UNIT 9

LINEAR GRAPHS

- Cartesian Plane and Linear Graphs
- Conversion Graph

After completion of this unit, the students will be able to:

- Identify pair of real numbers as an ordered pair.
- Recognize and ordered pair through different examples for instance, an ordered pair (2,3) to represent a seat, located in an examination hall, at the 2nd row and 3rd column.
- Describe rectangular or Cartesian plane consisting of two number lines intersecting at right angles at the point O.
- Identify origin (O) and coordinate axes (horizontal and vertical axes) in the rectangular plane.
- Locate an ordered pair *(a,b)* as a point in the rectangular plane and recognize:
  - *a* as the *x*-coordinate (or abscissa),
  - *b* as the *y*-coordinate (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 a given table of (discrete) values.
- Identify through graph the domain and the range of function.
- Interpret conversion graph as a linear graph relating to two quantities which are in direct proportion.
- Read a given graph to know one quantity corresponding to another.
- Read the graph for conversions of the form:
  - Miles and kilometres,
  - Acres and hectares,
  - Degrees Celsius and degrees Fahrenheit,
  - Pakistani currency and another currency, etc.

9.1 CARTESIAN PLANE AND LINEAR GRAPHS

9.1.1 Pair of Real Numbers as an Ordered Pair

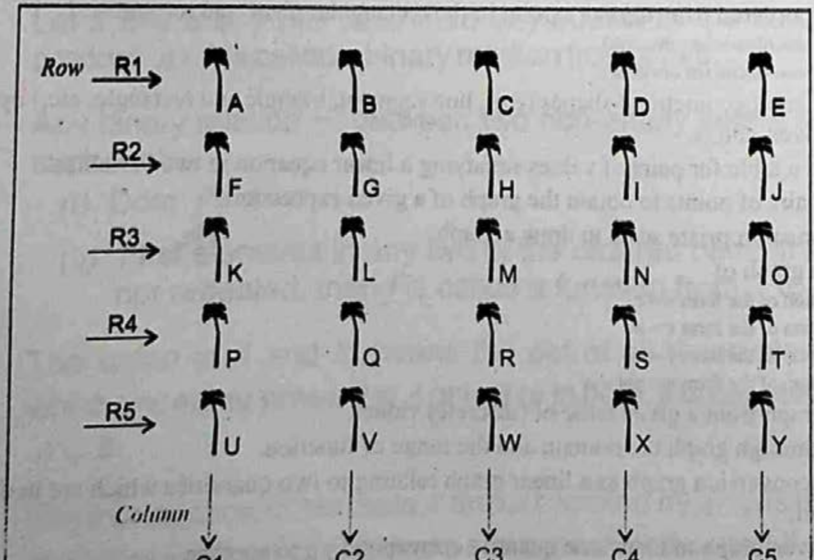
By the definition of equality of sets, for any two elements "a" and "b", we have $\{a,b\} = \{b,a\}$.

However, if we keep in mind the order in which the elements are being listed, then a pair of two elements, listed in a specific order, is called an ordered pair, denoted by (a,b). Thus for different elements "a" and "b", we have $(a,b) \neq (b,a)$.

In general $(a_1,b_1) = (a_2,b_2) \Leftrightarrow a_1 = a_2$ and $b_1 = b_2$ we represent each point in a plane by means of an ordered pair i.e. (x,y).

9.1.2 Ordered Pairs

A gardener prepares an arrangement plan of trees in a square field. The trees are marked with numbers. To identify each tree more easily, the gardener can connect each tree with the column and the row in which it is present. The tree "H" is present in *2nd* row and *3rd* column, while the tree number "R" is present in *4th* row and *3rd* column.



The gardener can write a pair of numbers against the number of a tree in the field as follows.

A(1,1),	*B(1,2),*	*C(1,3),*	*D(1,4),*	*E(1,5)*
F(2,1),	*G(2,2),*	*H(2,3),*	*I(2,4),*	*J(2,5)*
K(3,1),	*L(3,2),*	*M(3,3),*	*N(3,4),*	*O(3,5)*
P(4,1),	*Q(4,2),*	*R(4,3),*	*S(4,4),*	*T(4,5)*
U(5,1),	*V(5,2),*	*W(5,3),*	*X(5,4),*	*Y(5,5)*

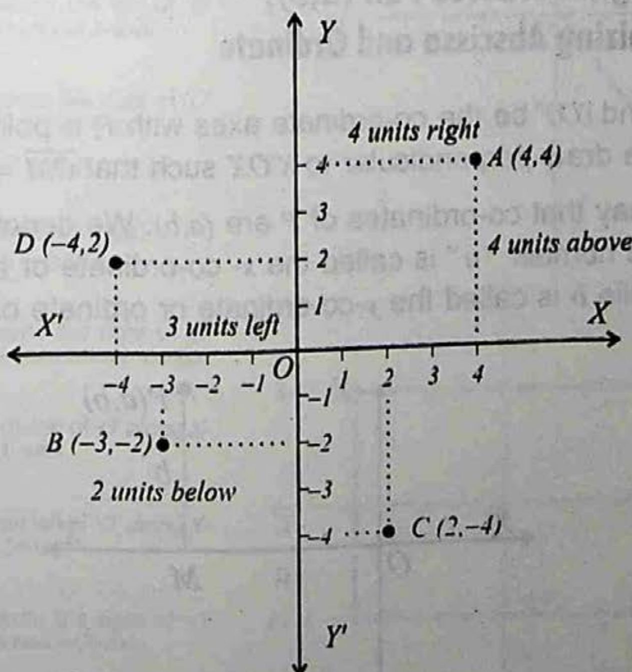
Can we write the pairs of numbers corresponding to the trees *F, G, H, K* and *M*?

Yes these are : *F(2,1), G(2,2), H(2,3), I(2,4), K(3,1)* and *M(3,3)*.

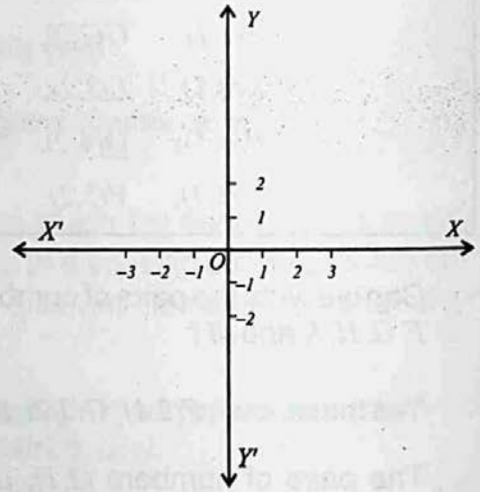
The pairs of numbers *(2,1), (2,2), (2,3), (2,4), (3,1), (3,3)* and so on are examples of **ordered pairs.**

9.1.3 Rectangular or Cartesian Plane

The given figure shows a rectangular or cartesian plane consisting of two number lines *XOX'* and *YOY'* intersecting at right angle at *O*.



9.1.4 Identifying Origin *(O)* and Co-ordinate Axis in Rectangular Plane



In cartesian plane. $X'OX$ and YOY' are two mutually perpendicular lines called co-ordinate axes, intersecting at a point "O". We call the point O as origin.

The horizontal line $X'OX$ is called the *x-axis* and the vertical line YOY' is called the *y-axis*.

We fix a convenient unit of length and mark the origin O.

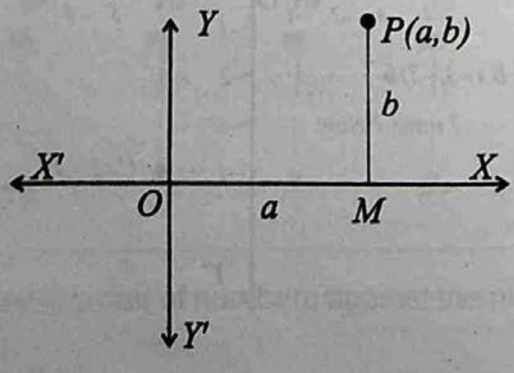
Now we mark equal distances (each equal to unit length) on *x-axis* as well as on *y-axis* on both sides of O.

