*** Choose the right answer from the given options. [1 Marks Each]** **[44]**

1. Which of the following is true for the line with equation:1. x + 0. y - 4 = 0?

   (A) The distance of the line from the x-axis is 1.

   (B) The distance of the line from the y-axis is 4.

   (C) The distance of the line from the y-axis is -1.

   (D) The distance of the line from the x-axis changes from 1 to 4.

   Ans. : The distance of the line from the y-axis is 4.

2. The equation of a line is ax + by + c = 0.
   What conditions ensure that the distance of the line from an axis is constant?

   (A) $c = 0$ and $a, b \neq 0$ (B) $c, < 0$ and $a, b \neq 0$

   (C) $c, b \neq 0$ and $a = 1$ (D) $c, b \neq 0$ and $a = 0$

   Ans. : $c, b \neq 0$ and $a = 0$

3. Which one of the following is a polynomial?

   (A) $\frac{x^2}{2} - \frac{2}{x^2}$ (B) $\sqrt{2x} - 1$ (C) $x^2 + \frac{3x^{\frac{3}{2}}}{\sqrt{x}}$ (D) $\frac{x-1}{x+1}$

   Ans. : $x^2 + \frac{3x^{\frac{3}{2}}}{\sqrt{x}}$

4. $\sqrt{2}$ is a polynomial of degree:

   (A) 2 (B) 0 (C) 1 (D) $\frac{1}{2}$

   Ans. : 0

5. Degree of the polynomial $4x^4 + 0.x^3 + 0.x^2 + 5x + 7$ is:

   (A) 4 (B) 5 (C) 3 (D) 7

   Ans. : 4

6. If $p(x) = x^2 - 2\sqrt{2}x + 1$, then $p(2\sqrt{2})$ is equal to:

   (A) 0 (B) 1 (C) $4\sqrt{2}$ (D) $8\sqrt{2} + 1$

   Ans. : 1

7. If p(x) = x + 3 then p(x) + p(-x) is equal to:

   (A) 3 (B) 2x (C) 0 (D) 6

   Ans. : 6

8. How many solutions does 2x + 3 = y have?

   (A) 0 (B) 1 (C) 2 (D) infinitely many

Ans. : infinitely many

9. Which of the following is not a solution of the equation 2x + y = 7?

(A) (1, 3) (B) (3, 1) (C) (-0, 7) (D) (1, 5)

Ans. : (1, 3)

10. If the point (2,-1) lies on the graph of the equation 3x + ky = 4 then the value of k is:

(A) 2 (B) -2 (C) 0 (D) -1

Ans. : 2

11. The graph of which of the following equations passes through the origin?

(A) 2x + 3y = 1 (B) 2x + 3y = 0 (C) 2x + 3y = 6 (D) 3x - 2y = 5

Ans. : 2x + 3y = 0

12. Which of the following does not pass through the origin?

(A) $y = \frac{2}{5}x$ (B) y = mx (C) x - y = 0 (D) x + y = 1

Ans. : x + y = 1

13. The equation of a line parallel to y-axis and 4 units to the left of origin, is:

(A) x = 4 (B) y = 4 (C) x = -4 (D) y = - 4

Ans. : x = -4

14. Any point on the line x = y is of the form:

(A) (0, a) (B) (a, 0) (C) (-a, 0) (D) (a, a)

Ans. : (a, a)

15. Which of the following is a linear equation in one variable?

(A) 2x = y (B) $y^2 = 3y + 5$ (C) 4x - y = 4 (D) 3t + 5 = 9t - 7

Ans. : 3t + 5 = 9t - 7

16. The inclination of every line parallel to the x-axis is:

(A) 0° (B) 90° (C) 180° (D) none of these

Ans. : 0°

17. The slope of a vertical line is:

(A) 0 (B) 1 (C) 90 (D) not defined

Ans. : not defined

18. The slope of a line passing through two given points $A(x_1, y_1)$ and $B(x_2, y_2)$ is given:

(A) $a = \frac{x_2 - x_1}{y_2 - y_1}$ (B) $a = \frac{y_2 \times y_1}{x_2 \times x_1}$ (C) $a = \frac{x_2 \times x_1}{y_2 \times y_1}$ (D) $a = \frac{y_2 - y_1}{x_2 - x_1}$

Ans. : $a = \frac{y_2 - y_1}{x_2 - x_1}$

19. The slope of the line passing through the points (-3,4) and B (2,-6) is :

(A) $-\frac{1}{2}$ (B) -2 (C) 2 (D) $\frac{1}{2}$

Ans. : -2

20. The slope of the straight line passing through the points A(3, -2) and B(3, -4) is:

(A) 0 (B) 1 (C) -2 (D) not defined

Ans. : not defined

21. The slope of the line, $3x - 2\sqrt{2}y - 4 = 0$ is :

(A) $\frac{3\sqrt{2}}{2}$ (B) $\frac{-3\sqrt{2}}{2}$ (C) $\frac{3\sqrt{2}}{4}$ (D) $-\frac{3\sqrt{2}}{4}$

Ans. : $\frac{3\sqrt{2}}{4}$

22. The value of m such that the points A(5, -2) B(8, -3) and C (m, -12) are collinear, is:

(A) 29 (B) 33 (C) 35 (D) 41

Ans. : 35

23. Any point on the line $x = y$ is of the form :

(A) $(0, a)$ (B) $(a, 0)$ (C) $(-a, 0)$ (D) (a, a)

Ans. : (D) (a, a)

24. Degree of the polynomial $4x^4 + 0.x^3 + 0.x^2 + 5x + 7$ is :

(A) 4 (B) 5 (C) 3 (D) 7

Ans.: (A) 4

25. How many solutions does $2x + 3 = y$ have?

(A) 0 (B) 1 (C) 2 (D) infinitely many

Ans. : (D) infinitely many

26. If $p(x) = x^2 - 2\sqrt{2}x + 1$, then $p(2\sqrt{2})$ is equal to :

(A) 0 (B) 1 (C) $4\sqrt{2}$ (D) $8\sqrt{2} + 1$

Ans. : (B) 1

27. If $p(x) = x + 3$, then $p(x) + p(-x)$ is equal to :

(A) 3 (B) $2x$ (C) 0 (D) 6

Ans. : (D) 6

28. If the point (2,-1) lies on the graph of the equation $3x + ky = 4$, then the value of k is :

(A) 2 (B) -2 (C) 0 (D) -1

Ans.: (A) 2

29. $\sqrt{2}$ is a polynomial of degree :

(A) 2 (B) 0 (C) 1 (D) $\frac{1}{2}$

Ans. : (B) 0

30. The equation of a line is $ax+by+c=0$.
What conditions ensure that the distance of the line from an axis is constant?
(A) $c=0$ and $a,b\neq 0$ (B) $c,<0$ and $a,b\neq 0$ (C) $c,b\neq 0$ and $a=1$ (D) $c,b\neq 0$ and $a=0$

Ans. : (D) $c,b\neq 0$ and $a=0$

31. The equation of a line parallel to y-axis and 4 units to the left of origin, is :
(A) $x=4$ (B) $y=4$ (C) $x=-4$ (D) $y=-4$

Ans. : (C) $x=-4$

32. The graph of which of the following equations passes through the origin?
(A) $2x+3y=1$ (B) $2x+3y=0$ (C) $2x+3y=6$ (D) $3x-2y=5$

Ans. : (B) $2x+3y=0$

33. The inclination of every line parallel to the x-axis is :
(A) 0° (B) 90° (C) 180° (D) none of these

Ans.: (A) 0°

34. The slope of a line passing through two given points $A(x_1,y_1)$ and $B(x_2,y_2)$ is given by :
(A) $a=\frac{x_2-x_1}{y_2-y_1}$ (B) $a=\frac{y_2\times y_1}{x_2\times x_1}$ (C) $a=\frac{x_2\times x_1}{y_2\times y_1}$ (D) $a=\frac{y_2-y_1}{x_2-x_1}$

Ans. : (D) $a=\frac{y_2-y_1}{x_2-x_1}$

35. The slope of a vertical line is :
(A) 0 (B) 1 (C) 90 (D) not defined

Ans. : (D) not defined

36. The slope of the line, $3x-2\sqrt{2}y-4=0$ is :
(A) $\frac{3\sqrt{2}}{2}$ (B) $\frac{-3\sqrt{2}}{2}$ (C) $\frac{3\sqrt{2}}{4}$ (D) $-\frac{3\sqrt{2}}{4}$

Ans. : (C) $\frac{3\sqrt{2}}{4}$

37. The slope of the line passing through the points $A(-3,4)$ and $B(2,-6)$ is :
(A) $-\frac{1}{2}$ (B) -2 (C) 2 (D) $\frac{1}{2}$

Ans. : (B) -2

38. The slope of the straight line passing through the points $A(3,-2)$ and $B(3,-4)$ is :
(A) 0 (B) 1 (C) -2 (D) not defined

Ans. : (D) not defined

39. The value of m such that the points $A(5,-2), B(8,-3)$ and $C(m,-12)$ are collinear, is :

(A) 29 (B) 33 (C) 35 (D) 41

Ans. : (C) 35

40. Which of the following does not pass through the origin?

(A) $y=\frac{2}{5}x$ (B) $y=mx$ (C) $x-y=0$ (D) $x+y=1$

Ans. : (D) $x+y=1$

41. Which of the following is a linear equation in one variable?

(A) $2x=y$ (B) $y^2=3y+5$ (C) $4x-y=4$ (D) $3t+5=9t-7$

Ans. : (D) $3t+5=9t-7$

42. Which of the following is not a solution of the equation $2x+y=7$?

(A) (1, 3) (B) (3, 1) (C) (-0, 7) (D) (1, 5)

Ans.: (A) (1, 3)

43. Which of the following is true for the line with equation: $1.x+0.y-4=0$?

(A) The distance of the line from the x-axis is 1.

(B) The distance of the line from the y-axis is 4.

(C) The distance of the line from the y-axis is -1.

(D) The distance of the line from the x-axis changes from 1 to -4.

Ans. : (B) The distance of the line from the y-axis is 4.

44. Which one of the following is a polynomial?

(A) $\frac{x^2}{2}-\frac{2}{x^2}$ (B) $\sqrt{2}x-1$ (C) $x^2+\frac{3x^{\frac{3}{2}}}{\sqrt{x}}$ (D) $\frac{x-1}{x+1}$

Ans. : (C) $x^2+\frac{3x^{\frac{3}{2}}}{\sqrt{x}}$

*** A statement of Assertion (A) is followed by a statement of Reason (R). [10]**
Choose the correct option.

Directions: In each question below, there are two statements labelled as Assertion (A) and Reason (R). Choose the correct answer as per the options given below:
(a) Both (A) and (R) are true and (R) is the correct explanation of (A)
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(c) (A) is true but (R) is false
(d) (A) is false but (R) is true

45. Assertion (A): Degree of polynomial (ax + b) (cx + d) is 2.
Reason (R): Product of two linear polynomials is a quadratic polynomial.

Ans. : Both (A) and (R) are true and (R) is the correct explanation of (A)

46. Assertion (A): Every monomial is a linear polynomial.
Reason (R): A monomial has only one term.

Ans. : Both (A) and (R) are true and (R) is the correct explanation of (A)

47. Assertion (A): x = 4, y = 5 is a solution of equation 2x + y = 3
Reason (R): At x = 4, y = 5 the LHS of equation 2x + y = 3 is equal to the RHS of the equation.

Ans. : (A) is true but (R) is false

48. Assertion (A): (0,2), (1, 0) and (3, 4) are the three solutions of equation 2x - y - 2 = 0
Reason (R): x = y is the equation of the line passing through (1, 0).

Ans. : (A) is true but (R) is false

49. Assertion (A) : The slope of the line passing through the points $(3,-2)$ and $(-7,-2)$ is 0.
Reason (R) : The slope of a line passing through the points (x_1,y_1) and (x_2,y_2) is $\frac{x_2-x_1}{y_2-y_1}$.

Ans. : (A) is true but (R) is false

50. Assertion (A) : (0, -2), (1, 0) and (3, 4) are the three solutions of equation $2x-y-2=0$.
Reason (R) : $x=y$ is the equation of the line passing through (1, 0).

Ans. : C

51. Assertion (A) : Degree of polynomial $(ax+b)(cx+d)$ is 2.
Reason (R) : Product of two linear polynomials is a quadratic polynomial.

Ans. : A

52. Assertion (A) : Every monomial is a linear polynomial.
Reason (R) : A monomial has only one term.

Ans. : A

53. Assertion (A) : The slope of the line passing through the points (3, -2) and (-7, -2) is 0.
Reason (R) : The slope of a line passing through the points (x_1,y_1) and (x_2,y_2) is $\frac{x_2-x_1}{y_2-y_1}$.

Ans. : C

54. Assertion (A) : $x=4,y=5$ is a solution of equation $2x+y=3$.
Reason (R) : At $x=4,y=5$, the LHS of equation $2x+y=3$ is equal to the RHS of the equation.

Ans. : C

*** Answer the following short questions. [2 Marks Each]** **[80]**

55. Write polynomials of degrees 1, 2 and 3.

Ans. : A polynomial of degree 1 (linear polynomial):
Example: 2x + 5
A polynomial of degree 2 (quadratic polynomial):
Example: $x^2 + 3x + 1$
A polynomial of degree 3 (cubic polynomial):
Example: $x^3 - 2x^2 + x + 4$

56. What are the coefficients of x^2 and x^3 in the polynomial $x^4 - 3x^3 + 6x^2 - 2x + 7$?

Ans. : Given polynomial:$x^4 - 3x^3 + 6x^2 - 2x + 7$
Coefficient of $x^3 = -3$
Coefficient of $x^2 = 6$

57. What is the coefficient of z in the polynomial $4z^3 + 5z^2 - 11$?

Ans. : The given polynomial is $4z^3 + 5z^2 - 11$.
There is no term containing z^1 (i.e., z).
Hence, the coefficient of z is 0.

