Unit 7

LINEAR GRAPH AND THEIR APPLICATION

Student Learning Outcomes (SLOs)

After completing this unit, students will be able to:

- Identify pair of real numbers as an ordered pair.
- Recognize an ordered pair through different examples; for instance, an ordered pair (2, 3) to represent a seat, located in an examination hall, at the intersection of 2^{nd} row and 3^{rd} column.
- Describe rectangular/Cartesian plane consisting of two number lines intersecting at right angle at a point 'O'.
- Identify origin O and co-ordinate axes (Horizontal and Vertical axis or x-axis and y-axis respectively) in rectangular plane.
- Locate an ordered pair (a,b) as a geometrical point in the rectangular plane and recognize:
- 'a' as the x- co-ordinate (or abscissa),
- 'b' as the y- co-ordinate (or ordinate).
- Draw different geometrical shapes (e.g., line segment, triangle and rectangle etc.) by joining a set of given points.
- Construct a table for pairs of values satisfying a linear equation in two variables.
- Plot the pairs of points to obtain the graph of a given expression.
- Choose an appropriate scale to draw a graph.
- Draw the graph of:
  - an equation of the form y = c.
  - an equation of the form x = a.
  - an equation of the form y = mx.
  - an equation of the form y = mx + c.
- Draw a graph from the given table of values for x and y.
- Solve applied real life problems.
- Interpret conversion graph as a linear graph relating to two quantities which are in direct proportions.
- Read a given graph to know one quantity corresponding to another.
- Read the graph for conversion of the forms:
  - Miles and kilometers,
  - Acres and hectares,
  - Degrees Celsius and Fahrenheit,
  - Pakistani currency and other currencies, etc.
- Solve simultaneous linear equations in two variables by graphical method.

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7.1 Cartesian Plane and Linear Graphs

7.1.1 Identify pair of real number as an ordered pair.

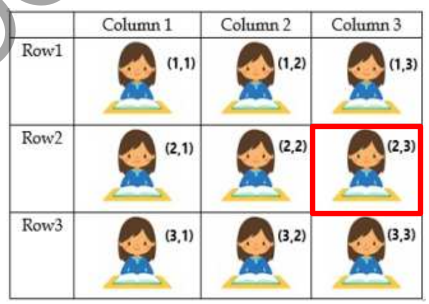
An ordered pair is a pair of two real numbers written in fix order within parenthesis. It helps to locate position of any object in two dimensional space.

7.1.2 Recognize an Ordered Pair Through Different Examples; for instance, an Ordered Pair (2,3) to represent a seat, located in an examination hall, at the intersection of 2^{nd} row and 3^{rd} column:

Let's see the following examples in our surrounding; because of these examples we can recognize the position of an object through rows and columns i.e. form an ordered pair. An ordered pair represents the position of an object or place.

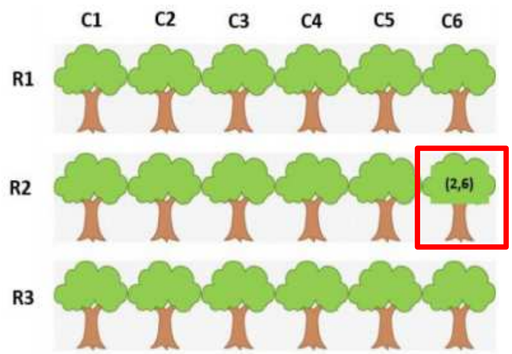
Example 01

The ordered pair (2,3) represents the position of the student in an examination hall as 2^{nd} row and 3^{rd} column. Likewise, every student in hall is located with a unique ordered pair.



Example 02

If a farmer has planned trees in a garden at equal distances, then (2, 6) represents the tree located in 2^{nd}row and 6^{th} column in the garden.



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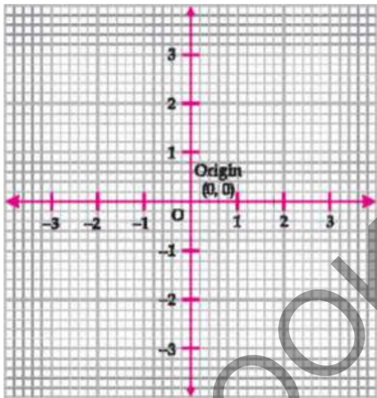
7.1.3 Describe Rectangular/Cartesian Plane Consisting of Two Number Lines Intersecting at Right Angle at a Point 'O'.

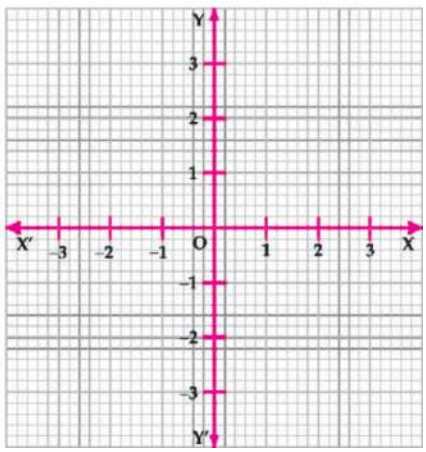
The **Cartesian (rectangular) coordinate system** consists of two real number lines that intersect at a right angle at a point O. These two number lines define a flat surface called a **Cartesian plane**.



7.1.4 Identify Origin 'O' and Coordinate Axis (Horizontal and Vertical axis or *x*-axis or *y*-axis respectively) in Rectangular Plane.