The distances measured along $\overrightarrow{OX}$ and $\overrightarrow{OY}$ are taken as positive while those along $\overrightarrow{OX'}$ and $\overrightarrow{OY'}$ are considered as negative.

9.1.5 Locating an Ordered Pair *(a,b)*, Recognizing Abscissa and Ordinate

Let XOX' and YOY' be the co-ordinate axes with P, a point in the plane. From P we draw perpendicular to $X'OX$ such that $\overline{OM} = a$ and $\overline{MP} = b$.

Then we say that co-ordinates of P are (a,b). We denote this point by $P(a,b)$. The number "a" is called the x- co-ordinate or abscissa of the point P while b is called the y-co-ordinate or ordinate of the point P.



9.1.6 Geometrical Shapes by Joining a Set of Given Points

EXAMPLES

Draw a line segment, a triangle and a rectangle with the help of the given points: (i) A(–3,–4), B(4,5), (ii) A(2,3), B(–3,4), C(4,–5) (iii) A(4,3), B(–4,3), C(–4, –3), D(4,–3)

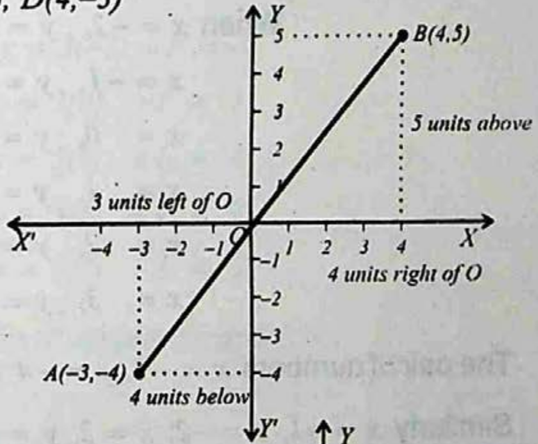
SOLUTION:

(i) The two ordered pairs are: *A(–3,–4)* and *B(4,5)*.

For point *A(–3,–4)*:
We move *3* units towards the left of '*O*' along *X*-axis and then *4* units below *X*-axis.

For point *B(4,5)*:
We move *4* units towards right of '*O*' along *X*-axis and then *5* units above *X*-axis.

Join *A* to *B* to obtain line-segment *AB*.



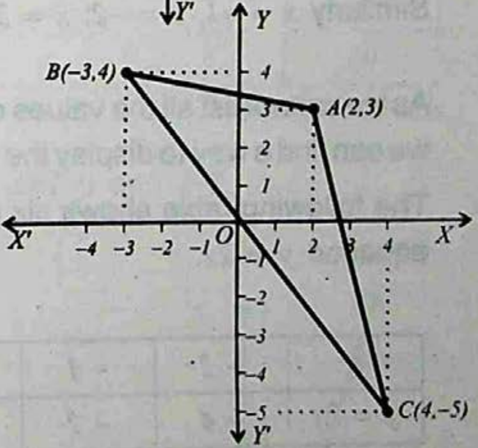
(ii) The given ordered pairs are *A(2,3)*, *B(–3,4)* and *C(4,–5)*.

For point *A(2,3)*:
We move *2* units towards the right of '*O*' along *X*-axis and *3* units above *X*-axis.

For point *B(–3,4)*:
We move *3* units towards the left of '*O*' along *X*-axis and *4* units above *X*-axis.

For point *B(4,–5)*:
We move *4* units towards the right of '*O*' along *X*-axis and *5* units below *X*-axis.

We join *A* to *B* : *B* to *C* and *C* to *A* to obtain a triangle *ABC*.



(iii) The given four ordered pairs are: *A(4,3)*, *B(–4,3)*, *C(–4,–3)* and *D(4,–3)*.

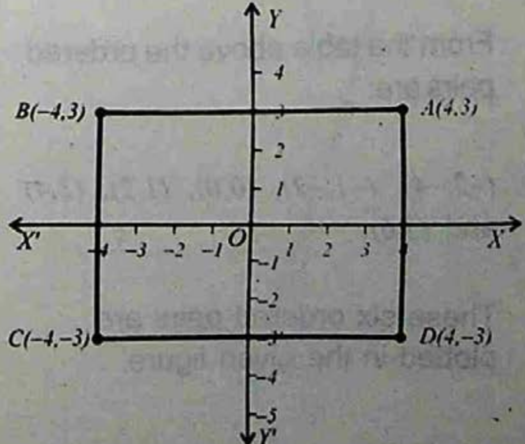
For point *A(4,3)*:
We move *4* units towards the right of '*O*' along *X*-axis and then *3* units above *X*-axis.

For point *B(–4,3)*:
We move *4* units towards left of '*O*' along *X*-axis and *3* units above *X*-axis.

For point *C(–4,–3)*:
We move *4* units towards left of '*O*' along *X*-axis and *3* units below *X*-axis.

For point *D(4,–3)*:
We move *4* units towards the right of '*O*' along *X*-axis and *3* units below *X*-axis.

We join *A* to *B* : *B* to *C* : *C* to *D* and *D* to *A* to obtain a rectangle *ABCD*.



9.1.7 Table for Pairs of Values Satisfying a Linear Equation in two Variables

Let us consider the equation $y = 2x$. We look all pairs of numbers x and y that satisfy the equation $y = 2x$.

When $x = -2, \; y = 2(-2) = -4$

$x = -1, \; y = 2(-1) = -2$

$x = 0, \; y = 2(0) = 0$

$x = 1, \; y = 2(1) = 2$

$x = 2, \; y = 2(2) = 4$

$x = 3, \; y = 2(3) = 6$

The pair of numbers $x = -2, y = -4$ satisfies $y = 2x$.

Similarly $x = -1, y = -2$; $x = 2, y = 4$ etc, satisfy the equation $y = 2x$.

As we cannot list all the values of x and y that satisfy the equation $y = 2x$, we can find a way to display the function $y = 2x$.

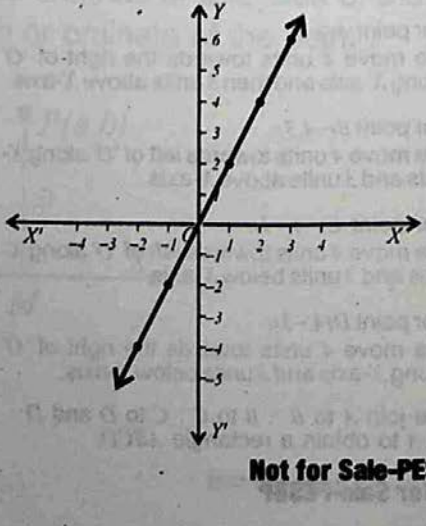
The following table shows six pairs of values of x and y that satisfy the equation $y = 2x$.

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

From the table above the ordered pairs are:

$(-2,-4)$, $(-1,-2)$, $(0,0)$, $(1,2)$, $(2,4)$ and $(3,6)$.

These six ordered pairs are plotted in the given figure.



9.1.8 Plot the Pairs of Points to Obtain the Graph of a given Expression

Let us consider an equation $y = 3x + 1$.
We look at some pair of numbers x and y that satisfy the equation $y = 3x + 1$.