58. The difference between two positive integers is 63. The ratio of the two integers is 2:5. Find the two integers.

Ans. : Let the integers be 2x and 5x
Difference: 5x − 2x = 63
⇒ 3x = 63
⇒ x = 21
Integers: 2x = 42
⇒ 5x = 105
Required integers are 42 and 105.

59. Write a polynomial of degree 3 in the variable x, in which the coefficient of the x^2term is −7.

Ans. : A polynomial of degree 3 has the general form: $ax^3 + bx^2 + cx + d$
Given that coefficient of x^2 is -7 , so $b = -7$
One such polynomial is $x^3 - 7x^2 + 2x + 1$.
(Any polynomial of degree 3 with -7 as the coefficient of x^2 is correct)

60. Find the slope of a line passing through the points $A(-2, -3)$ and $B(2, 4)$.

Ans. : Let $A(-2, -3) = (x_1, y_1)$ and $B(2, 4) = (x_2, y_2)$. Then,
Slope of $AB = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{4-(-3)}{2-(-2)} = \frac{7}{4}$.

61. Given the point (1, 2), find the equation of a line on which it lies. How many such equations are there?

Ans. : Here, we have to find a linear equation whose one solution is $x = 1, y = 2$. Such some equations are: (i) $x + y = 3$ (ii) $2x + y = 4$

Since, infinite number of lines may pass through a point, so infinitely many equations are there.

62. Express the following statements in linear equations in two variables.
(i) The cost of a notebook is ₹20 more than the cost of a pen.
(ii) The cost of a pencil is ₹2 less than half of the cost of fountain pen.

Ans. : (i) Let the cost of a notebook be ₹ x and cost of a pen be ₹ y. Then, according to the given statement,$x = y + 20 \Rightarrow x - y - 20 = 0$

(ii) Let the cost of a pencil be ₹ x and cost of a fountain pen be overline ₹ y. Then, according to the given statement,

$x = \frac{1}{2}y - 2 \Rightarrow x = \frac{y-4}{2} \Rightarrow 2x = y - 4 \Rightarrow 2x - y + 4 = 0$

63. Write the coefficient of x^3 in $\frac{-x^3+3x^2+5}{2}$.

Ans. : $\frac{-x^3+3x^2+5}{2} = -\frac{1}{2}x^3 + \frac{3}{2}x^2 + \frac{5}{2}$. So, coefficient of x^3 is $-\frac{1}{2}$.

64. Write the co-efficient of x^2 in each of the following :
(i) $2 - x^2 + x^3$, (ii) $\frac{\pi}{2}x^2 + x$

Ans. : (i) Coefficient of x^2 is -1 .
(ii) Coefficient of x^2 is $\frac{\pi}{2}$.

65. Find the slope and the equation of the line passing through the points :
(i) $A(-2,1)$ and $B(3,-4)$, (ii) $A(4,-2)$ and $B(2,-3)$

Ans. : (i) $-1, x + y + 1 = 0$, (ii) $\frac{1}{2}, x - 2y - 8 = 0$

66. Find the equation of a line :
(i) whose slope is 4 and which passes through the point (3, 7),
(ii) whose slope is -3 and which passes through the point (-2, 3).

Ans. : (i) $4x - y = 5$, (ii) $3x + y + 3 = 0$

67. Find the slope of the line passing through the point :
$A(2,5)$ and $B(-4,-4)$

Ans. : $\frac{3}{2}$

68. Find the slope of the line passing through the point :
$A(4,-9)$ and $B(-2,-1)$

Ans. : $\frac{-4}{3}$

69. Find the slope of the line passing through the point :
$A(-2,1)$ and $B(3,-4)$

Ans. : -1

70. Draw the graph of the following equation:
$x - 8 = 0$

Ans. : Add 8 to both sides to get $x = 8$. This is a vertical line passing through 8 on the x - axis.

71. Draw the graph of the following equation:
$3y = 8$

Ans. : Divide both sides by 3 to get $y = \frac{8}{3} \approx 2.67$. This is a horizontal line passing through approximately 2.67 on the y - axis.

72. Draw the graph of the following equation:
$2x = -7$

Ans. : Divide both sides by 2 to get $x = -3.5$. This is a vertical line passing through -3.5 on the x-axis.

73. Draw the graph of the following equation:
$y = 4$

Ans. : This is already simplified. It is a horizontal line passing through 4 on the y axis.

74. Draw the graph of the following equation:
$x = 1$

Ans. : This is already simplified. It is a vertical line passing through 1 on the x-axis.

75. If the point (2, -1) lies on the graph of the equation $2y = ax - 6$, then find the value of a.

Ans. : 2

76. Draw the graph of the equation $2x - 3y = 5$. From the graph, find
(i) the value of y, where $x = 4$., (ii) the value of x where, y = 3."

Ans. : $y = 1$ (ii) $x = 7$

77. Check whether $x = 2, y = 1$ is a solution of the following equation or not.
(i) $2x - 3y = 1$, (ii) $x + y + 4 = 0$

Ans. : (i) yes, (ii) no

78. For what value of c, the linear equation $3x - cy = 8$ has equal values of x and y for its solution.

Ans. : $\frac{3x-8}{y}$

79. How many solutions does the equation $3x - 5y = 6$ have?

Ans. : Infinitely many solution

80. Find two solution of the following equation:
$2x + 5y = 15$

Ans. : $(5,1), (0,3)$

81. Write a solution of the linear equation $2x + 0.y + 8 = 0$ in two variables.

Ans. : $(-4, -1)$

82. Write of the following as an equation in two variable.

$x = -1.3$

Ans. : $x = -1.3 \Rightarrow x + 0.y + 1.3 = 0$

83. Write of the following as an equation in two variable.

$x = -\frac{2}{3}$

Ans. : $1 \cdot x + 0 \cdot y + \frac{2}{3} = 0$

84. Write of the following as an equation in two variable.

$\frac{2}{5}y = -3$

Ans. : $\frac{2}{5}y = -3 \Rightarrow 2y = -15$

$\therefore 0.x + 2y + 15 = 0$

85. Write of the following as an equation in two variable.

$x = \frac{3}{2}$

Ans. : $1 \cdot x + 0 \cdot y - \frac{3}{2} = 0$

86. Write of the following equation in the form $ax + by + c = 0$ and indicate the value of a, b and c in case.

$\frac{x}{\sqrt{3}} + y = 1$

Ans. : $x + \sqrt{3}y - \sqrt{3} = 0 (a = 1, b = \sqrt{3}, c = -\sqrt{3})$

87. Write of the following equation in the form $ax + by + c = 0$ and indicate the value of a, b and c in case.

$\frac{\sqrt{2}x}{3} + 3y = \sqrt{5}$

Ans. : $\frac{\sqrt{2}}{3}x + 3y - \sqrt{5} = 0 \left(a = \frac{\sqrt{2}}{3}, b = 3, c = -\sqrt{5}\right)$

88. Write of the following as an equation in two variable.

$\frac{y}{6} = 12$

Ans. : $\frac{y}{6} = 12 \Rightarrow y = 72 \Rightarrow 0.x + 1.y - 72 = 0$

89. A phone battery is 90% charged and decreases by 4% every hour.
(i) Write expression for battery after x hours.
(ii) Find battery level after 5 hours.

Ans. : (i) $90 - 4x$
(ii) 70%

90. A plant is 12 cm tall and grows 3 cm every week.
(i) Write expression for height after x weeks.
(ii) Find height of the plant after 6 weeks.

Ans. : (i) $12 + 3x$

(ii) 30 cm

91. A tank contains 120 l water and leaks 5 l per hour.
    (i) Form expression for water left after x hours.
    (ii) Find the volume of water after 12 hours.

    Ans. : (i) $120 - 5x$

    (ii) $60l$

92. Height of a plant growth is given in the table. Find whether the pattern is linear or not.

Week	0	1	2	3
Money (₹)	10	14	18	22

    Ans. : Yes, constant change = 40, Equation: $y = 4x + 10$

93. In the given table, Riya's savings each week is given. Is the pattern linear?

Week	0	1	2	3
Money (₹)	200	240	280	320

    Ans. : Yes, constant change = 40 , Equation: $y = 40x + 200$

94. Taxi fare is given in the table. Is the pattern linear?

Distance	0	1	2	3
Fare (₹)	50	65	80	95

    Ans. : Yes, constant change = 40 , Equation: $y = 15x + 50$

*** Answer the following questions. [3 Marks Each]** **[165]**

95. Find the value of the linear polynomial 5x − 3 if:
    (i) x = 0
    (ii) x = −1
    (iii) x = 2

    Ans. : Given polynomial: 5x − 3

    (i) x = 0

    = 5(0) − 3 = −3

    (ii) x = −1

    = 5(−1) − 3 = −5 − 3 = −8

    (iii) x = 2

    = 5(2) − 3 = 10 − 3 = 7

96. Find the value of the quadratic polynomial $7s^2 - 4s + 6$ if:
    (i) s = 0

(ii) s = −3

(iii) s = 4

Ans. : (i) For s = 0

$7s^2 - 4s + 6$

$= 7(0)^2 - 4(0) + 6 = 6$

(ii) For s = −3

$7s^2 - 4s + 6$

$= 7(-3)^2 - 4(-3) + 6$

= 7(9) + 12 + 6

= 63 + 12 + 6 = 81

(iii) For s = 4/

$7s^2 - 4s + 6$

$= 7(4)^2 - 4(4) + 6$

= 7(16) − 16 + 6

= 112 − 16 + 6 = 102

97. The present age of Salil's mother is three times Salil's present age. After 5 years, their ages will add up to 70 years. Find their present ages.

Ans. : Let Salil's present age = x years

Mother's present age = 3x years

After 5 years:

Salil's age = x + 5

Mother's age = 3x + 5

According to question: (x + 5) + (3x + 5) = 70

⇒ 4x + 10 = 70

⇒ 4x = 60

⇒ x = 15

Therefore, Salil's age = 15 years

Mother's age = 45 years

98. Ruby has 3 times as many two-rupee coins as she has five-rupee coins. If she has a total ₹88, how many coins does she have of each type?

Ans. : Let number of five-rupee coins = x

Number of two-rupee coins = 3x

Total value: 5x + 2(3x) = 88

⇒ 5x + 6x = 88

⇒ 11x = 88

⇒ x = 8

Hence:

Five-rupee coins = 8

Two-rupee coins = 24

99. A farmer cuts a 300 feet fence into two pieces of different sizes. The longer piece is four times as long as the shorter piece. How long are the two pieces?

Ans. : Let shorter piece = x feet
Longer piece = 4x feet
Total: x + 4x = 300
⇒ 5x = 300
⇒ x = 60
Therefore:
Shorter piece = 60 feet
Longer piece = 240 feet.

100. If the length of a rectangle is three more than twice its width and its perimeter is 24 cm, what are the dimensions of the rectangle?

Ans. : Let width = x cm
Length = 2x + 3 cm
Perimeter = 2(length + width)
⇒ 2[(2x + 3) + x] = 24
⇒ 2(3x + 3) = 24
⇒ 6x + 6 = 24
⇒ 6x = 18
⇒ x = 3
Therefore:
Width = 3 cm
Length = 2(3) + 3 = 9 cm

101. A student has ₹500 in her savings bank account. She gets ₹150 every month as pocket money. How much money will she have at the end of every month from the second month onwards?

Find a linear expression to represent the amount she will have in the n^{th} month.

Ans. : Initial amount in bank = ₹500
Monthly pocket money = ₹150
At the end of:
2nd month = 500 + 2(150) = ₹800
3rd month = 500 + 3(150) = ₹950
4th month = 500 + 4(150) = ₹1100
and so on...
Let the amount in the n^{th} month be A_n
Then, $A_n = 500 + 150n$
Thus, the required linear expression is:
$A_n = 150n + 500$

102. A rally starts with 120 members. Each hour, 9 members drop out of the group. How many members will remain after 1, 2, 3, … hours? Find a linear expression to represent the number of members at the end of the n^{th} hour.

Ans. : Initial members = 120
Members leaving each hour = 9
After:
1 hour = 120 − 9 = 111
2 hours = 120 − 18 = 102
3 hours = 120 − 27 = 93
Let number of members after n hours $= M_n$
$M_n = 120 - 9n$
Thus, required linear expression is $M_n = 120 - 9n$.

103. Suppose the length of a rectangle is 13 cm. Find the area if the breadth is (i) 12 cm, (ii) 10 cm, (iii) 8 cm. Find the linear pattern representing the area of the rectangle.

Ans. : Length $= 13cm$
Area = Length × Breadth
(i) Breadth $= 12cm$
Area $= 13 \times 12 = 156\ cm^2$
(ii) Breadth $= 10cm$
Area $= 13 \times 10 = 130\ cm^2$
(iii) Breadth $= 8cm$
Area $= 13 \times 8 = 104\ cm^2$
Let breadth $= xcm$
Area $= 13x$
Thus, Linear pattern is $A = 13x$.

104. Suppose the length of a rectangular box is 7 cm and breadth is 11 cm. Find the volume if the height is (i) 5 cm, (ii) 9 cm, (iii) 13 cm. Find the linear pattern representing the volume of the rectangular box.