In Cartesian coordinate system, the horizontal number line is called the ***x*-axis** and the vertical number line is called ***y*-axis,** the point where both lines intersect is called origin and it is denoted by **O**.

In the given figure the horizontal line $X'X$ is ***x*-axes** and the vertical line $Y'Y$ is the y-axes of given Cartesian plane. The point where both line meet is origin of the plane that is 'O'.



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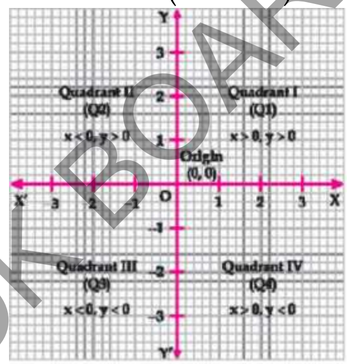
7.1.5 Locate an Ordered pair (*a*,*b*) as a Geometrical Point in the Rectangular Plane and recognize:

- '*a*' as the *x*-coordinate (abscissa)
- '*b*' as the *y*-coordinate (ordinate)

In general, any point in the Cartesian plane can be represented by the ordered pair (a, b), where 'a' is the x- co-ordinate (abscissa) and 'b' is the y-coordinate (ordinate).



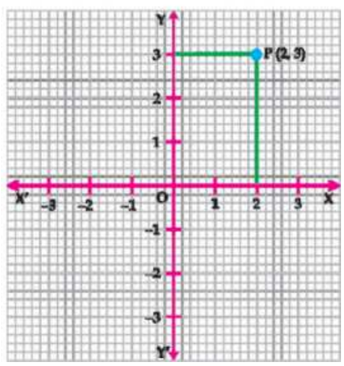
To locate a point in the plane, we must know its x-coordinate, which is its horizontal distance from y-axis and the y-co-ordinate which is its vertical distance from x-axis.

The x-axis and y-axis divide the Cartesian plane into four quadrants named in Roman numbers I, II, III and IV. The Cartesian plane is also known as xy-plane.

- In quadrant I, both x and y-coordinates are positive i.e. $x > 0$ and $y > 0$.
- In quadrant II, x-coordinate is negative and y- co-ordinate (ordinate) is positive i.e. $x < 0$ and $y > 0$.
- In quadrant III, both x and y- coordinate are negative i.e. $x < 0$ and $y < 0$.
- In quadrant IV, x- coordinate is positive and y- coordinate is negative i.e. $x > 0$ and $y < 0$.
- At the origin $x = y = 0$, so the origin has coordinates (0, 0).

Procedure of Graphing a Point in the Cartesian Plane (*xy*-Plane)

Let us learn, how to plot a point in the Cartesian plane through the following example.



To plot the point (2, 3) in the xy-plane, start from origin and move 2 units to the right of y-axis and then move 3 units up from x-axis as shown in the figure. We reached at the point p which represents (2,3).

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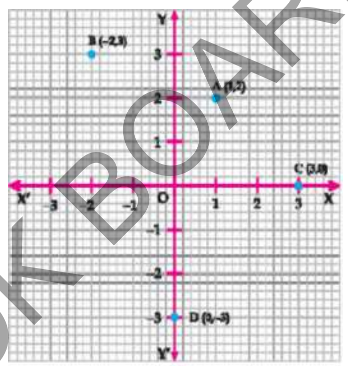
Example 01 Determine abscissa and ordinate of the following points. Mention the quadrant in which the point lies also locate the points.

i. A (1, 2) ii. B (-2, 3)

iii. C (3, 0) iv. D (0, -3)

Solution:

Scale: 5 small square = 1 unit



i. A (1, 2)

Here, the abscissa is 1 unit and ordinate is 2 unit, since $x > 0$ and $y > 0$, so, the given point lies in the quadrant I.

ii. B (–2, 3)

Here, the abscissa –2 and ordinate in 3. In $x < 0$ and $y > 0$, so, the given point lies in the quadrant II.

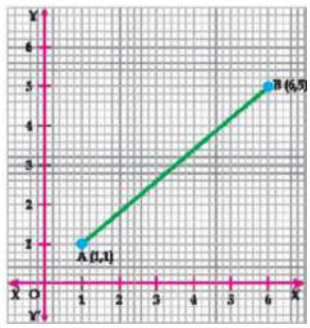
iii. C (3, 0)

Here, the abscissa is 3 unit and ordinate is 0 unit, therefore the point C lies on the x-axis, i.e. right of Origin.

iv. D(0, -3)

Here, the abscissa is 0 unit and ordinate is -3 units, therefore the point D lies on the y-axis, i.e. below the origin.

7.1.6 Draw Different Geometrical Shapes (line segment, triangle and rectangle etc.)



In the previous classes we have studied about the content of several geometrical shapes and also studied how to draw them according to the given information. Now we will draw different geometrical shapes on the graph paper by using the given points.

Example 01 Draw a line segment AB whose ends are A(1,1) and B(6,5).

Method:

Scale: 5 small squares = 1 unit

First we locate the points of line on the graph paper then we join them to obtain the line segment AB as shown in the figure.