When $x = -1 \Rightarrow y = 3(-1) + 1 = -2$

$x = 0 \Rightarrow y = 3(0) + 1 = 1$

$x = 1 \Rightarrow y = 3(1) + 1 = 4$

$x = 2 \Rightarrow y = 3(2) + 1 = 7$

$x = 3 \Rightarrow y = 3(3) + 1 = 10$

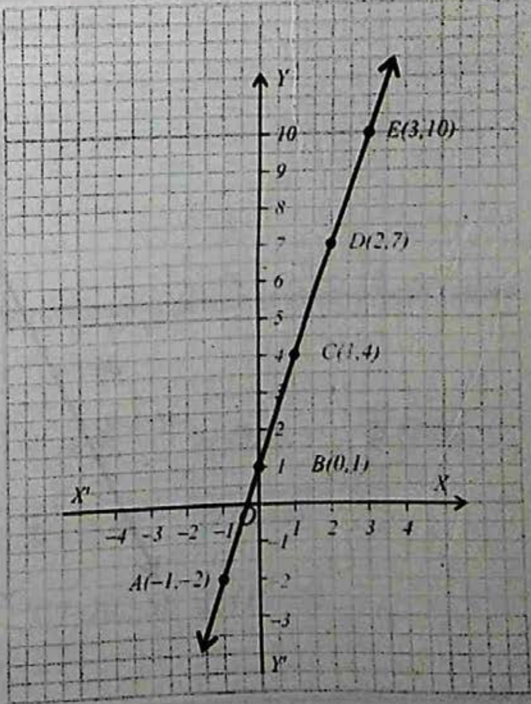
The table below shows five pairs of values of x and y.

x	-1	0	1	2	3
$y = 3x + 1$	-2	1	4	7	10

The five ordered pairs are :

$A(-1,-2)$, $B(0,1)$, $C(1,4)$, $D(2,7)$ and $E(3,10)$

Now we plot these pairs on the graph paper.



For point $A(-1,-2)$:
We move 1 unit towards left of 'O' along X-axis and 2 units below X-axis.

For point $B(0,1)$:
We move 1 unit along Y-axis above 'O'.

For point $C(1,4)$:
We move 1 unit towards right of 'O' along X-axis and 4 units above X-axis.

For point $D(2,7)$:
We move 2 units towards right of 'O' along X-axis and 7 units above X-axis.

For point $E(3,10)$:
We move 3 units towards the right of 'O' along X-axis and 10 units above X-axis.

We draw a line AE.

9.1.9 Choosing an Appropriate Scale to Draw a Graph

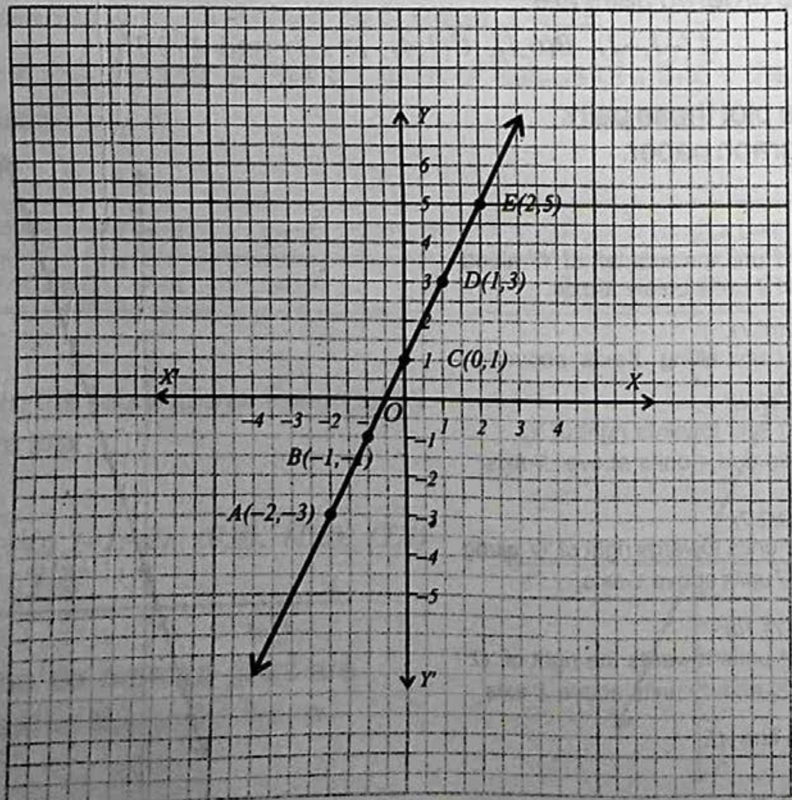
Let us consider the equation $y = 2x + 1$.

$$\begin{aligned}
\text{When } x &= -2, & y &= 2(-2) + 1 = -3 \\
x &= -1, & y &= 2(-1) + 1 = -1 \\
x &= 0, & y &= 2(0) + 1 = 1 \\
x &= 1, & y &= 2(1) + 1 = 3 \\
x &= 2, & y &= 2(2) + 1 = 5
\end{aligned}$$

The following table shows five pairs of values of x and y mentioned above.

x	-2	-1	0	1	2
$y = 2x + 1$	-3	-1	1	3	5

We use two small squares (or 1 big square) on the graph paper to represent both x and y.



EXERCISE – 9.1

1- Represent the points on the graph whose co-ordinates are given below.

(i) $A(2,-4)$	(ii) $B(3,2)$
(iii) $C(-5,-1)$	(iv) $D(6,-3)$
(v) $E(4,4)$	(vi) $F(-3,7)$
(vii) $G(0,7)$	(viii) $H(5,0)$

2- Write down the co-ordinates of:

(i) Origin

(ii) A point lying on the left hand side of *x-axis* and at a distance of *5* units from the origin.

(iii) A point lying to the right hand side of the origin on *x-axis* at a distance of *3* units from the origin.

(iv) A point lying above *x-axis* and on *y-axis* at a distance of *4* units.

(v) A point lying below *x-axis* and on *y-axis* at a distance of *6* units.

3- Draw the figures with help of the following points on the graph paper.

(i) $A(7,2)$, $B(-6,-3)$, $C(5,3)$

(ii) $A(0,-7)$, $B(3,-2)$, $C(4,0)$, $D(5,6)$, $E(7,8)$

(iii) $A(4,0)$, $B(0,4)$, $C(-4,0)$, $D(0,-4)$

(iv) $A(10,6)$, $B(-10,6)$, $C(-10,-6)$, $D(10,-6)$,

9.1.10 Graphs of Linear Equations of the form $y = c$

Graph of a Linear Equation of the form $y = c$

To draw the graph of $y = c$, we can write the equation $y = c$ in the form $0 . x + y = c$. Procedure to draw the graph is explained through the following example:

EXAMPLE

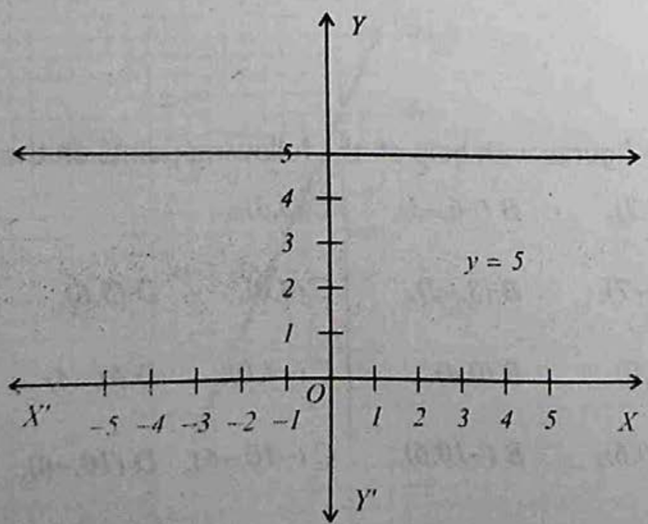
Draw the graph of an equation $y = 5$.

SOLUTION:

The equation $y = 5$ can be written as $y=0\times x+5$
If we put $x = 0$ in the equation we get $y = 5$.
Similarly putting $x=\pm 1, \pm 2, \pm 3,...$ in the equation $y = 0 . x + 5$, we have $y = 5$. For all values of x we have $y = 5$, i.e. y remains constant.

