

Telangana Board SSC Class 10 Maths 2019 Question Paper 1 with Solutions

PART A SECTION - I

1. If $A = \{x: x \text{ is a factor of } 24\}$, then find $n(A)$.

Solution:

$$A = \{1, 2, 3, 4, 6, 8, 12, 24\}$$

$$n(A) = 8$$

2. Find the HCF of 24 and 33 by using a division algorithm.

Solution:

$$24 < 33$$

$$\begin{array}{r} 24 \overline{) 33} \quad (1 \\ \underline{24} \\ 9 \\ 9 \overline{) 24} \quad (2 \\ \underline{18} \\ 6 \\ 6 \overline{) 9} \quad (1 \\ \underline{6} \\ 3 \\ 3 \overline{) 6} \quad (2 \\ \underline{6} \\ 0 \end{array}$$

3. Radha says "1, 1, 1,.... are in AP and also in GP". Do you agree with Radha? Give reason.

Solution:

Given,

$$1, 1, 1, \dots$$

If a, b, c are in AP, then $a + c = 2b$

$$\text{Thus, } 1 + 1 = 2(1)$$

$$2 = 2$$

Therefore, 1, 1, 1 are in AP.

If a, b, a are in GP, then, $ac = b^2$

$$(1)(1) = (1)^2$$

$$1 = 1$$

Therefore, 1, 1, 1 are in GP.

Hence, we can say that 1,1,1 are in AP and also in GP.

4. If $P(x) = x^4 + 1$, then find $P(2) - P(-2)$.

Solution:

Given,

$$P(x) = x^4 + 1$$

$$P(2) = (2)^4 + 1 = 16 + 1 = 17$$

$$P(-2) = (-2)^4 + 1 = 16 + 1 = 17$$

$$P(2) - P(-2) = 17 - 17 = 0$$

5. Find the roots of the quadratic equation $x^2 + 2x - 3 = 0$.

Solution:

Given quadratic equation is: $x^2 + 2x - 3 = 0$

$$x^2 + 3x - x - 3 = 0$$

$$x(x + 3) - 1(x + 3) = 0$$

$$(x - 1)(x + 3) = 0$$

$$x - 1 = 0, x + 3 = 0$$

$$x = 1, x = -3$$

Hence, the roots of the given quadratic equation are 1 and -3.

6. Find the centroid of ΔPQR , whose vertices are $P(1, 1)$, $Q(2, 2)$, $R(-3, -3)$.

Solution:

Let the given vertices of a triangle PQR are:

$$(x_1, y_1) = (1, 1)$$

$$(x_2, y_2) = (2, 2)$$

$$(x_3, y_3) = (-3, -3)$$

$$\text{Centroid of a triangle} = [(x_1 + x_2 + x_3)/3, (y_1 + y_2 + y_3)/3]$$

$$= [(1 + 2 - 3)/3, (1 + 2 - 3)/3]$$

$$= (0/3, 0/3)$$

$$= (0, 0)$$

7. For what value of 't' the following pair of linear equations has a no solution?

$$2x - ty = 5 \text{ and } 3x + 2y = 11$$

Solution:

Given pair of linear equations are:

$$2x - ty = 5$$

$$3x + 2y = 11$$

Comparing with the standard form,

$$a_1 = 2, b_1 = -t, c_1 = -5$$

$$a_2 = 3, b_2 = 2, c_2 = -11$$

Condition for no solution of linear equations is

$$a_1/a_2 = b_1/b_2 \neq c_1/c_2$$

$$2/3 = -t/2$$

$$\Rightarrow t = -4/3$$

SECTION - II

8. If $\mu = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{2, 3, 5, 8\}$ and $B = \{0, 3, 5, 7, 10\}$. Then represent $A \cap B$ in the Venn diagram.

Solution:

Given,

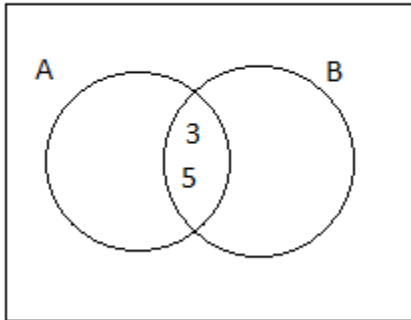
$$\mu = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

$$A = \{2, 3, 5, 8\}$$

$$B = \{0, 3, 5, 7, 10\}$$

$$A \cap B = \{2, 3, 5, 8\} \cap \{0, 3, 5, 7, 10\} = \{3, 5\}$$

$A \cap B$



9. Akhila says, "points A(1, 3), B(2, 2), C(5, 1) are collinear". Do you agree with Akhila? Why?

Solution:

Given points are A(1, 3), B(2, 2) and C(5, 1).