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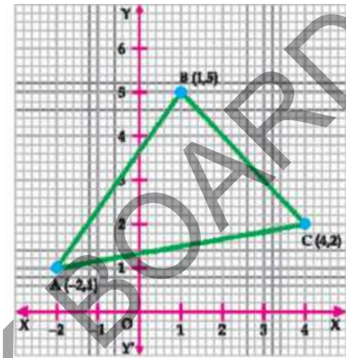
Example 02 Draw a triangle ABC whose vertices are A (-2,1), B(1,5) and C(4, 2).

Method:

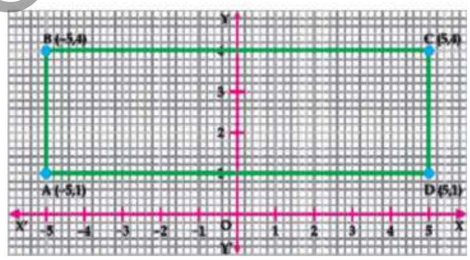
Scale: 5 small squares = 1 unit
First, we plot the points A, B, and C on the graph paper. Then we join them to get the ΔABC as shown in figure.



Example 03 Draw a rectangle ABCD whose vertices are A (-5, 1), B (-5, 4), C (5, 4) and D (5, 1).

Method:

Scale: 5 small squares= 1unit.
Plot the points A (-5, 1), B (-5, 4), C(5, 4) and D(5, 1) on the graph paper.
Join the points A to B, B to C, C to D and D to A on the graph paper which results ABCD rectangle.



7.1.7 Construction of table for pairs of values satisfying a linear equation in two variables

This can be explained with the help of below example:

Example 01 Let $x+y=5$ be a linear equation in two variables x and y respectively. Construct the table for some values of x and y.

Solution: Given that $x+y=5$, which can be written as: $y=5-x$
Now prepare the table, put the values of x and get their corresponding values of y.

x	-3	-2	-1	0	1	2	3	…
y	8	7	6	5	4	3	2	…

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Exercise 7.1

1. **Determine x and y co-ordinate in the following points:**
   i. A(-2, 2) ii. B(5, -1) iii. C(4, 0)
   iv. D(-5, -6) v. E(3, 4) vi. F($-\sqrt{8}$, $\sqrt{8}$)
2. **Mention the quadrant in which each of the following point lies.**
   i. A(2, -1) ii. B(-3, 3) iii. C($2\sqrt{2}$, $-2\sqrt{2}$)
   iv. D(-2, -4) v. E(5, 4) vi. F($\frac{3}{2}$, $\frac{5}{2}$)
3. **Plot the following points A, B, C and D in the xy-plane.**
   i. A(2, 1), B(3, 2), C(-3, 4), D(-4, -5)
   ii. A(2, 0), B(0, 2), C(3, -3), D(-3, 3)
   iii. A(0, 0), B(-3, -3), C(5, -6), D(-6, 5)
4. Draw a line segment AB by joining the points A(4, 6) and B (-6, 8).
5. Draw a triangle ABC by joining the points A(-1,4), B(-3,-6) and C(3,-2).
6. Draw a rectangle ABCD by joining the points A(0, -1), B(4, -3), C(8, 5) and D(4, 7).
7. Draw a square OABC by joining the points O(0, 0), A(5, 0), B(5, 5) and C(0, 5).
8. Draw a parallelogram OABC whose vertices are O(0, 0), A(3, -4), B(1, -7) and C(-2, -3).
9. **Construct the table for some values of x and y of the following linear equations.**
   i. $x+y-2=0$ ii. $2x-y-2=4$
   iii. $\frac{1}{2}(x+2y)-6=0$ iv. $\frac{2}{3}(x-2y)=-2$

7.1.8 Plot the Pairs of Points to Obtain the Graph of Given Expression

Suppose the linear equation y=2x consist of two variables. Here x is called independent variable and y is called the dependent variable. Because the value of y depends on the value of x.

To create a graph of the given equation we construct a table of values for x and y, and then plot these ordered pairs on the coordinate plane. Two points are enough to determine a line. However, it's always a good idea to plot more than two points to avoid possible errors.

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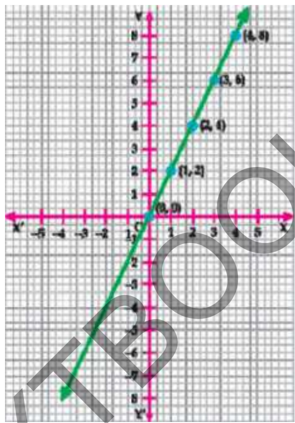
x	0	1	2	3	4	…
y	0	2	4	6	8	…

By continue adding ordered pairs (x,y) in the graph where y-value is the twice of the x-value. Then we draw a line through the points to show all of the points that are on the line. The arrows at each end of the graph indicate that the line continues endlessly in both directions. The resulting graph will look like as shown in the given figure.



7.1.9 Choose an Appropriate Scale to Draw a Graph

Scales should be chosen in such a way that data are easy to plot and easy to read. To determine the numerical value for each grid unit that best fits the range of each variable.

To draw the graph of an equation we choose a scale e.g. 1 small square length represents 1 unit or 2 small squares represent 1 unit etc. It is selected by keeping in mind the size of the paper. Some time the same scale is used for both x and y coordinates and some time we use different scales for x and y coordinate depending on the value of coordinates.

