MIND CURVE · INFINITY THINK BEYOND

Quadratic Equations

Chapter 4 · Previous Year Questions with Answers · Class X Mathematics Standard (041)

01 TOPIC 1 Solving Quadratic Equations & Roots

QUICK RECAP

- Standard form $ax^2 + bx + c = 0,\ a \neq 0$. Solve by factorisation (split the middle term) or by the quadratic formula $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.
- If k is a root, then $ak^2 + bk + c = 0$ (substitute to find an unknown coefficient).
- Sum of roots $= -\dfrac{b}{a}$, product of roots $= \dfrac{c}{a}$.

Q1 MCQ · 1 mark — **2023** – 30/C/B

If one root of the equation $2x^2 - 5x + (\lambda - 4) = 0$ be the reciprocal of the other, then the value of λ is :

(A) 5 (B) 4
(C) 6 (D) 8

ANSWER **(c) 6**

Q2 MCQ · 1 mark — **2023** – 30/2/1, 30/2/3

Which of the following quadratic equations has sum of its roots as 4 ?

(A) $2x^2 - 4x + 8 = 0$ (B) $-x^2 + 4x + 4 = 0$
(C) $\sqrt{2}x^2 - \dfrac{4}{\sqrt{2}}x + 1 = 0$ (D) $4x^2 - 4x + 4 = 0$

ANSWER *

Sum of roots $= -\dfrac{b}{a}$: (a) 2, (b) $\dfrac{-4}{-1} = 4$, (c) 2, (d) 1

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

Q3 MCQ · 1 mark — **2023** – 30/2/2

If $x = 0.3$ is a root of the equation $x^2 - 0.9k = 0$, then k is equal to :

(A) 1 (B) 10
(C) 0.1 (D) 100

ANSWER *

$0.09 - 0.9k = 0 \Rightarrow k = 0.1$

(c) 0.1

Q4 MCQ · 1 mark — **2023** – 30/4/1, 30/4/2, 30/4/3

The roots of the equation $x^2 + 3x - 10 = 0$ are :

(A) 2, −5
(B) −2, 5
(C) 2, 5
(D) −2, −5

ANSWER *

$(x+5)(x-2)=0$

(a) 2, −5

Q5 MCQ · 1 mark **2023** – 30/5/1, 30/5/2

A quadratic equation whose roots are $(2+\sqrt{3})$ and $(2-\sqrt{3})$ is :

(A) $x^2-4x+1=0$
(B) $x^2+4x+1=0$
(C) $4x^2-3=0$
(D) $x^2-1=0$

ANSWER *

Sum $=4$, product $=4-3=1$; $x^2-4x+1=0$

(a) $x^2-4x+1=0$

Q6 MCQ · 1 mark **2023** – 30/5/3

A quadratic equation whose roots are $(3-\sqrt{2})$ and $(3+\sqrt{2})$ is :

(A) $x^2-6x+7=0$
(B) $x^2+6x+7=0$
(C) $9x^2-2=0$
(D) $x^2-7=0$

ANSWER *

Sum $=6$, product $=9-2=7$

(a) $x^2-6x+7=0$

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

Q7 MCQ · 1 mark **2023** – 30/6/3

If 'p' is a root of the quadratic equation $x^2-(p+q)x+k=0$, then the value of 'k' is

(A) p
(B) q
(C) p + q
(D) pq

ANSWER *

$p^2-(p+q)p+k=0 \Rightarrow k=pq$

(D) pq

Q8 MCQ · 1 mark **2024** – 30/S/1, 30/S/2, 30/S/3

If $x=5$ is a solution of the quadratic equation $2x^2+(k-1)x+10=0$, then the value of k is :

(A) 11
(B) −11
(C) 13
(D) −13

ANSWER **(B) −11**

Q9 MCQ · 1 mark — **2024** – 30(B)/S

If the sum and the product of the roots of the quadratic equation $ax^2 + 6x + 4a = 0$ are equal, then 'a' is equal to :

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

ANSWER **(B) $-\frac{3}{2}$**

Q10 MCQ · 1 mark — **2024** – 30(B)

The roots of the quadratic equation $x^2 + x - p(p+1) = 0$ are :

(A) $p,\ p+1$
(B) $-p,\ p+1$
(C) $-p,\ -(p+1)$
(D) $p,\ -(p+1)$

ANSWER *
$x^2 + x - p(p+1) = (x-p)(x+p+1)$
(D) $p,\ -(p+1)$

Q11 MCQ · 1 mark — **2024** – 30/2/2

Value of k for which $x = 2$ is a solution of the equation $5x^2 - 4x + (2+k) = 0$, is

(A) 10
(B) −10
(C) 14
(D) −14

ANSWER *
$20 - 8 + 2 + k = 0 \Rightarrow k = -14$
(D) −14

Q12 MCQ · 1 mark — **2024** – 30/4/3

If $y = 1$ is one of the solutions of the quadratic equation $py^2 + py + 3 = 0$, then the value of p is :

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

ANSWER *
$p + p + 3 = 0 \Rightarrow p = -\frac{3}{2}$
(C) $-\frac{3}{2}$

Q13 MCQ · 1 mark — **2024** – 30/5/1, 30/5/3

The ratio of the sum and product of the roots of the quadratic equation $5x^2 - 6x + 21 = 0$ is :

(A) 5 : 21
(B) 2 : 7
(C) 21 : 5
(D) 7 : 2

ANSWER *

Sum $= \frac{6}{5}$, product $= \frac{21}{5}$; ratio $6 : 21 = 2 : 7$

(B) 2 : 7

Q14 MCQ · 1 mark **2025** – 30(B)/S

If one root of the quadratic equation $3x^2 - 9x + k - 1 = 0$ is reciprocal of the other, then the value of k is :

(A) 4
(B) −4
(C) −2
(D) 3

ANSWER **(A) 4**

Q15 MCQ · 1 mark **2025** – 30/2/1, 30/2/3

The quadratic equation whose roots are 7 and $\frac{1}{7}$ is :

(A) $7x^2 - 50x + 7 = 0$
(B) $7x^2 - 50x + 1 = 0$
(C) $7x^2 + 50x - 7 = 0$
(D) $7x^2 + 50x - 1 = 0$

ANSWER *

Sum $= \frac{50}{7}$, product $= 1$: $x^2 - \frac{50}{7}x + 1 = 0$

(A) $7x^2 - 50x + 7 = 0$

Q16 MCQ · 1 mark **2025** – 30/2/2

The quadratic equation whose sum and product of roots are 'a' and '$\frac{1}{a}$' respectively is :

(A) $ax^2 - ax + 1 = 0$
(B) $ax^2 - a^2x + 1 = 0$
(C) $ax^2 + ax + 1 = 0$
(D) $ax^2 + a^2x - 1 = 0$

ANSWER *

$x^2 - ax + \frac{1}{a} = 0 \Rightarrow ax^2 - a^2x + 1 = 0$

(B) $ax^2 - a^2x + 1 = 0$

Q17 MCQ · 1 mark **2025** – 30/5/2

Which of the following equations is a quadratic equation ?

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

ANSWER *

(B) gives $3x^2 + 3x + 1 = 0$, a quadratic. (A) reduces to $3x - 1 = 0$; (C) and (D) are not polynomial equations.

(B) $x^3 = (x+1)^3$

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

Q18 MCQ · 1 mark — **2026 (I)** – 30/3/1, 30/3/3

The roots of the quadratic equation $(x-1)^2 = 16$ are :

(A) 5, 3
(B) 4, −4
(C) 5, −3
(D) −5, 3

ANSWER *

$x - 1 = \pm 4$

(C) 5, −3

Q19 MCQ · 1 mark — **2026 (I)** – 30/3/2

The roots of the quadratic equation $4x^2 - (a-1)^2 = 0$ are :

(A) $a-1,\ a+1$
(B) $\frac{a-1}{2},\ \frac{-a+1}{2}$
(C) $\frac{a-1}{2},\ \frac{-a-1}{2}$
(D) $\pm(a-1)$

ANSWER *

$(2x)^2 = (a-1)^2 \Rightarrow x = \pm\frac{a-1}{2}$

(B) $\frac{a-1}{2},\ \frac{-a+1}{2}$

Q20 MCQ · 1 mark — **2026 (II)** – 30/8/1, 30/8/2, 30/8/3

If the roots of a quadratic equation $ax^2 + bx + c = 0$ are equal but opposite in sign, then :

(A) $a = 0$
(B) $b = 0$
(C) $b \neq 0$
(D) $a < b$

ANSWER **(B)** $b = 0$

Q21 Assertion–Reason · 1 mark — **2023** – 30/6/1, 30/6/2, 30/6/3

Statement A (Assertion) : If $5 + \sqrt{7}$ is a root of a quadratic equation with rational co-efficients, then its other root is $5 - \sqrt{7}$.
Statement R (Reason) : Surd roots of a quadratic equation with rational co-efficients occur in conjugate pairs.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER *

R is true and directly gives A.

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

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

Q22 Very Short Answer · 2 marks | Internal choice (OR) part | **2022** – 30/1/1, 30/1/2, 30/1/3

Solve the following quadratic equation for x : $\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$

ANSWER *

$\sqrt{3}x^2 + 3x + 7x + 7\sqrt{3} = \sqrt{3}x(x + \sqrt{3}) + 7(x + \sqrt{3}) = (x + \sqrt{3})(\sqrt{3}x + 7)$

$x = -\sqrt{3}$ or $x = -\dfrac{7}{\sqrt{3}}$

$\boxed{x = -\sqrt{3},\ -\dfrac{7}{\sqrt{3}}}$

Q23 Very Short Answer · 2 marks | **2022** – 30/2/1, 30/2/3

Solve the quadratic equation : $x^2 + 2\sqrt{2}x - 6 = 0$ for x.