Ans. : Length = 7 cm, Breadth = 11 cm
Volume = Length × Breadth × Height
= 7 × 11 × h = 77h
(i) Height = 5 cm
Volume $= 77 \times 5 = 385cm^3$
(ii) Height = 9 cm
Volume $= 77 \times 9 = 693cm^3$
(iii) Height = 13 cm
Volume $= 77 \times 13 = 1001cm^3$
Let height = h cm

Volume = 77h

Thus, linear pattern is V = 77h.

105. Sarita is reading a book of 500 pages. She reads 20 pages every day. How many pages will be left after 15 days? Express this as a linear pattern.

Ans. : Total pages = 500

Pages read per day = 20

Pages read in 15 days = 20 × 15 = 300

Pages left = 500 − 300 = 200

Let pages left after n days $= P_n$

So, $P_n = 500 - 20n$

Thus, linear pattern is $P_n = 500 - 20n$.

106. If we multiply a number by 5/2 and add 2/3 to the product, we get -7/12. Find the number.

Ans. : Let the number be x.

According to the question:

(5/2)x + 2/3 = -7/12

Subtract 2/3 from both sides, we get:

(5/2)x = -7/12 − 2/3

⇒ (5/2)x = -7/12 − 8/12

⇒ (5/2)x = -15/12

⇒ (5/2)x = -5/4

Now multiply both sides by 2/5, we get:

x = (-5/4) × (2/5)

⇒ x = -1/2

Therefore, the number is -1/2.

107. A positive number is 5 times another number. If 21 is added to both the numbers, then one of the new numbers becomes twice the other new number. What are the numbers?

Ans. : Let the smaller number be x.

Then the larger number = 5x

After adding 21 to both numbers: New numbers are x + 21 and 5x + 21

According to the question: 5x + 21 = 2(x + 21)

⇒ 5x + 21 = 2x + 42

⇒ 5x − 2x = 42 − 21

⇒ 3x = 21

⇒ x = 7

So, the smaller number = 7 and the larger number = 5 × 7 = 35

Therefore, the two numbers are 7 and 35.

108. The equation of a line is $2x - 2\sqrt{3}y - \sqrt{3} = 0$. Find :
(i) the slope of the line; (ii) the y-intercept of the line.

Ans. : The given equation of the line is $2\sqrt{3}y = 2x - \sqrt{3} \Rightarrow y = \frac{1}{\sqrt{3}}x - \frac{1}{2} \ldots$ (i)

This is of the form $y = ax + b$, where $a = \frac{1}{\sqrt{3}}$ and $b = \frac{-1}{2}$.

$\therefore$ (i) The slope of the line is given by $a = \frac{1}{\sqrt{3}}$.

(ii) y-intercept, $b = \frac{-1}{2}$.

109. Find the equation of the line passing through the point $P(-2,4)$ and making an intercept of 3 on the y-axis.

Ans. : It is given that the y-intercept of the required line is 3.
So, the equation of this line is of the form y= ax +3...(i)
Since it passes through the point P(- 2, 4) so we have 4 = - 2a + 3
$\Rightarrow a = \frac{-1}{2}$.
Putting $a = \frac{-1}{2}$ in (i), we get $y = \frac{-x}{2} + 3$ or $x + 2y - 6 = 0$.

110. Find the points where the graph of the equation $3x + 4y = 12$ cuts the x-axis and the y-axis.

Ans. : The graph of the linear equation $3x + 4y = 12$ cuts the x-axis at the point where $y = 0$.
i.e., $3x + 4(0) = 12 \Rightarrow 3x = 12 \Rightarrow x = 4$
Thus, the required point is $(4,0)$
Also, the graph of the linear equation $3x + 4y = 12$ cuts the y-axis at the point where $x = 0$.
i.e., $3(0) + 4y = 12 \Rightarrow 4y = 12 \Rightarrow y = 3$
Thus, the required point is $(0,3)$.

111. Show that (4, 0) as well as (6, 1) is a solution of $x - 2y = 4$.

Ans. : Putting $x = 4$ and $y = 0$ in the given equation, we get
$LHS = x - 2y = 4 - 2(0) = 4 - 0 = 4 = RHS$
$\therefore (4,0)$ is a solution of $x - 2y = 4$
Also, putting $x = 6$ and $y = 1$ in the given equation, we get
$LHS = x - 2y = 6 - 2(1) = 6 - 2 = 4 = RHS$
$\therefore (6,1)$ is also a solution of $x - 2y = 4$.

112. Write two solutions of the linear equation $ax - by = 2ab$.

Ans. : We have, $ax - by = 2ab$
$\Rightarrow ax = 2ab + by \Rightarrow x = \frac{2ab + by}{a}$
I. Let $y = a$. Then $x = \frac{2ab + ab}{a} = \frac{3ab}{a} = 3b$
II. Let $y = -a$. Then $x = \frac{2ab - ab}{a} = \frac{ab}{a} = b$
Hence, obtained solutions are $(3b, a)$ and $(b, -a)$.

113. Find four different solutions of the equation $x+2y=6$.

Ans. : We have, $x+2y=6 \Rightarrow x=6-2y$

I. Let $y=0$. Then, $x=6-2(0)=6-0=6$

II. Let $y=2$. Then, $x=6-2(2)=6-4=2$

III. Let $y=3$. Then, $x=6-2\times 3=6-6=0$

IV. Let $y=4$. Then, $x=6-2(4)=6-8=-2$

Hence, required solutions are $(6,0),(2,2),(0,3)$ and $(-2,4)$.

114. Write each of the following as an equation in two variables :
(i) $x=-5$, (ii) $y=2$, (iii) $2x=3$

Ans. : (i) $x=-5$, can be written as $1.x+0.y+5=0$

(ii) $y=2$, can be written as $0.x+1.y-2=0$

(iii) $2x=3$, can be written as $2x+0.y-3=0$

115. Classify the following as linear, quadratic and cubic.
(i) $x-x^3$, (ii) $1+x$, (iii) $3p$

Ans. : (i) Cubic

(ii) Linear

(iii) Linear

116. Write the degree of each of the following polynomials :
(i) $5x^3+4x^2+7x$, (ii) $5t-\sqrt{7}$, (iii) 3

Ans. : (i) Degree of $5x^3+4x^2+7x$ is 3 .

(ii) Degree of $5t-\sqrt{7}$ is 1 .

(iii) Degree of 3 is 0 , as $3=3x^0$. Also, 3 is a constant and the degree of a constant polynomial is 0 .

117. Find the slope and the y-intercept of the following line :
$\frac{x}{6}+\frac{y}{9}=1$

Ans. : $m=\frac{-3}{2}, c=9$

118. Find the slope and the y-intercept of the following line :
$5x-10y=3$

Ans. : $m=\frac{1}{2}, c=\frac{-3}{10}$

119. Find the value of k such that the points $P(k,1), Q(2,-5)$ and $R(k-2,-3)$ are collinear.

Ans. : $k=5$

120. Without using distance formula, prove that the points $A(1,4), B(3,-2)$ and $C(-3,16)$ are collinear.

Ans. : The points $A(1,4), B(3,-2)$, and $C(-3,16)$ are collinear because both the slopes between point pairs are equal to -3 and the area of the triangle they form is

0.

121. If the slope of the line joining $P(k,3)$ and $Q(8,-6)$ is $\frac{-3}{4}$, find the value of k.

Ans. : $k=-4$

122. Find the slope and the y-intercept of the following line :

$y=6$

Ans. : $m=0, c=6$

123. A(2, 3) and B(-2, 5) are two given points.
Find : (i) the slope of AB, (ii) the equation of AB, (iii) the co-ordinates of the point, where AB intersects x-axis.

Ans. : (i) $\frac{-1}{2}$, (ii) $x+2y=8$, (iii) $(8,0)$.

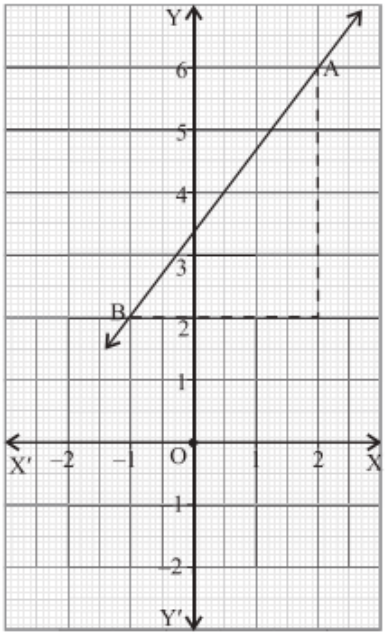
124. Find the slope and the y-intercept of the following line :

$x+4=0$

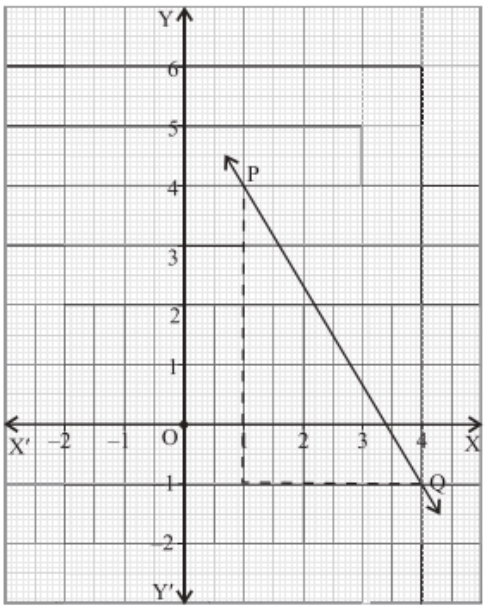
Ans. : m is not defined and the line has no y-intercept

125. Find the slope of the following lines given in the graph :

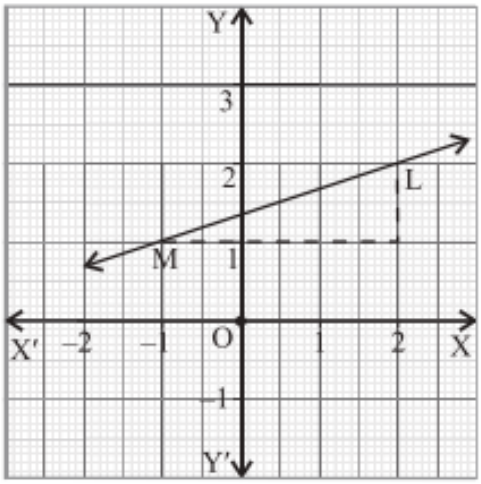
(i)



(ii)



(iii)



Ans. : (i) $\frac{4}{3}$, (ii) $\frac{-5}{3}$, (iii) $\frac{1}{3}$

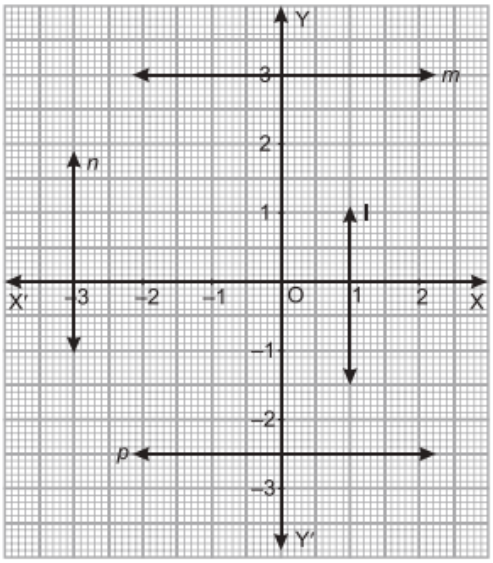
126. Write the equation of the line that is parallel to y-axis and passing through the point
(i) (2, 0), (ii) (-8, -4), (iii) (2, -5)

Ans. : (i) $x = 2$, (ii) $x = -8$, (iii) $x = 2$

127. Write the equation of the line that is parallel to x-axis and passing through the point
(i) (0, 5), (ii) (2, -7), (iii) (4, 1)

Ans. : (i) $y = 5$, (ii) $y = -7$, (iii) $y = 1$

128. Look at the graph given below and write the equations of lines l, m, n, and p.



Ans. : $l \to x = 1, m \to y = 3, n \to x = -3, p \Rightarrow y = -2.5$

129. Write the linear equation such that each point on its graph has ordinate 4 times its abscissa.

Ans. : $4x - y = 0$

130. Write the linear equation such that each point on its graph has an abscissa that is $2\frac{1}{2}$ times its ordinate.

Ans. : $2x - 5y = 0$

131. Determine the point on the graph of the equation $5x + y = 27$ whose x-coordinate is $\frac{5}{2}$ times its ordinate.

Ans. : $(5, 2)$

132. Find the points where the graph of the equation $-5x + 3y = 15$ cuts the x-axis and the y-axis.

Ans. : $(-3, 0), (0, 5)$

133. Find the point where the graph of the equation $2x + y = 7$ cuts the x-axis and the y-axis.

Ans. : $\left(\frac{7}{2}, 0\right), (0, 7)$

134. Find the point where the graph of the equation $x + y = 7$ cuts the x-axis and the y-axis.

Ans. : $(7, 0), (0, 7)$

135. Find the point where the graph of the equation $3 = 2x + y$ cuts the x-axis and the y-axis.

Ans. : $\left(\frac{3}{2}, 0\right), (0, 3)$

136. Express y in terms of x in the equation $2x-3y=12$. Find the points where the line represented by this equation cuts x-axis and y-axis.