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7.1.10 Draw the Graph of:

- An equation of the form $y=c$
- An equation of the form $x=a$
- An equation of the form $y=mx$
- An equation of the form $y=mx+c$

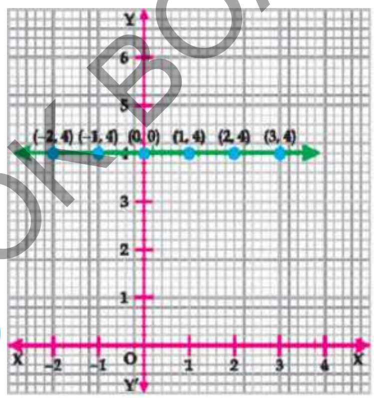
7.1.10 (i) To Draw the Graph of the Equation of the Form $y=c$

Example 01 Draw the graph of $y=4$.

Scale: 5 small squares = 1 unit

Solution: Construct table for drawing graph.

x	-3	-2	-1	0	1	2	3	…
y	4	4	4	4	4	4	4	…



Graph of the equation $y=4$ is shown in the figure.

Note:
Graph of $y = c$ is parallel to x-axis

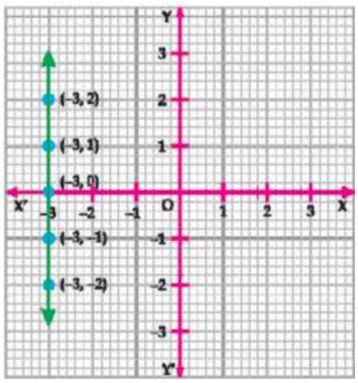
7.1.10(ii) To Draw the Graph of the Equation of the Form $x=a$

Example 01 Draw the graph of the equation $x=-3$

Method: Scale: 5 small squares = 1 unit

Construct table for drawing graph.

x	-3	-3	-3	-3	-3	…
y	-2	-1	0	1	2	…



Graph of the equation is shown in the figure.

Note:
Graph of $x = a$ is parallel to y-axis

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7.1.10(iii) To Draw a Graph of the Equation of the Form $y=mx$

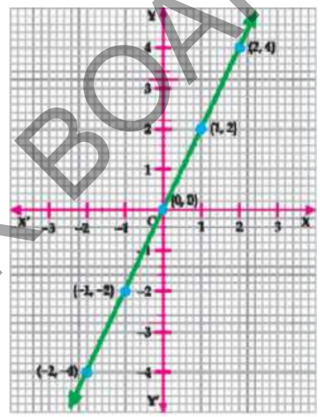
In the equation $y=mx$, the value of y (or its y-coordinate) is the multiple of m and the value of x, where m is constant real number.

Example 01 If $y=2x$, find the value of 'm' and draw its graph.

Solution:

Scale: 5 small square = 1unit
Construct table for drawing graph.

x	-2	-1	0	1	2	…
y	-4	-2	0	2	4	…



Note:
Graph of $y = mx$ always passes through the origin.

7.1.10(iv) To Draw the Graph of the Equation of the Form $y = mx+c$

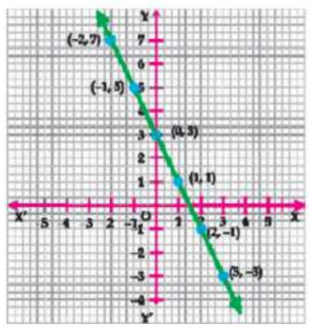
In the equation $y=mx+c$, where m and c are any real numbers, and m = Slope of the line and c =y-intercept of a line.

Example 01 Draw the graph of equation $y = -2x+3$.

Method:

Scale: 3 small squares = 1 unit
Construct table for drawing graph.

x	-2	-1	0	1	2	3	…
y	7	5	3	1	-1	-3	…



Note:
Graph of $y = mx+c$ always cut the y-axis at y=c .

7.1.11 To Draw a Graph from the Given Table of (discrete) values.

In order to draw a graph from a given table of (discrete) values, the values of x and y are combined in the form of the points which are then plotted on the graph paper.

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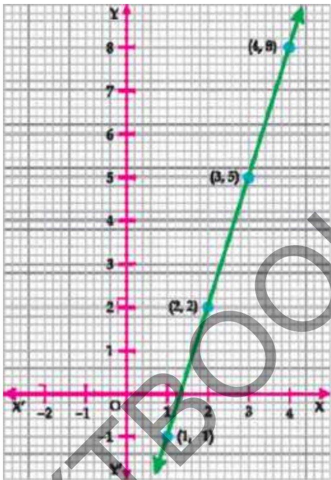
Example 01 Draw the graph of the values of the points given in the table below.

x	1	2	3	4	…
y	-1	2	5	8	…

Method: From the given table, we have, A(1, -1), B(2,2), C(3, 5) and D(4,8), so, we plot the graph on the graph paper.
Scale: 5 small squares = 1 unit



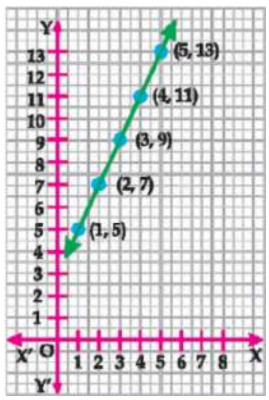
7.1.12 Solve Applied Real Life Problems

Linear equations can be used to model a number of real-life problems, like how much money you make over a time, or the distance that a bicyclist will travel given steady rate of pedaling. Graphing these relationships on a coordinate plane can often help you think about the problem and their solution.

