Q 1.

The cost of a notebook is twice the cost of a pen. Write a linear equation in two variables to represent this statement. (Take the cost of a notebook to be x and that of a pen to be y).

SOLUTION:

Let the cost of a note book = x
and the cost of a pen = y
According to the condition, we have
[Cost of a notebook] = 2 x [Cost of a pen]
[Cost of a notebook] = 2 x [Cost of a pen]
i.e. (x) = 2 x (y) or, x = 2y
or, x - 2y = 0
Thus, the required linear equation is x - 2y = 0.

Q 2.

Express the following linear equations in the form ax + by + c = 0 and indicate the values of a, b and c in each case.

(i) $2x+3y=9.3\overline{5}$ (ii) $x-\frac{y}{5}-10=0$
(iii) -2x + 3y = 6 (iv) x = 3y (v) 2x = - 5y (vi) 3x + 2 = 0 (vii) y - 2 = 0 (viii) 5 = 2x

SOLUTION:

(i) We have 2x + 3y = $(-9.3\overline{5})$
or (2)x + (3)y + $(-9.3\overline{5})$ = 0
Comparing it with ax + by + c = 0, we get a = 2, b = 3 and c = $(-9.3\overline{5})$
(ii) We have (ii) $x-\frac{y}{5}-10=0$
or $x+\left(-\frac{1}{5}\right)y+(-10)=0$
Comparing it with ax + by + c = 0, we get
$a=1,\ b=-\frac{1}{5}$ and $c=-10$
(iii) We have -2x + 3y = 6
or (-2)x + (3)y + (-6) = 0
Comparing it with ax + by + c = 0, we get a = - 2, b = 3 and c = - 6.
(iv) We have x = 3y or (1)x + (-3)y + (0) = 0
Comparing it with ax + by + c = 0, we get a = 1, b = -3 and c = 0.
(v) We have 2x = -5y or (2)x + (5)y + (0) = 0
Comparing it with ax + by + c = 0, we get a = 2, b = 5 and c = 0.
(vi) We have 3x + 2 = 0
or (3)x + (0)y + (2) = 0
Comparing it with ax + by + c = 0, we get a = 3, b = 0 and c = 2.
(vii) We have y - 2 = 0 or (0)x + (1)y + (-2) = 0
Comparing it with ax + by + c = 0, we get a = 0, b = 1 and c = -2.
(viii) We have 5 = 2x
⇒ 5 - 2x = 0 ⇒ - 2x + 0y + 5 = 0 ⇒ (-2)x + (0)y + (5) = 0
Comparing it with ax + by + c = 0, we get a = -2, b = 0 and c = 5.

Q 3.

Which one of the following options is true, and why?
y = 3x + 5 has
(i) a unique solution
(ii) only two solutions
(iii) infinitely many solutions

SOLUTION:

Option (iii) is true because a linear equation has an infinitely many solutions. Moreover when represented graphically a linear equation in two variables is a straight line which has infinite points and hence, it has infinite solutions.

Q 4.

Write four solutions for each of the following equations:
(i) 2x + y = 7

(ii) px + y = 9

(iii) x = 4y

SOLUTION:

(i) 2x + y = 7
When x = 0, 2(0) + y = 7 ⇒ 0 + y = 7 ⇒ y = 7 ∴ Solution is (0, 7)
When x = 1, 2(1) + y = 7 ⇒ y = 7 - 2 ⇒ y = 5 ∴ Solution is (1, 5)
When x = 2, 2(2) + y = 7 ⇒ y = 7 - 4 ⇒ y = 3 ∴ Solution is (2, 3)
When x = 3, 2(3) + y = 7 ⇒ y = 7 - 6 ⇒ y = 1 ∴ Solution is (3, 1).
(ii) px + y = 9
When x = 0, p(0) + y = 9 ⇒ y = 9 - 0 ⇒ y = 9 ∴ Solution is (0, 9)
When x = 1, p(1) + y = 9 ⇒ y = 9 – p ∴ Solution is (1, (9 -p))
When x = 2, p(2) + y = 9 ⇒ y = 9 - 2p ∴ Solution is (2, (9 - 2p))
When x = -1, p(-1) + y = 9 ⇒ -p + y = 9 ⇒ y = 9 + p ∴ Solution is (-1, (9 + p))
(iii) x = 4y
When x = 0, 4y = 0 ⇒ y = 0 ∴ Solution is (0, 0)
When x = 1, 4y = 1 $\Rightarrow\ y=\frac{1}{4}$

When x = 4, 4 = 4y $\Rightarrow\ y=\frac{4}{4}=1\ \Rightarrow\ y=1$ ∴ Solution is (4, 1)
When x = -4, 4y = -4
$\Rightarrow\ y=\frac{-4}{4}=-1\ \Rightarrow\ y=-1$
∴ Solution is (-4, -1).

Q 5.

Check which of the following are solutions of the equation x - 2y = 4 and which are not:

(i) (0, 2)
(ii) (2, 0)
(iii) (4, 0)
(iv) $(\sqrt{2}, 4\sqrt{2})$
(v) (1, 1)

SOLUTION:

(i) (0, 2) means x = 0 and y = 2
Putting x = 0 and y = 2 in x - 2y = 4, we have
L.H.S. = 0 - 2(2) = - 4. But R.H.S. = 4
∴ L.H.S. ≠ R.H.S.
∴ x = 0, y = 2 is not a solution.
(ii) (2, 0) means x = 2 and y = 0
Putting x = 2 and y = 0 in x - 2y = 4, we get
L.H.S. = 2 - 2(0) = 2 - 0 = 2. But R.H.S. = 4
∴ L.H.S. ≠ R.H.S.
∴ (2, 0) is not a solution.
(iii) (4, 0) means x = 4 and y = 0
Putting x = 4 and y = 0 in x - 2y = 4, we get
L.H.S. = 4 - 2(0) = 4 - 0 = 4 = R.H.S.
∴ L.H.S. = R.H.S.
∴ (4, 0) is a solution.
(iv) $(\sqrt{2}, 4\sqrt{2})$ means $x = \sqrt{2}$ and $y = 4\sqrt{2}$
Putting $x = \sqrt{2}$ and $y = 4\sqrt{2}$ in $x - 2y = 4$, we get
L.H.S. = $\sqrt{2} - 2(4\sqrt{2}) = \sqrt{2} - 8\sqrt{2}$
$= \sqrt{2}(1 - 8) = -7\sqrt{2}$
But R.H.S. = 4
∴ L.H.S. ≠ R.H.S.
∴ $(\sqrt{2}, 4\sqrt{2})$ is not a solution
(v) (1, 1) means x = 1 and y = 1
Putting x = 1 and y = 1 in x - 2y = 4, we get
L.H.S. = 1 - 2(1) = 1 - 2 = -1. But R.H.S. = 4
∴ L.H.S. ≠ R.H.S.
∴ (1, 1) is not a solution.