ANSWER *

$x^2 + 3\sqrt{2}x - \sqrt{2}x - 6 = (x + 3\sqrt{2})(x - \sqrt{2})$

$x = \sqrt{2}$ or $-3\sqrt{2}$

$\boxed{x = \sqrt{2},\ -3\sqrt{2}}$

Q24 Very Short Answer · 2 marks | **2022** – 30/2/2

Solve the quadratic equation : $x^2 - 2ax + (a^2 - b^2) = 0$ for x.

ANSWER *

$x^2 - 2ax + (a + b)(a - b) = [x - (a + b)][x - (a - b)] = 0$

$x = a + b$ or $x = a - b$

$\boxed{x = a + b,\ a - b}$

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

Q25 Very Short Answer · 2 marks | Internal choice (OR) part | **2022** – 30/3/1, 30/3/3

Solve the quadratic equation for x : $x^2 - 2ax - (4b^2 - a^2) = 0$

ANSWER *

$x^2 - 2ax + a^2 - 4b^2 = 0 \Rightarrow (x - a)^2 = (2b)^2$

$x - a = \pm 2b \Rightarrow x = a + 2b$ or $a - 2b$

$\boxed{x = a + 2b,\ a - 2b}$

Q26 Very Short Answer · 2 marks | Internal choice (OR) part | **2022** – 30/4/1, 30/4/2

If the sum of the roots of the quadratic equation $ky^2 - 11y + (k - 23) = 0$ is $\dfrac{13}{21}$ more than the product of

the roots, then find the value of k.

ANSWER *

Sum $= \frac{11}{k}$, product $= \frac{k-23}{k}$

$\frac{11}{k} - \frac{k-23}{k} = \frac{13}{21} \Rightarrow \frac{34-k}{k} = \frac{13}{21}$

$\Rightarrow 714 - 21k = 13k \Rightarrow k = 21$

$\boxed{k = 21}$

Q27 Very Short Answer · 2 marks | Internal choice (OR) part | **2022** – 30/4/1, 30/4/2

If $x = -2$ is the common solution of quadratic equations $ax^2 + x - 3a = 0$ and $x^2 + bx + b = 0$, then find the value of a^2b.

ANSWER *

$4a - 2 - 3a = 0 \Rightarrow a = 2$

$4 - 2b + b = 0 \Rightarrow b = 4$

$a^2b = 4 \times 4 = 16$

$\boxed{a^2b = 16}$

Q28 Very Short Answer · 2 marks | Internal choice (OR) part | **2022** – 30/4/3

Solve for x : $\frac{5}{2}x^2 + \frac{2}{5} = 1 - 2x$

ANSWER *

Multiplying by 10: $25x^2 + 20x - 6 = 0$

$D = 400 + 600 = 1000$

$x = \frac{-20 \pm 10\sqrt{10}}{50} = \frac{-2 \pm \sqrt{10}}{5}$

$\boxed{x = \frac{-2 \pm \sqrt{10}}{5}}$

Q29 Very Short Answer · 2 marks | Internal choice (OR) part | **2022** – 30/6/1, 30/6/3

Solve for x : $2x^2 - 2\sqrt{2}x + 1 = 0$

ANSWER *

$(\sqrt{2}x - 1)^2 = 0$

$x = \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}$

$\boxed{x = \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}}$

Q30 Very Short Answer · 2 marks | Internal choice (OR) part | **2022** – 30/6/2

Solve for y : $y^2 + \frac{3\sqrt{5}}{2}y - 5 = 0$

ANSWER *

$2y^2 + 3\sqrt{5}y - 10 = 0 \Rightarrow 2y^2 + 4\sqrt{5}y - \sqrt{5}y - 10 = 0$

$\Rightarrow (y + 2\sqrt{5})(2y - \sqrt{5}) = 0$

$y = \frac{\sqrt{5}}{2}$ or $-2\sqrt{5}$

$\boxed{y = \frac{\sqrt{5}}{2},\ -2\sqrt{5}}$

Q31 Very Short Answer · 2 marks | **2022** – 30/B/5

Find the roots of the quadratic equation $9x^2 - 6\sqrt{2}x + 2 = 0$.

ANSWER *

$(3x - \sqrt{2})^2 = 0$

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

$\boxed{x = \frac{\sqrt{2}}{3},\ \frac{\sqrt{2}}{3}}$

Q32 Very Short Answer · 2 marks | **2022** – 30/B/6

If 4 is a root of the equation $x^2 + kx + 8 = 0$ then find the other root. Also find the value of k.

ANSWER *

$16 + 4k + 8 = 0 \Rightarrow k = -6$

Product of roots $= 8 \Rightarrow$ other root $= \frac{8}{4} = 2$

$\boxed{k = -6\text{; other root } 2}$

Q33 Very Short Answer · 2 marks | Internal choice (OR) part | **2023** – 30/4/1, 30/4/2, 30/4/3

Find the sum and product of the roots of the quadratic equation $2x^2 - 9x + 4 = 0$.

ANSWER *

Sum $= -\frac{b}{a} = \frac{9}{2}$

Product $= \frac{c}{a} = \frac{4}{2} = 2$

$\boxed{\text{Sum} = \frac{9}{2}, \text{ product} = 2}$

Q34 Very Short Answer · 2 marks | **2026 (II)** – 30/8/1, 30/8/2

If 'α' and 'β' are the roots of quadratic equation $x^2 + (k^2 - 1)x - 20 = 0$ such that $\alpha^2 - \beta^2 - \alpha\beta = 29$ and

$\alpha - \beta = 9$, then find the value of k.

ANSWER

$\alpha + \beta = -k^2 + 1$ and $\alpha\beta = -20$ ½

$(\alpha - \beta)(\alpha + \beta) - \alpha\beta = 29$ ½

$\Rightarrow 9 \times (-k^2 + 1) + 20 = 29$ ½

$\Rightarrow k^2 = 0 \Rightarrow k = 0$ ½

$k = 0$

Q35 Short Answer · 3 marks **2023** – 30/4/3

Find the value of 'p' for which one root of the quadratic equation $px^2 - 14x + 8 = 0$ is 6 times the other.

ANSWER *

Let the roots be α and 6α. Sum: $7\alpha = \frac{14}{p} \Rightarrow \alpha = \frac{2}{p}$

Product: $6\alpha^2 = \frac{8}{p} \Rightarrow 6 \times \frac{4}{p^2} = \frac{8}{p}$

$\Rightarrow \frac{24}{p} = 8 \Rightarrow p = 3$

$p = 3$

Q36 Short Answer · 3 marks Internal choice (OR) part **2023** – 30/6/1, 30/6/2

If α and β are roots of the quadratic equation $x^2 - 7x + 10 = 0$, find the quadratic equation whose roots are α^2 and β^2.

ANSWER *

$\alpha + \beta = 7,\ \alpha\beta = 10$

$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta = 49 - 20 = 29;\ \alpha^2\beta^2 = 100$

Required equation: $x^2 - 29x + 100 = 0$

$x^2 - 29x + 100 = 0$

Q37 Short Answer · 3 marks Internal choice (OR) part **2023** – 30/6/3

If one root of the quadratic equation $x^2 + 12x - k = 0$ is thrice the other root, then find the value of k.

ANSWER *

Let the roots be α and 3α. Sum: $4\alpha = -12 \Rightarrow \alpha = -3$

Product: $3\alpha^2 = -k \Rightarrow 27 = -k$

$\Rightarrow k = -27$

$k = -27$

Q38 Short Answer · 3 marks — **2025** – 30(B)/S

Solve the following equation for x : $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}; x \neq -4, 7$

ANSWER

$\Rightarrow x^2 - 3x + 2 = 0$ — 1

$\Rightarrow (x-2)(x-1) = 0$ — 1

$\Rightarrow x = 1,\ 2$ — 1

$x = 1,\ 2$

Q39 Short Answer · 3 marks — **2026 (II)** – 30/8/1, 30/8/2, 30/8/3

Solve for x : $\frac{4}{x} - 3 = \frac{5}{2x+3}, x \neq 0,\ -\frac{3}{2}$

ANSWER

$\frac{4}{x} - \frac{5}{2x+3} = 3 \Rightarrow 6x^2 + 6x - 12 = 0$ or $x^2 + x - 2 = 0$ — 1

$\Rightarrow (x+2)(x-1) = 0$ — 1

$\therefore x = -2,\ 1$ — 1

$x = -2,\ 1$

Q40 Long Answer · 5 marks · Internal choice (OR) part — **2024** – 30(B)

Solve for x : $\frac{4}{x} - \frac{5}{2x+3} = 3$

ANSWER *

$\frac{4(2x+3) - 5x}{x(2x+3)} = 3 \Rightarrow 3x + 12 = 6x^2 + 9x$

$\Rightarrow 6x^2 + 6x - 12 = 0 \Rightarrow x^2 + x - 2 = 0$

$\Rightarrow (x+2)(x-1) = 0 \Rightarrow x = 1,\ -2$

$x = 1,\ -2$

Q41 Long Answer · 5 marks · Internal choice (OR) part — **2025** – 30(B)

Solve the following equation for x : $\frac{1}{x-2} + \frac{2}{x-1} = \frac{6}{x}, x \neq 0, 1, 2$

ANSWER *

$\frac{(x-1) + 2(x-2)}{(x-2)(x-1)} = \frac{6}{x} \Rightarrow \frac{3x-5}{x^2-3x+2} = \frac{6}{x}$

$\Rightarrow 3x^2 - 5x = 6x^2 - 18x + 12 \Rightarrow 3x^2 - 13x + 12 = 0$

$\Rightarrow (3x-4)(x-3) = 0 \Rightarrow x = 3,\ \frac{4}{3}$

$x = 3,\ \frac{4}{3}$

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

Q42 Long Answer · 5 marks · Internal choice (OR) part — **2025** – 30/4/1, 30/4/2, 30/4/3

Express the equation $\frac{x-2}{x-3}+\frac{x-4}{x-5}=\frac{10}{3}; (x \neq 3, 5)$ as a quadratic equation in standard form. Hence, find the roots of the equation so formed.

