

SAM - 28

Self Assessment Model Paper-1(2024-25)

MATHEMATICS

20

Class : X]

(Max. Marks : 20)

[Time : 45 Min.

Name of the Student : Roll No. :

I. Solve the following problems.

క్రింది సమస్యలను సాధించండి.

4 x 1 = 4

1. State Fundamental Theorem of Arithmetic.

అంకగణిత ప్రాథమిక సిద్ధాంతంను ప్రవచించండి.

2. The unit digit in $6^{2024} + 5^{2024}$ is

$6^{2024} + 5^{2024}$ లో ఒకట్ల స్థానంలోని సంఖ్య

[.]

A) 0

B) 1

C) 5

D) 6

3. Statement A : $x + y = 5$, $2x - 2y = 3$ have no solutions.

ప్రవచనం A : $x + y = 5$ మరియు $2x - 2y = 3$ లకు సాధన లేదు

Statement B : $x - 2y - 3 = 0$ and $3x + 4y - 20 = 0$ have exactly one solution.

ప్రవచనం B : $x - 2y - 3 = 0$ మరియు $3x + 4y - 20 = 0$ లకు

ఏకైక సాధన కలదు.

[.]

A) Both A & B are true

B) A is true & B is false

A మరియు B రెండూ సత్యం

A సత్యం మరియు B అసత్యం

C) A is false & B is true

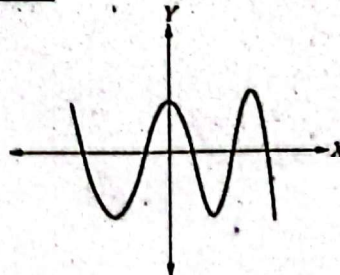
D) Both A & B are false

A అసత్యం మరియు B సత్యం

A మరియు B రెండూ అసత్యం

4. The graph of a polynomial is shown in Figure, the number of its zeroes is _____

క్రింది పటములో ఒక బహుపది గ్రాఫు చూపడమైనది దాని యొక్క శూన్యాల సంఖ్య _____



[Turn Over

II. Solve the following problems.

క్రింది సమస్యలను సాధించుము.

2 x 2 = 4

5. Explain why $7 \times 11 \times 13 + 13$ and $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$ are composite Numbers.

$7 \times 11 \times 13 + 13$ మరియు $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$ లు ఏ విధంగా సంయుక్త సంఖ్యలు అగునో వివరించండి.

6. In a shop the cost of 2 pencils and 3 erasers is ₹ 9 and the cost of 4 pencils and 6 erasers is ₹ 18. Express the situation in the form of pair of linear equations.

ఒక దుకాణంలో 2 పెన్సిళ్ళు మరియు 3 రబ్బర్ల విలువ 9 రూపాయలు, 4 పెన్సిళ్ళు మరియు 6 రబ్బర్ల విలువ 18 రూపాయలు, అయిన ఈ విషయాన్ని రేఖీయ సమీకరణాల జతరూపంలో వ్యక్తపరచండి?

III. Solve the following problem.

క్రింది సమస్యను సాధించుము.

1 x 4 = 4

7. Find the zeroes of quadratic polynomial $x^2 - 2x - 8$ and verify the relationship between the zeroes and the coefficients.

వర్గ బహుపది $x^2 - 2x - 8$ యొక్క శూన్యాలను కనుగొని, శూన్యాలకు మరియు గుణకాలకు మధ్య గల సంబంధాన్ని సరిచూడండి.

IV. Solve the following problem.

క్రింది సమస్యను సాధించుము.

1 x 8 = 8

8. a) Prove that $\sqrt{5}$ is an irrational number.

$\sqrt{5}$ కరణీయ సంఖ్య అని నిరూపించండి.

(Or) (లేదా)

b) Solve : $2x + y - 6 = 0$ and $4x - 2y - 4 = 0$

క్రింది వాటిని సాధించుము : $2x + y - 6 = 0$ మరియు $4x - 2y - 4 = 0$

1. State Fundamental Theorem of Arithmetic.

Sol: Every composite number can be expressed (factorised) as a product of primes, and this factorisation is unique, apart from the order in which the prime factors occur.

2. The unit digit in $6^{2024} + 5^{2024}$ is **[B]**
 A) 0 B) 1 C) 5 D) 6

Sol: The unit digit in $6^{2024} = 6$ and the unit digit in $5^{2024} = 5$

Total = $6 + 5 = 11$

The unit digit in $6^{2024} + 5^{2024}$ is 1

Option **(B)** is correct

3. Statement A: $x + y = 5, 2x - 2y = 3$ have no solutions. **[C]**

Statement B: $x - 2y - 3 = 0$ and $3x + 4y - 200$ have exactly one solution.

A) Both A & B are true B) A is true & B is false C) A is false & B is true D) Both A & B are false

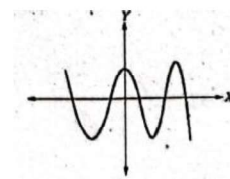
Sol: For statement A: $\frac{a_1}{a_2} = \frac{1}{2}; \frac{b_1}{b_2} = \frac{1}{-2} \Rightarrow \frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow$ Exactly one solution

For statement B: $\frac{a_1}{a_2} = \frac{1}{3}; \frac{b_1}{b_2} = \frac{-2}{4} = \frac{-1}{2} \Rightarrow \frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow$ Exactly one solution

Option **C) A is false & B is true** is correct

4. The graph of a polynomial is shown in Figure, the number of its zeroes is 5

5. Explain why $7 \times 11 \times 13 + 13$ and $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$ are composite numbers.



