INTRODUCTION TO GRAPHS

(A) Main Concepts and Results

- Graphical representation of data is easier to understand.

- A **bar graph**, a **pie chart** and **histogram** are graphical representations of data.

- A **line graph** displays data that changes continuously over periods of time.

- A line graph in which all the line segments form a part of a single line is called a **linear graph.**

- For fixing a point on the graph sheet, we need two mutually perpendicular lines (in which horizontal line is called x axis and the vertical line as y axis) alongwith, x coordinate (abscissa) and y coordinate (ordinate) of the point. The process of fixing a point with the help of the coordinates is known as **plotting a point in the plane.**

- The relation between a **dependent variable** and an **independent variable** is shown through a graph.

(B) Solved Examples

**In examples 1 and 2, there are four options out of which one is correct. Write the correct answer.**

Example 1 : Every point on the x axis is of the form.

　　　　　　(a) $(0, y)$　　　(b) $(x, 0)$　　　(c) (x, y)　　(d) $(x, 1)$

Solution : The correct answer is (b).

Example 2 : The given graph shows Nisha's trip to a mall by a car. Observe the graph carefully and find what was she doing between 5 pm and 7 pm?

  (a) Driving to the mall.   (b) Driving back home.

  (c) Was not driving.   (d) Not enough data to answer.
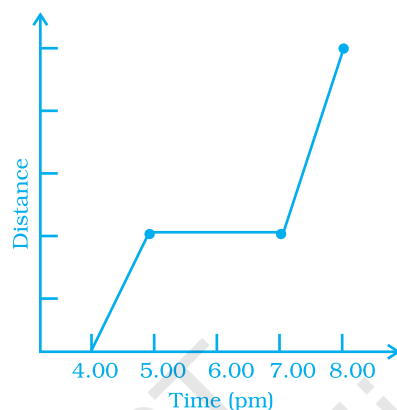
Solution   : The correct answer is (c).

In examples 3 and 4, fill in the blanks to make the statements true.

Example 3 : In a _____ graph, all the points on the graph lie on the same straight line.

Solution   : Linear.

Example 4 : The coordinates of the origin are _____

Solution   : (0, 0).

In examples 5 and 6, state whether the statements are true (T) or false (F).

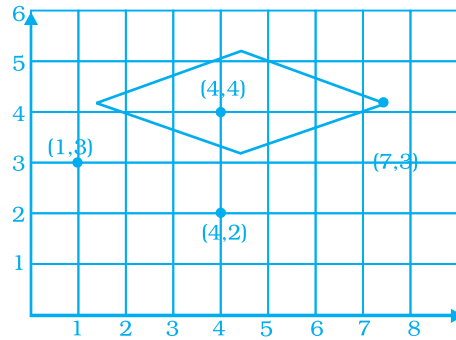**Example 5 :** Points (3, 4) and (4, 3) represent the same point on the graph.

Solution :   False.

Example 6 : The y coordinate of any point lying on the x axis will be 0.
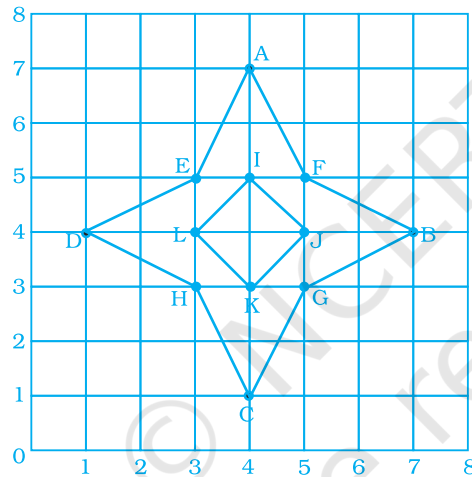
Solution :   True.

Example 7 : Plot the points (4, 4), (1, 3), (4, 2) and (7, 3) on a graph paper and connect them with line segments. Name the shape formed by these points.

Solution :

The shape formed is a rhombus.

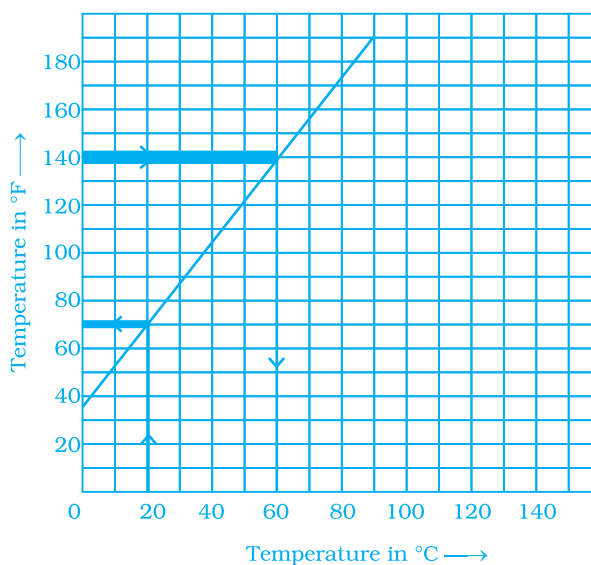**Example 8** : Write the coordinates of all the points in the given graph.

Solution : (A) (4, 7)   (E) (3, 5)   (I) (4, 5)

(B) (7, 4)   (F) (5, 5)   (J) (5, 4)

(C) (4, 1)   (G) (5, 3)   (K) (4, 3)

(D) (1, 4)   (H) (3, 3)   (L) (3, 4)

Example 9 : The following is a conversion graph of temperature in °C and °F.

Use the graph to answer the following questions.

(a) Convert 140 °F to °C.

(b) Convert 20 °C to °F

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Solution : (a) 140°F = 60°C.

(b) 20°C = 68°F

Example 10 : Following graph shows a comparison of the approximate sale of items manufactured by a company for the first two years of its operation.

(a) In which months there was maximum difference in the sale of items of two years?

(b) In which year was there more stability in the sale of items?

(c) In which month the sale remains the same in both the years?

Vocabulary Connections

To become familiar with some of the vocabulary terms in the chapter, consider the following.

1. The word origin means 'beginning.' How do you think this might apply to graphing?

2. The root of the word 'quadrant' is 'quad,' which means 'four.' What do you think a quadrant of a graph might be?

3. The word 'ordered' means 'arranged according to a rule.' Do you think it refers to a rule.' Do you think it matters which number comes first in an ordered pair? Explain.

(d) In which month was the sales of first year less than that of second year?
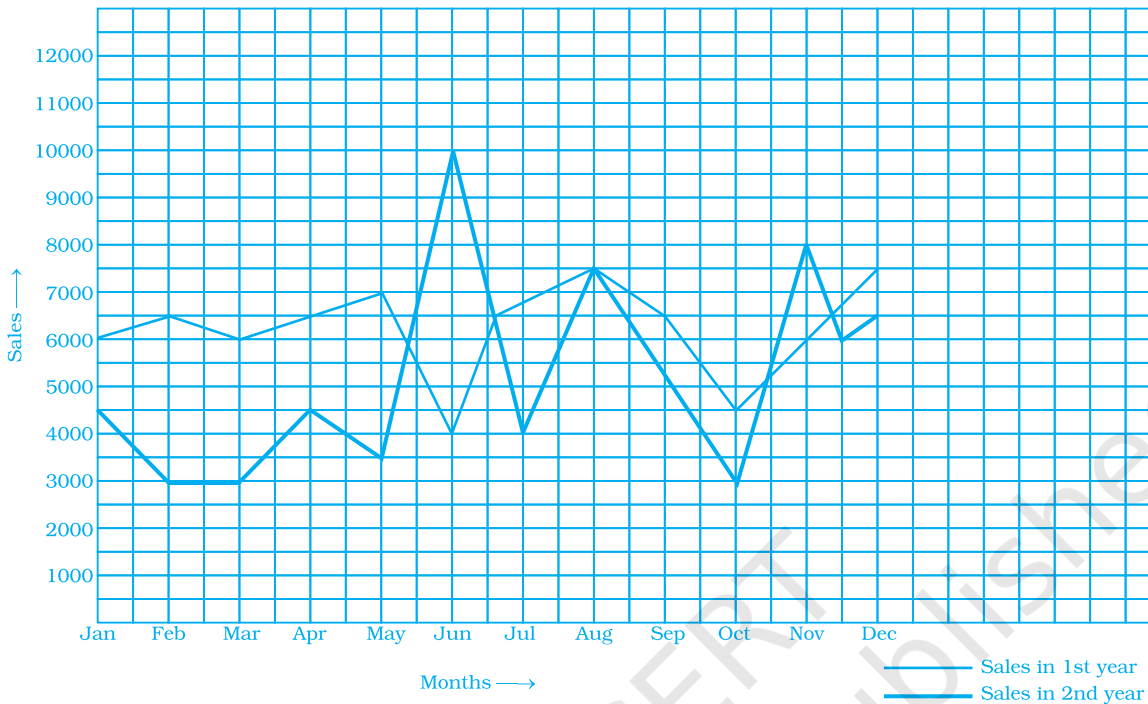
Solution : (a) The maximum difference was in June.

(b) There was more stability in sales in the first year.

(c) The sales remained the same in August.

(d) June and November.

Example 11 : The given graphs show the progress of two different cyclists during a ride. For each graph, describe the rider's progress over the period of time.
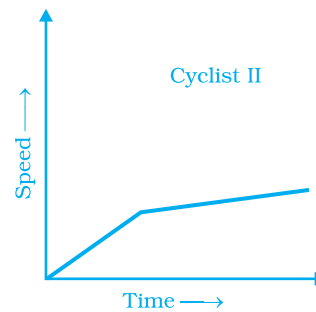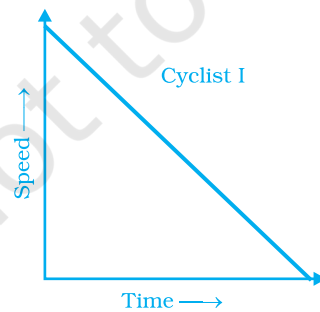
Solution : (a) As time passes, the speed of cyclist I decreases steadily.

(b) Speed of cyclist II increases for a short time period, and then increases very slowly.