ANSWER *

$3[(x-2)(x-5)+(x-4)(x-3)] = 10(x-3)(x-5)$

$\Rightarrow 6x^2-42x+66 = 10x^2-80x+150 \Rightarrow 2x^2-19x+42=0$

$\Rightarrow (2x-7)(x-6)=0 \Rightarrow x = 6, \frac{7}{2}$

$2x^2-19x+42=0$; **roots** $6, \frac{7}{2}$

Q43 Long Answer · 5 marks · Internal choice (OR) part — **2026 (II)** – 30(B)

Convert $\frac{1}{x+4}-\frac{1}{x-7}=\frac{11}{30}, x \neq -4, 7$ into a quadratic equation in standard form and hence solve it.

ANSWER

$\frac{x-7-x-4}{(x+4)(x-7)}=\frac{11}{30}$ — 1

$\Rightarrow x^2-3x+2=0$ — 2

$\Rightarrow (x-1)(x-2)=0$ — 1

$\Rightarrow x = 1, 2$ — 1

$x = 1, 2$

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

02 TOPIC 2 Nature of Roots (Discriminant)

QUICK RECAP

- Discriminant $D = b^2-4ac$. $D > 0$: two distinct real roots; $D = 0$: two equal real roots, each $-\frac{b}{2a}$; $D < 0$: no real roots.
- For rational roots (with rational coefficients) D must be a perfect square.

Q44 MCQ · 1 mark — **2023** – 30/C/1

The values of k for which the equation $4x^2+kx+9=0$ has real and equal roots are :

(A) ± 11 (B) ± 12

(C) ± 6 (D) ± 3

ANSWER **(b) ± 12**

Q45 MCQ · 1 mark — **2023** – 30/C/2

The value of k for which the quadratic equation $2x^2-10x+k=0$ has real and equal roots, is :

(A) $\frac{25}{2}$ (B) $\frac{1}{5}$

(C) $-\frac{5}{2}$ (D) $\frac{1}{2}$

ANSWER (a) $\frac{25}{2}$

Q46 MCQ · 1 mark **2023** – 30/C/3

The value(s) of k for which the equation $2x^2 - kx + 1 = 0$ has real and equal roots is/are :

(A) $2\sqrt{2}$
(B) $-2\sqrt{2}$
(C) $\pm 2\sqrt{2}$
(D) 2

ANSWER (c) $\pm 2\sqrt{2}$

Q47 MCQ · 1 mark **2023** – 30(B)

If $ax^2 + bx + c = 0$ has equal roots, then the value of a is :

(A) $-\frac{b}{4c}$
(B) $\frac{b^2}{4c}$
(C) $-\frac{b^2}{4c}$
(D) $\frac{b^2}{4ac}$

ANSWER *

$b^2 - 4ac = 0 \Rightarrow a = \frac{b^2}{4c}$

(b) $\frac{b^2}{4c}$

Q48 MCQ · 1 mark **2023** – 30/1/1, 30/1/2, 30/1/3

The least positive value of k, for which the quadratic equation $2x^2 + kx - 4 = 0$ has rational roots, is

(A) $\pm 2\sqrt{2}$
(B) 2
(C) ± 2
(D) $\sqrt{2}$

ANSWER *

$D = k^2 + 32$ must be a perfect square; for $k = 2$, $D = 36$.

(B) 2

Q49 MCQ · 1 mark **2023** – 30/6/1, 30/6/2

If the quadratic equation $ax^2 + bx + c = 0$ has two real and equal roots, then 'c' is equal to

(A) $\frac{-b}{2a}$
(B) $\frac{b}{2a}$
(C) $\frac{-b^2}{4a}$
(D) $\frac{b^2}{4a}$

ANSWER *

$b^2 - 4ac = 0 \Rightarrow c = \frac{b^2}{4a}$

(D) $\frac{b^2}{4a}$

INFINITY THINK BEYOND AN EDUCATIONAL INSTITUTE

Q50 MCQ · 1 mark — **2024** – 30/1/1, 30/1/2

If the roots of equation $ax^2 + bx + c = 0,\ a \neq 0$ are real and equal, then which of the following relation is true ?

(A) $a = \frac{b^2}{c}$
(B) $b^2 = ac$
(C) $ac = \frac{b^2}{4}$
(D) $c = \frac{b^2}{a}$

ANSWER *

$b^2 - 4ac = 0 \Rightarrow ac = \frac{b^2}{4}$

(c) $ac = \frac{b^2}{4}$

Q51 MCQ · 1 mark — **2024** – 30/4/1, 30/4/2

If the discriminant of the quadratic equation $3x^2 - 2x + c = 0$ is 16, then the value of c is :

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

ANSWER *

$4 - 12c = 16 \Rightarrow c = -1$

(C) −1

Q52 MCQ · 1 mark — **2024** – 30/5/2

If the quadratic equation $ax^2 + bx + c = 0$ has real and equal roots, then the value of c is :

(A) $\frac{b}{2a}$
(B) $-\frac{b}{2a}$
(C) $\frac{b^2}{4a}$
(D) $-\frac{b^2}{4a}$

ANSWER *

$b^2 - 4ac = 0 \Rightarrow c = \frac{b^2}{4a}$

(C) $\frac{b^2}{4a}$

Q53 MCQ · 1 mark — **2025** – 30(B)/S

Value(s) of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots is/are :

(A) 0 only
(B) 0, 4
(C) 8 only
(D) 0, 8

ANSWER **(D) 0, 8**

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

Q54 MCQ · 1 mark **2025** – 30/3/2

The discriminant of the quadratic equation $bx^2 + ax + c = 0;\ b \neq 0$ is given by :

(A) $b^2 - 4ac$
(B) $\sqrt{b^2 - 4ac}$
(C) $\sqrt{a^2 - 4bc}$
(D) $a^2 - 4bc$

ANSWER *

Here the coefficients are $b,\ a,\ c$, so $D = a^2 - 4bc$

(D) $a^2 - 4bc$

Q55 MCQ · 1 mark **2025** – 30/4/1, 30/4/2, 30/4/3

The value of 'a' for which $ax^2 + x + a = 0$ has equal and positive roots is :

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

ANSWER *

$D = 1 - 4a^2 = 0 \Rightarrow a = \pm\frac{1}{2}$; root $= -\frac{1}{2a} > 0 \Rightarrow a = -\frac{1}{2}$

(d) $-\frac{1}{2}$

Q56 MCQ · 1 mark **2025** – 30/5/1, 30/5/2, 30/5/3

If $x^2 + bx + b = 0$ has two real and distinct roots, then the value of b can be

(A) 0
(B) 4
(C) 3
(D) −3

ANSWER *

$D = b^2 - 4b > 0 \Rightarrow b < 0$ or $b > 4$; of the options only -3

(D) −3

Q57 MCQ · 1 mark **2025** – 30/6/1

Which of the following quadratic equations has real and equal roots ?

(A) $(x+1)^2 = 2x + 1$
(B) $x^2 + x = 0$
(C) $x^2 - 4 = 0$
(D) $x^2 + x + 1 = 0$

ANSWER *

(A) reduces to $x^2 = 0$, $D = 0$. (B), (C) have distinct roots; (D) has $D < 0$.

(A) $(x+1)^2 = 2x + 1$

Q58 MCQ · 1 mark **2025** – 30/6/2

Which of the following quadratic equations has real and distinct roots ?

(A) $x^2 + 2x = 0$
(B) $x^2 + x + 1 = 0$
(C) $(x-1)^2 = 1 - 2x$
(D) $2x^2 + x + 1 = 0$

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

ANSWER *

(A) $D = 4 > 0$. (B), (D) have $D < 0$; (C) reduces to $x^2 = 0$ (equal roots).

(A) $x^2 + 2x = 0$

Q59 MCQ · 1 mark **2025** – 30/6/3

Which of the following equations does not have a real root ?

(A) $x^2 = 0$
(B) $2x - 1 = 3$
(C) $x^2 + 1 = 0$
(D) $x^3 + x^2 = 0$

ANSWER *

$x^2 = -1$ has no real solution; the others have real roots.

(C) $x^2 + 1 = 0$

Q60 MCQ · 1 mark **2026 (I)** – 30/3/1, 30/3/2, 30/3/3

If the roots of the quadratic equation $\sqrt{3}x^2 - kx + 2\sqrt{3} = 0$ are real and equal, then the value(s) of k is/are :

(A) $\pm\sqrt{24}$
(B) 0
(C) 4
(D) −5

ANSWER *

$D = k^2 - 4(\sqrt{3})(2\sqrt{3}) = k^2 - 24 = 0$

(A) $\pm\sqrt{24}$

Q61 MCQ · 1 mark **2026 (I)** – 30/4/2

If roots of the quadratic equation $x^2 - k\sqrt{3}x + 2 = 0$ are real and equal, then value of k is

(A) −2
(B) $\sqrt{\frac{8}{3}}$
(C) 1
(D) 2

ANSWER *

$3k^2 - 8 = 0 \Rightarrow k = \pm\sqrt{\frac{8}{3}}$; of the options only $\sqrt{\frac{8}{3}}$

(B) $\sqrt{\frac{8}{3}}$

Q62 MCQ · 1 mark **2026 (I)** – 30/5/1, 30/5/2

The value of k for which the equation $kx^2 - 6x - 4 = 0$ has real and equal roots, is

(A) $\frac{9}{4}$
(B) −4
(C) $-\frac{9}{4}$
(D) −2

ANSWER *

$36 + 16k = 0 \Rightarrow k = -\frac{9}{4}$

(C) $-\frac{9}{4}$

Q63 MCQ · 1 mark **2026 (I)** – 30/5/1, 30/5/2, 30/5/3

The value of p for which roots of the quadratic equation $x^2 - px + 6 = 0$ are rational, is

(A) 1 (B) −5
(C) 25 (D) $\sqrt{5}$

ANSWER *

$D = p^2 - 24$ must be a perfect square; $p = -5$ gives $D = 1$

(B) −5

Q64 MCQ · 1 mark **2026 (I)** – 30/5/3

The value of m for which the quadratic equation $3x^2 - 7x + m = 0$ has real and equal roots, is

(A) 7 (B) $\frac{49}{12}$
(C) $\frac{49}{3}$ (D) 4

ANSWER *

$49 - 12m = 0 \Rightarrow m = \frac{49}{12}$

(B) $\frac{49}{12}$

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

Q65 Assertion–Reason · 1 mark **2025** – 30/S/1, 30/S/2, 30/S/3

Assertion (A): The quadratic equation $x^2 + 4x + 5 = 0$ has real roots.
Reason (R): The quadratic equation $ax^2 + bx + c = 0,\ a \neq 0$ has real roots if $b^2 - 4ac \geq 0$.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER **(D) Assertion (A) is false, but Reason (R) is true.**

Q66 Very Short Answer · 2 marks Internal choice (OR) part **2022** – 30/1/1, 30/1/2, 30/1/3

Find the value of m for which the quadratic equation $(m-1)x^2 + 2(m-1)x + 1 = 0$ has two real and equal roots.

