Pre-Mid Term

SOLUTIONS

- **1.** (c): $95 = 5 \times 19$ and $152 = 2 \times 2 \times 2 \times 19$
- :. HCF (95, 152) = 19
- **2.** (b) : Since, α and β are the zeroes of $f(x) = x^2 + x + 1$
- $\therefore \alpha + \beta = -1 \text{ and } \alpha\beta = 1$

Now, $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha + \beta}{\alpha\beta} = \frac{-1}{1} = -1$

- 3. (d) : Since, 1 is a root of the equation $ay^2 + ay + 3 = 0$
- $\therefore a(1)^2 + a(1) + 3 = 0$
- $\Rightarrow 2a = -3 \Rightarrow a = \frac{-3}{2}$
- 4. Common difference, $d = a_2 a_1 = \frac{1 6b}{2b} \frac{1}{2b}$ = $\frac{1 - 6b - 1}{2b} = \frac{-6b}{2b} = -3$
- 5. $144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 = 2^4 \times 3^2$
- \therefore Exponent of 2 in the prime factorisation of 144 = 4

6. Let two consecutive positive integers be x and x + 1. It is given that the product of two consecutive positive integers is 240.

 \therefore $x(x+1) = 240 \Rightarrow x^2 + x - 240 = 0$, which is the required quadratic equation.

7. y = 0 and y = -5 are parallel lines, hence they have no common solution.

Let first term = a and common difference = d. 8. According to the question, $5 \times a_5 = 10 \times a_{10}$ 5(a + 4d) = 10(a + 9d) \Rightarrow $5a + 20d = 10a + 90d \implies a = -14d$ \Rightarrow Now, $a_{15} = a + 14d \Rightarrow a_{15} = -14d + 14d = 0$ $576 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$ 9. $448 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 7$ HCF of 576 and 448 = 64 *.*.. Number of sections = $\frac{576}{64} + \frac{448}{64} = 9 + 7 = 16$... **10.** We have, $2qx^2 - (2q - p^2)x - p^2 = 0$ $\Rightarrow 2qx^2 - 2qx + p^2x - p^2 = 0$ $\Rightarrow 2qx (x-1) + p^2(x-1) = 0$ \Rightarrow $(2qx + p^2)(x - 1) = 0$ \Rightarrow $(2qx + p^2) = 0$ or (x - 1) = 0 $\Rightarrow x = -\frac{p^2}{2a} \text{ or } x = 1$

11. We have,
$$x + \frac{6}{y} = 6$$
 ...(i)

$$3x - \frac{8}{y} = 5 \qquad \dots (ii)$$

Multiplying (i) by 3, we get

$$3x + \frac{18}{y} = 18$$
 ...(iii)

Subtracting (ii) from (iii), we get

$$\frac{1}{y}(18+8) = 13 \quad \Rightarrow \quad \frac{26}{y} = 13 \Rightarrow \quad y = \frac{26}{13} = 2$$

Putting
$$y = 2$$
 in (i), we get
 $x + \frac{6}{2} = 6 \implies x + 3 = 6 \implies x = 6 - 3 = 3$

Hence,
$$x = 3$$
 and $y = 2$.

12. Let a =first term and d =common difference

Now,
$$a_{12} = a + (12 - 1)d$$
 [: $a_n = a + (n - 1)d$]
 $\Rightarrow -13 = a + 11d$ [Given, $a_{12} = -13$] ...(i)
Also, $S_4 = \frac{4}{2}[2a + (4 - 1)d]$
 $\Rightarrow 24 = 2(2a + 3d)$ [Given, $S_4 = 24$]
 $\Rightarrow 2a + 3d = 12$...(ii)
Multiplying (i) by 2 and subtracting from (ii), we get
 $3d - 22d = 12 - (-26) \Rightarrow -19d = 38 \Rightarrow d = -2$
Putting the value of d in (i), we get
 $a = -13 - 11d = -13 - 11 \times (-2) = -13 + 22 = 9$
 $\therefore S_{10} = \frac{10}{2} [2a + (10 - 1)d]$
 $= 5 [2 \times 9 + 9 \times (-2)] = 5 (18 - 18) = 0$

- **13.** Let $\sqrt{3}$ be a rational number.
- $\therefore \quad \sqrt{3} = \frac{a}{b}, \text{ where } a \text{ and } b \text{ are co-prime integers, } b \neq 0.$ Squaring both sides, we get $3 = \frac{a^2}{b^2}$.