Example 12 :   - A double bar graph is useful for the _____ of two sets of data.

               - Data represented in a circular form is called a _____ chart.

               - The graph of a linear equation is always a _____ line.

               - The cartesian system used two axes which are _____ to each other.

Solution :   Comparison, Pie, Straight, Perpendicular.

Think and Discuss

1. **Describe** the kind of data that is best represented by a bar graph.
2. **Give** a situation in which you would use a line graph to display data.

Application on Problem Solving Strategy

Example 11 :

Complete the given table and draw a graph for it.

x	0	1	2	3	4
$y = 2x$					

Understand and Explore the problem

- What information does the question give?

  The x-coordinates and the equation for finding the y-coordinate

- What are you trying to find?

  (1) The y-coordinates.

  (2) The coordinates of all 5 points.

  (3) Plotting the graph of these 5 points.

Plan a Strategy

- You have learnt to solve linear equations. Use the concept to find the y-coordinates by putting x = 0, 1, 2, 3, 4 in the equation y = 2x.

- Take a graph sheet and draw the 2 axes and locate the points on it. Join the points to get a graph.

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Solve

- Given $y = 2x$

  If $x = 0$, $y = 2$ (0) = 2

  If $x = 1$, $y = 2$ (1) = 2

  If $x = 2$, $y = 2$ (2) = 4

  If $x = 3$, $y = 2$ (3) = 6

  If $x = 4$, $y = 2$ (4) = 8

So the completed table will be

x	0	1	2	3	4
$y = 2x$	0	2	4	6	8

The coordinates of the 5 points are (0,0),(1, 2), (2, 4), (3, 6), (4, 8)

Take a graph sheet and plot the coordinates of these 5 points on it. Join the points to get a graph.

The graph sheet will look like this.
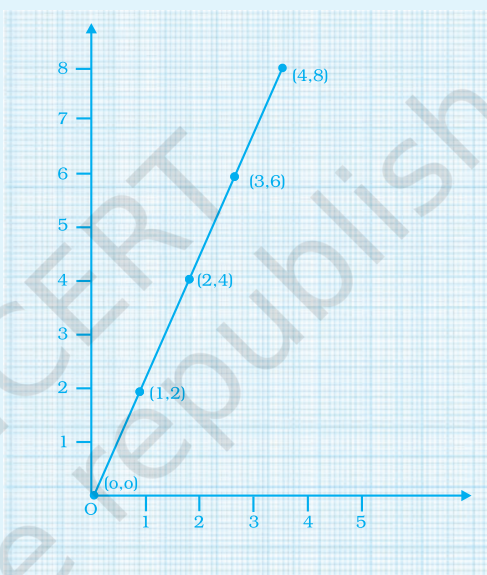
Revise

- Substitute the values of x and y from each coordinate in the given equation $y = 2x$ and see if the coordinates satisfy the equation.

For coordinate (0, 0)

L.H.S. = 0

R.H.S. = 2 (0) = 0 LHS = RHS

Hence satisfied.

For coordinate (1, 2)

L H S = 2

R H S = 2 (1) = 2 = LHS = RHS

Hence satisfied.

Similarly, you can verify for other coordinates to see if the coordinates found were correct.

Think and Discuss ⚪⚪⚪ ⚬

(a) Can you predict from the graph, the value of y when $x = 7$?

(b) How would the graph change when the equation changes to $y = 3x$?

(C) Exercises

In questions 1 to 10, there are four options out of which one is correct. Write the correct answer.

1. Comparison of parts of a whole may be done by a

    (a) bar graph   (b) pie chart   (c) linear graph   (d) line graph

2. A graph that displays data that changes continuously over periods of time is

    (a) bar graph   (b) pie chart   (c) histogram   (d) line graph

3. In the given graph the coordinates of point x are

    (a) (0, 2)   (b) (2, 3)   (c) (3, 2)   (d) (3, 0)
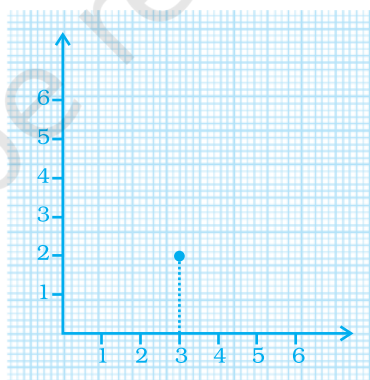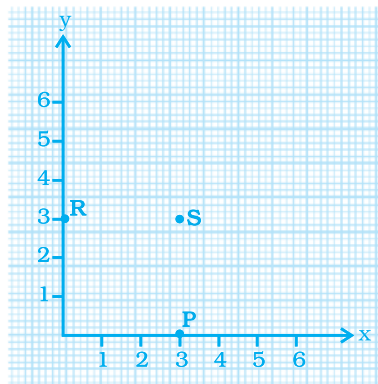

Find Some Solutions to Plot a Graph

To graph a linear equation, you need to find some ordered pairs to plot that are solutions to the linear equation.

You do this by putting some x-values into the equation and finding their corresponding y-values.

4. In the given graph the letter that indicates the point (0, 3) is

(a) P   (b) Q   (c) R   (d) S

5. The point (3, 4) is at a distance of

     (a) 3 from both the axis   (b) 4 from both the axis

     (c) 4 from the x axis and   (d) 3 from x axis and

        3 from y axis   from y axis

6. A point which lies on both the axis is _____

     (a)   (0, 0)   (b) (0, 1)   (c) (1, 0)   (d) (1, 1)

7. The coordinates of a point at a distance of 3 units from the x axis and 6 units from the y axis is

     (a)   (0, 3)   (b) (6, 0)   (c) (3, 6)   (d) (6, 3)

8. In the given figure the position of the book on the table may be given by
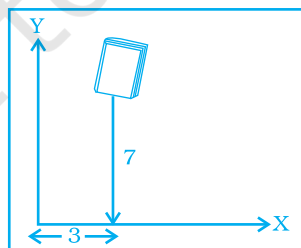
     (a) (7, 3)   (b) (3, 7)

     (c) (3, 3)   (d) (7, 7)

Think and Discuss

1. **Give** the coordinates of a point on the x-axis and a point on the y-axis.
2. **Give** the missing y-coordinates for the solutions to $y = 5x + 2$; $(1, y)$, $(3, y)$, $(10, y)$.

9. Data was collected on a student's typing rate and graph was drawn as shown below. Approximately how many words had this student typed in 30 seconds?
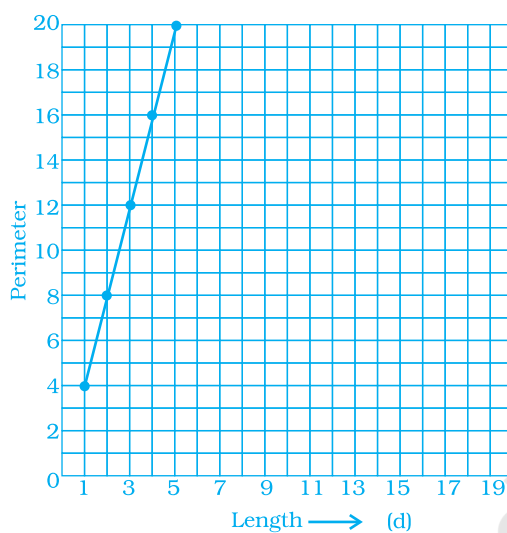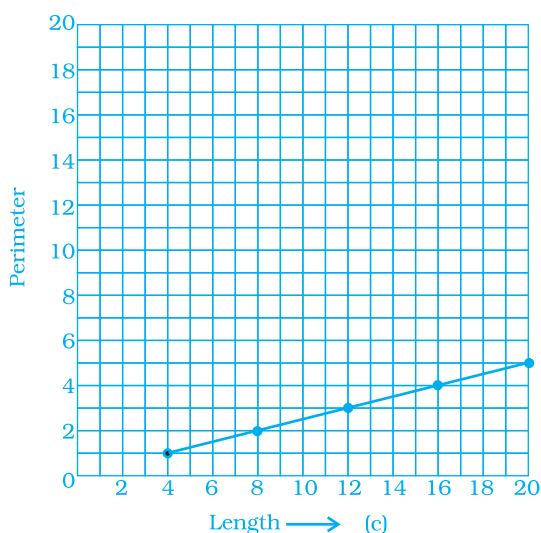

Typing Rate
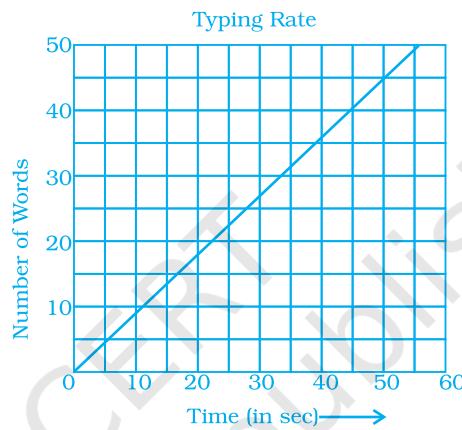
(a) 20   (b) 24   (c) 28   (d) 34

10. Which graphs of the following represent the table below?

Length of Side of a Square	1	2	3	4	5
Perimeter	4	8	12	16	20

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Length ⟶ (c)

Length ⟶ (d)
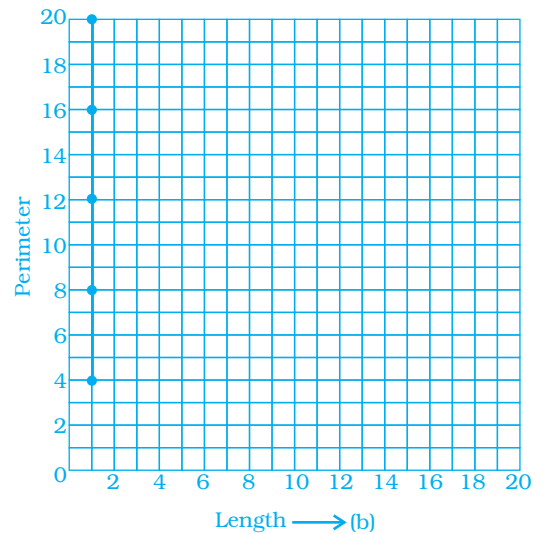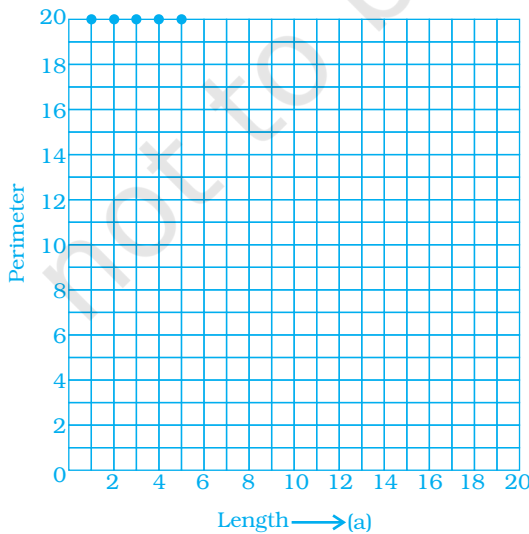
In questions 11 to 25, fill in the blanks to make the statements true.