Sol: $7 \times 11 \times 13 + 13$
 $= 13 \times (7 \times 11 + 1)$
 $= 13 \times (77 + 1)$
 $= 13 \times 78 = 2 \times 3 \times 13^2 .$

2, 3 and 13 are the factors of $7 \times 11 \times 13 + 13$.

So, $7 \times 11 \times 13 + 13$ is a composite number.

$7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$
 $= 5 \times (7 \times 6 \times 4 \times 3 \times 2 \times 1 + 1)$
 $= 5 \times (1008 + 1)$

$$= 5 \times 1009$$

5,1009 are factors of $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$.

So, $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$ is a composite number.

6. In a shop the cost of 2 pencils and 3 erasers is ₹9 and the cost of 4 pencils and 6 erasers is ₹18. Find the cost of each pencil and each eraser.

Sol: Let cost of 1 pencil = x and cost of 1 eraser = y

$$2 \text{ pencils} + 3 \text{ erasers} = ₹9 \Rightarrow 2x + 3y = 9 \rightarrow (1)$$

$$4 \text{ pencils} + 6 \text{ erasers} = ₹18 \Rightarrow 4x + 6y = 18 \rightarrow (2)$$

7. Find the zeroes of the quadratic polynomial $x^2 - 2x - 8$, and verify the relationship between the zeroes and the coefficients.

Sol: $p(x) = x^2 - 2x - 8$; $a = 1, b = -2, c = -8$

$$= x^2 - 4x + 2x - 8$$

$$= x(x - 4) + 2(x - 4)$$

$$= (x - 4)(x + 2)$$

To find zeroes let $p(x) = 0$

$$(x - 4)(x + 2) = 0$$

$$x - 4 = 0 \quad \text{or} \quad x + 2 = 0$$

$$x = 4 \quad \text{or} \quad x = -2$$

The zeroes of the polynomial $p(x) = x^2 - 2x - 8$ are 4 and -2

$$\text{Sum of the zeroes} = (4) + (-2) = 2 = \frac{-(-2)}{1} = \frac{-(\text{coefficient of } x)}{\text{coefficient of } x^2} = \frac{-b}{a}$$

$$\text{Product of the zeroes} = (4) \times (-2) = -8 = \frac{-8}{1} = \frac{\text{constant term}}{\text{coefficient of } x^2} = \frac{c}{a}$$

$$\text{Coefficient of } x^2 = a = 1$$

$$\text{Coefficient of } x = b = -2$$

$$\text{Constant term} = c = -8$$

8. a) Prove that $\sqrt{5}$ is irrational.

Proof: Let us assume $\sqrt{5}$ is rational.

$$\text{Then } \sqrt{5} = \frac{a}{b} \quad (a, b \text{ are coprimes})$$

Squaring on both sides we get

$$5 = \frac{a^2}{b^2} \Rightarrow 5b^2 = a^2 \rightarrow (1)$$

$$\Rightarrow b^2 = \frac{a^2}{5}$$

$$\Rightarrow 5 \text{ divides } a^2$$

$$\Rightarrow 5 \text{ divides } a$$

p be a prime number .

If p divides a^2 then p divides a

We can write $a = 5c$ for some integer c

$$\Rightarrow a^2 = 25c^2$$

$$\Rightarrow 5b^2 = 25c^2 \quad (\text{from (1)})$$

$$\Rightarrow b^2 = 5c^2$$

$$\Rightarrow c^2 = \frac{b^2}{5}$$

$$\Rightarrow 5 \text{ divides } b^2$$

$$\Rightarrow 5 \text{ divides } b$$

Therefore, both a and b have 5 as a common factor.

But this contradicts the fact that a and b are co-prime.

Thus our assumption is false.

So, we conclude that $\sqrt{5}$ is irrational.

b) **Solve: $2x + y - 6 = 0, 4x - 2y - 4 = 0$**

Sol: **Substitution method:**

$$2x + y - 6 = 0 \rightarrow (1)$$

$$4x - 2y - 4 = 0 \rightarrow (2)$$

$$\text{From (1): } y = 6 - 2x \rightarrow (3)$$

Substituting the value of y in (2)

$$4x - 2(6 - 2x) - 4 = 0$$

$$4x - 12 + 4x - 4 = 0$$

$$8x - 16 = 0$$

$$8x = 16$$

$$x = \frac{16}{8} = 2$$

Substitute $x = 2$ in (3)

$$y = 6 - 2 \times 2$$

$$y = 6 - 4$$

$$y = 2$$

$$\text{Solution: } x=2, y=2$$

Elimination method:

$$2x + y = 6 \rightarrow (1)$$

$$4x - 2y = 4 \rightarrow (2)$$

$$2 \times (1) \Rightarrow 4x + 2y = 12$$

$$1 \times (2) \Rightarrow 4x - 2y = 4$$

$$\text{Adding } \underline{8x} \quad = 16$$

$$x = \frac{16}{8} = 2$$

Substitute $x = 2$ in (1)

$$2 \times 2 + y = 6$$

$$4 + y = 6$$

$$y = 6 - 4$$

$$y = 2$$

$$\text{Solution: } x=2, y=2$$