Table of values of x and y is as under:

x	-3	-2	-1	0	1	2	3
y	5	5	5	5	5	5	5



Graph of a Linear Equation of the form $x = a$

To draw the graph of $x = a$, we can write the equation $x = a$ in the form of $x + 0 \cdot y = a$ procedure to draw the graph is explained in the following example:

EXAMPLE

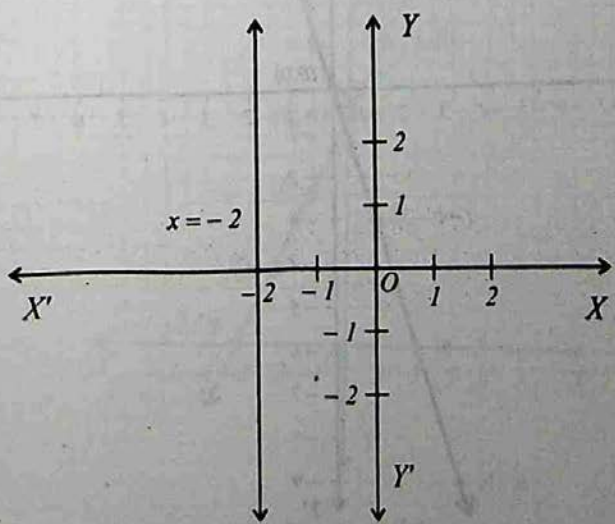
Draw the graph of an equation $x = -2$.

SOLUTION:

The equation $x = -2$ can be written as $x + 0 \cdot y = -2$. If we put $y = 0$ in this equation, we get $x = -2$. Similarly putting $y = \pm 1, \pm 2, \pm 3, \ldots$ in the equation $x + 0 \cdot y = -2$, we have $x = -2$.
For all values of y we have $x = -2$, i.e. x remains constant.

Table of values of x and y is as under:

x	-2	-2	-2	-2	-2	-2	-2
y	-3	-2	-1	0	1	2	3



Graph of a Linear Equation $y = mx$

To draw the graph of $y = mx$, we consider the following example:

EXAMPLE

Draw the graph of $y = 3x$.

SOLUTION:

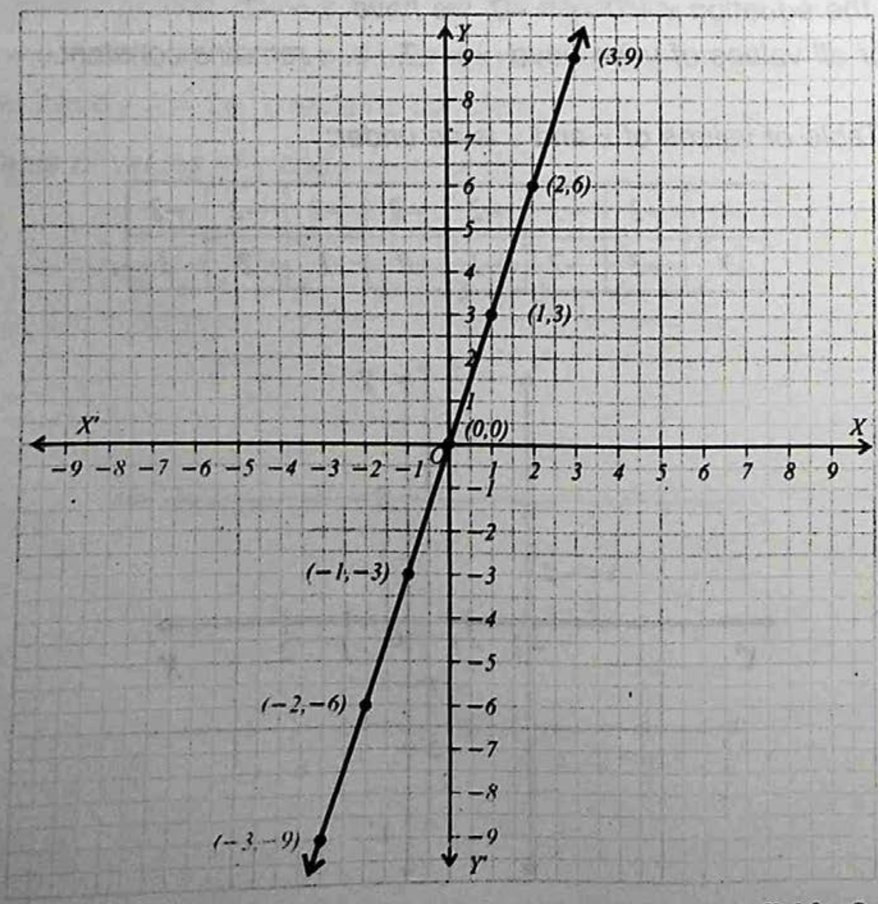
To draw the graph of $y = 3x$, first we find the x and y–intercept of this equation.

Putting $x = 0$ in $y = 3x$, we get $y = 0$. The point of interception is $(0,0)$.

Putting $x = \pm 1, \pm 2, \pm 3, \ldots$ in $y = 3x$, we get $y = \pm 3$, $y = \pm 6$, $y = \pm 9, \ldots$

Table of values of x and y is as under:

x	-3	-2	-1	0	1	2	3
y	-9	-6	-3	0	3	6	9



Graph of an Equation $y = mx + c$

To draw the graph of an equation $y = mx + c$, we consider the following example:

EXAMPLE

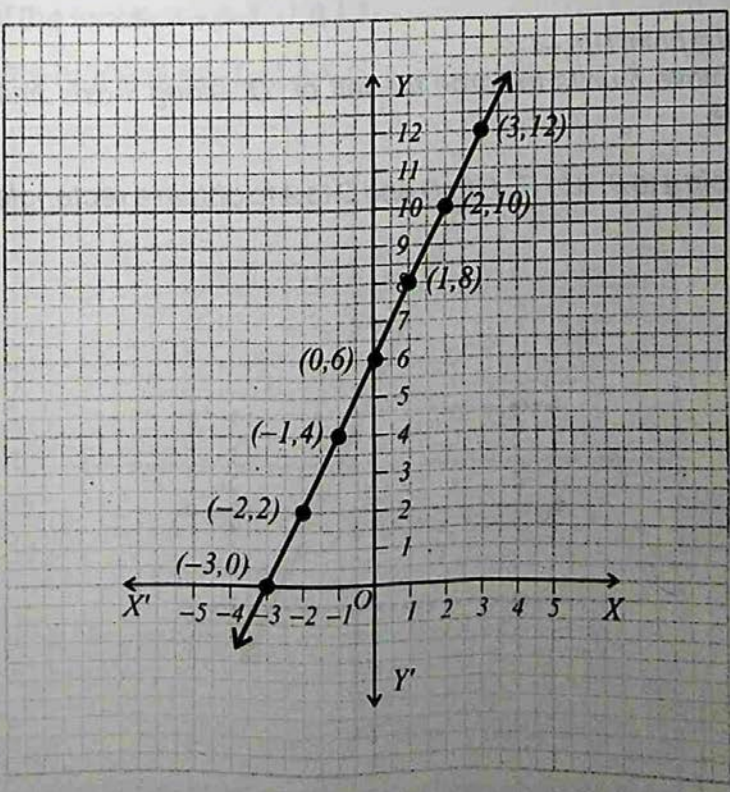
Draw the graph of $y = 2x + 6$.

SOLUTION:

If we put $x = 0$ in $y = 6 - 2x$, we get $y = 2 \times 0 + 6 = 6$ i.e. $y = 6$.

Similarly putting $x = \pm 1, \pm 2, \pm 3, ...$ we get the values of y as shown in the table.

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



9.1.11 Draw a Graph from a given Table

We plot the following points on a piece of graph paper.

x	6	−6	−6	6
y	4	4	−4	−4

The four ordered pairs from the table are:
$A(6,4)$, $B(-6,4)$, $C(-6,-4)$, and $D(6,-4)$.

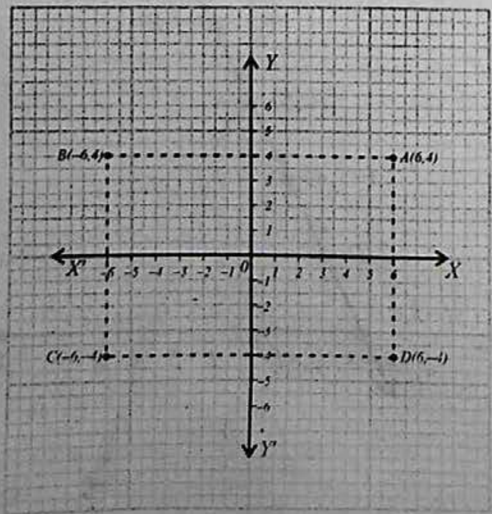
For the point $A(6,4)$:
We move 6 units towards the right of 'O' along x-axis and 4 units below x-axis.