Ans. : $(6,0),(0,-4)$

137. If the point (1, 2) lies on the graph of the equation $5y-ax=7$, then find the value of a.

Ans. : $a=3$

138. Find the point where the graph of the equation $2x-3y=5$ cuts the x-axis and the y-axis.

Ans. : $\left(\frac{5}{2},0\right),\left(0,-\frac{5}{3}\right)$

139. Find two solutions of the linear equation $3x+5y=15$ and check whether (2, 3) is its solution.

Ans. : $(5,0),(0,3);(2,3)$ is not a solution.

140. Write four solutions of the equation : $x+\pi y=3$.

Ans. : $(3,0),(3-\pi,1)(3-2\pi,2),(3-3\pi,3)$

141. Find three solutions of the equation $5x-4y+8=0$.

Ans. : $(0,2),(4,7),(8,12)$

142. Find the value of a for which the equation $2x+ay=5$ has $(1,-1)$ as a solution. Find two more solutions for the equation obtained.

Ans. : $a=-3;(4,1),(-2,-3)$

143. Find the value of m, if (5, 8) is a solution of the equation $11x-2y=3m$.
Then find one more solution of this equation.

Ans. : $m=13$; $(3,-3)$

144. If $(1,-2)$ is a solution of the equation $2x-y=p$, find the value of p.

Ans. : $p=4$

145. Give an example of each of the following :
(i) Binomial of degree 37, (ii) Trinomial of degree 2, (iii) Monomial of degree 500

Ans. : (i) $x^{37}-5$, (ii) x^2+5x-3, (iii) x^{500}

146. Determine the degree of each of following polynomials :
(i) $x^4-3x+5x^2+x$, (ii) $y^2(1-y^3)$, (iii) $(y+2)(y-2)$

Ans. : (i) 4, (ii) 5, (iii) 2

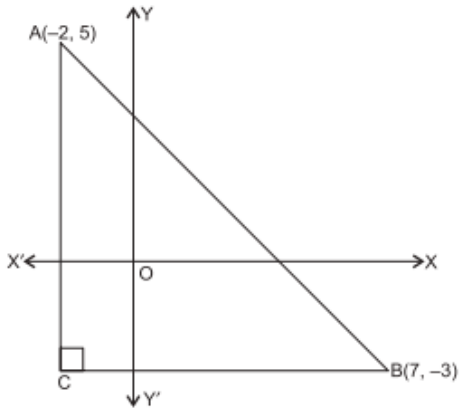
147. For the polynomial $\frac{3x^3+5x^2+2}{5}-\frac{7}{2}x+6$ write :
(i) the coefficient of x^3, (ii) the coefficient of x^2, (iii) the coefficient of x

Ans. : (i) $\frac{3}{5}$, (ii) 1, (iii) $\frac{-7}{2}$

148. A candle is 20 cm long and burns 2 cm every hour.
(i) Form expression for remaining length after x hours.
(ii) Find the length of the candle after 5 hours.
(iii) When will it finish?

Ans. : (i) $20 - 2x$
(ii) 10
(iii) 10 hours

149. A right angled triangle ABC is drawn on the coordinate plane as shown below. Find the area of the right triangle.



Ans. : 36 sq units

*** Questions with calculation. [4 Marks Each]** **[68]**

150. Find the degrees of the following polynomials:
(i) (i) $2x^2 - 5x + 3$
(ii) $y^3 + 2y - 1$
(iii) –9
(iv) 4z – 3

Ans. : Degree of a polynomial is the highest power of the variable.
(i) $2x^2 - 5x + 3$
Highest power of x = 2
∴ Degree = 2
(ii) $y^3 + 2y - 1$
Highest power of y = 3
∴ Degree = 3
(iii) –9
This is a constant polynomial (no variable)
∴ Degree = 0
(iv) 4z – 3
Highest power of z = 1
∴ Degree = 1

151. A telecom company charges ₹600 for a certain recharge scheme. This prepaid balance is reduced by ₹15 each day after recharge.
(i) Write an equation that models the remaining balance b(x) after using the scheme for x days. Explain why it represents linear decay.
(ii) After how many days will the balance run out?
(iii) Make a table of values for x varying from 1 to 10 days and show how the balance b(x) reduces with time.

Ans. : (i) Expression:
Let remaining balance after x days = b(x)
b(x) = 600 − 15x
This represents linear decay because the balance decreases by a constant amount (₹15) every day.
(ii) When balance runs out:
b(x) = 0
600 − 15x = 0
15x = 600
x = 40
So, the balance will run out after 40 days.
(iii) Table of values:

x (days)	b(x) (₹)
1	585
2	570
3	555
4	540
5	525
6	510
7	495
8	480
9	465
10	450

152. A learning platform charges a fixed monthly fee and an additional cost per digital learning module accessed. A student observed that when she accessed 10 modules, her bill was ₹400. When she accessed 14 modules, her bill was ₹500. If the monthly bill y depends on the number of modules accessed, x, according to the relation y = ax + b, find the values of a and b.

Ans. : Given:
When x = 10, y = 400
When x = 14, y = 500
Using y = ax + b
For x = 10: 400 = 10a + b ...(1)

For x = 14: 500 = 14a + b ...(2)
Subtracting (1) from (2), we get:
500 − 400 = 14a − 10a
⇒ 100 = 4a
⇒ a = 25
Substituting a = 25 in (1), we get:
400 = 10(25) + b
⇒ 400 = 250 + b
⇒ b = 150
Therefore, a = 25 and b = 150.

153. A gym charges a fixed monthly fee and an additional cost per hour for using the badminton court. A student using the gym observed that when she used the badminton court for 10 hours, her bill was ₹800. When she used it for 15 hours, her bill was ₹1100. If the monthly bill y depends on the hours of the use of the badminton court, x, according to the relation y = ax + b, find the values of a and b.

Ans. : Given:
When x = 10, y = 800
When x = 15, y = 1100
Using y = ax + b
For x = 10: 800 = 10a + b ...(1)
For x = 15: 1100 = 15a + b ...(2)
Subtracting (1) from (2), we have:
1100 − 800 = 15a − 10a
⇒ 300 = 5a
⇒ a = 60
Substitute a = 60 in (1), we get:
800 = 10(60) + b
⇒ 800 = 600 + b
⇒ b = 200
Therefore, a = 60 and b = 200.

154. If you have ₹800 and you save ₹250 every month, find the amount you have after (i) 6 months (ii) 2 years. Express this as a linear pattern.

Ans. : Initial amount = ₹800
Saving every month = ₹250
Linear pattern: Amount after n months = 800 + 250n
(i) Amount after 6 months:
= 800 + 250(6)
= 800 + 1500
= ₹2300

(ii) Amount after 2 years: 2 years = 24 months
Amount after 24 months:
= 800 + 250(24)
= 800 + 6000
= ₹6800
Therefore:
Amount after 6 months = ₹2300
Amount after 2 years = ₹6800
Linear pattern: A = 800 + 250n, where n is the number of months.

155. The digits of a two-digit number differ by 3. If the digits are interchanged, and the resulting number is added to the original number, we get 143. Find both the numbers.

Ans. : Let the tens digit be x and the units digit be y.
Then the original number = 10x + y
The interchanged number = 10y + x
According to the question: (10x + y) + (10y + x) = 143
⇒ 11x + 11y = 143
⇒ 11(x + y) = 143
⇒ x + y = 13 ...(1)
The digits differ by 3.
So, x – y = 3 ...(2)
Now adding (1) and (2), we get:
2x = 16
⇒ x = 8
Substitute x = 8 in (1), we have:
8 + y = 13
⇒ y = 5
Therefore, the original number = 85 and the interchanged number = 58
Hence, the two numbers are 85 and 58.

156. If the temperature of a liquid can be measured in Kelvin units as x K and in Fahrenheit units as y $^\circ F$, the relation between the two systems of measurement of temperature is given by the linear equation y = (9/5)(x – 273) + 32
(i) Find the temperature of the liquid in Fahrenheit if the temperature of the liquid is 313 K.
(ii) If the temperature is $158^\circ F$, then find the temperature in Kelvin.

Ans. : (i) When x = 313 K, We have to find y:
Using equation y = (9/5)(x – 273) + 32, we have
y = (9/5)(313 – 273) + 32
⇒ y = (9/5)(40) + 32
⇒ y = 72 + 32

⇒ y = 104

Therefore, the temperature is $104^\circ F$.

(ii) When $y = 158^\circ F$, we have to find x :

Using equation y = (9/5)(x – 273) + 32, we have

158 = (9/5)(x – 273) + 32

Subtracting 32 from both sides, we get:

158 – 32 = (9/5)(x – 273)

⇒ 126 = (9/5)(x – 273)

Multiply both sides by 5/9, we get:

126 × (5/9) = x – 273

⇒ 70 = x – 273

⇒ x = 343

Therefore, the temperature is 343 K.

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

(i) $2x + 3y = 4.37$, (ii) $x - 4 = \sqrt{3}y$, (iii) $4 = 5x - 3y$, (iv) $2x = y$

Ans. : (i) $2x + 3y = 4.37 \Rightarrow 2x + 3y - 4.37 = 0$

Comparing it with $ax + by + c = 0$, we get, $a = 2, b = 3$ and $c = -4.37$

(ii) $x - 4 = \sqrt{3}y \Rightarrow x - \sqrt{3}y - 4 = 0$

Comparing it with $ax + by + c = 0$, we get, $a = 1, b = -\sqrt{3}$ and $c = -4$

(iii) $4 = 5x - 3y \Rightarrow -5x + 3y + 4 = 0$

Comparing it with $ax + by + c = 0$, we get, $a = -5, b = 3$ and $c = 4$

It can also be expressed as $5x - 3y - 4 = 0$

Comparing it with $ax + by + c = 0$, we get, $a = 5, b = -3$ and $c = -4$.

(iv) $2x = y \Rightarrow 2x - y + 0 = 0$

Comparing it with $ax + by + c = 0$, we get, $a = 2, b = -1$ and $c = 0$.

158. Which of the following expressions are polynomials and which are not?

(i) $4x^2 - 3x + 7$, (ii) $3\sqrt{t} + t\sqrt{2}$, (iii) $y + \frac{2}{y}$, (iv) $x^{10} + y^3 + t^{50}$

Ans. : (i) Yes, power of variable (x) is non-negative and non-fractional.

(ii) No, power of variable (t) is fractional, i.e., $3t^{1/2} + t\sqrt{2}$.

(iii) No, power of variable (y) is negative, i.e., $y + 2y^{-1}$.

(iv) Yes, it is a polynomial in three variables.

159. Give the geometrical representation of (a) $x = -4$ (b) $5x = 9$ as an equation in (i) one variable (ii) two variables

Ans. : (a) $x = -4$

(i) one variable

The equation is already solved: $x = -4$. On a horizontal number line, this is represented by a single point located at -4 .

(ii) two variables

To represent this on a Cartesian plane, we rewrite it as $1x + 0y = -4$. This means that for any value of y, x will always be -4 . Geometrically, this is a vertical line passing through $(-4, 0)$ and parallel to the y-axis.

(b) $5x = 9$

(i) one variable

$x = \frac{9}{5} = 1.8$

(ii) two variables

Rewrite the equation as $5x + 0y = 9$ (or $x = 1.8$). On a Cartesian plane, this is represented as a vertical line passing through $(1.8, 0)$ and parallel to the y axis.

160. The ratio of girls and boys in a class is 1 : 3. Set up an equation between the students of a class and boys and then draw its graph. From the graph, find the number of boys in the class of 40 students.

Ans. : 30

161. The taxi fare in a city is ₹20 for first kilometre and ₹8 per kilometre for subsequent distance covered. Write the linear equation to represent the above statement. Draw the graph of the linear equation.

Ans. : $y = 8x + 12$

162. Draw the graphs of the equations $x + y - 10 = 0$ and $x - y + 4 = 0$ on the same graph paper and find the coordinates of their points of intersection.

Ans. : $(3, 7)$

163. Which of the following are linear equations in two variables?

(i) $(x + 1) + (y + 3) = 2(x + 3) - (2y + 5)$, (ii) $2x^2 + x + y = 2x(x + 5) + 3y$, (iii) $3x^2 + 5x = 2y(y + 2)$, (iv) $-x(y + 3) = y(y + 2)$

Ans. : (i) linear, (ii) linear, (iii) not linear, (iv) not linear.

164. Which of the following are linear equations?

(i) $y(y - 3) = y^2 + 3y + 5$, (ii) $(y - 5)(y + 5) = 0$, (iii) $3y + y^2 - 2y = y^2 + 22$, (iv) $2(x + 1) + 5 = 5(x - 2) + 3$

Ans. : (i) linear, (ii) not linear, (iii) linear, (iv) linear.

165. Which of the following expressions are polynomials ?

(i) $\frac{1}{x^{-2}} + \frac{1}{x^{-1}} + \frac{1}{2}$, (ii) $x^2(x^3 - 1)$, (iii) $\frac{(x^2+x+1)(x+1)}{(x+1)}$, (iv) $x^2 + \frac{1}{x^2}$

Ans. : (i) yes, (ii) yes, (iii) yes, (iv) no

166. Write the coefficient of x^3 in each of the following :

(i) $-x^3 - x^2 + 3x + 2$, (ii) $\frac{\pi}{3}x^3 + 8x^2 - 9$, (iii) $\frac{5x^3+3}{2} + x^2$, (iv) $\frac{-3x^3}{7} + 5x^2 + 2x$

Ans. : (i) -1 (ii) $\frac{\pi}{3}$ (iii) $\frac{5}{2}$ (iv) $\frac{-3}{7}$

*** Answer the following questions. [5 Marks Each]** **[140]**

167. Suppose a plant has height 1.75 feet and it grows by 0.5 feet each month.
(i) Find the height after 7 months.
(ii) Make a table of values for t varying from 0 to 10 months and show how the height, h, increases every month.
(iii) Find an expression that relates h and t, and explain why it represents linear growth.