Example 01

The weight (y) in kg and age (x) in years of a person expressed by the equation y=2x+3, draw the age weight graph of the equation.

x(age)	1	2	3	4	5	…
y(weight)	5	7	9	11	13	…



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Exercise 7.2

1. Construct a table for the equation given below, satisfying the pair of values: $x + y = 6$

2. Draw the graph from the table given below, using suitable scale.

x	0	-1	4	-4
y	2	4	5	-5

3. Plot the graph of:

i. $y = 3$ ii. $x = 3$ iii. $y = 0$

iv. $y = 2x + y$ v. $x = 3.5$ vi. $-y = 2x$

4. Find the missing coordinates in the table given below.

S.No	Equation	x-coordinates	y-coordinates
(i)	$y = \frac{1}{2}x$		0
		4	
(ii)	$x = \frac{2}{3}y$	1	
			$\frac{3}{2}$
(iii)	$2x + 4y = 8$	0	?
			$\frac{1}{4}$
(iv)	$2x + y = 6$	1	
			0
(v)	$x - y = 2$		0
		1	?
(vi)	$x - 3y = 6$	3	?
			-1

5. The weight (y) in kg and age (x) in years of a person expressed by the equation $y = 2x$. Draw the Age – Weight graph.

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6. Ayesha can drive a two-wheeler continuously at the speed of 20km/hour. Construct a distance-time graph for this situation. Through the linear graph calculate:
a) The time taken by Ayesha to ride 100km.
b) The total distance covered by Ayesha in 3 hours.

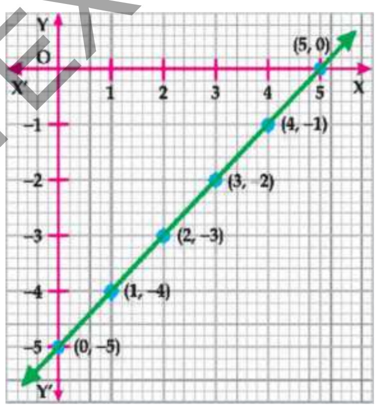
7.2 Conversion Graphs

7.2.1 Interpret conversion graph as a linear graph relating to two quantities which are in direct proportions

Here we consider the conversion graph as a linear graph of two quantities which are related in direct proportion.
We demonstrate the ordered pairs which lies on the graph of the equation $y = x - 5$, are calculated values given below table:

x	0	1	2	3	4	5
y	-5	-4	-3	-2	-1	0
(x, y)	(0, -5)	(1,-4)	(2, -3)	(3, -2)	(4, -1)	(5, 0)

Locate the points on the graph for the given linear equation in which for every unit change in x coordinate value there is proportional change in y-coordinate value.



7.2.2 Read a Given Graph to Know One Quantity Corresponding to Another:

Consider the linear equation $y = x - 5$
For the given values of x we can read the corresponding value of y with the help of: $y = x - 5$

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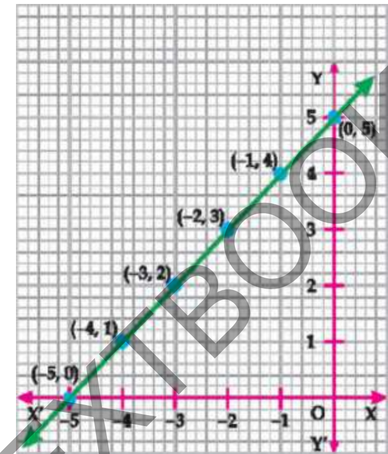
For the given values of y we can read the corresponding value of x, by converting the equation $y = x - 5$ to the equation $x = y + 5$ and draw the corresponding conversion graph. In the conversion graph we express x in term of y as given below: $x = y + 5$

y	-5	-4	-3	-2	-1	0
x	0	1	2	3	4	5
(y, x)	(-5, 0)	(-4, 1)	(-3, 2)	(-2, 3)	(-1, 4)	(0, 5)

The conversion graph of x.r.t. y is drawn on the graph paper.



7.2.3 Read the graph for conversion of the forms:

- Miles and kilometers
- Acres and hectares
- Degrees Celsius and Fahrenheit
- Pakistani currency and other currencies, etc.

If both quantities are in a relation either is increasing or decreasing, then the graph of the relation will be the straight line showing the levels of both quantities indicated by co-ordinate axes.

(i) Read the Graph for Conversion of Miles and Kilometers

Let us discuss the graph of the form of miles and kilometers, both are the units of the distance. If the distance in miles indicated along x-axis and the distance in kilometers along y-axis. Let's see the following examples.

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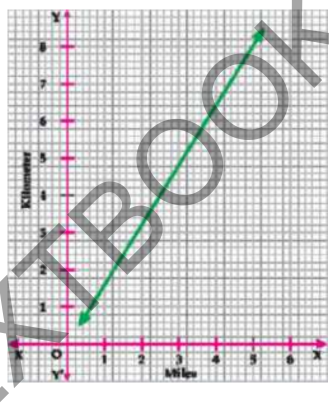
Example Read the following conversion graph between miles and kilometer to approximately convert:

i) 2 miles to kilometers
ii) 5 miles to kilometers
iii) 3 kilometers to miles
iv) 7 kilometers to miles

By using given scales.