For the point $B(-6,4)$:
We move 6 units towards the right of 'O' along x-axis and 4 units above x-axis.

For the point $C(-6,-4)$:
We move 6 units towards the left of 'O' along x-axis and 4 units above x-axis.

For the point $D(6,-4)$:
We move 6 units towards the left of 'O' along x-axis and 4 units below x-axis.

We join A to B; B to C; C to D and D to A to obtain a rectangle ABCD.



9.1.12 Identification of Domain and Range of a Function Through Graph

The graph shown in the figure is of a function $y = 2x + 1$. This graph has been drawn with the help of the following ordered pairs. $A(-2,-3)$, $B(-1,-1)$, $C(0,1)$, $D(1,3)$ and $E(2,5)$.

From these ordered pairs we construct a table consisting the values of x and y.

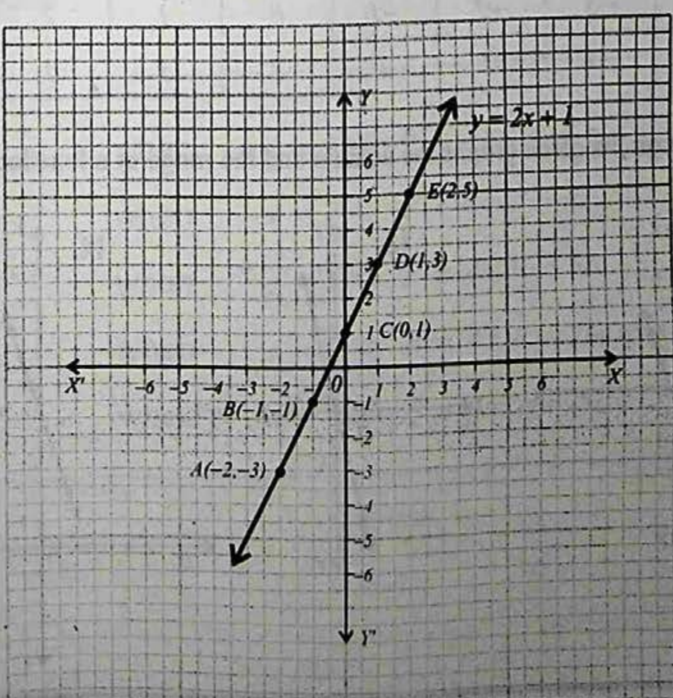
x	-2	-1	0	1	2
y	-3	-1	1	3	5

In a function $y = 2x + 1$, the set consisting of the values of x is called the domain and the set consisting the values of y is called the range of the function.

Thus for $y = 2x + 1$:

Domain of the function $= \{-2, -1, 0, 1, 2\}$

Range of the function $= \{-3, -1, 1, 3, 5\}$



EXERCISE – 9.2

Draw the graph of:

1. $y = 3x$
2. $y = x + 7$
3. $y = 2x - 3$
4. $y = 4x + 1$
5. $y = -\frac{x}{2} - \frac{3}{2}$
6. $y = x - 1$
7. $y = 2x - 3$
8. $y = 3x + 5$
9. $y = \frac{x}{2}$

10. Draw the graph by plotting the points $A(1,0)$, $B(7,0)$ and $C(1,8)$.

11. Draw the graph from the given tables.

(i)

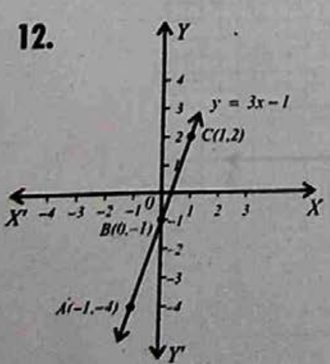
x	3	2	1	0	−1	−2	−3
y	−5	−3	−1	1	3	5	7

(ii)

x	−3	−2	−1	0	1	2	3
y	−1	0	1	2	3	4	5

Identify through the given graphs the domain and the range of a function

12.



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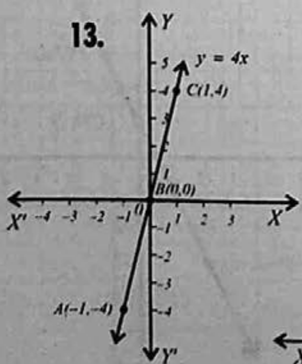

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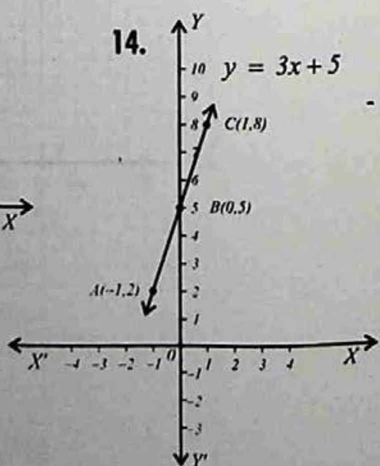


9.2 CONVERSION GRAPHS

If we have to go to London for holidays, we would probably have a little difficulty in knowing the cost of things in pounds and pence. If we know the rate of exchange, we can use a simple straight line graph to convert a given number of rupees into pounds or a given number of pounds into rupees.

The straight line used for this purpose is called the conversion graph.

9.2.1 Conversion Graph as a Linear Graph

The perimeter of a square is given by the formula $P = 4s$, where "P" units are the perimeter and "s" units are the length of the sides. This is an example of direct proportion, because by changing one quantity, the other also changes.

For example:

when $s = 1 \Rightarrow P = 4\times 1 = 4,$

when $s = 2 \Rightarrow P = 4\times 2 = 8,$

when $s = 3 \Rightarrow P = 4\times 3 = 12,$

when $s = 4 \Rightarrow P = 4\times 4 = 16,$

when $s = 5 \Rightarrow P = 4\times 5 = 20,$

9.2.2 Read a given Graph to Know One Quantity Corresponding to Another

Let us consider the following examples:

EXAMPLE-1

The graph shows the conversion from US dollars ($) to pounds (£) for various amounts of money.

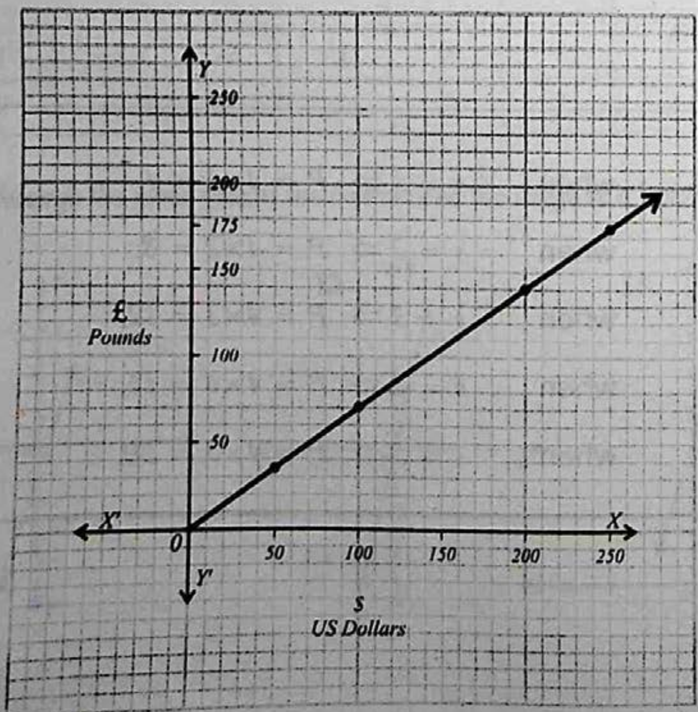
$	50	100	200	250
£	35	70	140	175

SOLUTION: (i) 50 dollars are converted into 35 pounds.