Ans. : Given:
Initial height = 1.75 feet
Growth per month = 0.5 feet
(i) Height growth in each month = 0.5 feet
So, Height after 7 months:
h = 1.75 + (0.5 × 7)
= 1.75 + 3.5
= 5.25 feet
(ii) Table of values:

t (months)	h (feet)
0	1.75
1	2.25
2	2.75
3	3.25
4	3.75
5	4.25
6	4.75
7	5.25
8	5.75
9	6.25
10	6.75

(iii) Expression:
Let height after t months = h
h = 1.75 + 0.5t
This represents linear growth because height increases by a constant amount (0.5 feet) every month.

168. A mobile phone is bought for ₹10,000. Its value decreases by ₹800 every year.
(i) Find the value of the phone after 3 years.
(ii) Make a table of values for t varying from 0 to 8 years and show how the value of the phone, v, depreciates with time.
(iii) Find an expression that relates v and t, and explain why it represents linear decay.

Ans. : Given:
Initial value = ₹10,000

Decrease per year = ₹800

(i) Decrease in value after 1 year = ₹800

So, Value after 3 years:

v = 10000 − (800 × 3)

= 10000 − 2400

= ₹7600

(ii) Table of values:

t (years)	v (₹)
0	10000
1	9200
2	8400
3	7600
4	6800
5	6000
6	5200
7	4400
8	3600

(iii) Expression:

Let value after t years = v

v = 10000 − 800t

This represents linear decay because the value decreases by a constant amount (₹800) every year.

169. The initial population of a village is 750. Every year, 50 people move from a nearby city to the village.

(i) Find the population of the village after 6 years.

(ii) Make a table of values for t varying from 0 to 10 years and show how the population, P, increases every year.

(iii) Find an expression that relates P and t, and explain why it represents linear growth.

Ans. : (i) Population after 6 years:

P = 750 + (50 × 6)

= 750 + 300

= 1050

(ii) Table of values:

t (years)	P (population)
0	750
1	800
2	850
3	900
4	950

5	1000
6	1050
7	1100
8	1150
9	1200
10	1250

(iii) Expression:

Let population after t years = P

P = 750 + 50t

This represents linear growth because the population increases by a constant number (50 people) every year.

170. Consider the relationship between temperature measured in degrees Celsius $(^\circ C)$ and degrees Fahrenheit $(^\circ F)$,which is given by $^\circ C = a^\circ F + b$. Find a and b, given that ice melts at 0 degrees Celsius and 32 degrees Fahrenheit, and water boils at 100 degrees Celsius and 212 degrees Fahrenheit.
(Hint: When $^\circ C = 0, ^\circ F = 32$ and when $^\circ C = 100, ^\circ F = 212$. Use this information to find a and b, and thus, the Linear relationship between $^\circ C$ and $^\circ F$.)

Ans. : Given relation: $^\circ C = a^\circ F + b$

Using the point $(^\circ F, ^\circ C) = (32, 0)$, we have:

0 = 32a + b ...(1)

Using the point $(^\circ F, ^\circ C) = (212, 100)$, we have:

100 = 212a + b ...(2)

Subtracting (1) from (2), we get:

100 − 0 = 212a − 32a

⇒ 100 = 180a

⇒ a = 100/180

⇒ a = 5/9

Substitute a = 5/9 in (1), we get:

0 = 32(5/9) + b

⇒ 0 = 160/9 + b

⇒ b = −160/9

Therefore, a = 5/9 and b = −160/9.

Hence, the linear relationship is $^\circ C = (5/9)^\circ F - 160/9$.

It can also be written as $^\circ C = (5/9)(^\circ F - 32)$.

171. Draw the graphs of the following sets of lines. In each case, reflect on the role of ‘a’ and ‘b’.

(i) y = 4x, y = 2x, y = x

(ii) y = −6x, y = −3x, y = −x

(iii) y = 5x, y = −5x

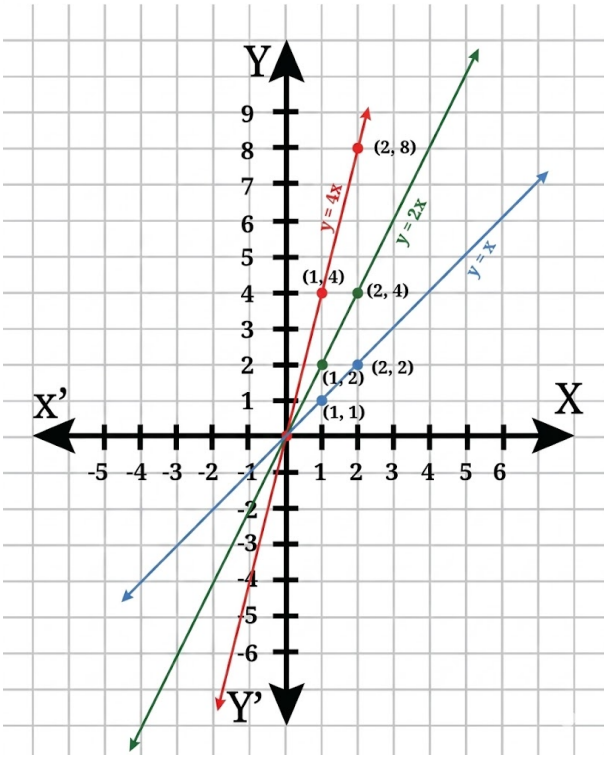
(iv) y = 3x − 1, y = 3x, y = 3x + 1

(v) y = −2x − 3, y = −2x, y = 2x + 3

Ans. : (i) All lines are of the form y = ax (b = 0).

Observation:

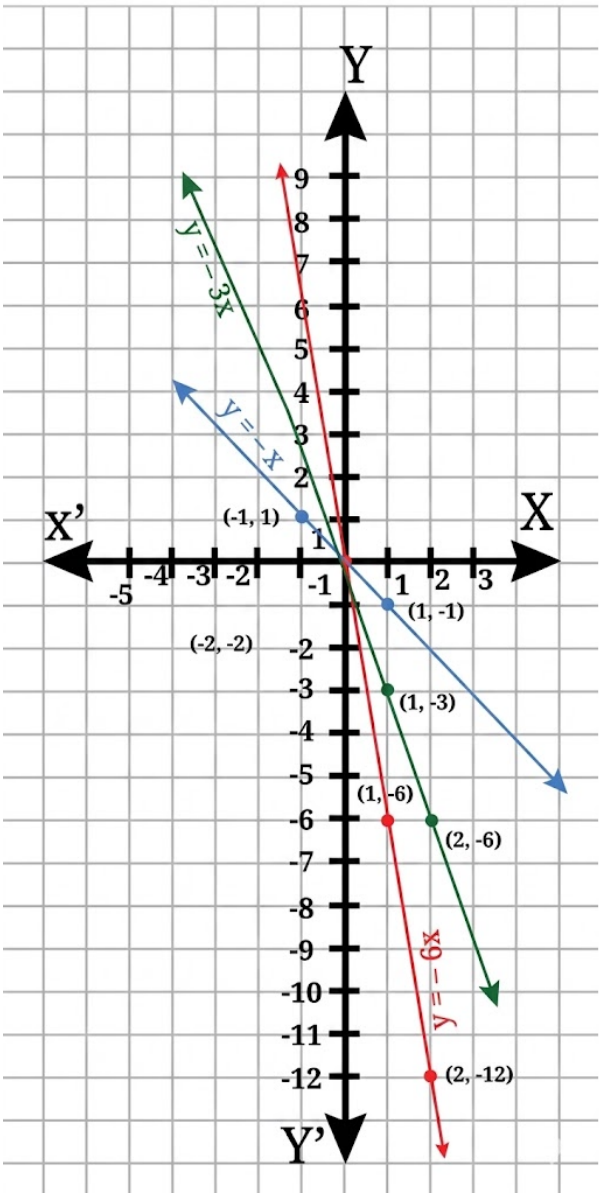
- All lines pass through the origin (0,0).
- The value of ‘a’ (slope) determines steepness.
- Larger ‘a’ → steeper line.



(ii) All lines are of the form y = ax (b = 0).

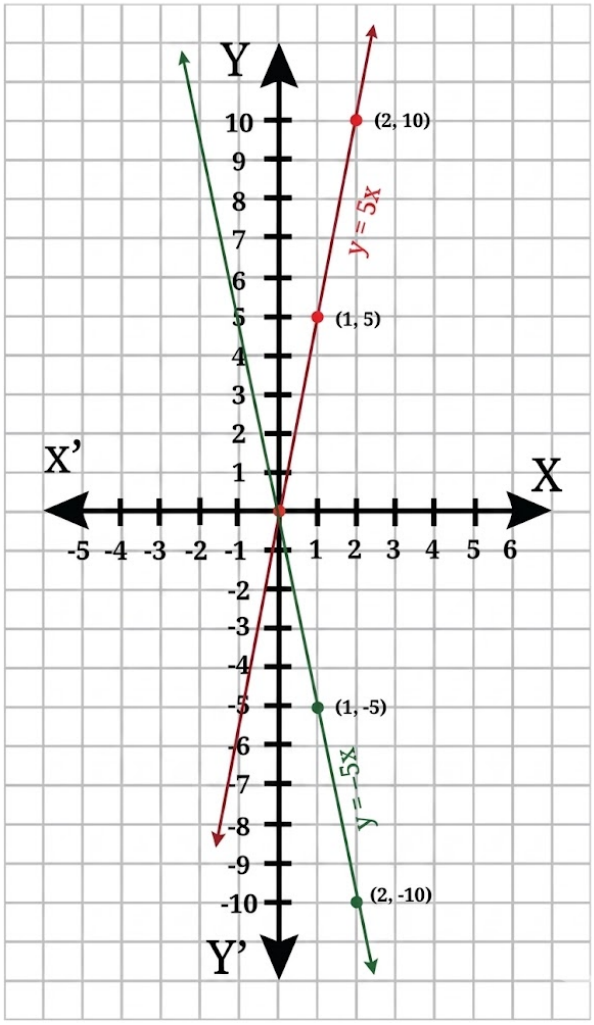
Observation:

- All lines pass through the origin.
- Negative ‘a’ means lines slope downward.
- Larger magnitude of ‘a’ → steeper downward slope.



(iii) Observation:

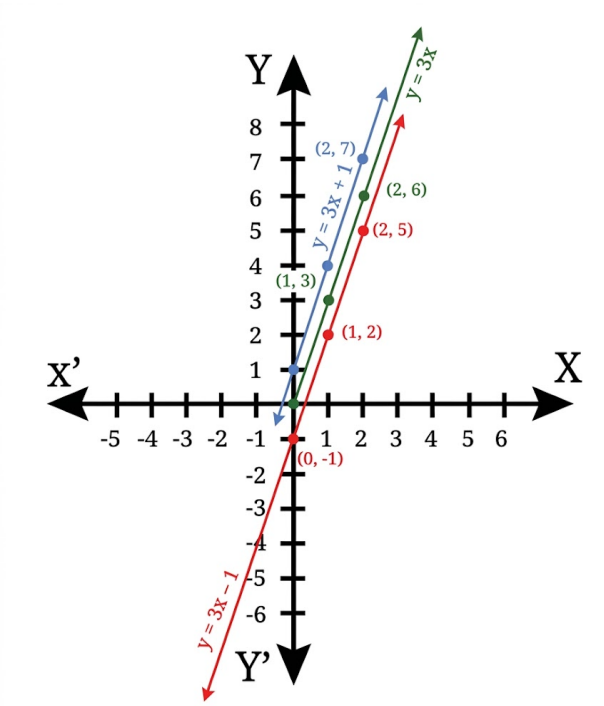
- Both lines pass through the origin.
- y = 5x slopes upward, y = −5x slopes downward.
- Same magnitude of ‘a’ → same steepness but opposite direction



(iv) All lines have same slope (a = 3).

Observation:

- Lines are parallel (same slope).
- Different values of ‘b’ shift the line up or down.
- b = −1 → line below origin
- b = 0 → passes through origin
- b = +1 → line above origin.



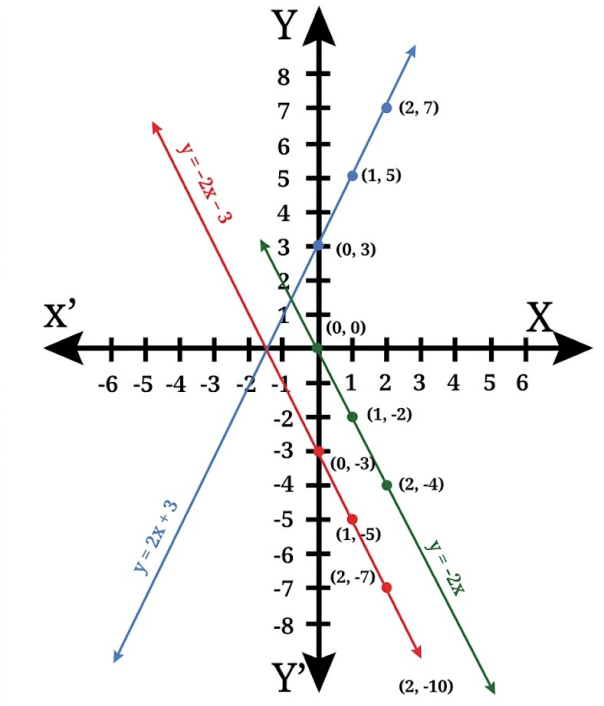
(v) Observation:

- y = −2x − 3 and y = −2x have same slope (−2) → parallel lines.
- y = 2x + 3 has positive slope → different direction.