Multiplying with *b* on both sides, we get $3b = \frac{a^2}{b}$ Now, LHS = 3 × *b* = Integer

and RHS = $\frac{a^2}{b} = \frac{\text{Integer}}{\text{Integer}} = \text{Rational number}$

Since, LHS \neq RHS

- \therefore Our supposition is wrong.
- $\Rightarrow \sqrt{3}$ is an irrational number.

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Let $15+17\sqrt{3}$ be a rational number

$$\therefore \quad 15 + 17\sqrt{3} = \frac{a}{b}$$

 $\Rightarrow 17\sqrt{3} = \frac{a}{b} - 15$

 $\Rightarrow \quad \sqrt{3} = \frac{a - 15b}{17b}$, which is a contradiction because $\sqrt{3}$ is an irrational number and $\frac{a - 15b}{17b}$ is a rational number.

 \therefore Our supposition is wrong and hence $15 + 17\sqrt{3}$ is irrational.

14. Let denominator of a fraction = x

 \Rightarrow Numerator = x - 2

$$\therefore \quad \text{Original fraction} = \frac{x-2}{x} \qquad \dots (i)$$

On adding 1 to numerator as well as denominator, the fraction becomes $\frac{x-2+1}{x+1}$ *i.e.*, $\frac{x-1}{x+1}$(ii)

According to question, x + 1

$$\frac{x-2}{x} + \frac{x-1}{x+1} = \frac{19}{15} \implies \frac{(x-2)(x+1) + x(x-1)}{x(x+1)} = \frac{19}{15}$$
$$\implies \frac{x^2 - 2x + x - 2 + x^2 - x}{x^2 + x} = \frac{19}{15}$$

$$\Rightarrow \quad \frac{2x^2 - 2x - 2}{x^2 + x} = \frac{19}{15}$$

$$\Rightarrow 30x^2 - 30x - 30 = 19x^2 + 19x$$

$$\Rightarrow 11x^2 - 49x - 30 = 0 \Rightarrow 11x^2 - 55x + 6x - 30 = 0$$

$$\Rightarrow \quad 11x(x-5) + 6(x-5) = 0 \Rightarrow (x-5)(11x+6) = 0$$

$$\Rightarrow x = 5, -\frac{6}{11}$$

 \therefore *x* = 5 (Rejecting fractional value)

Thus, original fraction = $\frac{5-2}{5} = \frac{3}{5}$.

15. By division algorithm, we have

$$f(x) = g(x) \times q(x) + r(x)$$

⇒ $f(x) - r(x) = g(x) \times q(x)$ ⇒ $f(x) + [-r(x)] = g(x) \times q(x)$ Clearly, RHS is divisible by g(x). ∴ LHS is also divisible by g(x). Thus, if we add -r(x) to f(x), then the resulting polynomial is divisible by g(x). On dividing $4x^4 + 2x^3 - 2x^2 + x - 1$, by $x^2 + 2x - 3$, we get

$$x^{2} + 2x - 3) 4x^{4} + 2x^{3} - 2x^{2} + x - 1 (4x^{2} - 6x + 22)$$

$$4x^{4} + 8x^{3} - 12x^{2}$$

$$(-) (-) (+)$$

$$- 6x^{3} + 10x^{2} + x - 1$$

$$- 6x^{3} - 12x^{2} + 18x$$

$$(+) (+) (-)$$

$$22x^{2} - 17x - 1$$

$$22x^{2} + 44x - 66$$

$$(-) (-) (+)$$

$$- 61x + 65$$

$\therefore \quad r(x) = -61x + 65$

Hence, we should add -r(x) = 61x - 65 to f(x) so that the resulting polynomial is divisible by g(x).

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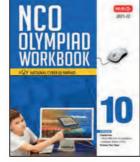


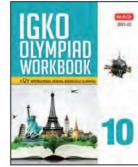
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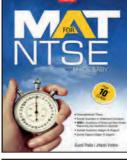


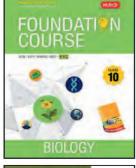
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