(ii) 100 dollars are converted into 70 pounds.

(iii) 150 dollars into 105 pounds.

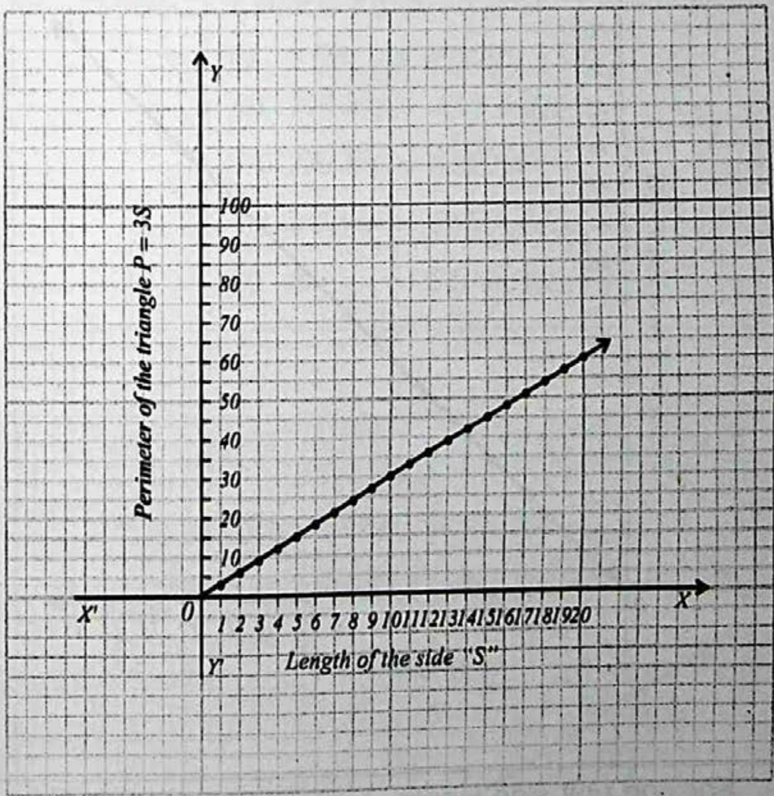
(iv) 250 $ into 175 pounds.



EXAMPLE-2

The graph is the relationship between the side length and the perimeter of an equilateral triangle $P = 3S$ for values of 'S' from 1 to 20.

S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
$P = 3S$	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60

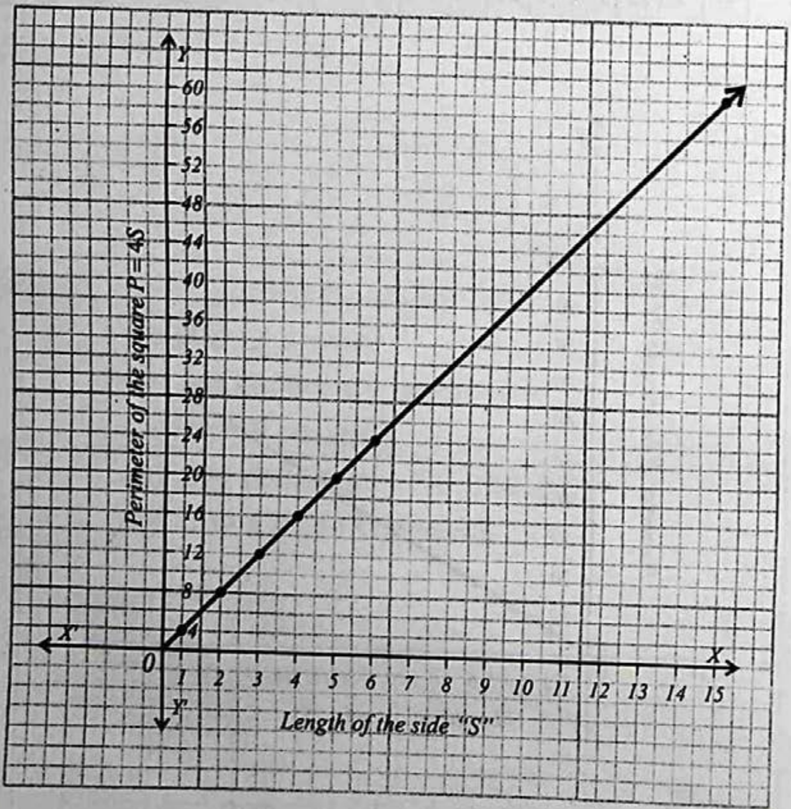


(i) For one unit side length, perimeter is 3 units.
(ii) For 3 units side length, perimeter is 9 units.
(iii) For $S = 4$, $P = 12$
(iv) For $S = 6$, $P = 18$
(v) For $S = 9$, $P = 27$
(vi) For $S = 11$, $P = 33$
(vii) For $S = 14$, $P = 42$
(viii) For $S = 16$, $P = 48$
(ix) For $S = 20$, $P = 60$

EXAMPLE-3

The graph is the relationship between the side length and the perimeter of a square $P = 4S$ for values of 'S' from 1 to 15.

S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$P = 4S$	4	8	9	12	16	20	24	28	32	36	40	44	48	52	60



(i) For one unit side length, perimeter is 4 units.

(ii) For 4 units side length, perimeter is 8 units.

(iii) For $S = 3,\ P = 12$

(iv) For $S = 4,\ P = 16$

(v) For $S = 5,\ P = 20$

(vi) For $S = 6,\ P = 24$

(vii) For $S = 7,\ P = 28$

(viii) For $S = 8,\ P = 32$

(ix) For $S = 9,\ P = 36$

(x) For $S = 10,\ P = 40$

(xi) For $S = 11,\ P = 44$

(xii) For $S = 12,\ P = 48$

(xiii) For $S = 13,\ P = 52$

(xiv) For $S = 14,\ P = 56$

(xv) For $S = 15,\ P = 60$

9.2.3 Read the Graph for Conversion

Miles and Kilometers

Read the conversion graph.