'b' changes vertical position of line.

Conclusion:

1. 'a' (coefficient of x) controls slope (steepness and direction).
2. 'b' (constant term) controls vertical shift (y-intercept).

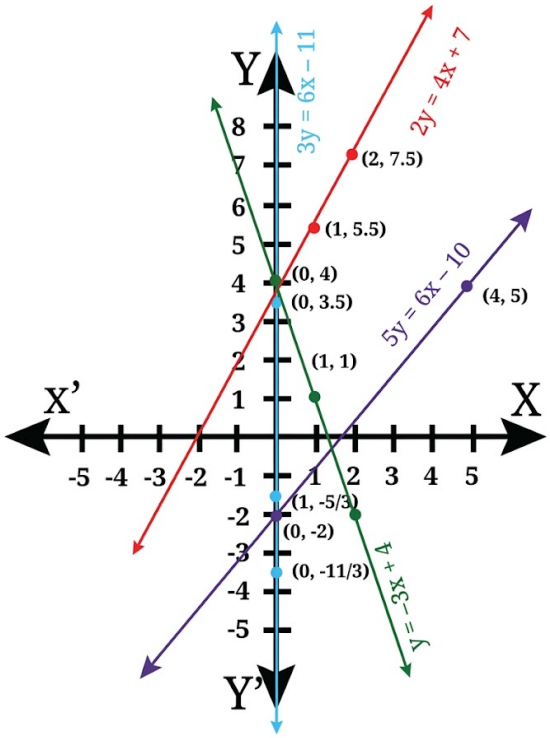


172. Draw the graph of the following equations, and identify their slopes and y-intercepts. Also, find the coordinates of the points where these lines cut the y-

axis.
(i) $y = -3x + 4$
(ii) $2y = 4x + 7$
(iii) $5y = 6x - 10$
(iv) $3y = 6x - 11$
Are any of the lines parallel?

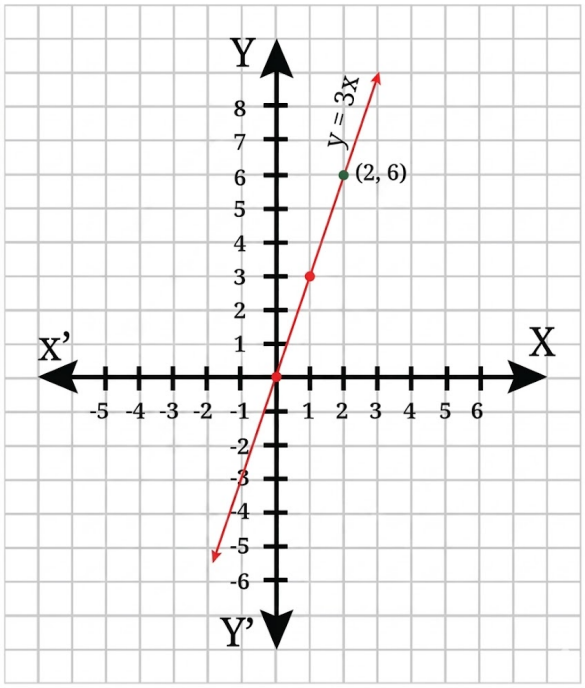
Ans. : (i) $y = -3x + 4$
Comparing with $y = ax + b$:
Slope $a = -3$
y-intercept $b = 4$
So, the point, where the line cuts the y-axis, is $(0, 4)$.
(ii) $2y = 4x + 7$
Dividing both sides by 2: $y = 2x + 7/2$
Slope $a = 2$
y-intercept $b = 7/2$
So, the point, where the line cuts the y-axis, is $(0, 7/2)$.
(iii) $5y = 6x - 10$
Dividing both sides by 5: $y = (6/5)x - 2$
Slope $a = 6/5$
y-intercept $b = -2$
So, the point, where the line cuts the y-axis is $(0, -2)$.
(iv) $3y = 6x - 11$
Dividing both sides by 3: $y = 2x - 11/3$
Slope $a = 2$
y-intercept $b = -11/3$
So, the point, where the line cuts the y-axis is $(0, -11/3)$.
Parallel lines:
Two lines are parallel if they have the same slope.
Equation (ii): slope = 2
Equation (iv): slope = 2

Therefore, lines (ii) and (iv) are parallel.



173. The work done by a body on the application of a constant force is the product of the constant force and the distance travelled by the body in the direction of the force.
Express this in the form of a linear equation in two variables (work w and distance d), and draw its graph by taking the constant force as 3 units. What is the work done when the distance travelled is 2 units? Verify it by plotting it on the graph.

Ans. : We know that:
Work done = Force × Distance
According to question, work done = w
Distance travelled = d
Constant force = 3 units
Therefore, w = 3d
This is the required linear equation in two variables.
If d = 2 units, force w = 3 × 2 = 6 units.
Taking w on y-axis and d on x-axis, we can plot the graph.



The point (2, 6) lie on a straight line, so, it is verified by graph.
So, the Work done when distance travelled is 2 units: w = 3 × 2
Hence, w = 6 units
Verification from graph:
The point corresponding to d = 2 is (2, 6), so the work done is 6 units.

174. The graph of a linear polynomial p(x) passes through the points (1, 5) and (3, 11).
(i) Find the polynomial p(x).
(ii) Find the coordinates where the graph of p(x) cuts the axes.
(iii) Draw the graph of p(x) and verify your answers.

Ans. : (i) Let p(x) = ax + b
Since the graph passes through (1, 5),
a(1) + b = 5
⇒ a + b = 5 ...(1)
Since the graph passes through (3, 11),
a(3) + b = 11
⇒ 3a + b = 11 ...(2)
Subtracting (1) from (2), we get:
3a + b – (a + b) = 11 – 5
⇒ 2a = 6
⇒ a = 3
Substituting a = 3 in (1), we have:
3 + b = 5
⇒ b = 2
Therefore, p(x) = 3x + 2.
(ii) Coordinates where the graph cuts the axes:

To find the y-axis intercept: Put x = 0

y = p(0) = 3(0) + 2 = 2

So, the graph cuts the y-axis at (0, 2).

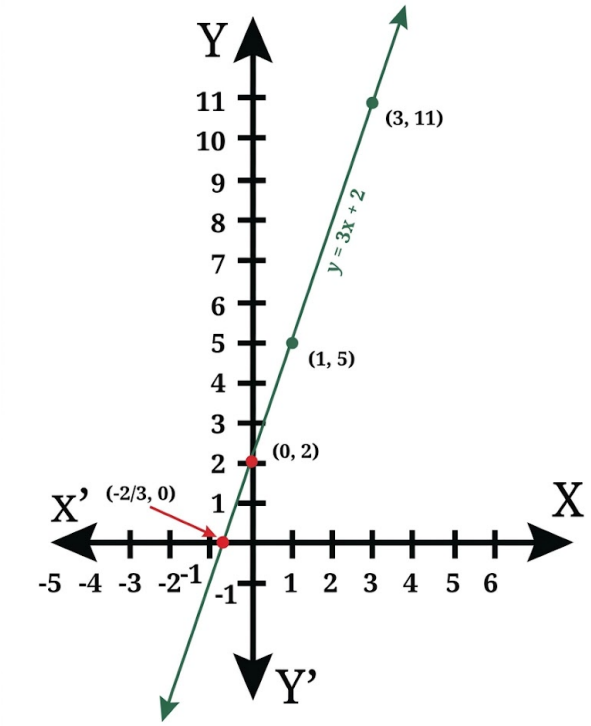
To find the x-axis intercept: Put y = 0

3x + 2 = 0

⇒ 3x = -2

⇒ x = -2/3

So, the graph cuts the x-axis at (-2/3, 0).



(iii) From the graph, it verifies that the line passes through the given points and cuts:

y-axis at (0, 2)

x-axis at (-2/3, 0).

175. Let p(x) = ax + b and q(x) = cx + d be two linear polynomials such that:

(i) p(0) = 5

(ii) The polynomial p(x) − q(x) cuts the x-axis at (3, 0).

(iii) The sum p(x) + q(x) is equal to 6x + 4 for all real x.

Find the polynomials p(x) and q(x).

Ans. : Let p(x) = ax + b and q(x) = cx + d

Using the condition (i), we have p(0) = 5

⇒ a(0) + b = 5

⇒ b = 5

So, p(x) = ax + 5

Now, using condition (iii), we have

p(x) + q(x) = 6x + 4

⇒ (ax + 5) + (cx + d) = 6x + 4

⇒ (a + c)x + (5 + d) = 6x + 4

Comparing coefficients, we get a + c = 6 ...(1)

5 + d = 4

⇒ d = −1

So, q(x) = cx − 1

Using condition (ii), p(x) − q(x) cuts x-axis at (3, 0)

⇒ p(3) − q(3) = 0

Here:

p(3) = 3a + 5

q(3) = 3c − 1

So, (3a + 5) − (3c − 1) = 0

⇒ 3a + 5 − 3c + 1 = 0

⇒ 3a − 3c + 6 = 0

⇒ a − c = −2 ...(2)

Solving equations

From (1): a + c = 6

From (2): a − c = −2

Adding both: 2a = 4 ⇒ a = 2

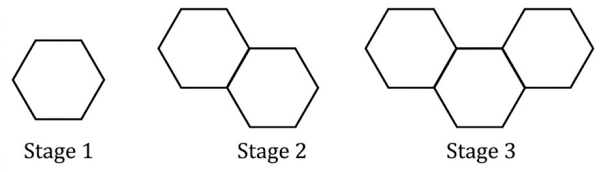
Then: 2 + c = 6 ⇒ c = 4

Hence:

p(x) = 2x + 5

q(x) = 4x − 1.

176. Look at the first three stages of a growing pattern of hexagons made using matchsticks. A new hexagon gets added at every stage which shares a side with the last hexagon of the previous stage.



(i) Draw the next two stages of the pattern. How many matchsticks will be required at these stages?

(ii) Complete the following table.

Stage Number	1	2	3	4	5	...	n
Number of matchsticks							

(iii) Find a rule to determine the number of matchsticks required for the n^{th} stage.

(iv) How many matchsticks will be required for the 15th stage of the pattern?

(v) Can 200 matchsticks form a stage in this pattern? Justify your answer.

Ans. : A single hexagon needs 6 matchsticks.

Since each new hexagon shares one side with the previous hexagon, only 5 new matchsticks are added at every new stage.

So the pattern is:

Stage 1 = 6

Stage 2 = 6 + 5 = 11

Stage 3 = 11 + 5 = 16

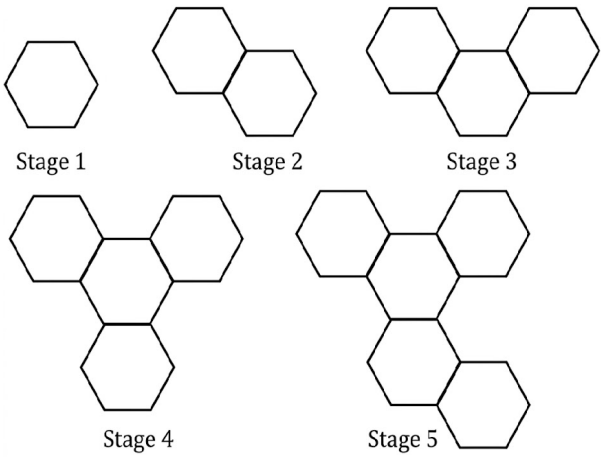
(i) Next two stages:

Stage 4: Number of matchsticks = 16 + 5 = 21

Stage 5: Number of matchsticks = 21 + 5 = 26

Therefore:

- Stage 4 requires 21 matchsticks
- Stage 5 requires 26 matchsticks



Stage Number	1	2	3	4	5	...	n
Number of matchsticks	6	11	16	21	26		$5n+1$

(iii) Rule for the n^{th} stage:

The number of matchsticks forms an arithmetic pattern: 6, 11, 16, 21, 26, ...

First term = 6

Difference = 5

So, Number of matchsticks in the n^{th} stage

= 6 + (n – 1) × 5

= 6 + 5n – 5

= 5n + 1

Hence, the rule is $M_n = 5n + 1$

(iv) Matchsticks required for the 15th stage:

$M_{15} = 5(15) + 1$

= 75 + 1

= 76

Therefore, 76 matchsticks will be required for the 15th stage.

(v) Can 200 matchsticks form a stage in this pattern?

For some stage n,

$5n + 1 = 200$

$\Rightarrow 5n = 199$

$\Rightarrow n = 199/5$

$\Rightarrow n = 39.8$

Since n is not a whole number, 200 matchsticks cannot form any stage in this pattern.

Therefore, 200 matchsticks cannot form a stage in this pattern.

177. Let $p(x) = ax + b$ and $q(x) = cx + d$ be two linear polynomials such that:

(i) The graph of p(x) passes through the points (2, 3) and (6, 11).

(ii) The graph of q(x) passes through the point (4, -1).

(iii) The graph of q(x) is parallel to the graph of p(x).

Find the polynomials p(x) and q(x). Also, find the coordinates of the point where these lines meet the x-axis.

Ans. : Given:

$p(x) = ax + b$

$q(x) = cx + d$

First, to find p(x).

Since p(x) passes through (2, 3) and (6, 11), its slope is $m = (11 - 3) / (6 - 2)$

$= 8/4 = 2$

So, $p(x) = 2x + b$

Using the point (2, 3), we have:

$3 = 2(2) + b$

$\Rightarrow 3 = 4 + b$

$\Rightarrow b = -1$

Therefore, $p(x) = 2x - 1$.