11. _____ displays data that changes continuously over periods of time.

12. The relation between dependent and independent variables is shown through a _____.

13. We need _____ coordinates for representing a point on the graph sheet.

14. A point in which the x-coordinate is zero and y-coordinate is non-zero will lie on the _____

15. The horizontal and vertical line in a line graph are usually called _____ and _____.

16. The process of fixing a point with the help of the coordinates is known as _____ of the point.

17. The distance of any point from the y-axis is the _____ coordinate.

18. All points with y-coordinate as zero lie on the _____.

19. For the point (5, 2), the distance from the x-axis is _____ units.

20. The x-coordinate of any point lying on the y-axis will be _____.

21. The y-coordinate of the point (2, 4) is _____.

22. In the point (4, 7), 4 denotes the _____.

23. A point has 5 as its *x*–coordinate and 4 as its *y*–coordinate. Then the coordinates of the point are given by _____.

24. In the coordinates of a point, the second number denotes the _____.

25. The point where the two axes intersect is called the _____.

In the questions 26 to 34, state whether the statements are true (T) or false (F).

26. For fixing a point on the graph sheet we need two coordinates.

Distribution of Primes

Remember that a prime number is only divisible by 1 and itself. There are infinitely many prime numbers, but there is no algebraic formula to find them. The largest known prime number, discovered on November 14, 2001, is $2^{13,466,917}$ –1. In standard form, this number would have 4,053,948 digits.

Sieve of Eratosthenes

One way to find prime numbers is called the Sieve of Eratosthenes. Use a list of whole numbers in order. Cross off 1. The next number 2 is prime. Circle it. Then cross off all multiples of 2, because they are not prime. Circle the next number on the list. Cross off all of its multiples. Repeat this step until all of the numbers are circled or crossed off. The circled numbers will all be primes.

1̸	②	3	4̸	5	6̸	7	8̸	9	1̸0̸
11	1̸2̸	13	1̸4̸	15	1̸6̸	17	1̸8̸	19	2̸0̸
21	2̸2̸	23	2̸4̸	25	2̸6̸	27	2̸8̸	29	2̸0̸
31	3̸2̸	33	3̸4̸	35	3̸6̸	37	3̸8̸	39	4̸0̸
41	4̸2̸	43	4̸4̸	45	4̸6̸	47	4̸8̸	49	5̸0̸

1. Use the Sieve of Eratosthenes to find all prime number less than 50.

2. On graph paper plot the first 15 prime number. Use the prime number as the x-coordinates and their positions in the sequence as the y-coordinates; 2 is the 1st prime, 3 is the 2nd prime, and so on.

Prime Number	2	3	5	7											
Position in Sequence	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

3. Estimate the line of best fit and use it to estimate the number of primes under 100. Use the Sieve of Eratosthenes to check your estimate.

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27. A line graph can also be a whole unbroken line.

28. The distance of any point from the x-axis is called the x-coordinate.

29. The distance of the point (3, 5) from the y-axis is 5.

30. The ordinate of a point is its distance from the y-axis.

31. In the point (2, 3), 3 denotes the y-coordinate.

32. The coordinates of the origin are (0, 0).

33. The points (3, 5) and (5, 3) represent the same point.

34. The y-coordinate of any point lying on the x-axis will be zero.

35. Match the coordinates given in **Column A** with the items mentioned in **Column B.**

Column A	Column B
(1) (0, 5)	(a) y coordinate is 2 × x - coordinate + 1.
(2) (2, 3)	(b) Coordinates of origin.
(3) (4, 8)	(c) Only y–coordinate is zero.
(4) (3, 7)	(d) The distance from x–axis is 5.
(5) (0, 0)	(e) y coordinate is double of x–coordinate.
(6) (5, 0)	(f) The distance from y–axis is 2.

36. Match the ordinates of the points given in **Column A** with the items mentioned in **Column B**.

| Column A	Column B
(a) (7, 0)	(i) The ordinate is double the abscissa.
(b) (11, 11)	(ii) The ordinate is zero.
(c) (4, 8)	(iii) The ordinate is equal to the abscissa.
(d) (6, 2)	(iv) The abscissa is double the ordinate.
(e) (0, 9)	(v) The abscissa is triple the ordinate.
(f) (6, 3)	(vi) The abscissa is zero.

37. From the given graph, choose the letters that indicate the location of the points given below.
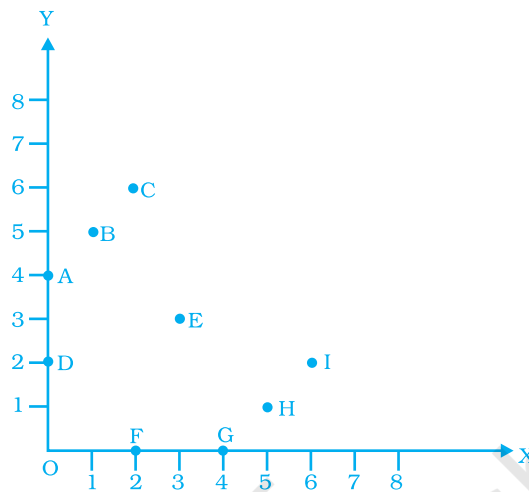
(a) (2, 0)   (b) (0, 4)   (c) (5, 1)   (d) (2, 6)   (e) (3,3)
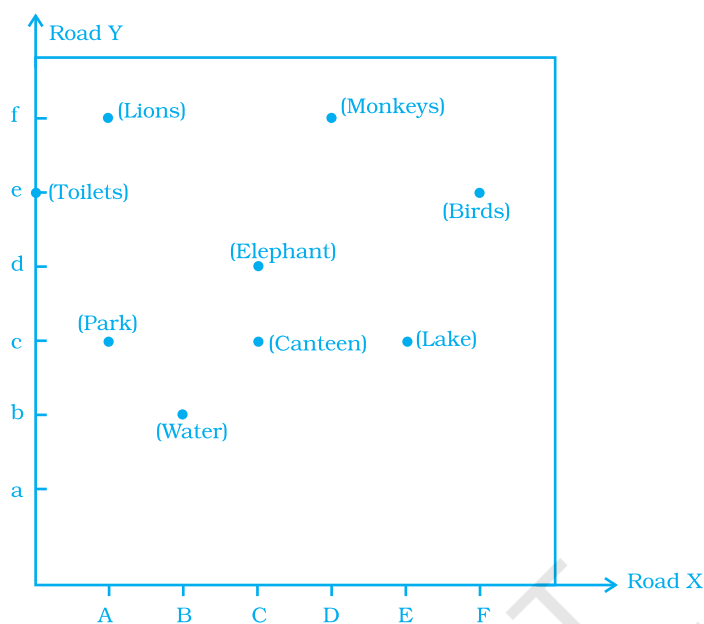
38. Find the coordinates of all letters in the graph given below.
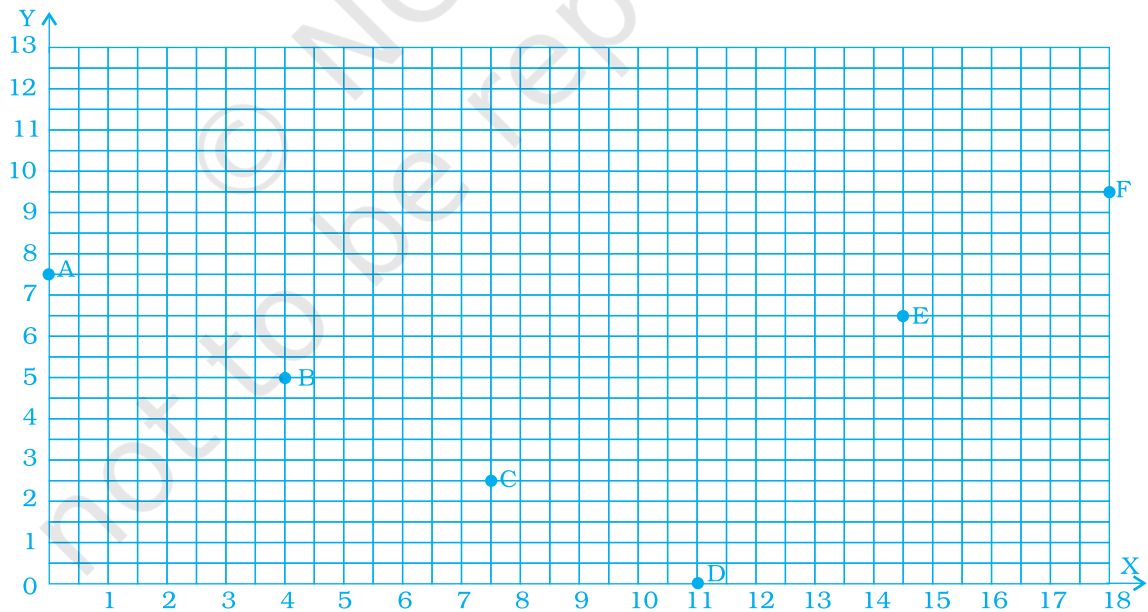
39. Plot the given points on a graph sheet.