Conversion: *1 mile = 1.6 km*

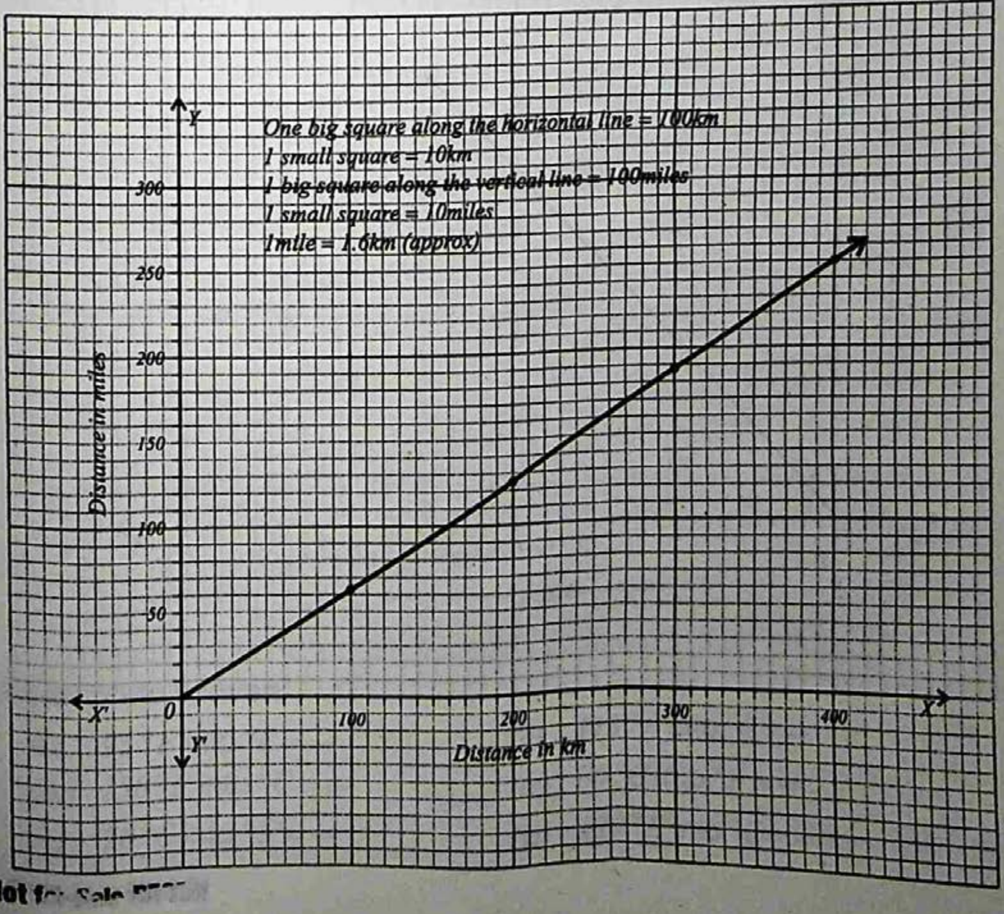
(i) 0 km = 0 miles

(ii) 100 km = 62.5 miles

(iii) 200 km = 125 miles

(iv) 300 km = 187.5 miles

(v) 400 km = 250 miles

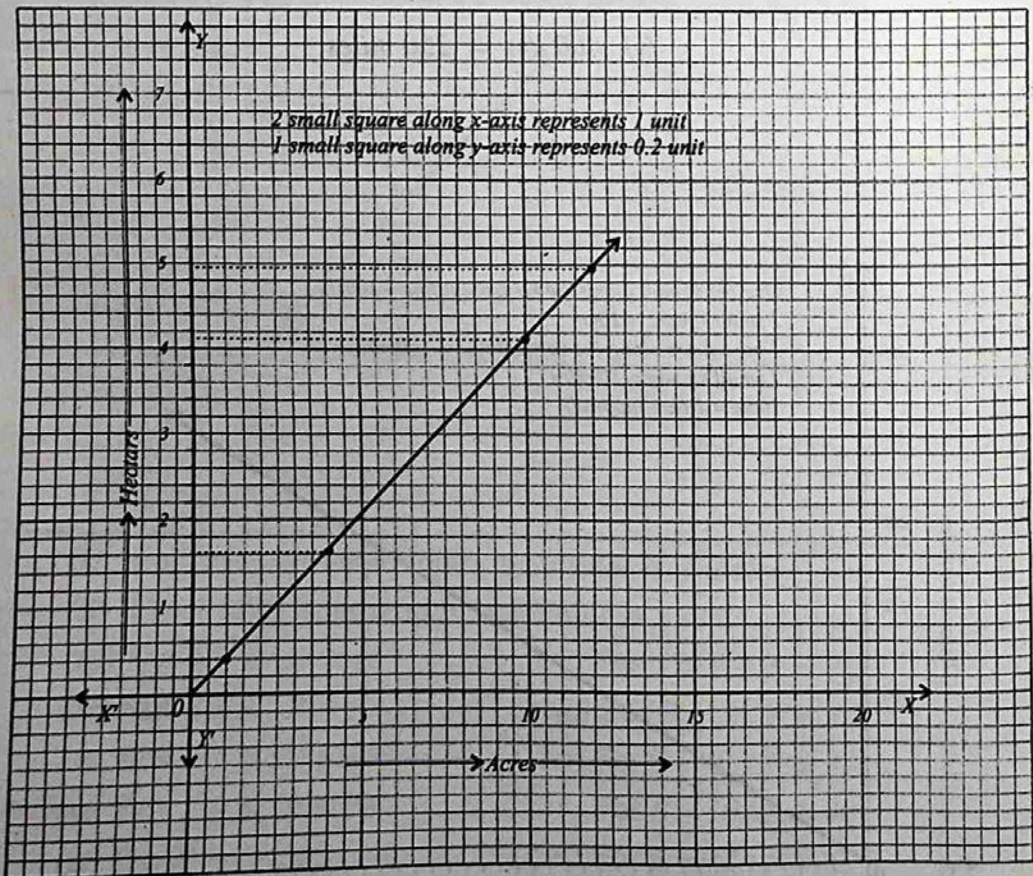


Acres and Hacters

The table gives area in acres and the equivalent values in hectares.

Acres	*1*	*4*	*10*	*12*
Hectares	*0.4046*	*1.6187*	*4.0468*	*4.8562*

Plot these points on the graph for acres values from *0* to *30* and hectares values from *0* to *12.1405*. Let *2* small squares represents one unit along *x-axis*. One small square along *y-axis* represents *0.2* units.

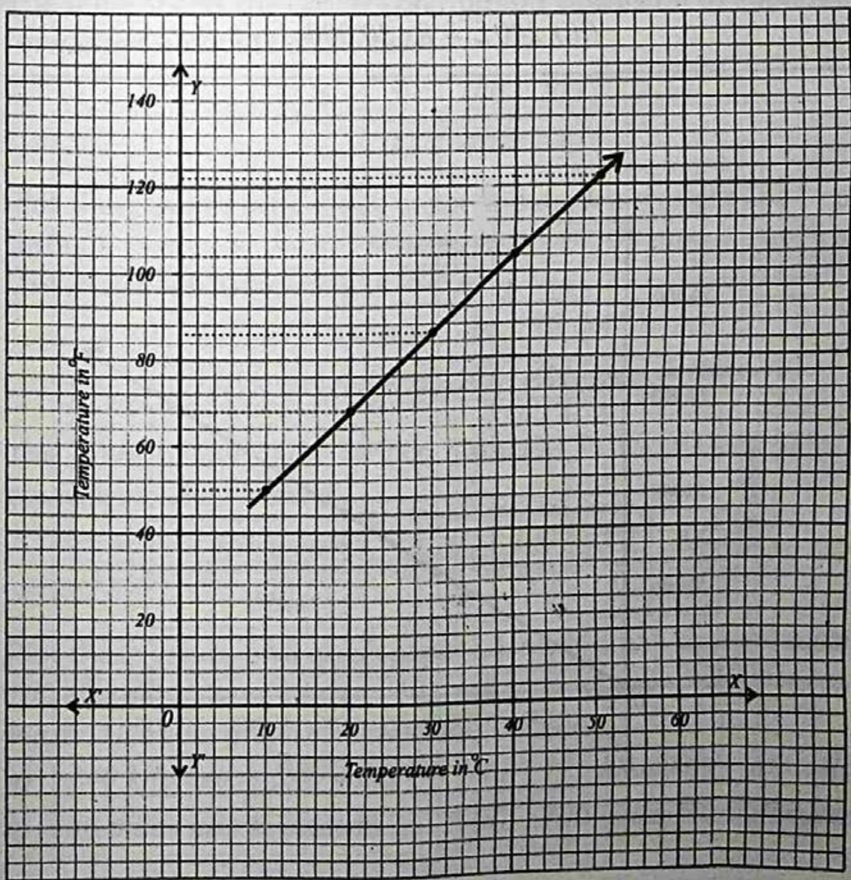


Degrees Celsius and Degrees Fahrenheit

The graph gives temperature in degrees Fahrenheit (F) and the equivalent values in degrees Celsius $^\circ C$. Read the graph carefully and answer the questions.

Temperature in degrees Celsius from 0 to 50 is along the horizontal line, where as temperature in degrees Fahrenheit is along the vertical line. 5 small square along x-axis represents $10^\circ C$ and 5 small squares along y-axis represents $20^\circ F$.