If (x_1, y_1) , (x_2, y_2) and (x_3, y_3) are collinear, then area of triangle = 0

i.e. $\frac{1}{2} [x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)] = 0$

$$= \frac{1}{2} [1(2 - 1) + 2(1 - 3) + 5(3 - 2)]$$

$$= 1 + 2(-2) + 5(1)$$

$$= 1 - 4 + 5$$

$$= 2 \neq 0$$

Thus, the given points are not collinear.

Hence, we do not agree with Akhila.

10. Write the quadratic equation, whose roots are $2 + \sqrt{3}$ and $2 - \sqrt{3}$.

Solution:

Let α and β be the roots of the quadratic equation.

Given,

$2 + \sqrt{3}$ and $2 - \sqrt{3}$ are the roots of the quadratic equation.

$$\text{Sum of the roots} = \alpha + \beta = 2 + \sqrt{3} + 2 - \sqrt{3} = 4$$

$$\text{Product of the roots} = \alpha\beta = (2 + \sqrt{3})(2 - \sqrt{3})$$

$$= (2)^2 - (\sqrt{3})^2$$

$$= 4 - 3$$

$$= 1$$

Hence, the quadratic equation is $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

$$x^2 - 4x + 1 = 0$$

11. Divide $x^3 - 4x^2 + 5x - 2$ by $x - 2$.

Solution:

$$\begin{array}{r}
 x^2 - 2x + 1 \\
 x - 2 \overline{) x^3 - 4x^2 + 5x - 2} \\
 \underline{x^3 - 2x^2} \\
 -2x^2 + 5x - 2 \\
 \underline{-2x^2 + 4x} \\
 x - 2 \\
 \underline{x - 2} \\
 0
 \end{array}$$

Quotient = $q(x) = x^2 - 2x + 1$

12. Write the formula of the nth term of GP and explain the terms in it.

Solution:

The formula for nth term of GP is

$$a_n = ar^{n-1}$$

Here,

a_n = nth term of the sequence

a = first term

r = common ratio

13. Solve the pair of linear equations $2x + 3y = 8$ and $x + 2y = 5$ by elimination method.

Solution:

Given,

$$2x + 3y = 8 \dots (i)$$

$$x + 2y = 5 \dots (ii)$$

$$(ii) \times 2 - (i),$$

$$2x + 4y - (2x + 3y) = 10 - 8$$

$$y = 2$$

Substituting $y = 2$ in (ii),

$$x + 2(2) = 5$$

$$x = 5 - 4$$

$$x = 1$$

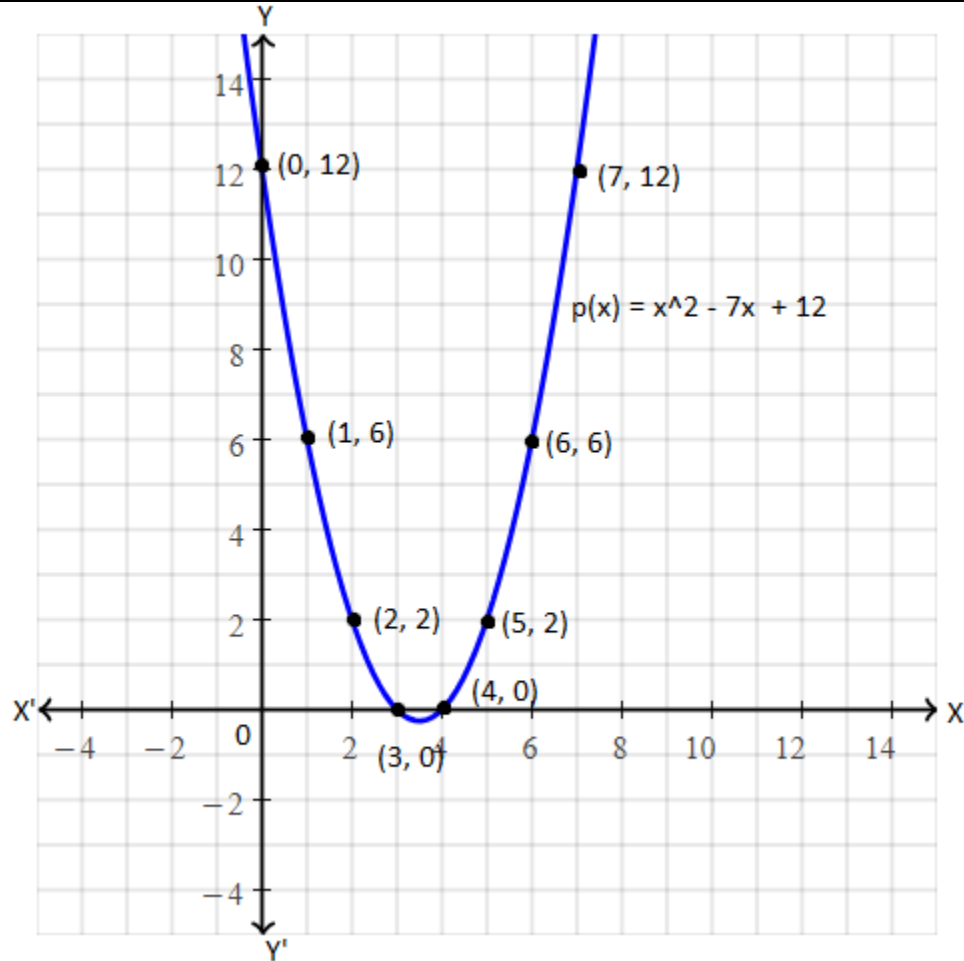
SECTION - III

14. (a) Draw the graph of the polynomial $p(x) = x^2 - 7x + 12$, then find its zeroes from the graph.

Solution:

Given polynomial is $p(x) = x^2 - 7x + 12$

x	0	1	2	3	4	5	6	7
y	12	6	2	0	0	2	6	12



The graph of the given polynomial cut the x-axis at (3, 0) and (4, 0)
Hence, $x = 3$ and $x = 4$ are the zeroes of the given polynomial.

OR

(b) Solve the equations graphically $3x + 4y = 10$ and $4x - 3y = 5$.

Solution:

Given,

$$3x + 4y = 10$$

$$4x - 3y = 5$$

Consider the first equation:

$$3x + 4y = 10$$

$$4y = -3x + 10$$

$$y = \left(-\frac{3}{4}\right)x + \left(\frac{10}{4}\right)$$

$$y = \left(-\frac{3}{4}\right)x + \left(\frac{5}{2}\right)$$

x	-2	0	2	6
y	4	5/2	1	-2

Now, consider the another equation,

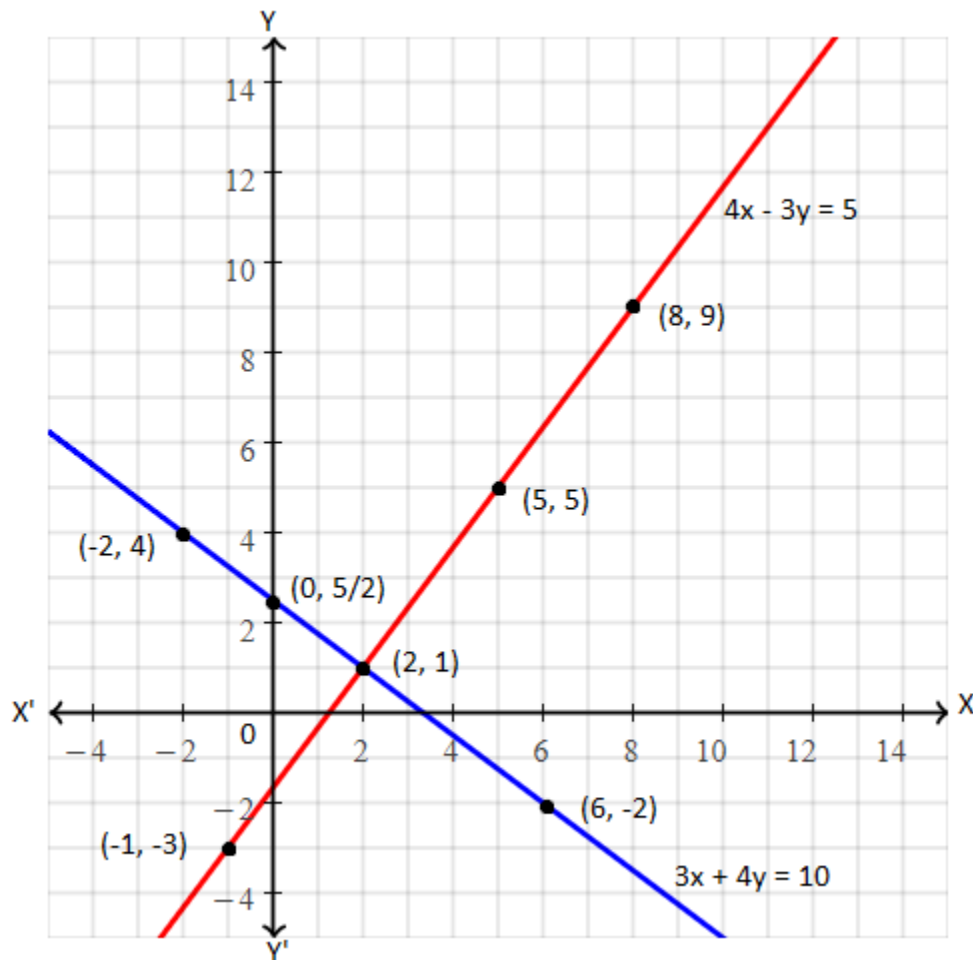
$$4x - 3y = 5$$

$$3y = 4x - 5$$

$$y = (4/3)x - (5/3)$$

x	-1	2	5	8
y	-3	1	5	9

Graph:



The lines representing the given pair of equations intersect each other at $(2, 1)$.

Hence, the solution of a given pair of linear equations is $x = 2$ and $y = 1$.

15. (a) Find the ratio in which X-axis divides the line segment joining the points $(2, -3)$ and $(5, 6)$. Then find the intersection point on X-axis.

Solution:

Let $P(x, 0)$ divide the line segment joining the points $A(2, -3)$ and $B(5, 6)$ in the ratio $m : n$.

Here,

$$(x_1, y_1) = (2, -3)$$

$$(x_2, y_2) = (5, 6)$$

Using the section formula,

$$P(x, 0) = [(mx_2 + nx_1)/(m + n), (my_2 + ny_1)/(m + n)]$$

$$(x, 0) = [(5m + 2n)/(m + n), (6m - 3n)/(m + n)]$$

$$\Rightarrow (6m - 3n)/(m + n) = 0$$

$$\Rightarrow 6m = 3n$$

$$\Rightarrow m/n = 3/6$$

$$\Rightarrow m/n = 1/2$$

Therefore, the required ratio is $1 : 2$.

Now,

$$x = (5m + 2n)/(m + n)$$

$$x = [5 + 2(2)]/(1 + 2)$$

$$x = 9/3$$

$$x = 3$$

Hence, the required point on the x-axis is $(3, 0)$.

OR

(b) Find the sum of all two digit odd multiples of 3.

Solution:

Two digit odd multiples of 3 are 15, 21, 27, 33, 39, 45, 51, 57, 63, 69, 75, 81, 87, 93, 99.

This is an AP with $a = 15$

Common difference = $d = 6$

$$n = 15$$

Sum of first n terms

$$S_n = n/2[2a + (n - 1)d]$$

$$S_{15} = (15/2)[2(15) + (15 - 1)6]$$

$$= (15/2)[30 + 14(6)]$$

$$= (15/2)[30 + 84]$$

$$= (15/2) \times 114$$

$$= 855$$

Hence, the required sum is 855.

16. (a) If $A = \{x : 2x + 1, x \in \mathbb{N}, x \leq 5\}$, $B = \{x : x \text{ is a composite number}, x \leq 12\}$, then show that $(A \cup B) - (A \cap B) = (A - B) \cup (B - A)$.