(a) (5, 4)   (b) (2, 0)   (c) (3, 1)   (d) (0, 4)   (e) (4,5)

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40. Study the given map of a zoo and answer the following questions.

(a) Give the location of lions in the zoo.

(b) (D, f) and (C, d) represent locations of which animals in the zoo?

(c) Where are the toilets located?

(d) Give the location of canteen.

41. Write the x-coordinate (abscissa) of each of the given points.

(a) (7, 3)   (b) (5, 7)   (c) (0, 5)

42. Write the y-coordinate (ordinate) of each of the given points.

(a) (3, 5)   (b) (4, 0)   (c) (2, 7)

Make a Plan :

- **Do you need an estimate or an exact answer?**

  When you are solving a word problem, ask yourself whether you need an exact answer or whether an estimate is sufficient. For example, if the amounts given in the problem are approximate, only an approximate answer can be given. If an estimate is sufficient, you may wish to use estimation techniques to save time in your calculations.

43. Plot the given points on a graph sheet and check if the points lie on a straight line. If not, name the shape they form when joined in the given order.

(a) (1, 2), (2, 4), (3, 6), (4, 8).

(b) (1, 1), (1, 2), (2, 1), (2, 2).

(c) (4, 2), (2, 4), (3, 3), (5, 4).

44. If y–coordinate is 3 times x-coordinate, form a table for it and draw a graph.

**45.** Make a line graph for the area of a square as per the given table.

Side (in cm)	1	2	3	4
Area (in cm²)	1	4	9	16

Is it a linear graph?

46. The cost of a note book is Rs 10. Draw a graph after making a table showing cost of 2, 3, 4, ... note books. Use it to find

(a) the cost of 7 notebooks.

(b) The number of note books that can be purchased with Rs 50.

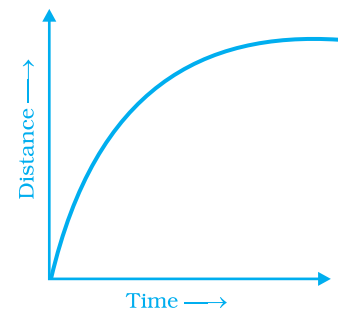**47.** Explain the situations represented by the following distance-time graphs.
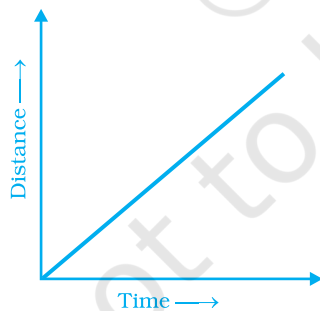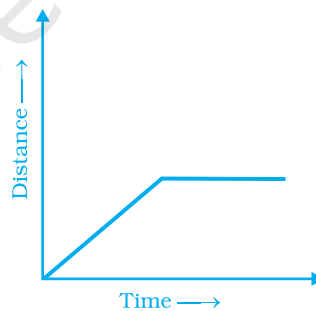
(a)   (b)   (c)

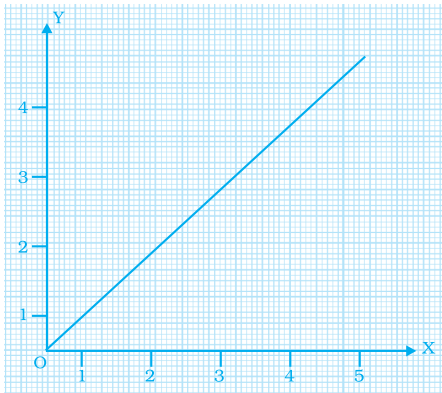**48.** Complete the given tables and draw a graph for each.

(a)
x	0	1	2	3
$y = 3x + 1$	1	4	-	-

(b)
x	1	2	4	6
$y = x–1$	0			

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49. Study the given graphs (a) and (b) and complete the corresponding tables below.

(a)   b)
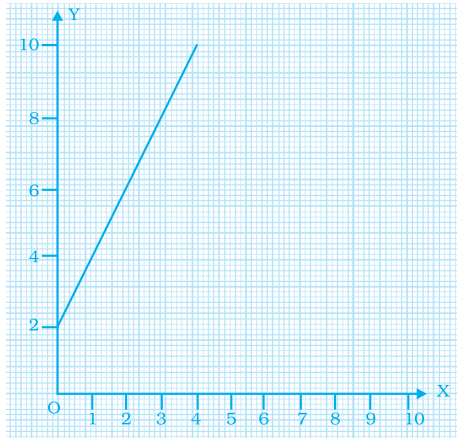
x	0	1	2	3
y				

| x	0	1	2	3	4
y					

50. Draw a graph for the radius and circumference of circle using a suitable scale.

(Hint : Take radius = 7, 14, 21 units and so on)

From the graph,

(a) Find the circumference of the circle when radius is 42 units.

(b) At what radius will the circumference of the circle be 220 units?

51. The graph shows the maximum temperatures recorded for two consecutive weeks of a town. Study the graph and answer the questions that follow.
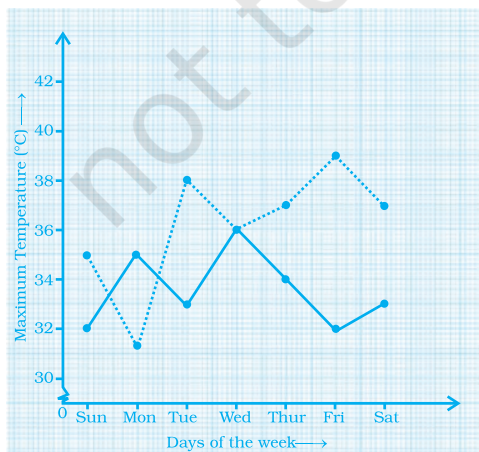
(a) What information is given by the two axes?

(b) In which week was the temperature higher on most of the days?

(c) On which day was the temperature same in both the weeks?

(d) On which day was the difference in temperatures the maximum for both the weeks?

(e) What were the temperatures for both the weeks on Thursday?

(f) On which day was the temperature 35°C for the first week?

(g) On which day was the temperature highest for the second week?

52. The graph given below gives the actual and expected sales of cars of a company for 6 months. Study the graph and answer the questions that follow.
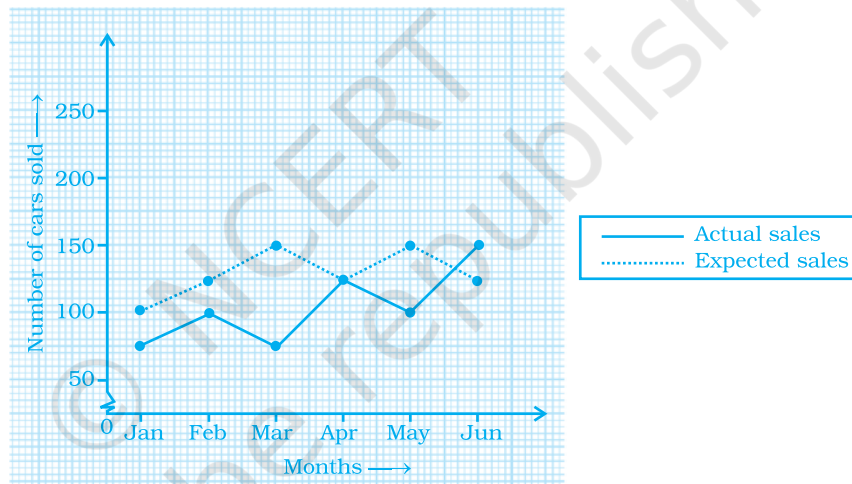

(a) In which month was the actual sales same as the expected sales?

(b) For which month(s) was (were) the difference in actual and expected sales the maximum?

(c) For which month(s) was (were) the difference in actual and expected sales the least?

(d) What was the total sales of cars in the months–Jan, Feb. and March?

(e) What is the average sales of cars in the last three months?

(f) Find the ratio of sales in the first three months to the last three months.

53. The graph given below shows the marks obtained out of 10 by Sonia in two different tests. Study the graph and answer the questions that follow.
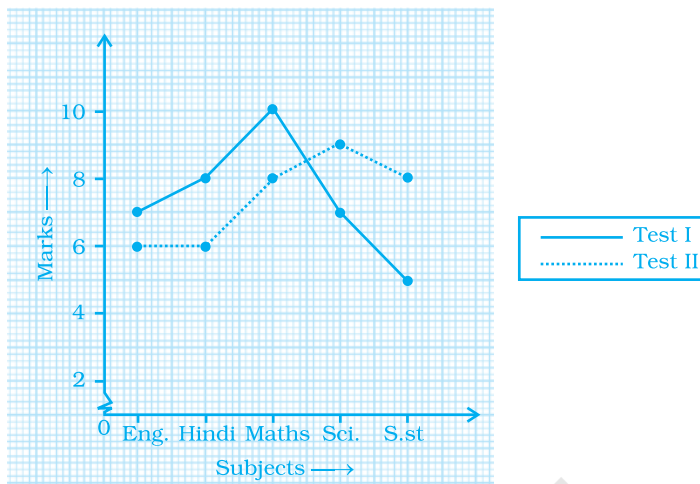

(a) What information is represented by the axes?

(b) In which subject did she score the highest in Test I?

(c) In which subject did she score the least in Test II?

(d) In which subject did she score the same marks in both the Tests?

(e) What are the marks scored by her in English in Test II?

(f) In which test was the performance better?

(g) In which subject and which test did she score full marks?