Conversion graph between miles and kilometer

Scale: 5 small squares = 1 mile along x-axis
5 small squares = 1 kilometer along y-axis



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Solution:

i) 2 miles to kilometers

By reading the above graph as per given scale we can see
2 miles $\cong$ 3.20 kilometers

ii) 5 miles to kilometers

By reading the above graph as per given scale we can see
5miles $\cong$ 8 kilometers

iii) 3 kilometer to miles

By reading the above graph as per given scale we can see
3 kilometers $\cong$ 1.8 miles

iv) 7 kilometer to miles

By reading the above graph as per given scale we can see
7 kilometers $\cong$ 4.20

(ii) Read the Conversion of Hectares into Acres:

Let us discuss the graph of the form of Hectares and Acres, both are the units of land area. If the distance in Hectares indicated along x-axis and the distance in Acres along y-axis. Let's see the following examples.

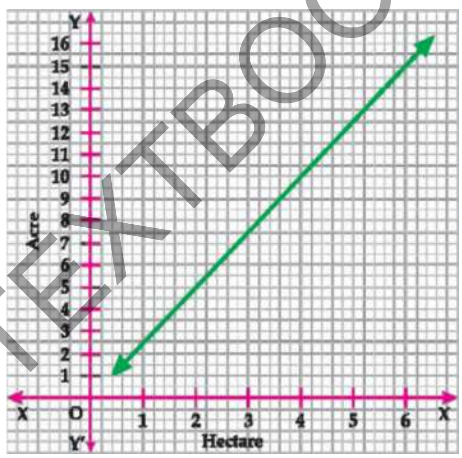
Example: Read the following conversion graph between Hectares and Acres to approximately convert:

i) 2 hectares to acres
ii) 6 hectares to acres
iii) 10 acres to hectares
iv) 8 acres to hectares

By using given scales.

Conversion graph between hectares and acres

Scale: 5 small squares = 1 hectares along x-axis
2 small squares = 1 acres along y-axis



Solution:

i) 2 hectares to acres

By reading the above graph as per given scale we can see
2 hectares $\cong$ 5 acres

ii) 6 hectares to acres

By reading the above graph as per given scale we can see
6 hectares $\cong$ 15 acres

iii) 10 acres to hectares

By reading the above graph as per given scale we can see
10 hectares $\cong$ 4 acres

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iv) 8 acres to hectares

By reading the above graph as per given scale we can see

8 kilometers ≅ 3.20

(iii) Read the Conversion graph of Degrees Celsius into Degrees Fahrenheit:

Let us discuss the graph of the form of Celsius and Fahrenheit, both are the units of temperature. If the temperature in Celsius indicated along *x*-axis and the temperature in Fahrenheit along *y*-axis. Let's see the following examples.

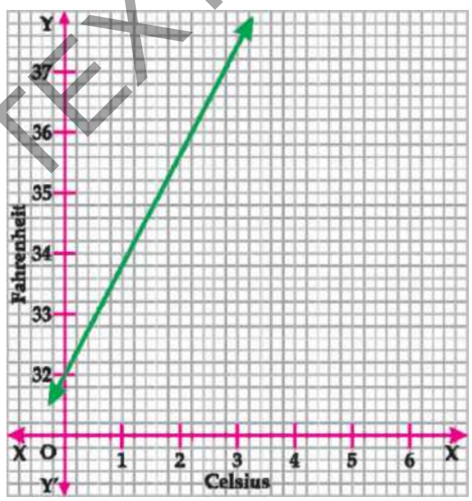
Example: Read the following conversion graph between Celsius and Fahrenheit to approximately convert:

i) 1^o Celsius to Fahrenheit
ii) 3^o Celsius to Fahrenheit
iii) 36^o Fahrenheit to Celsius
iv) 37^o Fahrenheit to Celsius

By using given scales.

Conversion graph between Celsius and Fahrenheit

Scale: 5 small squares = 1 Celsius along *x*-axis
5 small squares = 1 Fahrenheit along *y*-axis



Solution:

i) 1^o Celsius to Fahrenheit

By reading the above graph as per given scale we can see

1^o Celsius ≅ 33.8^o Fahrenheit

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ii) 3° Celsius to Fahrenheit

By reading the above graph as per given scale we can see
3° Celsius ≅ 37.4° Fahrenheit

iii) 36° Fahrenheit to Celsius

By reading the above graph as per given scale we can see
36° Fahrenheit ≅ 2.2° Celsius

iv) 37° Fahrenheit to Celsius

By reading the above graph as per given scale we can see
37° Fahrenheit ≅ 2.8° Celsius

(iv) Read the Currency Conversion Graph:

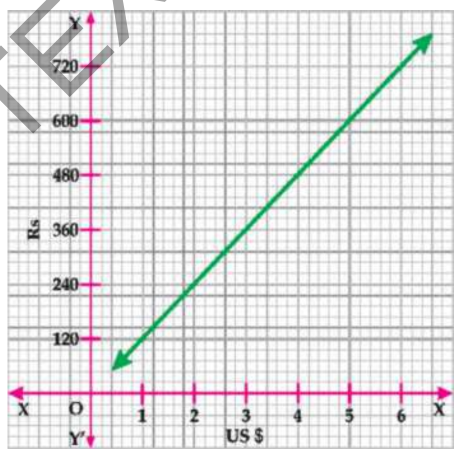
Example 1: Read the following conversion graph US dollar ($) and Pakistani rupees (Rs) to approximately convert:

i) 2 US $ to Rs
ii) 5 US $ to Rs
iii) 360 Rs to US $
iv) 720 Rs to US $

By using given scales.