Solution:

$$A = \{x : 2x + 1, x \in \mathbb{N}, x \leq 5\}$$

$$= \{3, 5, 7, 9, 11\}$$

$$B = \{x : x \text{ is a composite number}, x \leq 12\}$$

$$= \{4, 6, 8, 9, 10, 12\}$$

$$A \cup B = \{3, 5, 7, 9, 11\} \cup \{4, 6, 8, 9, 10, 12\}$$

$$= \{3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$

$$A \cap B = \{3, 5, 7, 9, 11\} \cap \{4, 6, 8, 9, 10, 12\}$$

$$= \{9\}$$

$$\begin{aligned}(A \cup B) - (A \cap B) &= \{3, 4, 5, 6, 7, 8, 9, 10, 11, 12\} - \{9\} \\ &= \{3, 4, 5, 6, 7, 8, 10, 11, 12\} \\ A - B &= \{3, 5, 7, 9, 11\} - \{4, 6, 8, 9, 10, 12\} = \{3, 5, 7, 11\} \\ B - A &= \{4, 6, 8, 9, 10, 12\} - \{3, 5, 7, 9, 11\} = \{4, 6, 8, 10, 12\} \\ (A - B) \cup (B - A) &= \{3, 5, 7, 11\} \cup \{4, 6, 8, 10, 12\} = \{3, 4, 5, 6, 7, 8, 10, 11, 12\} \\ \text{Therefore, } (A \cup B) - (A \cap B) &= (A - B) \cup (B - A)\end{aligned}$$

OR

(b) Prove that $\sqrt{2} + \sqrt{7}$ is an irrational number.

Solution:

Let $\sqrt{2} + \sqrt{7}$ be a rational number.

$\sqrt{2} + \sqrt{7} = a$, where a is an integer.

Squaring on both sides,

$$(\sqrt{2} + \sqrt{7})^2 = a^2$$

$$(\sqrt{2})^2 + (\sqrt{7})^2 + 2(\sqrt{2})(\sqrt{7}) = a^2$$

$$2 + 7 + 2\sqrt{14} = a^2$$

$$9 + 2\sqrt{14} = a^2$$

$$2\sqrt{14} = a^2 - 9$$

$$\sqrt{14} = (a^2 - 9)/2$$

$(a^2 - 9)/2$ is a rational number since a is an integer.

Therefore, $\sqrt{14}$ is also an integer.

We know that integers are not rational numbers.

Thus, our assumption that $\sqrt{2} + \sqrt{7}$ is a rational number is wrong.

Hence, $\sqrt{2} + \sqrt{7}$ is an irrational number.

17. (a) Sum of the areas of two squares is 850 m^2 . If the difference of their perimeters is 40 m. Find the sides of the two squares.

Solution:

Let x and y be the sides of two squares.

According to the given,

Sum of the areas of two squares = 850 m^2

$$x^2 + y^2 = 850 \dots (i)$$

Difference of their perimeters = 40 m

$$4x - 4y = 40$$

$$4(x - y) = 40$$

$$x - y = 10$$

$$x = y + 10 \dots (ii)$$

Substituting (ii) in (i),

$$(y + 10)^2 + y^2 = 850$$

$$y^2 + 100 + 20y + y^2 - 850 = 0$$

$$2y^2 + 20y - 750 = 0$$

$$2(y^2 + 10y - 375) = 0$$

$$y^2 + 10y - 375 = 0$$

$$y^2 + 25y - 15y - 375 = 0$$

$$y(y + 25) - 15(y + 25) = 0$$

$$(y - 15)(y + 25) = 0$$

$$y - 15 = 0, y + 25 = 0$$

$$y = 15, y = -25$$

Measure cannot be negative.

Therefore, $y = 15$

Substitute $y = 15$ in (ii),

$$x = 15 + 10 = 25$$

Hence, the sides of two squares are 25 cm and 15 cm.

OR

(b) Sum of the present ages of two friends are 23 years, five years ago the product of their ages was 42. Find their ages 5 years hence.

Solution:

Let x and $(23 - x)$ be the present ages (in years) of two friends.

According to the given

$$(x - 5)(23 - 5 - x) = 42$$

$$(x - 5)(18 - x) = 42$$

$$18x - x^2 - 90 + 5x = 42$$

$$\Rightarrow x^2 - 5x - 18x + 90 + 42 = 0$$

$$\Rightarrow x^2 - 23x + 132 = 0$$

$$\Rightarrow x^2 - 11x - 12x + 132 = 0$$

$$\Rightarrow x(x - 11) - 12(x - 11) = 0$$

$$\Rightarrow (x - 11)(x - 12) = 0$$

$$\Rightarrow x = 12, x = 11$$

If $x = 12$, then $23 - x = 23 - 12 = 11$

If $x = 11$, then $23 - x = 23 - 11 = 12$

Therefore, the present ages of two friends is 11 and 12 years.

Hence, their ages after 5 years will be 16 and 17 years.