54. Find the coordinates of the vertices of the given figures.
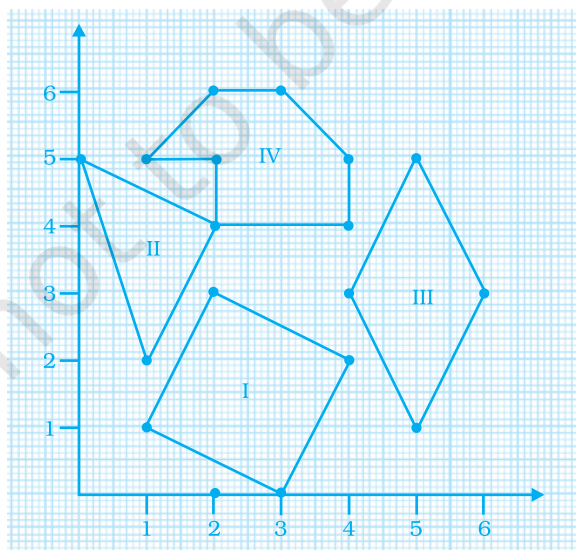
55. Study the graph given below of a person who started from his home and returned at the end of the day. Answer the questions that follow.
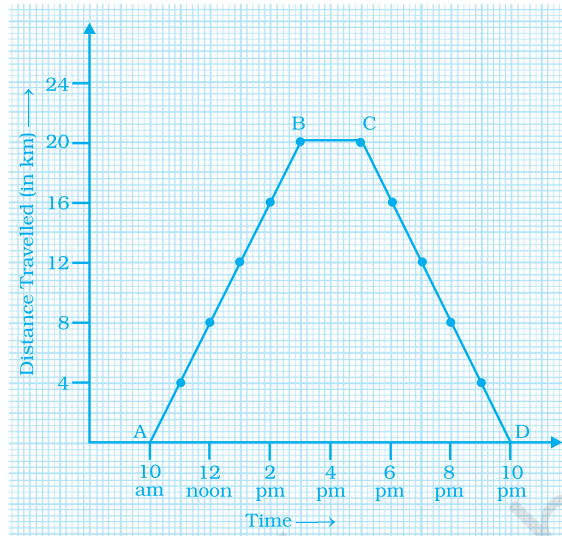

(a) At what time did the person start from his home?

(b) How much distance did he travel in the first four hours of his journey?

(c) What was he doing from 3 pm to 5 pm?

(d) What was the total distance travelled by him throughout the day?

(e) Calculate the distance covered by him in the first 8 hours of his journey.

(f) At what time did he cover 16 km of his journey?

(g) Calculate the average speed of the man from (a) A to B (b) B to C (*c*) At what time did he return home?

56. Plot a line graph for the variables p and q where p is two times q i.e, the equation *is* $p = 2q$. Then find.

(a) the value of p when $q = 3$

(b) the value of q when $p = 8$

57. Study the graph and answer the questions that follow.

(a) What information does the graph give?

(b) On which day was the temperature the least?

(c) On which day was the temperature 31°C?

(d) Which was the hottest day?

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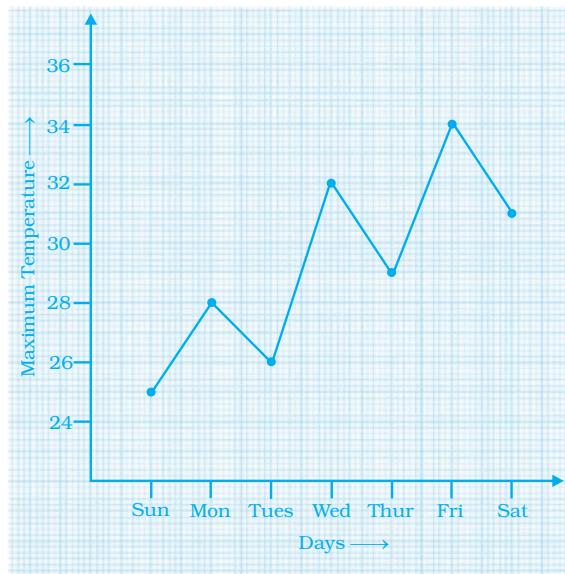
58. Study the distance-time graph given below for a car to travel to certain places and answer the questions that follow.

(a) How far does the car travel in 2 hours?

(b) How much time does the car take to reach R?

(c) How long does the car take to cover 80 km?

(d) How far is Q from the starting point?

(e) When does the car reach the place S after starting?

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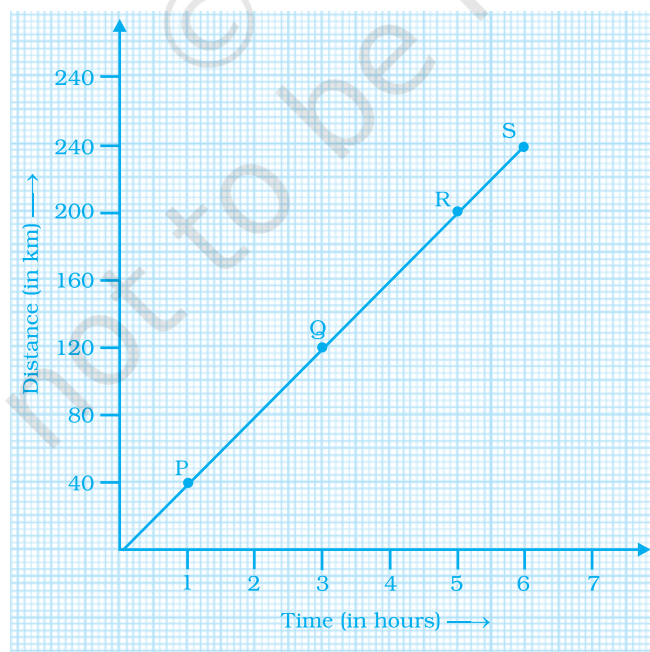
**59.** Locate the points A (1,2), B (4,2) and C (1,4) on a graph sheet taking suitable axes. Write the coordinates of the fourth point D to complete the rectangle ABCD.

60. Locate the points A(1,2), B (3,4) and C (5,2) on a graph sheet taking suitable axes. Write the coordinates of the fourth point D to complete the rhombus ABCD. Measure the diagonals of this rhombus and find whether they are equal or not.

61. Locate the points P (3,4), Q (1,0), R (0,4), S (4,1) on a graph sheet and write the coordinates of the point of intersection of line segments PQ and RS.

62. The graph given below compares the sales of ice creams of two vendors for a week.
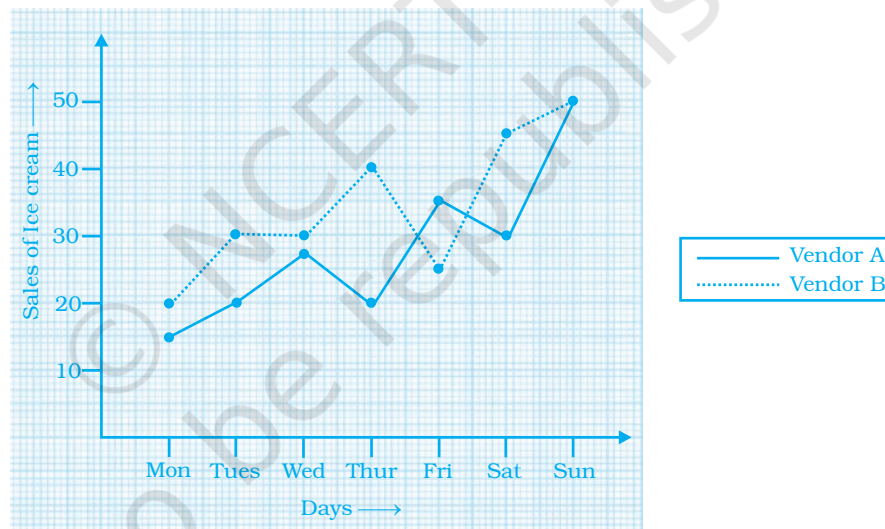
Observe the graph and answer the following questions.

(a) Which vendor has sold more icecreams on Friday?

(b) For which day was the sales same for both the vendors?

(c) On which day did the sale of vendor A increase the most as compared to the previous day?

(d) On which day was the difference in sales the maximum?

(e) On which two days was the sales same for vendor B?

63. The table given below shows the temperatures recorded on a day at different times.
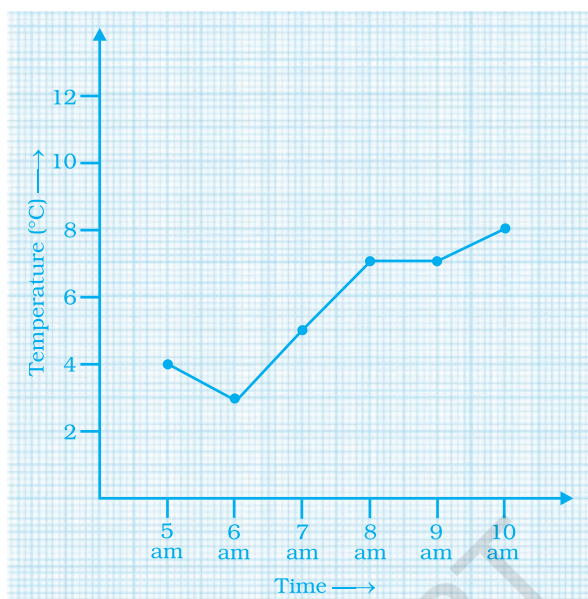
Observe the table and answer the following questions.

(a) What is the temperature at 8 am?

(b) At what time is the temperature 3°C?

(c) During which hour did the temperature fall?

(d) What is the change in temperature between 7 am and 10 am?

(e) During which hour was there a constant temperature?

64. The following table gives the growth chart of a child.

Height (in cm)	75	90	110	120	130
Age (in years)	2	4	6	8	10

Draw a line graph for the table and answer the questions that follow.

(a) What is the height at the age of 5 years?

(b) How much taller was the child at the age of 10 than at the age of 6?

(c) Between which two consecutive periods did the child grow more faster?

65. The following is the time-distance graph of Sneha's walking.
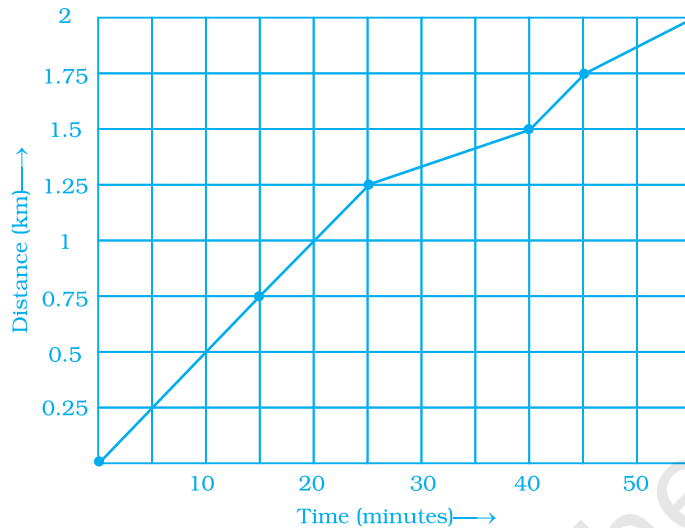
(a) When does Sneha make the least progress? Explain your reasoning.