Conversion graph between US dollar ($) to Pakistani rupees (Rs)

Scale: 5 small squares = 1 US $ along x-axis
5 small squares = 120 Rs along y-axis



Solution:

i) 2 US $ to Rs

By reading the above graph as per given scale we can see
2 $ ≅ Rs. 240

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ii) 5 US \$ to Rs

By reading the above graph as per given scale we can see

5 \$ ≅ Rs. 600

iii) 360 Rs to US \$

By reading the above graph as per given scale we can see

Rs. 360 ≅ 3\$

iv) 720 Rs to US \$

By reading the above graph as per given scale we can see

Rs. 720 ≅ 6\$

7.3 Graphic Solution of Equations in Two Variables:

7.3.1 Solve simultaneous linear equation in two variables by graphical method

We have already studied the solution of two linear equations with two variables algebraically. Now in this section we will find the solution of the two linear equations in two variables graphically. The point of intersection of these two straight lines is the solution of these equations.

Example 01 Find the solution set graphically for the given equations.
$x + y = 3$ and $x - y = 5$.

Solution: Given equations are as under:

$x+y = 3$… (1)

and $x-y = 5$ … (2)

From equations (1) and (2), we can re-write them in term of y as under

$y = 3-x$… (3)

and $y = x-5$ … (4)

Now prepare separate tables for each linear equation

Table for the equation (3) is given below:

x	-1	0	1	2	3	4	…
y	4	3	2	1	0	-1	…

Table for the equation (4) given bellow:

x	-1	0	1	2	3	4	…
y	-6	-5	-4	-3	-2	-1	…

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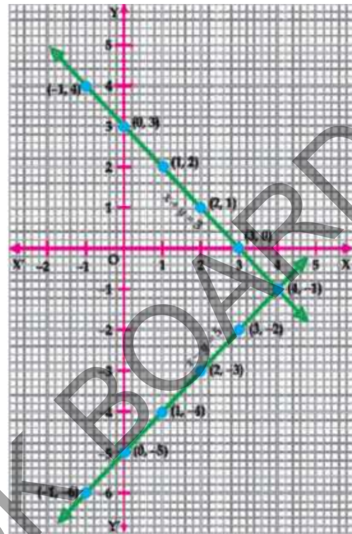
Now draw the straight lines by using the points of both the tables.
We see that graph of the given equations are straight lines l_1 and l_2, which meets at the point (4, -1), i.e., l_1 intersect l_2 at the point (4,-1).
Thus, solution Set is {(4,-1)}.



Example 02 Find the solution set graphically for the given equations. $y=2x+4$ and $y=2x-2$

Solution: The given equations are as under:

$y = 2x + 4$ ... (1)

and $y = 2x- 2$ ... (2)

Now make the separate sets for each linear equation.

For equation (1) table is given below:

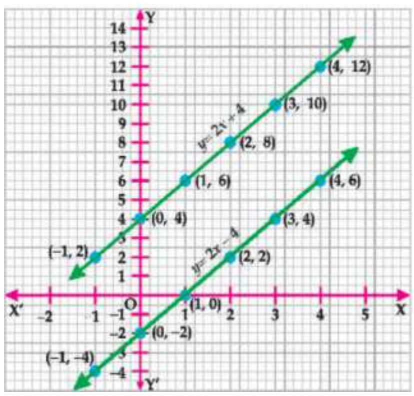
x	-1	0	1	2	3	4
y	2	4	6	8	10	12

For equation (2) table is given below:

x	-1	0	1	2	3	4
y	-4	-2	0	2	4	6

Now locate these points for both the equations on the same graph and then make two lines by joining the points of the two equations.
We can see that straight lines are obtained from these equations which have no common point. It means these lines don't intersect at any point hence its solution set is empty.

Thus, solution set is { }.



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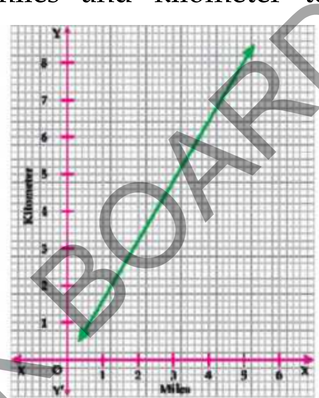
Exercise 7.3

1. Read the given conversion graph between miles and kilometer to approximately convert:
   i) 1 miles to kilometers
   ii) 3 miles to kilometers
   iii) 2 kilometers to miles
   iv) 8 kilometers to miles

   By using given scales.

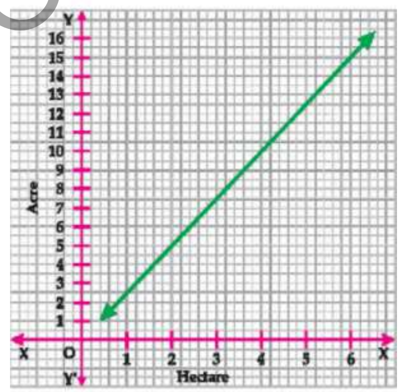


Conversion graph between miles and kilometer

Scale: 5 small squares = 1 mile along x-axis
5 small squares = 1 kilometer along y-axis

2. Read the given conversion graph between Hectares and Acres to approximately convert:
   i) 2 hectares to acres
   ii) 5 hectares to acres
   iii) 5 acres to hectares
   iv) 15 acres to hectares

   By using given scales.