ANSWER *

$D = 4(m-1)^2 - 4(m-1) = 0 \Rightarrow 4(m-1)(m-2) = 0$

$m \neq 1$ (else not quadratic), $\therefore m = 2$

$m = 2$

Q67 Very Short Answer · 2 marks | Internal choice (OR) part | **2022** – 30/3/1, 30/3/3

If the quadratic equation $(1+a^2)x^2+2abx+(b^2-c^2)=0$ has equal and real roots, then prove that : $b^2=c^2(1+a^2)$

ANSWER *

$D=4a^2b^2-4(1+a^2)(b^2-c^2)=0$

$\Rightarrow a^2b^2=b^2-c^2+a^2b^2-a^2c^2$

$\Rightarrow b^2=c^2+a^2c^2=c^2(1+a^2)$

$b^2=c^2(1+a^2)$ **(proved)**

Q68 Very Short Answer · 2 marks | Internal choice (OR) part | **2022** – 30/3/2

For what value of m, the quadratic equation $mx^2-2(m-1)x+(m+2)=0$ has two real and equal roots ?

ANSWER *

$D=4(m-1)^2-4m(m+2)=0$

$\Rightarrow m^2-2m+1-m^2-2m=0\Rightarrow -4m+1=0\Rightarrow m=\frac{1}{4}$

$m=\frac{1}{4}$

Q69 Very Short Answer · 2 marks | Internal choice (OR) part | **2022** – 30/4/3

Find the value of 'k' for which the quadratic equation $2kx^2-40x+25=0$ has real and equal roots.

ANSWER *

$D=1600-200k=0$

$\Rightarrow k=8$

$k=8$

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

Q70 Very Short Answer · 2 marks | Internal choice (OR) part | **2022** – 30/6/1, 30/6/3

Find the value(s) of k for which the quadratic equation $x^2+5kx+16=0$ has real and equal roots.

ANSWER *

$D=25k^2-64=0$

$\Rightarrow k=\pm\frac{8}{5}$

$k=\pm\frac{8}{5}$

Q71 Very Short Answer · 2 marks | Internal choice (OR) part | **2022** – 30/6/2

Find the value of 'k' for which the quadratic equation $kx^2 - 5x + k = 0$ has real and equal roots.

ANSWER *

$D = 25 - 4k^2 = 0$

$\Rightarrow k = \pm\frac{5}{2}$

$k = \pm\frac{5}{2}$

Q72 Very Short Answer · 2 marks | Internal choice (OR) part | **2022** – 30/B/5

Find the value(s) of k for the quadratic equation, $(k+3)x^2 + kx + 1 = 0$, to have two real and equal roots.

ANSWER *

$D = k^2 - 4(k+3) = 0 \Rightarrow k^2 - 4k - 12 = 0$

$(k-6)(k+2) = 0 \Rightarrow k = 6,\ -2$

$k = 6,\ -2$

Q73 Very Short Answer · 2 marks | Internal choice (OR) part | **2023** – 30/4/1, 30/4/2, 30/4/3

Find the discriminant of the quadratic equation $4x^2 - 5 = 0$ and hence comment on the nature of roots of the equation.

ANSWER *

$a = 4,\ b = 0,\ c = -5;\ D = b^2 - 4ac = 0 + 80 = 80$

$D > 0$, so the roots are real and distinct.

$D = 80$; **real and distinct roots**

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

Q74 Very Short Answer · 2 marks | Internal choice (OR) part | **2025** – 30/3/1, 30/3/3

Find the value(s) of 'k' so that the quadratic equation $4x^2 + kx + 1 = 0$ has real and equal roots.

ANSWER *

$D = k^2 - 16 = 0$

$\Rightarrow k = \pm 4$

$k = \pm 4$

Q75 Very Short Answer · 2 marks | **2026 (I)** – 30/4/1, 30/4/2, 30/4/3

Verify that roots of the quadratic equation $(p-q)x^2 + (q-r)x + (r-p) = 0$ are equal when $q + r = 2p$.

ANSWER *

$D = (q-r)^2 - 4(p-q)(r-p)$

With $p = \frac{q+r}{2}$: $p - q = \frac{r-q}{2}$, $r - p = \frac{r-q}{2}$, so $4(p-q)(r-p) = (r-q)^2$

$\therefore D = (q-r)^2 - (r-q)^2 = 0$; roots are equal

D = 0, so the roots are equal (verified)

Q76 Short Answer · 3 marks · Internal choice (OR) part — **2022** – 30/4/1, 30/4/2, 30/4/3

Find the value of 'p' for which the quadratic equation $p(x-4)(x-2)+(x-1)^2=0$ has real and equal roots.

ANSWER *

$(p+1)x^2-(6p+2)x+(8p+1)=0$

$D=(6p+2)^2-4(p+1)(8p+1)=0 \Rightarrow 4p^2-12p=0$

$\Rightarrow 4p(p-3)=0 \Rightarrow p=0$ or $p=3$

$p=0$ **or** $p=3$

Q77 Short Answer · 3 marks — **2023** – 30/4/1, 30/4/2

Find the value of 'p' for which the quadratic equation $px(x-2)+6=0$ has two equal real roots.

ANSWER *

$px^2-2px+6=0$

For equal roots $D=0$: $4p^2-24p=0 \Rightarrow 4p(p-6)=0$

$p\neq 0$ (else not quadratic), $\therefore p=6$

$p=6$

Q78 Short Answer · 3 marks — **2025** – 30(B)

Find the value of p for which the quadratic equation $(2p+1)x^2-(7p+2)x+(7p-3)=0$ has equal roots. Also, find these roots.

ANSWER *

$D=(7p+2)^2-4(2p+1)(7p-3)=0 \Rightarrow 7p^2-24p-16=0 \Rightarrow (7p+4)(p-4)=0$

$p=4$: $9x^2-30x+25=0 \Rightarrow (3x-5)^2=0 \Rightarrow x=\frac{5}{3},\ \frac{5}{3}$

$p=-\frac{4}{7}$: $-\frac{1}{7}x^2+2x-7=0 \Rightarrow x^2-14x+49=0 \Rightarrow x=7,\ 7$

$p=4$: **roots** $\frac{5}{3},\frac{5}{3}$; $p=-\frac{4}{7}$: **roots** $7,7$

Q79 Long Answer · 5 marks · Internal choice (OR) part — **2023** – 30(B)

If -3 is a root of the quadratic equation $3x^2+14x+p=0$, find p and hence find k so that the roots of the quadratic equation $x^2+k(4x+k-4)+p=0$ are equal.

ANSWER *

$3(-3)^2+14(-3)+p=0 \Rightarrow 27-42+p=0 \Rightarrow p=15$

$x^2+4kx+(k^2-4k+15)=0$; for equal roots $D=0$

$16k^2-4(k^2-4k+15)=0 \Rightarrow 12k^2+16k-60=0 \Rightarrow 3k^2+4k-15=0$

$(3k-5)(k+3)=0 \Rightarrow k=\frac{5}{3}$ or $k=-3$

$p=15; k=\frac{5}{3}$ **or** $k=-3$

Q80 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 30(B)/S

Find the value of p if the equation $(2p+1)x^2-(7p+2)x+7p-3=0$ has real and equal roots.

ANSWER

$\{-(7p+2)\}^2-4(2p+1)(7p-3)=0$ — 2

$\Rightarrow 7p^2-24p-16=0$ — 1

$\Rightarrow (7p+4)(p-4)=0$ — 1

$\Rightarrow p=-\frac{4}{7},\ p=4$ — 1

$p=-\frac{4}{7},\ p=4$

Q81 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 30/4/1, 30/4/3

Find the value of 'c' for which the quadratic equation $(c+1)x^2-6(c+1)x+3(c+9)=0;\ c\neq -1$ has real and equal roots.

ANSWER *

$D=36(c+1)^2-12(c+1)(c+9)=0$

$\Rightarrow 12(c+1)[3(c+1)-(c+9)]=0\Rightarrow 12(c+1)(2c-6)=0$

$c\neq -1$, so $c=3$

$c=3$

Q82 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 30/4/2

Find the value of 'k' for which the quadratic equation $(k+1)x^2-2(3k+1)x+(8k+1)=0$ has real and equal roots.

ANSWER *

$D=4(3k+1)^2-4(k+1)(8k+1)=0$

$\Rightarrow 9k^2+6k+1-(8k^2+9k+1)=0\Rightarrow k^2-3k=0$

$\Rightarrow k(k-3)=0\Rightarrow k=0$ or $k=3$

$k=0$ **or** $k=3$

Q83 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 30/5/1, 30/5/3

Find the value of 'k' for which the quadratic equation $(k+1)x^2-6(k+1)x+3(k+9)=0,\ k\neq -1$ has real and equal roots.