(b) Find her average speed in km/hour.

66. Draw a parallelogram ABCD on a graph paper with the coordinates given in Table I. Use this table to complete Tables II and III to get the coordinates of E, F, G, H and J, K, L, M.

Point	(x, y)
A	(1, 1)
B	(4. 4)
C	(8, 4)
D	(5, 1)

Table I

Point	$(0.5x, 0.5y)$
E	(0.5, 0.5)
F	
G	
H	

Table II

| Point	$(2x, 1.5y)$
J	(2, 1.5)
K	
L	
M	

Table III

Draw parallelograms EFGH and JKLM on the same graph paper.

Plot the points (2, 4) and (4, 2) on a graph paper, then draw a line segment joining these two points.

67. Extend the line segment on both sides to meet the coordinate axes. What are the coordinates of the points where this line meets the x-axis and the y-axis?

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68. The following graph shows the change in temperature of a block of ice when heated. Use the graph to answer the following questions:

(a) For how many seconds did the ice block have no change in temperature?

(b) For how long was there a change in temperature?

(c) After how many seconds of heating did the temperature become constant at 0°C?

(d) What was the temperature after 25 seconds?

(e) What will be the temperature after 1.5 minutes? Justify your answer.
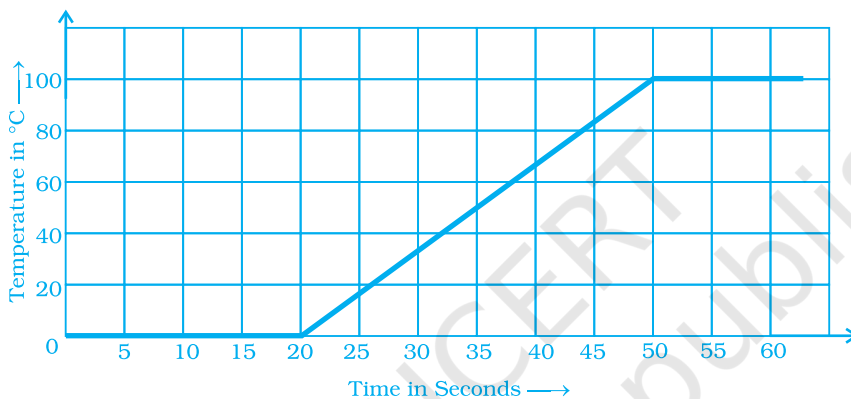
69. The following graph shows the number of people present at a certain shop at different times. Observe the graph and answer the following questions.
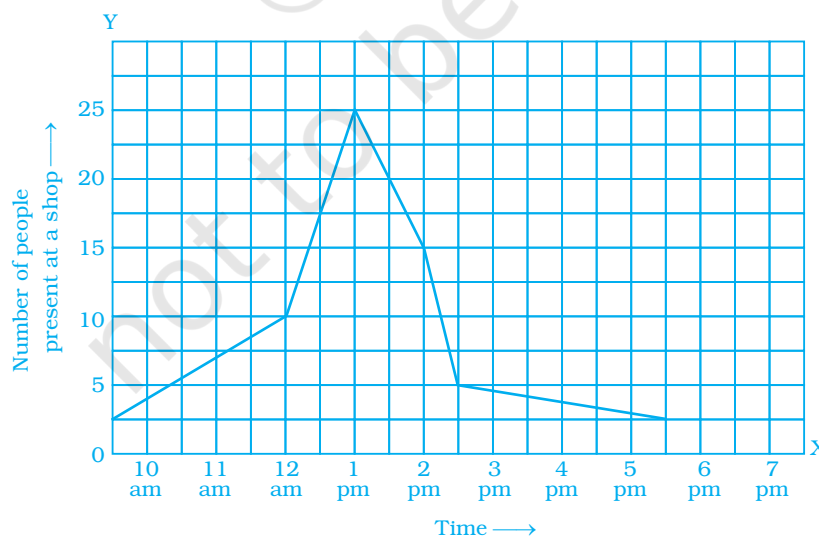

(a) What type of a graph is this?

(b) What information does the graph give?

(c) What is the busiest time of day at the shop?

(d) How many people enter the shop when it opens?

(e) About how many people are there in the shop at 1:30 pm?

70. A man started his journey on his car from location A and came back. The given graph shows his position at different times during the whole journey.

(a) At what time did he start and end his journey?

(b) What was the total duration of journey?

(c) Which journey, forward or return, was of longer duration?

(d) For how many hours did he not move?

(e) At what time did he have the fastest speed?
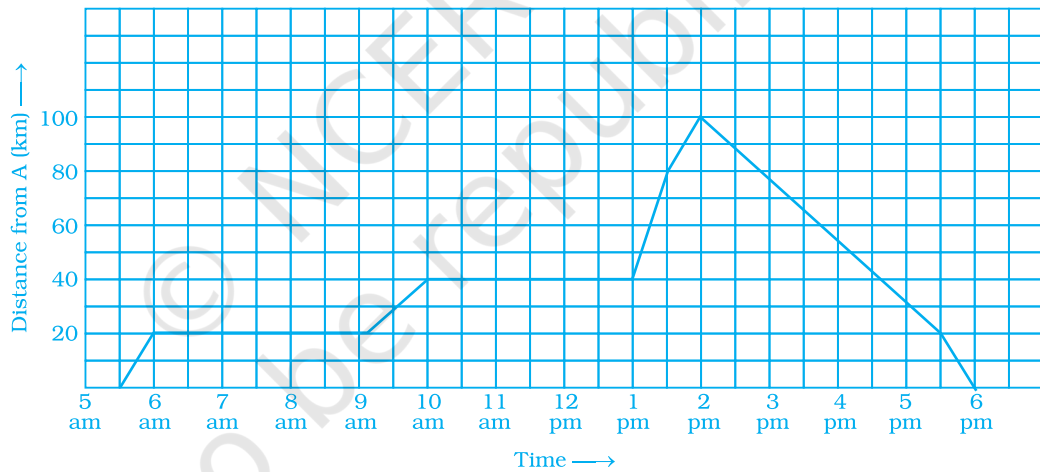
71. The following graph shows the journey made by two cyclists, one from town A to B and the other from town B to A.

(a) At what time did cyclist II rest? How long did the cyclist rest?

(b) Was cyclist II cycling faster or slower after the rest?

(c) At what time did the two cyclists meet?

(d) How far had cyclist II travelled when he met cyclist I?

(e) When cyclist II reached town A, how far was cyclist I from town B?
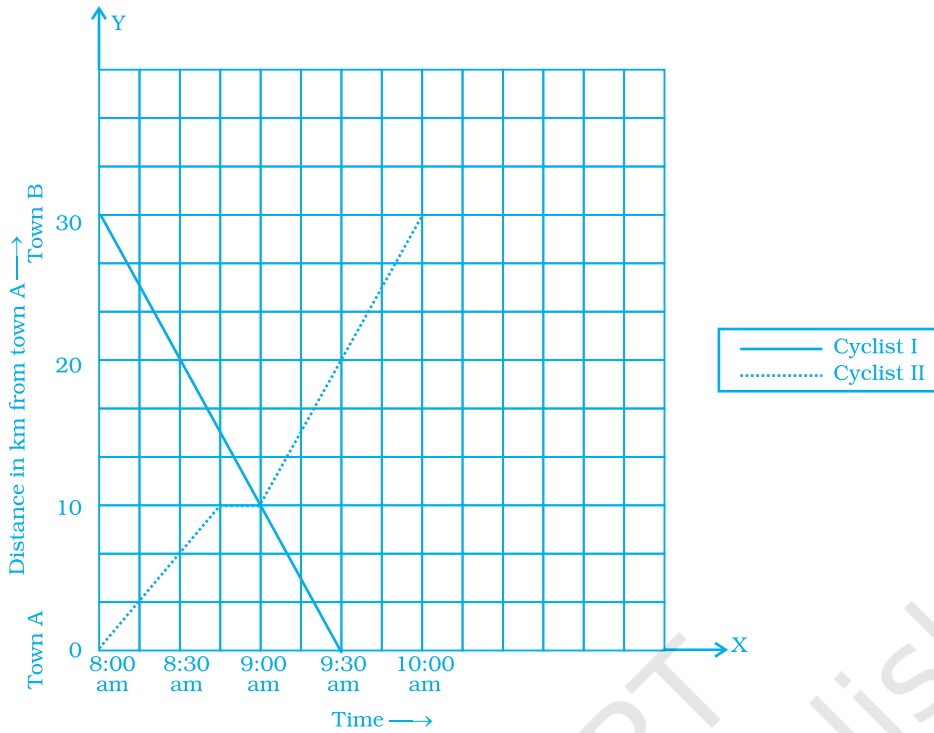
72. Ajita starts off from home at 07.00 hours with her father on a scooter that goes at a uniform speed of 30 km/h and drops her at her school after half an hour. She stays in the school till 13.30 hours and takes an auto rickshaw to return home. The rickshaw has a uniform speed of 10 km/h. Draw the graph for the above situation and also determine the distance of Ajita's school from her house.

73. Draw the line graph using suitable scale to show the annual gross profit of a company for a period of five years.

Year	1st	2nd	3rd	4th	5th
Gross Profit (in Rs)	17,00,000	15,50,000	11,40,000	12,10,000	14,90,000

74. The following chart gives the growth in height in terms of percentage of full height of boys and girls with their respective ages.

Age (in years)	8	9	10	11	12	13	14	15	16	17	18
Boys	72%	75%	78%	81%	84%	88%	92%	95%	98%	99%	100%
Girls	77%	81%	84%	88%	91%	95%	98%	99%	99.5%	100%	100%

Draw the line graph of above data on the same sheet and answer the following questions.

(a) In which year both the boys and the girls achieve their maximum height?