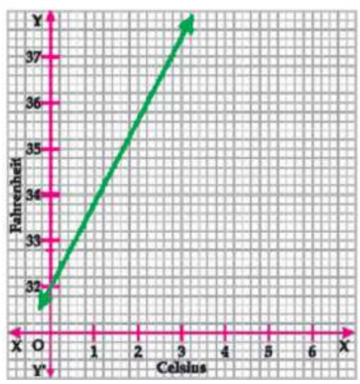


Conversion graph between hectares and acres

Scale: 5 small squares = 1 hectares along x-axis
2 small squares = 1 acres along y-axis

3. Read the given conversion graph between Celsius and Fahrenheit to approximately convert:
   i) 2° Celsius to Fahrenheit
   ii) 1.80° Celsius to Fahrenheit
   iii) 32° Fahrenheit to Celsius
   iv) 36.4° Fahrenheit to Celsius

   By using given scales.



Conversion graph between Celsius and Fahrenheit

Scale: 5 small squares = 1 Celsius along x-axis
5 small squares = 1 Fahrenheit along y-axis

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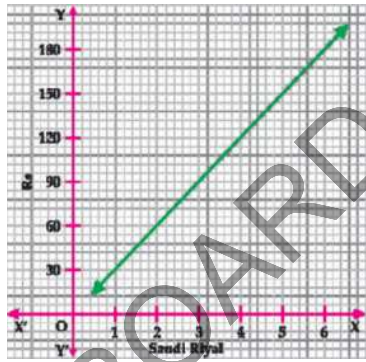
4. Read the given conversion graph Saudi Riyal and Pakistani rupees (Rs) to approximately convert:

i) 3 Saudi riyal to Rs
ii) 5.2 Saudi riyal to Rs
iii) 150 Rs to Saudi riyal
iv) 78 Rs to Saudi riyal

By using given scales.



Conversion graph between Saudi Riyal to Pakistani rupees (Rs)

Scale: 5 small squares = 1 Saudi riyal along x-axis
5 small squares = 30 Rs along y-axis

5. Solve the following simultaneous equations by graphical method.

i. $3x - 11 = y$; $x-3y=9$

ii. $x + y = 4$; $2x - 1=5y$

iii. $2x = y + 5$; $x=2y+1$

iv. $y=3x - 5$; $x+y=11$

v. $2x + y = 3$; $x - y=0$

vi. $2x+2=y$; $y=x - 1$

vii. $5 = x + 4y$; $2x+3y=0$

viii. $3x = 5y-2$; $3x+5y=8$

ix. $\frac{x+2}{5}+y=6$; $y=2x - 12$

x. $3x -2y = 13$; $2x+3y=13$

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Review Exercise 7

True and false question

1. Read the following sentences carefully and encircle T or F whichever is.

(i) The Cartesian plane is also called *xy*-plane. T / F

(ii) In 2^{nd} quadrant both x and y coordinates are positive. T / F

(iii) The point (1, –2) lies in 1^{st} quadrant. T / F

(iv) The (–3, –4) lies in the 4^{th} quadrant. T / F

2. Tick (✓) the correct answer in the following:

(i) The point (–3, –4) is located in
(a) 1^{st} quadrant (b) 2^{nd} quadrant
(c) 3^{rd} quadrant (d) 4^{th} quadrant

(ii) The two coordinates axes intersect at an angle of
(a) 45^0 (b) 90^0
(c) 180^0 (d) 270^0

(iii) The line y = 4 is parallel to
(a) x-axis (b) y-axis
(c) Both axes (d) None

(iv) The line x=–5 is parallel to
(a) x-axis (b) y-axis
(c) Both axis (d) None

(v) The line x=–5 has a point on x-axis
(a) (–5, 5) (b) (0, -5)
(c) (–5, 0) (d) (5, 0)

(vi) The solution set of the line x=2 and x=5
(a) {(2, 5)} (b) {2, 5}
(c) {(0, 5)} (d) { }

(vii) The co-ordinate axes are mutually
(a) Perpendicular (b) Parallel
(c) Intersecting at 30^o (d) Intersecting at 45^o

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Summary

- An ordered pair represents the position of a point in the Cartesian plane.
- The 2-dimensional Cartesian co-ordinate system is defined by two perpendicular lines i.e. x-axis and y-axis. Both the axes intersect each other at the specific point i.e., called origin (0, 0).
- Plane is divided into four quadrants by the axes.
- The Cartesian plane is also known as ***xy*-plane**.
- In quadrant I, both x and y-coordinates are positive i.e., $x > 0$ and $y > 0$.
- In quadrant II, x- co-ordinate (abscissa) is negative and y co-ordinate (ordinate) is positive i.e., $x < 0$ and $y > 0$.
- In quadrant III, both x and y- co-ordinate are negative i.e., $x<0$ and $y<0$.
- In quadrant IV, x- co-ordinate is positive and y- co-ordinate is negative i.e. $x > 0$ and $y < 0$.
- At the origin $x = y = 0$, so the origin has coordinates (0, 0).
- In general, any point in the Cartesian plane can be represented by the ordered pair (a, b), where 'a' is the x- co-ordinate (abscissa) and 'b' is the y- co-ordinate (ordinate).
- Graph of $x = a$ is parallel to the y-axes.
- Graph of $y = c$ is parallel to the x-axes.
- Graph of $y = mx$ always passes through the origin.
- Graph of $y = mx + c$ cut the y-axes at $y = c$.

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