Now to find q(x).

Since q(x) is parallel to p(x), it has the same slope.

So, slope of $q(x) = 2$

Hence, $q(x) = 2x + d$

Since q(x) passes through (4, -1), so $-1 = 2(4) + d$

$\Rightarrow -1 = 8 + d$

$\Rightarrow d = -9$

Therefore, $q(x) = 2x - 9$

Now we have to find where these lines meet the x-axis.

A line meets the x-axis where y = 0.

For $p(x) = 2x - 1$: $0 = 2x - 1$

$\Rightarrow 2x = 1$

$\Rightarrow x = 1/2$

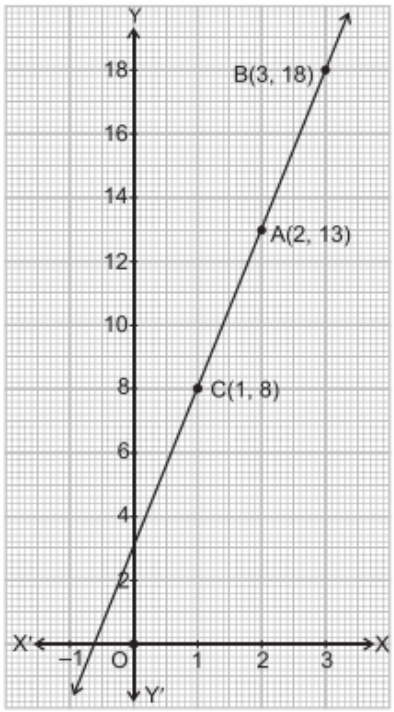
So, p(x) meets the x-axis at (1/2, 0).
For q(x) = 2x – 9: 0 = 2x – 9
⇒ 2x = 9
⇒ x = 9/2
So, q(x) meets the x-axis at (9/2, 0).
Hence, p(x) = 2x – 1 and q(x) = 2x – 9.
The x-axis intercepts are:
For p(x): (1/2, 0)
For q(x): (9/2, 0)

178. What do all linear functions of the form f(x) = ax + a, a > 0, have in common?

Ans. : Given: f(x) = ax + a, where a > 0
We can write it as: f(x) = a(x + 1)
Common properties of all such linear functions are:
1. Slope:
The slope is a, and since a > 0, all the lines have positive slope.
So, all these lines rise from left to right.
2. y-intercept:
Putting x = 0,
f(0) = a
So, the y-intercept is (0, a).
Since a > 0, all the lines cut the y-axis above the origin.
3. x-intercept:
To find where the line cuts the x-axis, put f(x) = 0
ax + a = 0
a(x + 1) = 0
Since a > 0, a is not zero.
So, x + 1 = 0
or x = -1
Thus, every line cuts the x-axis at the same point (-1, 0).
Therefore, all linear functions of the form f(x) = ax + a, a > 0, have the following in common:
all have positive slope
all cut the y-axis above the origin
all pass through the fixed point (-1, 0).

179. The taxi fare in a city is as follows:
For the first kilometre, the fare is ₹8 and for the subsequent distance it is ₹5 per km. Taking the distance covered as x km and total fare as ₹y, write a linear equation for this information and draw its graph.

Ans. :



We have, total distance covered $= xkm$.

And, total fare $= ₹y$.

Since for the first kilometre, fare charged is ₹ 8 .

Therefore, for remaining $(x-1)km$ fare will be $₹5(x-1)$.

According to the statement, $y = 8 + 5(x-1)$

$\Rightarrow y = 8 + 5x - 5 \Rightarrow y = 5x + 3$

Putting $x = 2$, we get

$y = 5(2) + 3 = 13$, i.e., $A(2,13)$

Putting $x = 3$, we get

$y = 5(3) + 3 = 18$, i.e., $B(3,18)$

Putting $x = 1$, we get

$y = 5(1) + 3 = 8$, i.e., $C(1,8)$

We plot these points on a graph paper and join them to get the graph of the equation $y = 5x + 3$ as shown.

180. In countries like USA and Canada, temperature is measured in Fahrenheit, whereas in countries like India, it is measured in Celsius. Here is a linear equation that converts Fahrenheit to Celsius : $F = \frac{9}{5}C + 32$.

(i) Draw the graph of the linear equation given above using the Celsius for x-axis and Fahrenheit for y-axis.

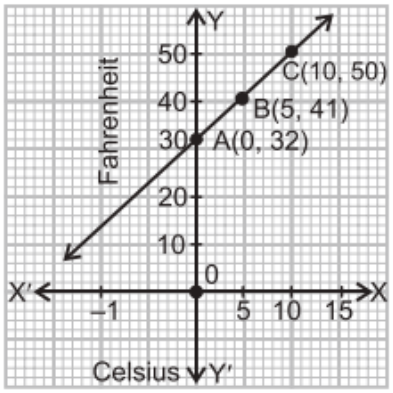
(ii) If the temperature is $30°C$, what is the temperature in Fahrenheit?

(iii) If the temperature is $95°F$, what is the temperature in Celsius?

(iv) If the temperature is $0°C$, what is the temperature in Fahrenheit and if the temperature is $0°F$, what is the temperature in Celsius?

(v) Is there a temperature which is numerically the same in both Fahrenheit and Celsius. If yes, find it.

Ans. :



We have, $F = \left(\frac{9}{5}\right) C + 32$.

(i) For, $C = 0, F = 32$

For, $C = 5, F = 41$

For, $C = 10, F = 50$

We plot the point $A(0,32), B(5,41)$, and $C(10,50)$ and join them to get the graph of the equation $F = \frac{9}{5}C + 32$ as shown.

(ii) If $C = 30^\circ C$, then $F = \frac{9}{5}(30) + 32$ [From (1)]

$= 9(6) + 32 = 54 + 32 = 86^\circ F$.

(iii) If $F = 95^\circ F$, then $95 = \frac{9}{5}C + 32$ [From (1)]

$\Rightarrow 95 = \frac{9C+160}{5}$

$\Rightarrow 475 = 9C + 160$

$\Rightarrow 9C = 475 - 160$

$\Rightarrow C = \frac{315}{9} = 35^\circ C$

(iv) If $C = 0$, then $F = \frac{9}{5}(0) + 32$

$\Rightarrow F = 32^\circ F$

If $F = 0$, then $C = \frac{-160}{9} = \left(\frac{-160}{9}\right)^\circ C$

(v) Let $F = C$. Then $F = \frac{9}{5}F + 32 \Rightarrow F = \frac{9F+160}{5} \Rightarrow 5F = 9F + 160$

$\Rightarrow -4F = 160 \Rightarrow F = -40$

$\therefore F = C = -40^\circ C$.

181. Yamini and Fatima, two students of class IX of a school, together contributed ₹100 towards the Prime Minister's Relief Fund to help earthquake victims. Write a linear equation which satisfies this data. Draw the graph of the same.

Ans. : Let the contribution made by Yamini be ₹x and contribution made by Fatima be ₹y.

According to the given statement,

$x + y = 100 \Rightarrow y = 100 - x$

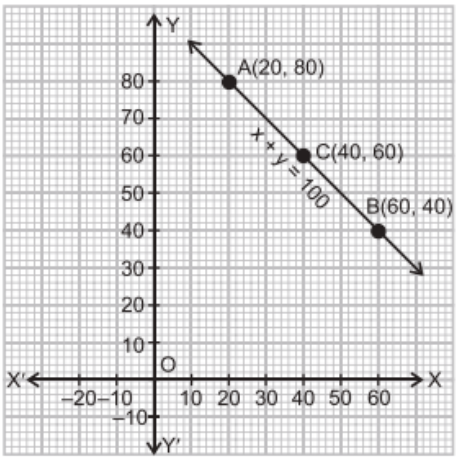
Putting $x = 20$, we get, $y = 100 - 20 = 80; \quad (20,80)$

Putting $x = 60$, we get, $y = 100 - 60 = 40; \quad (60, 40)$

Putting $x = 40$, we get, $y = 100 - 40 = 60; \quad (40, 60)$

We plot these points on a graph paper and join them to get the graph of the equation $x + y = 100$; as shown.

x	20	60	40
$y = 100 - x$	80	40	60
Points	A(20, 80)	B(60, 40)	C(40, 60)



182. Draw the graph of the equation $y = 3x$.

Ans. : We have, $y = 3x$

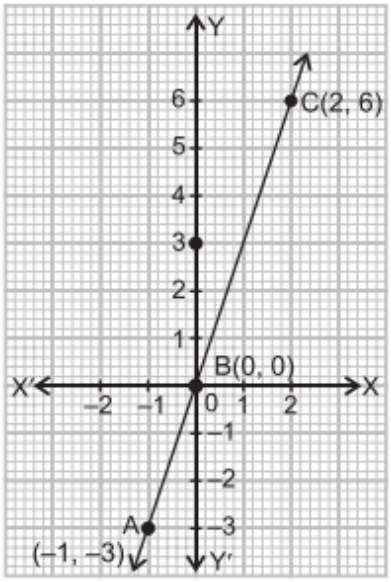
Putting $x = -1$, we get $y = 3(-1) = -3; \quad (-1, -3)$

Putting $x = 0$, we get $y = 3(0) = 0; (0, 0)$

Putting $x = 2$, we get $y = 3(2) = 6; \quad (2, 6)$

We write these values in a table as

x	-1	0	2
$y = 3x$	-3	0	6
Points	A(-1, -3)	B(0, 0)	C(2, 6)



183. Draw the graph of the equation $3x + 4y = 6$. At what point does the graph cut the x-axis and the y-axis?

Ans. : We have, $3x + 4y = 6 \Rightarrow 4y = 6 - 3x \Rightarrow y = \frac{6-3x}{4}$

Putting $x = 2$, we get $y = \frac{6-3(2)}{4} = \frac{0}{4} = 0; (2, 0)$

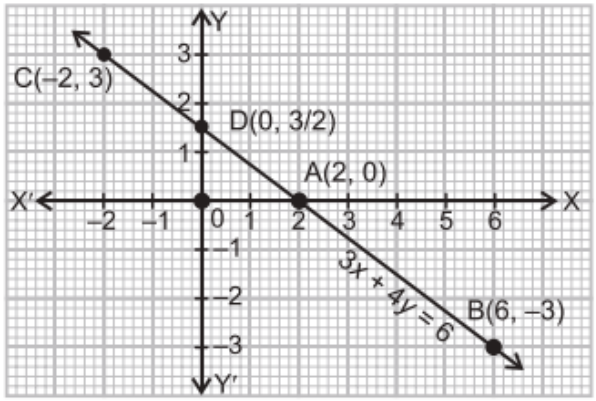
Putting $x = 6$, we get $y = \frac{6-3(6)}{4} = \frac{-12}{4} = -3; (6, -3)$

Putting $x = -2$, we get $y = \frac{6-3(-2)}{4} = \frac{12}{4} = 3; (-2, 3)$

We write these values in a table as

x	2	6	-2
$y = \frac{6-3x}{4}$	0	-3	3
Points	A(2, 0)	B(6, -3)	C(-2, 3)

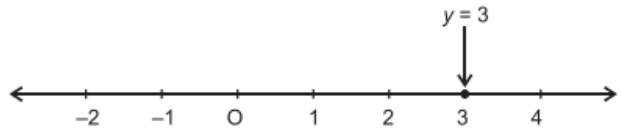
On a graph paper, we plot these points and join them to get the graphs of the equation. 3x + 4y = 6 as shown alongside.



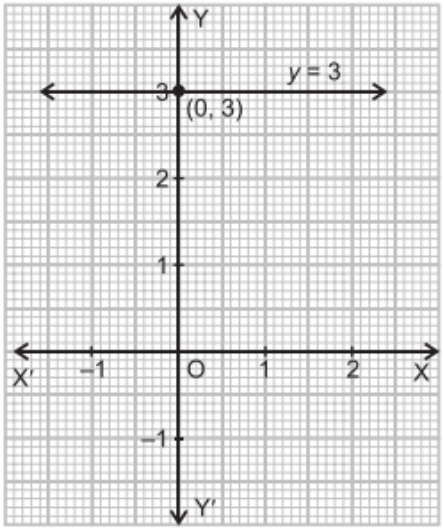
From the graph we see that the graph of the line cuts x-axis at A(2, 0) and y-axis at $D\left(0, \frac{3}{2}\right)$.

184. Give the geometric representations of $y = 3$ as an equation
(i) in one variable, (ii) in two variables

Ans. : (i) The representation of the solution of the number line is shown below, where y = 3 is treated as an equation in one variable.



(ii) Also, y = 3 is a line parallel to x-axis passing through (0, 3). Also y = 3 can be expressed as 0.x + y = 3, which is an equation in two variables x and y, So, the graph of y = 3 or 0.x + y = 3 is shown here.