(b) Who grows faster at puberty (14 years to 16 years of age)?

75. The table shows the data collected for Dhruv's walking on a road.

Time (in minutes)	0	5	10	15	20	25
Distance (in km)	0	0.5	1	1.25	1.5	1.75

(a) Plot a line graph for the given data using a suitable scale.

(b) In what time periods did Dhruv make the most progress?

76. Observe the given graph carefully and complete the table given below.

x	1	2	3	4	5
y					
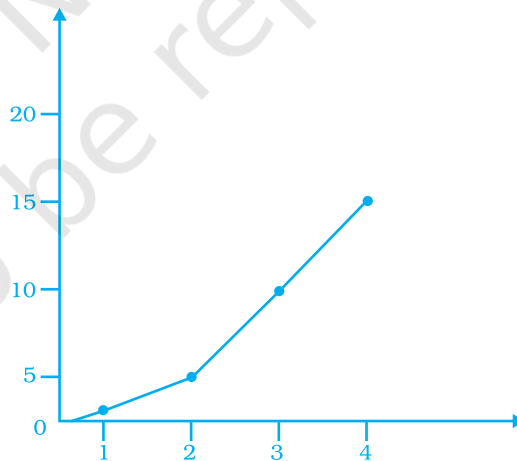
77. This graph shows the per cent of students who dropped out of school after completing High School. The point labelled A shows that, in 1996, about 4.7% of students dropped out.
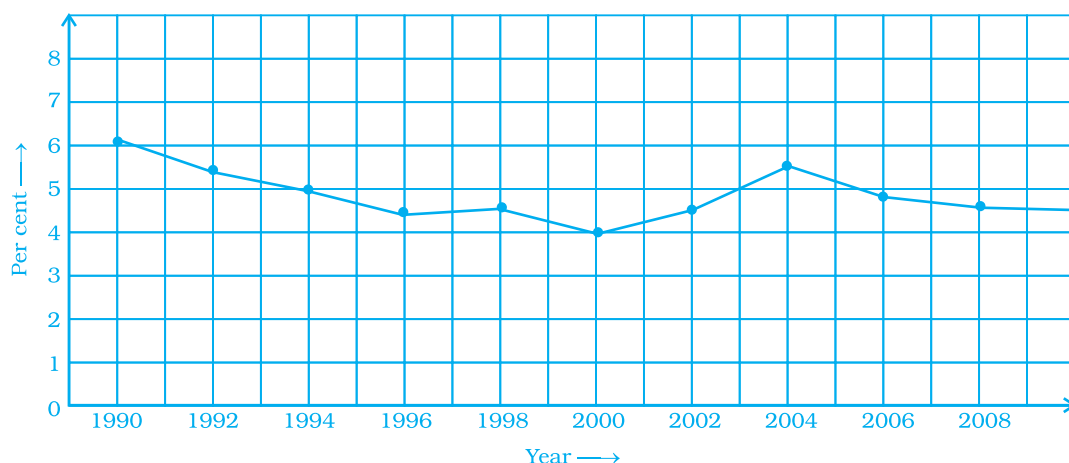
(a) In which year was the dropout the rate highest? In which year was it the lowest?

(b) When did the per cent of students who dropped out of high school first fall below 5%?

(c) About what per cent of students dropped out of high school in 2007? About what per cent of students stayed in high school in 2008?

78. Observe the toothpick pattern given below:

Pattern 1   Pattern 2   Pattern 3   Pattern 4

(a) Imagine that this pattern continues. Complete the table to show the number of toothpicks in the first six terms.

| Pattern	1	2	3	4	5	6
Toothpicks	4			13		

(b) Make a graph by taking the pattern numbers on the horizontal axis and the number of toothpicks on the vertical axis. Make the horizontal axis from 0 to 10 and the vertical axis from 0 to 30.

(c) Use your graph to predict the number of toothpicks in patterns 7 and 8. Check your answers by actually drawing them.

(d) Would it make sense to join the points on this graph? Explain.

79. Consider this input/output table.

Input	1	2	4	5	7
Output	2	5	11	14	20

(a) Graph the values from the table by taking Input along horizontal axis from 0 to 8 and Output along vertical axis from 0 to 24.

(b) Use your graph to predict the outputs for inputs of 3 and 8.

80. This graph shows a map of an island just off the coast of a continent. The point labelled B represents a major city on the coast. The distance between grid lines represents 1 km.
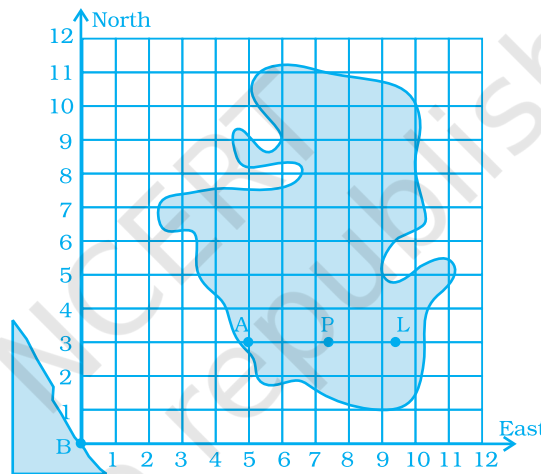
Point A represents a resort that is located 5 km East and 3 km North of Point B. The values 5 and 3 are the coordinates of Point A. The coordinates can be given as the ordered pair (5, 3), where 5 is the horizontal coordinate and 3 is the vertical coordinate.

(i) On a copy of the map, mark the point that is 3 km East and 5 km North of Point B and label it S. Is Point S in the water or on the island? Is Point S in the same place as Point A?

(ii) Mark the point that is 7 km east and 5 km north of Point B and label it C. Then mark the point that is 5 km east and 7 km north of Point B and label it D. Are Points C and D in the same place? Give the coordinates of Points C and D.

(iii) Which point is in the water, (2, 7) or (7, 2)? Mark the point which is in water on your map and label it E.

(iv) Give the coordinates of two points on the island that are exactly 2 km from Point A.

(v) Give the coordinates of the point that is halfway between Points L and P.

(vi) List three points on the island with their *x*-coordinates greater than 8.

(vii) List three points on the island with a *y*-coordinate less than 4.

81. As part of his science project, Prithvi was supposed to record the temperature every hour one Saturday from 6 am to midnight. At noon, he was taking lunch and forgot to record the temperature. At 8:00 pm, his favourite show came on and so forgot again. He recorded the data so collected on a graph sheet as shown below.
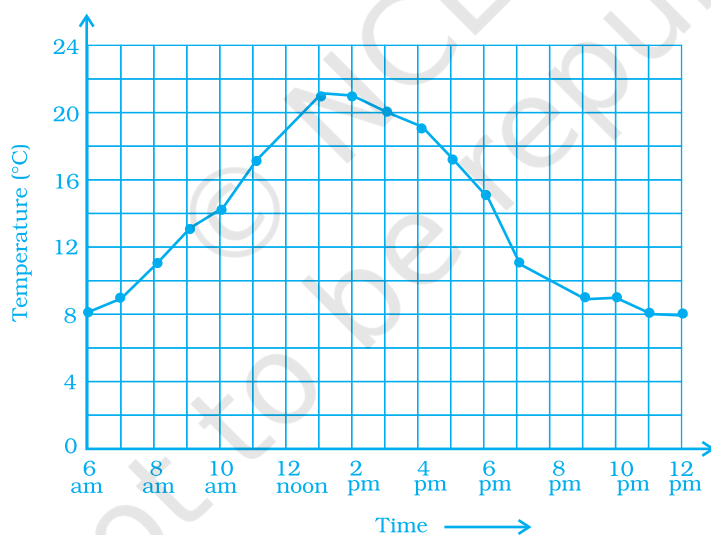

(a) Why does it make sense to connect the points in this situation?

(b) Describe the overall trend, or pattern, in the way the temperature changes over the time period shown on the graph.

(c) Estimate the temperature at noon and 8 pm.

82. The graph given below compares the price (in Rs) and weight of 6 bags (in kg) of sugar of different brands A, B, C, D, E, F.
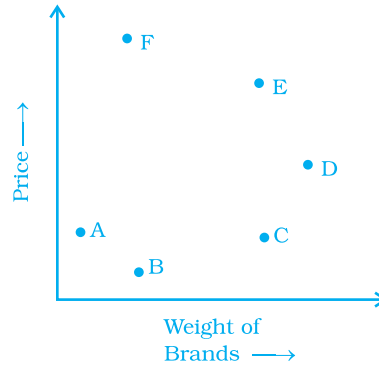

(a) Which brand(s) costs/cost more than Brand D?

(b) Bag of which brand of sugar is the heaviest?

(c) Which brands weigh the same?

(d) Which brands are heavier than brand B?

(e) Which bag is the lightest?

(f) Which bags are of the same price?

83. The points on the graph below represent the height and weight of the donkey, dog, crocodile, and ostrich shown in the drawing.
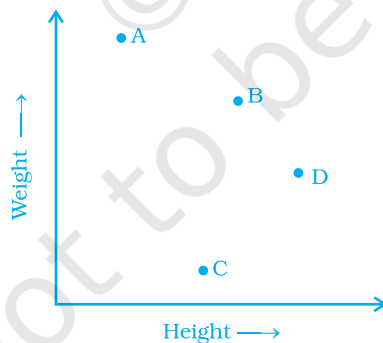
(a) What are the two variables represented in the graph?

(b) Which point represents each animals? Explain.

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84. The two graphs below compare Car A and Car B. The left graph shows the relationship between age and value. The right graph shows the relationship between size and maximum speed.
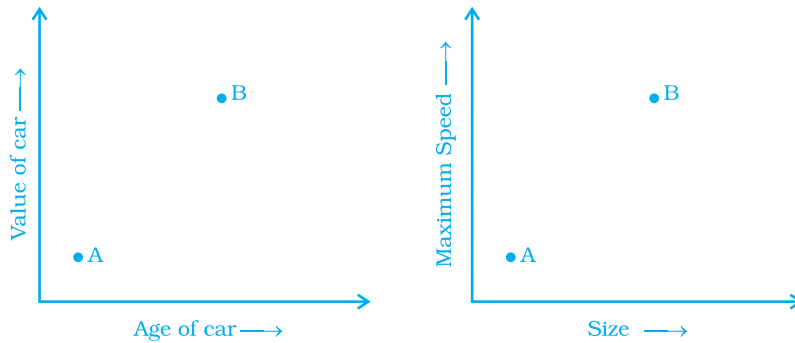

Use the graphs to determine whether each statement is true or false, and explain your answer.

