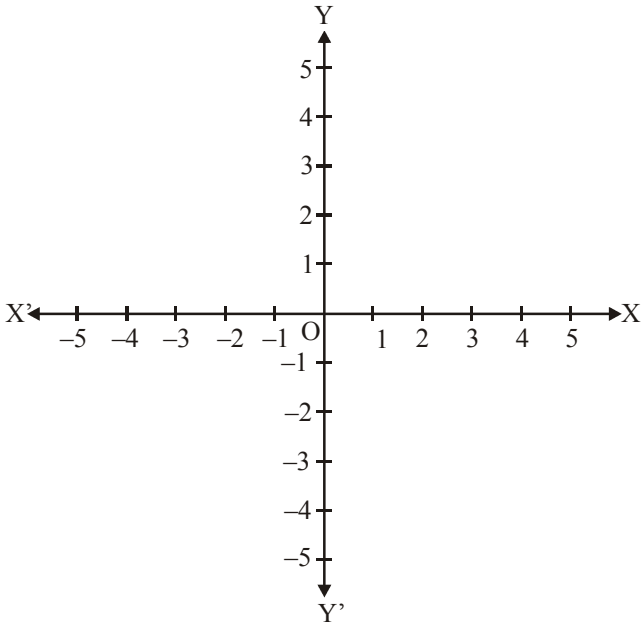
(a) Average sped $= \frac{\text{Distance}}{\text{Time}} = \frac{30}{2}$ or 15 km/hr

(b) From 11 a.m. till 12 noon, the cyclist rests.
(c) The cyclist starts homeward journey.
(d) The cyclist starts homeward journey at 2 p.m.

(e) His average speed on return journey $= \frac{35}{2}$ or $17\frac{1}{2}$ km/hr

Example 4 :

Plot the following points on a graph paper :



(i) P(–5, 1) **(ii) Q(2, –5)** **(iii) R(0, 3)** **(iv) S(–2, –4)**
(v) T(4, 1) **(vi) U(0, –2)**

Solution