ANSWER *

$D=36(k+1)^2-12(k+1)(k+9)=0$

$\Rightarrow 12(k+1)[3(k+1)-(k+9)]=0\Rightarrow 12(k+1)(2k-6)=0$

$k\neq -1$, so $k=3$

$k=3$

INFINITY THINK BEYOND AN EDUCATIONAL INSTITUTE

Q84 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 30/5/1, 30/5/2, 30/5/3

Find the value(s) of p for which the quadratic equation given as $(p+4)x^2-(p+1)x+1=0$ has real and equal roots. Also, find the roots of the equation(s) so obtained.

ANSWER *

$D=(p+1)^2-4(p+4)=0 \Rightarrow p^2-2p-15=0$

$\Rightarrow (p-5)(p+3)=0 \Rightarrow p=5 \text{ or } -3$

$p=5$: $9x^2-6x+1=0 \Rightarrow (3x-1)^2=0 \Rightarrow x=\frac{1}{3},\ \frac{1}{3}$

$p=-3$: $x^2+2x+1=0 \Rightarrow x=-1,\ -1$

$p=5$: roots $\frac{1}{3},\frac{1}{3}$; $p=-3$: roots $-1,-1$

Q85 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 30/6/1, 30/6/2, 30/6/3

Find the smallest value of p for which the quadratic equation $x^2-2(p+1)x+p^2=0$ has real roots. Hence, find the roots of the equation so obtained.

ANSWER *

For real roots $D \geq 0$: $4(p+1)^2-4p^2 \geq 0 \Rightarrow 2p+1 \geq 0 \Rightarrow p \geq -\frac{1}{2}$

Smallest value $p=-\frac{1}{2}$

Equation: $x^2-x+\frac{1}{4}=0 \Rightarrow \left(x-\frac{1}{2}\right)^2=0 \Rightarrow x=\frac{1}{2},\ \frac{1}{2}$

$p=-\frac{1}{2}$; roots $\frac{1}{2},\ \frac{1}{2}$

INFINITY THINK BEYOND.....

03 TOPIC 3 Word Problems on Quadratic Equations

AN EDUCATIONAL INSTITUTE

QUICK RECAP

- Form the equation from the situation, solve, and **reject values that are not meaningful** (negative speed, age, length, number of items, etc.).
- Time–speed: $\frac{d}{x}-\frac{d}{x+k}=t$. Two-digit number $10x+y$. Consecutive odd numbers $2x+1,\ 2x+3$.

Q86 Very Short Answer · 2 marks | **2022** – 30/1/1, 30/1/2, 30/1/3

The product of Rehan's age (in years) 5 years ago and his age 7 years from now, is one more than twice his present age. Find his present age.

ANSWER *

Let the present age be x years. $(x-5)(x+7)=2x+1$

$\Rightarrow x^2+2x-35=2x+1 \Rightarrow x^2=36$

$x=6$ (age cannot be negative)

Present age = 6 years

Q87 Very Short Answer · 2 marks · Internal choice (OR) part · **2022** – 30/3/2

The diagonal of a rectangular field is 60 metres more than the shorter side. If the longer side is 30 metres more than the shorter side, find the sides of the field.

ANSWER *

Let the shorter side be x m; longer $x+30$, diagonal $x+60$. $x^2+(x+30)^2=(x+60)^2$

$\Rightarrow x^2-60x-2700=0 \Rightarrow (x-90)(x+30)=0$

$x=90$; sides 90 m and 120 m

90 m and 120 m

Q88 Very Short Answer · 2 marks · Internal choice (OR) part · **2022** – 30/B/5

The product of two consecutive odd positive integers is 255. Find the integers, by formulating a quadratic equation.

ANSWER *

Let the integers be x and $x+2$. $x(x+2)=255 \Rightarrow x^2+2x-255=0$

$(x+17)(x-15)=0 \Rightarrow x=15$ (positive)

Integers are 15 and 17

15 and 17

Q89 Very Short Answer · 2 marks · **2026 (II)** – 30/8/3

The area of a right-angled triangle is 600 sq. cm. If the base of the triangle exceeds the altitude by 10 cm, find the dimensions of the triangle.

ANSWER

Let the altitude be x cm and base $(x+10)$ cm ½

$\frac{1}{2}\times x\times(x+10)=600 \Rightarrow x^2+10x-1200=0$ ½

$\Rightarrow (x+40)(x-30)=0$; $x\neq -40$, so $x=30$ ½

Dimensions of the triangle are 30 cm, 40 cm and 50 cm. ½

30 cm, 40 cm and 50 cm

Q90 Short Answer · 3 marks · Internal choice (OR) part · **2022** – 30/4/1, 30/4/2, 30/4/3

Had Aarush scored 8 more marks in a Mathematics test, out of 35 marks, 7 times these marks would have been 4 less than square of his actual marks. How many marks did he get in the test ?

ANSWER *

Let his marks be x. $7(x+8)=x^2-4$

$\Rightarrow x^2-7x-60=0 \Rightarrow (x-12)(x+5)=0$

Marks cannot be negative, $x=12$

Aarush got 12 marks.

Q91 Short Answer · 3 marks — **2023** – 30/C/1, 30/C/2

Two water taps together can fill a tank in $3\frac{1}{3}$ hours. The tap of larger diameter takes 5 hours less than the smaller one to fill the tank separately. Find the time in which each tap can fill the tank separately.

ANSWER

Let the smaller tap fill the tank in x hours, so the larger tap in $(x-5)$ hours.

$\frac{1}{x}+\frac{1}{x-5}=\frac{3}{10}$ — 1

$\Rightarrow 3x^2-35x+50=0$ — 1

$\Rightarrow (x-10)(3x-5)=0 \Rightarrow x=10$ or $\frac{5}{3}$; $x=\frac{5}{3}$ is not possible, so $x=10$ — ½

Smaller tap takes 10 hours and larger tap takes 5 hours. — ½

Smaller tap: 10 hours; larger tap: 5 hours.

Q92 Short Answer · 3 marks — **2023** – 30/C/2

Sum of the areas of two squares is 468 m^2. If the difference of their perimeters is 24 m, find the lengths of the sides of the two squares.

ANSWER

Let sides be x m and y m, $x>y$. $x^2+y^2=468$ ...(1) — ½

$4x-4y=24 \Rightarrow x-y=6$ ...(2) — ½

From (1) and (2), $y^2+6y-216=0 \Rightarrow y=12,\ -18$ — 1

Side cannot be negative, so $y=12$, $x=18$ — 1

Sides are 12 m and 18 m.

Q93 Short Answer · 3 marks — **2023** – 30/C/3

Three consecutive odd numbers are such that the sum of the squares of the first two numbers is greater than the square of the third by 65. Find the numbers.

ANSWER

Let the numbers be $2x+1,\ 2x+3,\ 2x+5$ — ½

$(2x+1)^2+(2x+3)^2=(2x+5)^2+65$ — 1

$\Rightarrow x^2-x-20=0 \Rightarrow (x-5)(x+4)=0$ — 1

$x=5$ or -4. Odd and even numbers are natural numbers, $\therefore x=5$; numbers are 11, 13, 15 — ½

Numbers are 11, 13, 15.

Q94 Short Answer · 3 marks · Internal choice (OR) part — **2023** – 30/6/1, 30/6/2

The sum of two numbers is 15. If the sum of their reciprocals is $\frac{3}{10}$, find the two numbers.

ANSWER *

Let the numbers be x and $15-x$. $\frac{1}{x}+\frac{1}{15-x}=\frac{3}{10}$

$\Rightarrow \frac{15}{x(15-x)}=\frac{3}{10} \Rightarrow x(15-x)=50 \Rightarrow x^2-15x+50=0$

$\Rightarrow (x-10)(x-5)=0 \Rightarrow x=10$ or 5

The numbers are 10 and 5.

Q95 Short Answer · 3 marks | Internal choice (OR) part | **2023** – 30/6/3

A natural number, when increased by 12, equals 160 times its reciprocal. Find the number.

ANSWER *

Let the number be x. $x + 12 = \frac{160}{x}$

$\Rightarrow x^2 + 12x - 160 = 0 \Rightarrow (x + 20)(x - 8) = 0$

x is natural, so $x = 8$

The number is 8.

Q96 Short Answer · 3 marks | **2024** – 30/2/1

In a 2-digit number, the digit at the unit's place is 5 less than the digit at the ten's place. The product of the digits is 36. Find the number.

ANSWER *

Let ten's digit be x; unit's digit $= x - 5$. $x(x - 5) = 36$

$\Rightarrow x^2 - 5x - 36 = 0 \Rightarrow (x - 9)(x + 4) = 0$

$x = 9$ (digit cannot be negative); unit digit $= 4$; number is 94

The number is 94.

Q97 Short Answer · 3 marks | **2024** – 30/2/2

Three consecutive integers are such that sum of the square of second and product of other two is 161. Find the three integers.

ANSWER *

Let the integers be $x - 1,\ x,\ x + 1$

$x^2 + (x - 1)(x + 1) = 161 \Rightarrow 2x^2 - 1 = 161 \Rightarrow x^2 = 81$

$x = \pm 9$; integers are 8, 9, 10 or $-10,\ -9,\ -8$

8, 9, 10 or −10, −9, −8

Q98 Short Answer · 3 marks | **2026 (I)** – 30/3/1, 30/3/2, 30/3/3

Find two consecutive negative integers, sum of whose squares is 481.

ANSWER *

Let the integers be x and $x + 1$. $x^2 + (x + 1)^2 = 481$

$\Rightarrow x^2 + x - 240 = 0 \Rightarrow (x + 16)(x - 15) = 0$

Negative integers, so $x = -16$; integers -16 and -15

−16 and −15

Q99 Long Answer · 4 marks | Internal choice (OR) part | **2022** – 30/2/1, 30/2/3

A 2-digit number is such that the product of its digits is 24. If 18 is subtracted from the number, the digits

interchange their places. Find the number.