(a) The older car is less valuable. (b) The faster car is larger.

(c) The larger car is older. (d) The faster car is older.
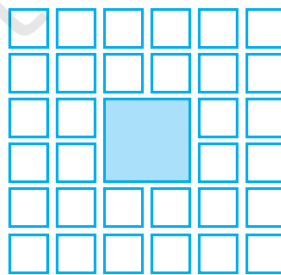
(e) The more valuable car is slower.

85. Sonal and Anmol made a sequence of tile designs from square white tiles surrounding one square purple tile. The purple tiles come in many sizes. Three of the designs are shown below.
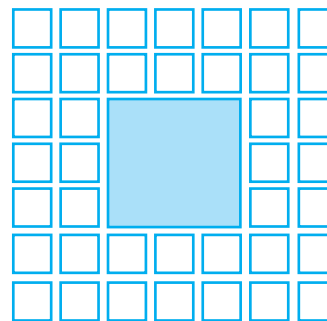
(a) Copy and complete the table

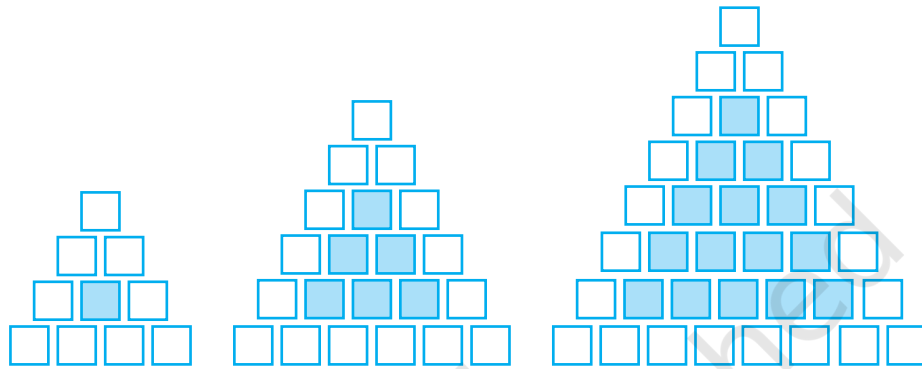| Side Length of Purple Tiles	1	2	3	4	5	10	100
Number of white Tiles in Border							
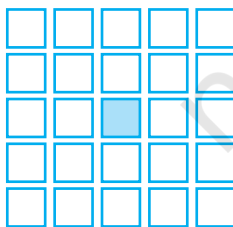
Side length 1

Side length 2

Side length 3

(b) Draw a graph using the first five pairs of numbers in your table.

(c) Do the points lie on a line?

86. Sonal and Anmol then made another sequence of the designs. Three of the designs are shown below.

(a) Complete the table.

Rows, r	4	6	8
Number of white Tiles, w	9		
Number of Purple Tiles, p	1		

(b) Draw a graph of rows and number of white tiles. Draw another graph of the number of rows and the number of purple tiles. Put the number of rows on the horizontal axis.

(c) Which graph is linear?

(D) Activities

Create a table like the one shown.

Object	Estimate	Actual
	(in cm) (guessed measurement)	Measurement (in cm)
* Length of a pen		
* Length of an eraser		
* Length of your palm		

* Length of your geometry box

* Length of your maths notebook

If an estimate is the same as the actual measurement then the point (actual measurement, estimate) lies on the line, straight line *p*. For example, if an object measures 5 cm and you estimate it to 5 cm, then the graph of its point lies on line *p* in the figure below.

actual measurement (in cm) $\longrightarrow$
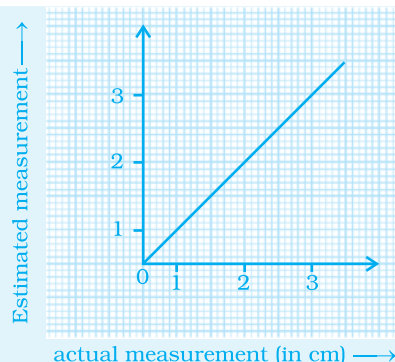
Using your completed table,

(i) Plot the data from the table where the coordinates of the points are (measurement, estimate).

(ii) Identify the objects overestimated.

(iii) Identify the objects underestimated.

(iv) By looking at the graph, how can overestimates and underestimates be determined? How accurate is your estimation?
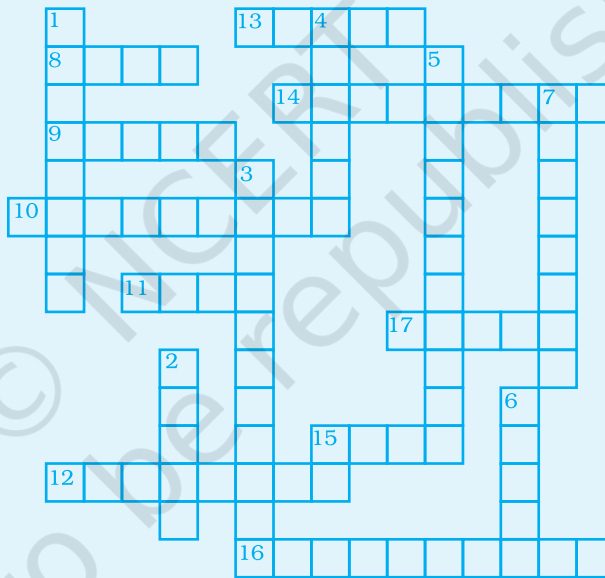
Activity 2

Clues

Down

(1) A graph used to show comparison among categories. (2 words)

(2) The point (0, 4) lies on the _____.

(3) A line graph which is a whole unbroken line.

(4) The point where the two axes meet.

(5) _____ of a point are required to locate the point on a graph.

(6) The *x*-axis and *y*-axis are at _____ angles to each other.

(7) *x*-coordinate of a point.

Across

(8) The plural of Axis.

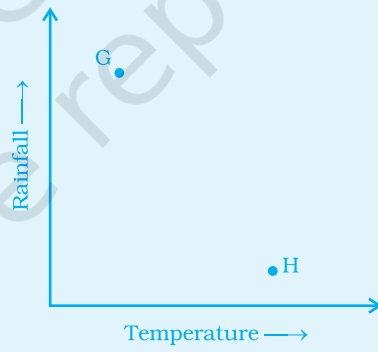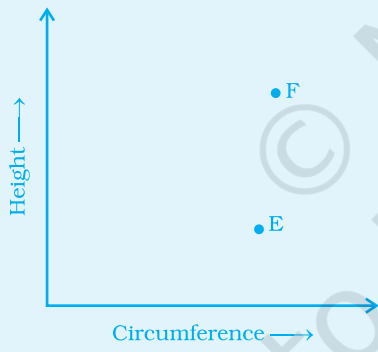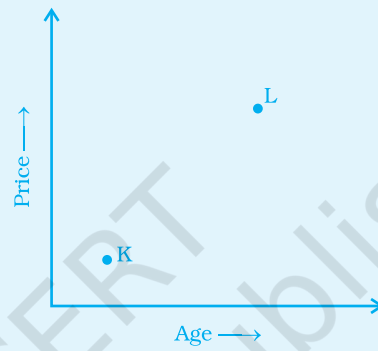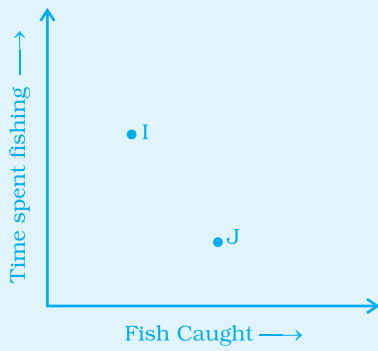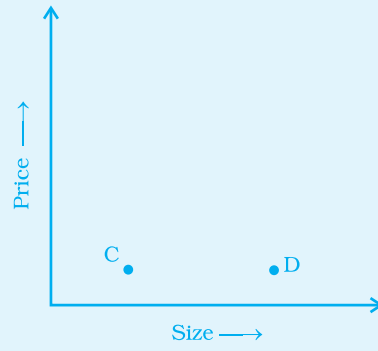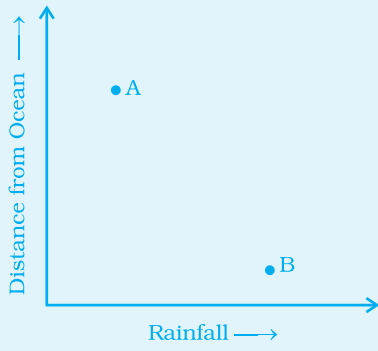(9) The sheet of paper on which coordinates of any given point are plotted.

(10) The system of fixing points on a graph with the help of coordinates.

(11) A _____ graph displays the data that changes continuously over time.

(12) y-coordinate of a point.

(13) A pie chart is used to compare parts of a _____.

(14) A bar graph that shows data in intervals.

(15) In a histogram there are no _____ between the bars.

(16) The x-axis is a _____ line on a plane.

(17) y-coordinate of a point represents the distance of the point from the _____.

Activity 3

Complete Parts (*a*) and (*b*) for each following graphs.

(a) Tell what two variables does the graph show.

(b) Describe what the graph tells you about the things represented by the points. Then try to come up with an idea about what the points could represent.

Graph 1: Distance from Ocean (y-axis) vs Rainfall (x-axis) — points A, B

Graph 2: Price (y-axis) vs Size (x-axis) — points C, D

Graph 3: Time spent fishing (y-axis) vs Fish Caught (x-axis) — points I, J

Graph 4: Price (y-axis) vs Age (x-axis) — points L, K

Graph 5: Height (y-axis) vs Circumference (x-axis) — points F, E

Graph 6: Rainfall (y-axis) vs Temperature (x-axis) — points G, H

Rough Work

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Rough Work

Rough Work

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