Conversion: $^\circ C = \frac{5}{9}(^\circ F - 32)$, $^\circ F = \left(\frac{9}{5} \times ^\circ C\right) + 32$



Use graph to convert

(i) $95\,^\circ F$ into $^\circ C = \cdots$ (ii) $113\,^\circ F$ into $^\circ C = \cdots$

(iii) $150\,^\circ F$ into $^\circ C = \cdots$ (iv) $86\,^\circ C$ into $^\circ F = \cdots$

(v) $20\,^\circ C$ into $^\circ F = \cdots$ (vi) $220\,^\circ F$ into $^\circ C = \cdots$

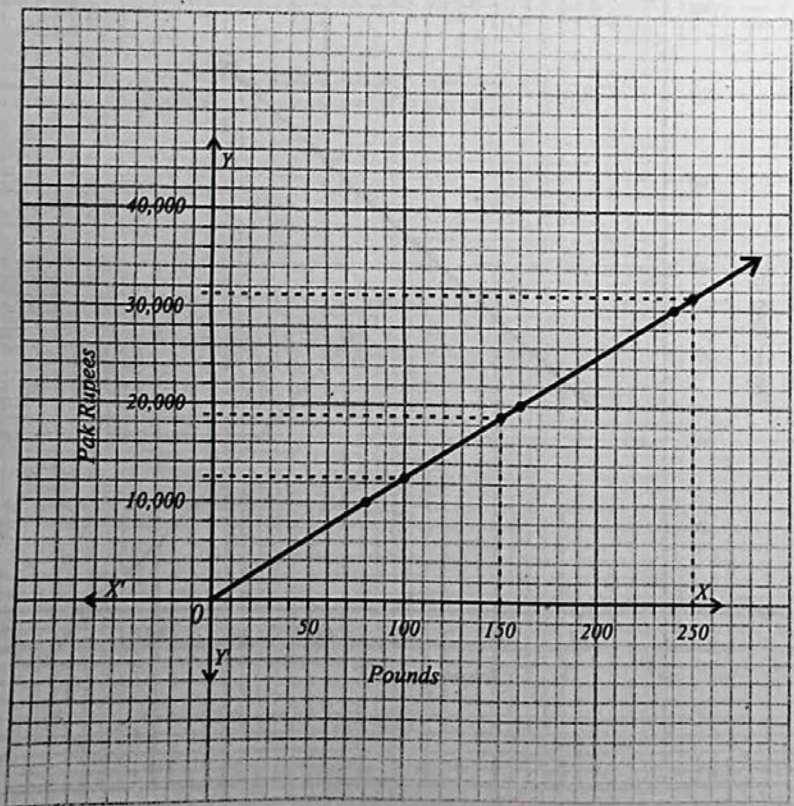
Pakistani Currency and another Currency

The graph shows the conversion from *UK* pounds £ to Pakistani rupees for various amounts of money.

Let *5* small squares on horizontal line represent *50£* and *5* small squares on vertical line represent *10,000* rupees. *1* pound = *Rs.125.*

From that graph:

(i) 80£ = Rs 10,000
(ii) 160£ = Rs 20,000
(iii) 240£ = Rs 30,000



Read the graph and tell ?

*(iv)250£ = Rs.*____ *(v) 150£ = Rs.*____ *(vi) 100£ = Rs.*____

*(vii) Rs 5000 = £*____ *(viii) Rs 8000 = £*____

EXERCISE – 9.3

1. The table gives temperatures in degrees Fahrenheit ^{o}F and the equivalent values in degrees Centigrade ^{o}C.

Temperature in ^{o}F	57	126	158	194
Temperature in ^{o}C	14	52	70	90

Plot these points on a graph paper for centigrade values from *0* to *100* and Fahrenheit value from *0* to *220*. Let *5* small squares represent *20* units on each axis. Use your graph to convert the following:

a) $97\,^{o}F$ *into* ^{o}C, *b)* $127\,^{o}F$ *into* ^{o}C, *c)* $25\,^{o}C$ *into* ^{o}F, *d)* $80\,^{o}C$ *into* ^{o}F

2. The table shows the conversion from US Dollars ($) to Pounds (£) for various amounts of money.

$	50	100	200
£	35	70	140

Plot these points on a graph paper and draw a straight line to pass through them. Let *5* small squares represent *50* units on each axis. Use your graph to convert the following:

a) *160 dollars into £* *b)* *96 dollars into £*

c) *120 £ into dollars* *d)* *76£ into dollars*

3. The table below gives various distances in kilometers with the equivalent values in miles.

Kilometers	0	100	200	300
Miles	0	62.5	125	187.5

Plot these values on a graph paper taking *10* small squares equal to *100* kilometers on *x-axis* and *10* small squares equal to *100* miles on *y-axis*. Use your graph to convert the following:

a) *140 kilometers into miles* *b)* *175 kilometers into miles*

c) *50 miles into kilometers* *d)* *100 miles into kilometers*

4. Use the graph in article *9.2.3* to convert:

(a) *6 acres into hectares.* *(b)* *18 acres into hectares.*

(c) *24 acres into hectares.* *(d)* *6.0702 hectares into acres.*

(e) *11.3311 hectares into acres.*

Review Exercis – 9

1- Encircle the correct answer.

(i) The co-ordinates of origin are:

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

(ii) The perpendicular distance of a point from y-axis is called

(a) *ordinate* (b) *abscissa* (c) *origin* (d) *straight line*

(iii) The perpendicular distance of point from x-axis is called

(a) *ordinate* (b) *abscissa* (c) *origin* (d) *straight line*

(iv) For $x = 1$ in $2x + y = 6$, we have $y = ?$

(a) 8 (b) 4 (c) -8 (d) -4

(v) For $y = 2$ in $2x - y = 6$, we have $x = ?$

(a) 4 (b) -4 (c) 2 (d) -2

(vi) Graph of equation in the form $y = c$ has y co-ordinate:

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

(vii) Graph of equation in the form $x = a$ has x co-ordinate:

(a) a (b) *undefined* (c) 1 (d) c

(viii) $f(x) = \frac{x}{2}, 4 \le x \le 12$, where x is a multiple of "2".
The domain of $f(x)$ is:

(a) $\{4,6,8,10,12\}$ (b) $\{6,8,10\}$ (c) $\{4,6,8,10\}$ (d) $\{2,3,4,5,6\}$

(ix) $f(x) = \frac{x}{2}, 4 \le x \le 12$, where x is a multiple of "2".
The range of $f(x)$ is:

(a) $\{4,6,8,10,12\}$ (b) $\{2,3,4,5,6\}$ (c) $\{3,4,5\}$ (d) $\{2,3,4,5,6\}$

(x) If $y = 3x$, then for $x = 2$, we have $y = ?$:

(a) 0 (b) 6 (c) -3 (d) 2

2- Fill in the blanks.

(i) A plane consisting of two number lines OX and OY intersecting at right angle at "O" is called a __________.

(ii) The perpendicular distance of a point from y-axis is called __________.

(iii) The perpendicular distance of a point from x-axis is called __________.

(iv) The pair of number $(2,3)$ is called an __________.

(v) The horizontal line $X'OX$ is called __________.

(vi) The vertical line YOY' is called __________.

(vii) For a point $(-1,-2)$ we move 1 unit towards left of "O" and 2 units __________.

(viii) The co-ordinate of origin are __________.

(ix) An equation for a straight line that consist of y term is as __________.

(x) In the graph of $2x + y = 6$, the x-intercept is __________

3- Draw the figures with the help of the following points on the graph paper.

(i) $A(5,2)$, $B(-6,-3)$ and $C(3,5)$

(ii) $A(0,-5)$, $B(3,-2)$, $C(3,0)$ and $D(6,7)$

(iii) $A(8,4)$, $B(-6,3)$, $C(-5,-3)$ and $D(10,-6)$.

4- Sketch the graph of:

(i) $y = 3x + 2$

(ii) $y = 2x + 1$

(iii) $y = x + 1$

(iv) $y = -\frac{x}{2} - \frac{5}{2}$

(v) $y = 3x + 4$

5- Draw the graph by plotting the points $A(2,0)$, $B(7,0)$ and $C(1,8)$.

SUMMARY

- By the definition of equality of sets, for any two elements *"a"* and *"b"*, we have $\{a,b\} = \{b,a\}$.
- The pairs of numbers *(2,1), (2,2), (2,3), (2,4), (3,1), (3,3)* and so on are examples of ordered pairs.
- We can use a simple straight line graph to convert a given number of rupees into pounds or a given number of pounds into rupees.