ANSWER *

Let ten's digit be x and unit's digit y; $xy = 24$

$10x + y - 18 = 10y + x \Rightarrow x - y = 2$

$\Rightarrow y(y+2) = 24 \Rightarrow y^2 + 2y - 24 = 0 \Rightarrow (y+6)(y-4) = 0 \Rightarrow y = 4$

$x = 6$; number is 64

The number is 64.

Q100 Long Answer · 4 marks | Internal choice (OR) part | **2022** – 30/2/1, 30/2/3

The difference of the squares of two numbers is 180. The square of the smaller number is 8 times the greater number. Find the two numbers.

ANSWER *

Let the greater number be x and the smaller y. $x^2 - y^2 = 180$, $y^2 = 8x$

$\Rightarrow x^2 - 8x - 180 = 0 \Rightarrow (x-18)(x+10) = 0$

$x = -10$ gives $y^2 < 0$, so $x = 18$; $y^2 = 144 \Rightarrow y = \pm 12$

Numbers are 18 and 12 (or 18 and −12)

Numbers are 18 and 12 (or 18 and −12)

Q101 Long Answer · 4 marks | Internal choice (OR) part | **2022** – 30/2/2

The sum of two numbers is 34. If 3 is subtracted from one number and 2 is added to another, the product of these two numbers becomes 260. Find the numbers.

ANSWER *

Let the numbers be x and $34 - x$. $(x-3)(34-x+2) = 260$

$\Rightarrow -x^2 + 39x - 108 = 260 \Rightarrow x^2 - 39x + 368 = 0 \Rightarrow (x-23)(x-16) = 0$

$x = 23$: numbers 23 and 11; $x = 16$: numbers 16 and 18

23 and 11, or 16 and 18

Q102 Long Answer · 4 marks | Internal choice (OR) part | **2022** – 30/2/2

The hypotenuse (in cm) of a right angled triangle is 6 cm more than twice the length of the shortest side. If the length of third side is 6 cm less than thrice the length of shortest side, then find the dimensions of the triangle.

ANSWER *

Let the shortest side be x cm; hypotenuse $2x + 6$, third side $3x - 6$

$x^2 + (3x-6)^2 = (2x+6)^2 \Rightarrow 6x^2 - 60x = 0$

$x = 10$ $(x \neq 0)$

Sides: 10 cm, 24 cm, 26 cm

10 cm, 24 cm, 26 cm

Q103 Long Answer · 5 marks | Internal choice (OR) part | **2023** – 30(B)

Three consecutive natural numbers are such that the square of the middle number exceeds the difference of the squares of the other two by 60. Find the numbers.

ANSWER *

Let the numbers be $x-1,\ x,\ x+1$

$x^2 = (x+1)^2 - (x-1)^2 + 60 \Rightarrow x^2 = 4x + 60$

$x^2 - 4x - 60 = 0 \Rightarrow (x-10)(x+6) = 0$

x is natural, so $x = 10$; numbers are 9, 10, 11

The numbers are 9, 10 and 11.

Q104 Long Answer · 5 marks | Internal choice (OR) part | **2023** – 30/5/1, 30/5/2, 30/5/3

A train travels at a certain average speed for a distance of 54 km and then travels a distance of 63 km at an average speed of 6 km/h more than the first speed. If it takes 3 hours to complete the journey, what was its first average speed ?

ANSWER *

Let the first speed be x km/h. $\frac{54}{x} + \frac{63}{x+6} = 3$

$\Rightarrow 54(x+6) + 63x = 3x(x+6) \Rightarrow 3x^2 - 99x - 324 = 0 \Rightarrow x^2 - 33x - 108 = 0$

$\Rightarrow (x-36)(x+3) = 0$

Speed cannot be negative, $\therefore x = 36$ km/h

First average speed = 36 km/h

Q105 Long Answer · 5 marks | Internal choice (OR) part | **2023** – 30/5/1, 30/5/2, 30/5/3

Two pipes together can fill a tank in $\frac{15}{8}$ hours. The pipe with larger diameter takes 2 hours less than the pipe with smaller diameter to fill the tank separately. Find the time in which each pipe can fill the tank separately.

ANSWER *

Let the smaller pipe take x hours; larger takes $(x-2)$ hours. $\frac{1}{x} + \frac{1}{x-2} = \frac{8}{15}$

$\Rightarrow 15(2x-2) = 8x(x-2) \Rightarrow 8x^2 - 46x + 30 = 0 \Rightarrow 4x^2 - 23x + 15 = 0$

$\Rightarrow (4x-3)(x-5) = 0 \Rightarrow x = 5$ or $\frac{3}{4}$

$x = \frac{3}{4}$ gives $x - 2 < 0$, so $x = 5$: smaller pipe 5 hours, larger pipe 3 hours

Smaller pipe 5 hours, larger pipe 3 hours

Q106 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 30/S/1, 30/S/2, 30/S/3

If Nidhi were 7 years younger than what she actually is, then the square of her age (in years) would be 1

more than 5 times her actual age. What is her present age ?

ANSWER

Let present age be x years. $(x-7)^2 = 5x+1$ — 2

$\Rightarrow x^2 - 19x + 48 = 0$ — 1

$\Rightarrow (x-16)(x-3) = 0$ — 1

$x \neq 3, \therefore x = 16$. Hence, the present age of Nidhi $= 16$ years — 1

Present age of Nidhi = 16 years

Q107 Long Answer · 5 marks · Internal choice (OR) part · **2024** – 30/S/1, 30/S/2, 30/S/3

A shopkeeper buys a number of books for ₹ 1,800. If he had bought 15 more books for the same amount, then each book would have cost him ₹ 20 less. Find how many books he bought initially.

ANSWER

Let the number of books be x. $\frac{1800}{x} - \frac{1800}{x+15} = 20$ — 2

$\Rightarrow x^2 + 15x - 1350 = 0$ — 1

$\Rightarrow (x+45)(x-30) = 0$ — 1

$x \neq -45, \therefore x = 30$ — 1

Books bought initially = 30

Q108 Long Answer · 5 marks · Internal choice (OR) part · **2024** – 30(B)/S

Some students planned a picnic. The total budget for food was ₹ 500, but 5 of them failed to go and thus the cost of food for each student increased by ₹ 5. How many students attended the picnic ?

ANSWER

Let the number of students who attended be x. $\frac{500}{x} - \frac{500}{x+5} = 5$ — 2

$\Rightarrow x^2 + 5x - 500 = 0$ — 1

$\Rightarrow (x+25)(x-20) = 0$ — 1

$x = -25,\ 20$; number cannot be negative, $\therefore x = 20$ — 1

20 students attended the picnic.

Q109 Long Answer · 5 marks · Internal choice (OR) part · **2024** – 30(B)

The sum of two numbers is 18 and the sum of their reciprocals is $\frac{1}{4}$. Find the numbers.

ANSWER *

Let the numbers be x and $18-x$. $\frac{1}{x} + \frac{1}{18-x} = \frac{1}{4}$

$\Rightarrow \frac{18}{x(18-x)} = \frac{1}{4} \Rightarrow x(18-x) = 72$

$\Rightarrow x^2 - 18x + 72 = 0 \Rightarrow (x-12)(x-6) = 0$

$x = 12$ or 6; numbers are 12 and 6

The numbers are 12 and 6.

Q110 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 30/3/1, 30/3/2, 30/3/3

In a flight of 2800 km, an aircraft was slowed down due to bad weather. Its average speed is reduced by 100 km/h and by doing so, the time of flight is increased by 30 minutes. Find the original duration of the flight.

ANSWER *

Let the original speed be x km/h. $\frac{2800}{x-100} - \frac{2800}{x} = \frac{1}{2}$

$\Rightarrow x^2 - 100x - 560000 = 0 \Rightarrow (x-800)(x+700) = 0$

Speed cannot be negative, $x = 800$ km/h

Original duration $= \frac{2800}{800} = 3.5$ hours

Original duration = 3.5 hours

Q111 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 30/3/1, 30/3/2, 30/3/3

The denominator of a fraction is one more than twice the numerator. If the sum of the fraction and its reciprocal is $2\frac{16}{21}$, find the fraction.

ANSWER *

Let the fraction be $\frac{x}{2x+1}$. $\frac{x}{2x+1} + \frac{2x+1}{x} = \frac{58}{21}$

$\Rightarrow 21(5x^2 + 4x + 1) = 58x(2x+1) \Rightarrow 11x^2 - 26x - 21 = 0$

$\Rightarrow (x-3)(11x+7) = 0 \Rightarrow x = 3$ or $-\frac{7}{11}$

Taking $x = 3$, fraction $= \frac{3}{7}$

The fraction is $\frac{3}{7}$

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

Q112 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 30/4/1, 30/4/3

A train travels a distance of 90 km at a constant speed. Had the speed been 15 km/h more, it would have taken 30 minutes less for the journey. Find the original speed of the train.

ANSWER *

Let the speed be x km/h. $\frac{90}{x} - \frac{90}{x+15} = \frac{1}{2}$

$\Rightarrow 2700 = x(x+15) \Rightarrow x^2 + 15x - 2700 = 0$

$\Rightarrow (x+60)(x-45) = 0$

Speed cannot be negative, $x = 45$ km/h

Original speed = 45 km/h

Q113 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 30/4/2

A 2-digit number is such that the product of its digits is 18. When 63 is subtracted from the number, the

digits interchange their places. Find the number.

ANSWER *

Let ten's digit be x and unit's digit y; $xy = 18$

$(10x + y) - 63 = 10y + x \Rightarrow x - y = 7$

$\Rightarrow y(y + 7) = 18 \Rightarrow y^2 + 7y - 18 = 0 \Rightarrow (y + 9)(y - 2) = 0$

$y = 2,\ x = 9$; number is 92

The number is 92.