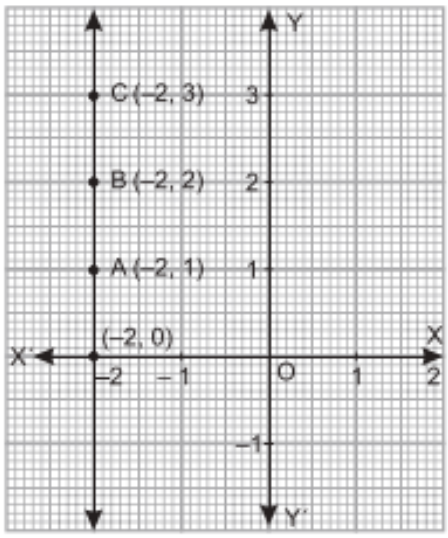


185. Draw the graph of the following equations.
(i) $x = -2$, (ii) $y = 4$

Ans. : (i) $x = -2$
Here, for every y coordinate, the x coordinate is -2.
So, we can prepare a table as below.

x	-2	-2	-2
y	1	2	3

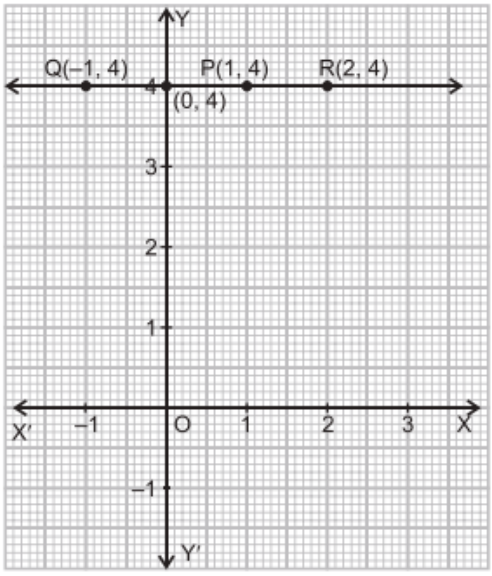
Plot the points A (-2, 1), B (-2, 2) and C (-2, 3) and join them to get the graph of x = - 2 Clearly x = - 2 is a line parallel to y-axis, passing through (-2, 0).



(ii) $y = 4$, Here, for every x-coordinate, the y-coordinate is 4 .
So, we can prepare a table as below.

x	1	-1	2
y	4	4	4

Plot the points P(1,4) Q(- 1, 4) and R(2, 4) On a graph paper and join them to get the graph of the equation y = 4 Clearly, y = 4 is a line parallel to x-axis passing through (0,4)



186. Check which of the following are solutions of the equations $x - 2y = 4$ and which are not:

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

Ans. : We have, $x - 2y = 4$

(i) LHS $= x - 2y = 0 - 2(2) = 0 - 4 = -4$

$\because$ LHS $\neq$ RHS

$\therefore (0,2)$ is not a solution of the given equation.

(ii) LHS $= x - 2y = 2 - 2(0) = 2$

$\because$ LHS $\neq$ RHS

$\therefore (2,0)$ is not a solution of the given equation.

(iii) LHS $= x - 2y = 4 - 2(0) = 4$

$\because$ LHS $=$ RHS

$\therefore (4,0)$ is a solution of the given equation.

(iv) LHS $= x - 2y = \sqrt{2} - 2(4\sqrt{2}) = \sqrt{2} - 8\sqrt{2} = -7\sqrt{2}$

$\because$ LHS $\neq$ RHS

$\therefore (\sqrt{2}, 4\sqrt{2})$ is not a solution of the given equation.

(v) LHS $= x - 2y = 1 - 2(1) = 1 - 2 = -1$

$\because$ LHS $\neq$ RHS.

$\therefore (1,1)$ is not a solution of the given equation

187. The linear equation that converts Fahrenheit (F) to Celsius (C) is given by the relation, $C = \frac{5F-160}{9}$.

(i) If the temperature is $86^\circ F$, what is the temperature in Celsius?

(ii) If the temperature is $35^\circ C$, what is the temperature in Fahrenheit?

(iii) If the temperature is $0^\circ C$, what is the temperature in Fahrenheit and if the temperature is $0^\circ F$, what is the temperature in Celsius?

(iv) What is the numerical value of the temperature which is same in both the scales?

Ans. : We have, $C = \frac{5F-160}{9}$ ....(i)

$\Rightarrow 9C = 5F - 160 \Rightarrow 5F = 9C + 160 \Rightarrow F = \frac{9C+160}{5}$ ....(ii)

(i) If $F = 86^\circ F$, then $C = \frac{5(86)-160}{9} = \frac{430-160}{9} = \frac{270}{9} = 30^\circ C$

(ii) If $C = 35^\circ C$, then $F = \frac{9(35)+160}{5} = \frac{315+160}{5} = \frac{475}{5} = 95^\circ C$

(iii) If $C = 0^\circ C$, then $F = \frac{9(0)+160}{5} = \frac{160}{5} = 32^\circ F$

If $F = 0^\circ F$, then $C = \frac{5(0)-160}{9} = \frac{-160}{9} = \left(\frac{-160}{9}\right)^\circ C$

(iv) If $C = F$, then $C = \frac{5C-160}{9} \Rightarrow 9C = 5C - 160$

$\Rightarrow 4C = -160 \Rightarrow C = \frac{-160}{4} = -40 = F$

Hence, $-40^\circ F = -40^\circ C$

188. 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) $-2x + 3y = 6$, (ii) $2x = -5y$, (iii) $3x + 2 = 0$, (iv) $y - 2 = 0$, (v) $5 = 2x$

Ans. : (i) $-2x + 3y = 6 \Rightarrow -2x + 3y - 6 = 0$

Comparing it with $ax + by + c = 0$, we get, $a = -2, b = 3$ and $c = -6$

(ii) $2x = -5y \Rightarrow 2x + 5y + 0 = 0$

Comparing it with $ax + by + c = 0$, we get, $a = 2, b = 5$ and $c = 0$

(iii) $3x + 2 = 0 \Rightarrow 3x + 0.y + 2 = 0$

Comparing it with $ax + by + c = 0$, we get, $a = 3, b = 0$ and $c = 2$

(iv) $y-2=0 \Rightarrow 0.x+1.y-2=0$

Comparing it with $ax+by+c=0$, we get, $a=0, b=1$ and $c=-2$

(v) $5=2x \Rightarrow -2x+0.y+5=0$

Here, $a=-2, b=0$ and $c=5$

It can also be expressed as $2x+0.y-5=0$

Here, $a=2, b=0$ and $c=-5$.

189. Which of the following are linear equations?

(i) $3x(x-1)=x(3x+5)-2$, (ii) $(y+2)=2y-3$, (iii) $(x-1)=(2x+3)$, (iv) $y-5=2y+(y-1)$, (v) $2x-(y+5)=y+2x-3$

Ans. : (i) $3x(x-1)=x(3x+5)-2 \Rightarrow 3x^2-3x=3x^2+5x-2$

$\Rightarrow -8x+2=0 \Rightarrow -8x+0.y+2=0$

Hence, it is a linear equation.

(ii) $(y+2)=2y-3 \Rightarrow -y+5=0 \Rightarrow 0.x-y+5=0$

Hence, it is a linear equation.

(iii) $x-1=2x+3 \Rightarrow -x-4=0 \Rightarrow -x+0.y-4=0$

Hence, it is a linear equation.

(iv) $y-5=2y+y-1 \Rightarrow -2y-4=0 \Rightarrow 0.x-2y-4=0$

Hence, it is a linear equation.

(v) $2x-(y+5)=y+2x-3 \Rightarrow 2x-y-5=y+2x-3$

$\Rightarrow -2y-2=0 \Rightarrow 0.x-2y-2=0$

Hence, it is a linear equation.

190. Find the slope and the y-intercept of each of the following lines :

(i) $5x-10y=3$, (ii) $\frac{x}{6}+\frac{y}{9}=1$, (iii) $x+4=0$, (iv) $y=6$

Ans. : (i) $m=\frac{1}{2}, c=\frac{-3}{10}$, (ii) $m=\frac{-3}{2}, c=9$, (iii) m is not defined and the line has no y-intercept, (iv) $m=0, c=6$

191. Express the following statement in linear equations in two variables.

(i) An obtuse angle of a parallelogram is twice its acute angle.

(ii) I am three times as old as my son.

(iii) 7 audio cassettes and 3 video cassettes cost ₹1110.

(iv) In a cyclic quadrilateral ABCD, $\angle A=(2x+4)^\circ$ and $\angle C=(2y+10)^\circ$.

(v) When both the numerator and denominator decrease by 6, then the denominator becomes 12 times the numerator.

Ans. : (i) $x-2y=0$

(ii) $x-3y=0$

(iii) $7x+3y-1110=0$

(iv) $x+y-83=0$

(v) $12x-y-66=0$

192. Express the following statements in linear equations in two variables.

(i) The larger of two supplementary angles exceeds the smaller by 18 degrees.

(ii) The coach of a cricket team buys 7 bats and 6 balls for ₹3800.
(iii) A lady has only 25 paise and 50 paise coins in her purse, totalling ₹12.50.
(iv) A and B are friends and their ages differ by 2 years.
(v) The denominator of a fraction is 4 more than twice the numerator.

Ans. : (i) $x - y - 18 = 0[x > y]$
(ii) $7x + 6y - 3800 = 0$
(iii) $0.25x + 0.50y - 12.50 = 0$
(iv) $x - y - 2 = 0$
(v) $y = 2x + 4 \Rightarrow 2x - y + 4 = 0$.

193. Classify the following as linear, quadratic, cubic, constant and bi-quadratic polynomials:
(i) $5z^3$, (ii) $-7x + \frac{9}{2}$, (iii) $\frac{7}{4}$, (iv) $x^2 - \frac{\pi}{2}x$, (v) $7x^4 + 4x^3 + 3x - 2$, (vi) $x^3 - 3x^2 + 4x - 5$

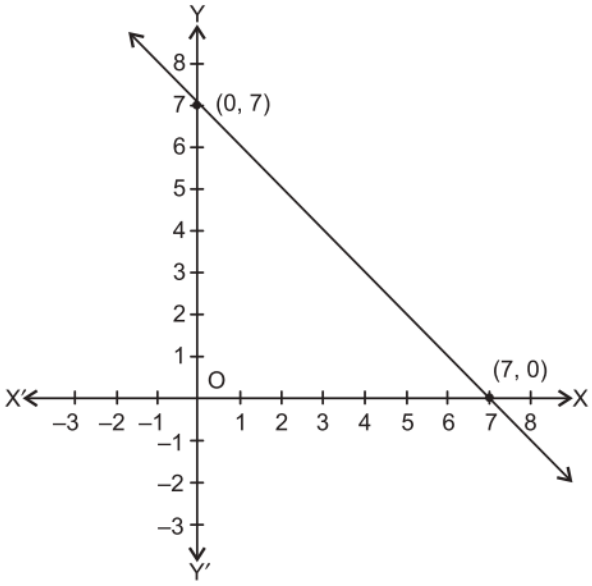
Ans. : (i) cubic, (ii) linear, (iii) constant, (iv) quadratic, (v) bi-quadratic, (vi) cubic

194. Which of the following expressions are polynomials and which are not?
(i) $y^2 + \sqrt{2}$, (ii) $x^{20} + y^3 + t^{31}$, (iii) $7\sqrt{z} + \sqrt{8}x$, (iv) $5x^2 - \frac{9}{x} + 2x + 6$, (v) $7x^5 - \sqrt{5}x^4 + 2x - 5$

Ans. : (i) Yes, (ii) Yes, (iii) No, (iv) No, (v) Yes

*** Case study based questions.** **[8]**

Aditya purchased two types of chocolates A and B at the rate of x and y respectively. The total amount spent is 7. After reaching home, he forms a linear equation in two variables for two types of chocolates. He prepares a table and a graph of the linear equation as shown in adjoining graph:



Based on the above information, answer the following questions :
195. How to represent the above situation in linear equations in two variables?
196. If the cost of chocolate A is ₹5, then find the cost of chocolate B?

197. Does the point (3, 4) lie on the line x + y = 7?

198. Where does the line x + y = 7 intersect y-axis?

Ans. : 1. Let x be the cost of chocolate A and y be the cost of chocolate B. Since the total amount spent is 7, the linear equation is :

x + y + 7

2. Substitute x = 5 into the equation :

5 + y + 7

y = 7 - 5

y = 2

So, the cost of chocolate B is ₹2

3. Substitute x = 3 and y = 4 into the equation :

3 + 4 = 7

7 = 7

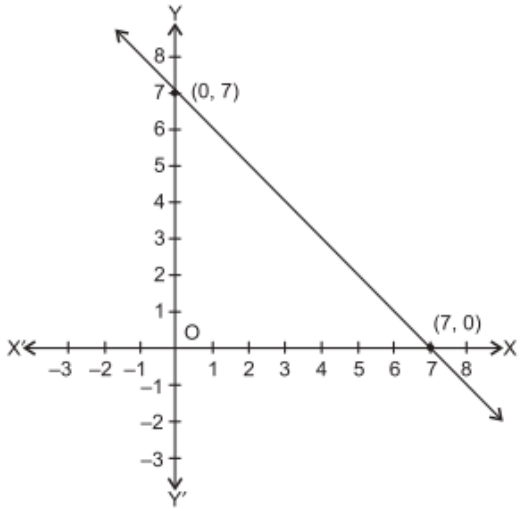
Since the equation holds true, yes, the point (3, 4) lies on the line.

4. A line intersects the y-axis where x = 0. Looking at the graph and the equation :

$0 + y = 7 \Rightarrow y = 7$

The line intersects the y-axis at the point $(0,7)$.

199. Aditya purchased two types of chocolates A and B at the rate of ₹x and ₹y respectively. The total amount spent is ₹ 7. After reaching home, he forms a linear equation in two variables for two types of chocolates. He prepares a table and a graph of the linear equation as shown in adjoining graph:



Based on the above information, answer the following questions :

(i) How to represent the above situation in linear equations in two variables?

(ii) If the cost of chocolate A is $\u20b95$, then find the cost of chocolate B?

(iii) Does the point (3, 4) lie on the line $x + y = 7$?

(iv) Where does the line $x + y = 7$ intersect y-axis?

Ans. : (i) $x + y = 7$

(ii) ₹2

(iii) Yes
(iv) (7, 0)