Q114 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 30/5/1, 30/5/3

The age of a man is twice the square of the age of his son. Eight years hence, the age of the man will be 4 years more than three times the age of his son. Find their present ages.

ANSWER *

Let the son's age be x years; man's age $= 2x^2$

$2x^2 + 8 = 3(x + 8) + 4 \Rightarrow 2x^2 - 3x - 20 = 0$

$\Rightarrow (2x + 5)(x - 4) = 0 \Rightarrow x = 4$ (age cannot be negative)

Son's age 4 years, man's age 32 years

Son 4 years, man 32 years

Q115 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 30/5/2

A 2-digit number is such that the product of the digits is 14. When 45 is added to the number, the digits are reversed. Find the number.

ANSWER *

Let ten's digit be x and unit's digit y; $xy = 14$

$10x + y + 45 = 10y + x \Rightarrow y - x = 5$

$\Rightarrow x(x + 5) = 14 \Rightarrow x^2 + 5x - 14 = 0 \Rightarrow (x + 7)(x - 2) = 0$

$x = 2,\ y = 7$; number is 27

The number is 27.

Q116 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 30/5/2

The side of a square exceeds the side of another square by 4 cm and the sum of the areas of the two squares is 400 cm^2. Find the sides of the squares.

ANSWER *

Let the smaller side be x cm; other side $(x + 4)$ cm

$x^2 + (x + 4)^2 = 400 \Rightarrow 2x^2 + 8x - 384 = 0 \Rightarrow x^2 + 4x - 192 = 0$

$\Rightarrow (x + 16)(x - 12) = 0 \Rightarrow x = 12$

Sides are 12 cm and 16 cm

Sides are 12 cm and 16 cm.

Q117 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 30/S/1

The denominator of a fraction is 2 more than the numerator. If 2 is added to both its numerator and denominator, then the sum of the new fraction and the original fraction is $\frac{46}{35}$. Find the original fraction.

ANSWER

Let the fraction be $\frac{x}{x+2}$ ½

$\frac{x}{x+2}+\frac{x+2}{x+4}=\frac{46}{35}$ 2

$\Rightarrow 24x^2+4x-228=0$ or $6x^2+x-57=0$ 1

$\Rightarrow (6x+19)(x-3)=0$ ½

$x\neq -\frac{19}{6}, \therefore x=3$ ½

Required fraction is $\frac{3}{5}$ ½

Fraction is $\frac{3}{5}$

Q118 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 30/S/1, 30/S/2, 30/S/3

At present, Sourav's age is 3 years more than the square of his son Ravi's age. When Ravi grows to his father's present age, Sourav's age would be 6 years less than 13 times the present age of Ravi. Find present ages of Ravi and Sourav.

ANSWER

Let present ages of Ravi and Sourav be r and s years. $s=3+r^2$ ...① 1

Ravi grows to father's present age in $(s-r)$ years. 1

Father's age after $(s-r)$ years $=(2s-r); \therefore 2s-r=13r-6$ or $s=7r-3$ ...② 1

Using ① and ②, $r^2-7r+6=0\Rightarrow (r-6)(r-1)=0\Rightarrow r=6,1$ 1

Ignoring $r=1$ as $s\neq 4$; $r=6$ ½

Hence $s=39$ ½

Ravi 6 years, Sourav 39 years

Q119 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 30/1/1, 30/1/3; **2026 (II)** – 30/7/3

A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, then it would have taken 3 hours more to cover the same distance. Find the original speed of the train.

ANSWER

Let the original speed be x km/h. $\frac{480}{x-8}-\frac{480}{x}=3$ 2

$\Rightarrow x^2-8x-1280=0$ 1

$\Rightarrow (x-40)(x+32)=0$ 1

$x\neq -32, \therefore x=40$ 1

Original speed of train is 40 km/h

Q120 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 30(B)

Find two consecutive odd numbers, sum of whose squares is 650.

ANSWER *

Let the numbers be x and $x+2$. $x^2+(x+2)^2=650$

$\Rightarrow 2x^2+4x-646=0 \Rightarrow x^2+2x-323=0$

$\Rightarrow (x+19)(x-17)=0 \Rightarrow x=17$ or -19

Numbers: 17 and 19, or -19 and -17

17 and 19, or −19 and −17

Q121 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 30/1/1, 30/1/3

The perimeter of a right triangle is 60 cm and its hypotenuse is 25 cm. Find the lengths of other two sides of the triangle.

ANSWER *

Let the other sides be x cm and $(35-x)$ cm (since $60-25=35$)

$x^2+(35-x)^2=625 \Rightarrow 2x^2-70x+600=0 \Rightarrow x^2-35x+300=0$

$\Rightarrow (x-15)(x-20)=0 \Rightarrow x=15$ or 20

The other two sides are 15 cm and 20 cm

15 cm and 20 cm

Q122 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 30/1/2

A two-digit number is such that the product of its digits is 12. When 36 is added to this number, the digits interchange their places. Find the number.

ANSWER *

Let ten's digit be x and unit's digit y; $xy=12$

$10x+y+36=10y+x \Rightarrow y-x=4$

$\Rightarrow x(x+4)=12 \Rightarrow x^2+4x-12=0 \Rightarrow (x+6)(x-2)=0$

$x=2,\ y=6$; number is 26

The number is 26.

Q123 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 30/1/2

A student scored a total of 32 marks in class tests in Mathematics and Science. Had he scored 2 marks less in Science and 4 marks more in Mathematics, the product of his marks would have been 253. Find his marks in the two subjects.

ANSWER *

Let marks in Mathematics be x; Science $=32-x$

$(x+4)(30-x)=253 \Rightarrow -x^2+26x+120=253 \Rightarrow x^2-26x+133=0$

$\Rightarrow (x-7)(x-19)=0 \Rightarrow x=7$ or 19

Maths 7 and Science 25, or Maths 19 and Science 13

Maths 7, Science 25 or Maths 19, Science 13

INFINITY THINK BEYOND AN EDUCATIONAL INSTITUTE

Q124 Long Answer · 5 marks Internal choice (OR) part **2025** – 30/2/1, 30/2/2

The sum of the areas of two squares is 52 cm^2 and difference of their perimeters is 8 cm. Find the lengths of the sides of the two squares.

ANSWER *

Let the sides be x and y $(x > y)$. $4x - 4y = 8 \Rightarrow x = y + 2$

$x^2 + y^2 = 52 \Rightarrow (y+2)^2 + y^2 = 52 \Rightarrow y^2 + 2y - 24 = 0$

$\Rightarrow (y+6)(y-4) = 0 \Rightarrow y = 4$

Sides are 6 cm and 4 cm

Sides are 6 cm and 4 cm.

Q125 Long Answer · 5 marks Internal choice (OR) part **2025** – 30/2/1, 30/2/2

The time taken by a person to travel an upward distance of 150 km was $2\frac{1}{2}$ hours more than the time taken in the downward return journey. If he returned at a speed of 10 km/h more than the speed while going up, find the speeds in each direction.

ANSWER *

Let the upward speed be x km/h. $\frac{150}{x} - \frac{150}{x+10} = \frac{5}{2}$

$\Rightarrow \frac{1500}{x(x+10)} = \frac{5}{2} \Rightarrow x^2 + 10x - 600 = 0$

$\Rightarrow (x+30)(x-20) = 0 \Rightarrow x = 20$

Upward 20 km/h, downward 30 km/h

Upward 20 km/h, downward 30 km/h

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

Q126 Long Answer · 5 marks Internal choice (OR) part **2025** – 30/2/3

The numerator of a fraction is 3 less than its denominator. If 2 is added to both numerator and denominator, then the sum of the new fraction and the original fraction is $1\frac{9}{20}$. Find the original fraction.

ANSWER *

Let the fraction be $\frac{x}{x+3}$. $\frac{x}{x+3} + \frac{x+2}{x+5} = \frac{29}{20}$

$\Rightarrow 20(2x^2 + 10x + 6) = 29(x^2 + 8x + 15) \Rightarrow 11x^2 - 32x - 315 = 0$

$\Rightarrow (x-7)(11x+45) = 0 \Rightarrow x = 7$ (rejecting $-\frac{45}{11}$)

Fraction $= \frac{7}{10}$

The fraction is $\frac{7}{10}$

Q127 Long Answer · 5 marks Internal choice (OR) part **2025** – 30/2/3

A train travelling at a uniform speed for 360 km would have taken 48 minutes less to travel the same

distance if its speed were 5 km/h more. Find the original speed of the train.

ANSWER *

Let the speed be x km/h. $\frac{360}{x} - \frac{360}{x+5} = \frac{48}{60} = \frac{4}{5}$

$\Rightarrow \frac{1800}{x(x+5)} = \frac{4}{5} \Rightarrow x^2 + 5x - 2250 = 0$

$\Rightarrow (x+50)(x-45) = 0$

Speed cannot be negative, $x = 45$ km/h

Original speed = 45 km/h

Q128 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 30/4/1, 30/4/2, 30/4/3

The sides of a right triangle are such that the longest side is 4 m more than the shortest side and the third side is 2 m less than the longest side. Find the length of each side of the triangle. Also, find the difference between the numerical values of the area and the perimeter of the given triangle.

ANSWER *

Let the shortest side be x m; longest $= x+4$, third side $= x+2$

$x^2 + (x+2)^2 = (x+4)^2 \Rightarrow x^2 - 4x - 12 = 0 \Rightarrow (x-6)(x+2) = 0 \Rightarrow x = 6$

Sides are 6 m, 8 m and 10 m

Area $= \frac{1}{2} \times 6 \times 8 = 24$, perimeter $= 24$; difference $= 0$

Sides 6 m, 8 m, 10 m; difference = 0

Q129 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 30/5/1, 30/5/2, 30/5/3

A 2-digit number is seven times the sum of its digits and two (2) more than 5 times the product of its digits. Find the number.

ANSWER *

Let ten's digit be x and unit's digit y. $10x + y = 7(x+y) \Rightarrow x = 2y$

$10x + y = 5xy + 2 \Rightarrow 21y = 10y^2 + 2 \Rightarrow 10y^2 - 21y + 2 = 0$

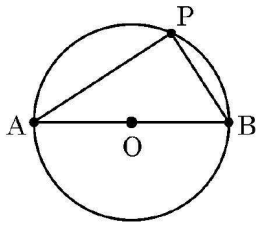
$\Rightarrow (10y - 1)(y - 2) = 0 \Rightarrow y = 2$ (digit)

$x = 4$; number is 42

The number is 42.

Q130 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 30/6/1, 30/6/2, 30/6/3

There is a circular park of diameter 65 m as shown in the following figure, where AB is a diameter. An entry gate is to be constructed at a point P on the boundary of the park such that distance of P from A is 35 m more than the distance of P from B. Find distance of point P from A and B respectively.



ANSWER *

Let PB $= x$ m; PA $= (x + 35)$ m. $\angle APB = 90^\circ$ (angle in a semicircle)

$x^2 + (x + 35)^2 = 65^2 \Rightarrow x^2 + 35x - 1500 = 0$

$\Rightarrow (x + 60)(x - 25) = 0 \Rightarrow x = 25$

PA $= 60$ m, PB $= 25$ m

PA = 60 m, PB = 25 m

Q131 Long Answer · 5 marks | Internal choice (OR) part | **2026 (I)** – 30(B)

Three consecutive positive integers are such that sum of square of the first and the product of the other two is 67, find the integers.

ANSWER *

Let the integers be $n,\ n + 1,\ n + 2$. $n^2 + (n + 1)(n + 2) = 67$

$\Rightarrow 2n^2 + 3n - 65 = 0 \Rightarrow (2n + 13)(n - 5) = 0$

n is positive, so $n = 5$; integers 5, 6, 7

The integers are 5, 6, 7.

Q132 Long Answer · 5 marks | Internal choice (OR) part | **2026 (I)** – 30/1/1, 30/1/2, 30/1/3

A faster train takes one hour less than a slower train for a journey of 200 km. If the speed of the slower train is 10 km/hr less than that of the faster train, find the speeds of the two trains.

ANSWER *

Let the speed of the slower train be x km/h; faster $= (x + 10)$ km/h

$\frac{200}{x} - \frac{200}{x + 10} = 1 \Rightarrow x^2 + 10x - 2000 = 0$

$\Rightarrow (x + 50)(x - 40) = 0 \Rightarrow x = 40$

Speeds: 40 km/h and 50 km/h

Slower train 40 km/h, faster train 50 km/h

Q133 Long Answer · 5 marks | Internal choice (OR) part | **2026 (I)** – 30/1/1, 30/1/2, 30/1/3

The sum of the areas of two squares is 640 m^2. If the difference in their perimeters is 64 m, find the sides of the two squares.

ANSWER *

Let the sides be x and y $(x > y)$. $4x - 4y = 64 \Rightarrow x = y + 16$

$(y + 16)^2 + y^2 = 640 \Rightarrow y^2 + 16y - 192 = 0$

$\Rightarrow (y + 24)(y - 8) = 0 \Rightarrow y = 8$

Sides are 24 m and 8 m

Sides are 24 m and 8 m.

Q134 Long Answer · 5 marks | Internal choice (OR) part | **2026 (I)** – 30/2/2

In a flight of 600 km, an aircraft slowed down its speed due to bad weather. Its average speed for the trip reduced by 200 km/h from its usual speed and time of flight increased by 30 minutes. Find the scheduled

duration of the flight.

ANSWER *

Let the usual speed be x km/h. $\frac{600}{x-200} - \frac{600}{x} = \frac{1}{2}$

$\Rightarrow x^2 - 200x - 240000 = 0 \Rightarrow (x-600)(x+400) = 0$

$x = 600$ km/h

Scheduled duration $= \frac{600}{600} = 1$ hour

Scheduled duration = 1 hour

Q135 Long Answer · 5 marks | Internal choice (OR) part | **2026 (I)** – 30/2/2

Two pipes are used to fill a swimming pool. If the pipe of the larger diameter is used for 4 hours and the pipe of the smaller diameter for 9 hours, only half of the pool can be filled. Find how long it would take for each pipe to fill the pool, separately, if the pipe of smaller diameter takes 10 hours more than the pipe of larger diameter to fill the pool.

ANSWER *

Let the larger pipe take x hours; smaller $(x+10)$ hours. $\frac{4}{x} + \frac{9}{x+10} = \frac{1}{2}$

$\Rightarrow 8(x+10) + 18x = x(x+10) \Rightarrow x^2 - 16x - 80 = 0$

$\Rightarrow (x-20)(x+4) = 0 \Rightarrow x = 20$

Larger pipe 20 hours, smaller pipe 30 hours

Larger pipe 20 hours, smaller pipe 30 hours

Q136 Long Answer · 5 marks | Internal choice (OR) part | **2026 (I)** – 30/4/1, 30/4/2, 30/4/3

A person on tour has ₹ 5,400 for his expenses. If he extends his tour by 5 days, he has to cut down his daily expenses by ₹ 180. Find the original duration of the tour and daily expense.

ANSWER *

Let the original duration be x days. $\frac{5400}{x} - \frac{5400}{x+5} = 180$

$\Rightarrow x^2 + 5x - 150 = 0 \Rightarrow (x+15)(x-10) = 0$

$x = 10$ days

Daily expense $= \frac{5400}{10} =$ ₹ 540

10 days; ₹ 540 per day

Q137 Long Answer · 5 marks | Internal choice (OR) part | **2026 (I)** – 30/4/1, 30/4/2, 30/4/3

The total cost of certain piece of cloth was ₹ 2,100. During special sale time, the shopkeeper offered 2 m extra cloth for free thus reducing the price of cloth per metre by ₹ 120. What was the original per metre

price of cloth and its length ?

ANSWER *

Let the length be x m. $\frac{2100}{x} - \frac{2100}{x+2} = 120$

$\Rightarrow x^2 + 2x - 35 = 0 \Rightarrow (x+7)(x-5) = 0$

$x = 5$ m

Price per metre $= \frac{2100}{5} = ₹\,420$

Length 5 m; ₹ 420 per metre

Q138 Long Answer · 5 marks — **2026 (I)** – 30/5/1

Venkat can row a boat in still water at the speed of 12 km/h. He ferries tourists 15 km upstream and 18 km downstream in 3 hours. Find the speed of the stream.

ANSWER *

Let the speed of the stream be x km/h. $\frac{15}{12-x} + \frac{18}{12+x} = 3$

$\Rightarrow 15(12+x) + 18(12-x) = 3(144 - x^2) \Rightarrow 3x^2 - 3x - 36 = 0$

$\Rightarrow x^2 - x - 12 = 0 \Rightarrow (x-4)(x+3) = 0$

Speed cannot be negative, $x = 4$ km/h

Speed of the stream = 4 km/h

Q139 Long Answer · 5 marks · Internal choice (OR) part — **2026 (II)** – 30/7/1, 30/7/2

The sum of the squares of two natural numbers is 29. If the second number is one more than twice the first number, find the numbers.

ANSWER

Let the numbers be x and y. $x^2 + y^2 = 29$ and $y = 2x + 1 \Rightarrow x^2 + (2x+1)^2 = 29$ — 2

$\Rightarrow 5x^2 + 4x - 28 = 0$ — 1

$\Rightarrow (x-2)(5x+14) = 0$ — 1

$x \neq -\frac{14}{5}$, so $x = 2$ — ½

and $y = 5$ — ½

The numbers are 2 and 5.

Q140 Long Answer · 5 marks · Internal choice (OR) part — **2026 (II)** – 30/7/1, 30/7/2

A farmer prepares a rectangular vegetable garden of area 180 m^2. With 39 m of barbed wire, he can fence the three sides of the garden, leaving one of the longer sides unfenced. Find the dimensions of the

garden.

ANSWER

Let the longer side be x m and smaller side y m. $xy = 180$ and $2y + x = 39 \Rightarrow 2 \times \frac{180}{x} + x = 39 \Rightarrow$ — 2

$x^2 - 39x + 360 = 0$

$\Rightarrow (x - 24)(x - 15) = 0$ — 1

$\Rightarrow x = 24$ or $x = 15$ — ½

If $x = 24$ then $y = 7.5$, or if $x = 15$ then $y = 12$ — 1

Dimensions are 24 m × 7.5 m or 15 m × 12 m — ½

24 m × 7.5 m or 15 m × 12 m

Q141 Long Answer · 5 marks · Internal choice (OR) part — **2026 (II)** – 30/7/3

Himakshi can row her boat at a speed of 5 km/h in still water. If she takes 1 hour more to row the boat 5.25 km upstream than to return downstream, find the speed of the boat in upstream.

ANSWER

Let the speed of the stream be x km/h. $\frac{5.25}{5 - x} - \frac{5.25}{5 + x} = 1$ — 2

$\Rightarrow 2x^2 + 21x - 50 = 0$ — 1

$\Rightarrow (2x + 25)(x - 2) = 0$ — 1

$x \neq -\frac{25}{2}, \therefore x = 2$ — ½

Speed of the boat upstream $= 5 - 2 = 3$ km/h — ½

Speed of the boat upstream = 3 km/h

Q142 Long Answer · 5 marks · Internal choice (OR) part — **2026 (II)** – 30(B)

A man can row a boat in still water at the rate of 7 km per hour. He takes 14 hours in going 45 km upstream and coming back to the same spot. Find the speed of the stream.

ANSWER

Let speed of stream be x km/h. Speed upstream $= (7 - x)$ km/h — ½

and speed downstream $= (7 + x)$ km/h — ½

$\frac{45}{7 + x} + \frac{45}{7 - x} = 14$ — 2

$\Rightarrow 45(7 - x + 7 + x) = 14(49 - x^2) \Rightarrow x^2 = 4$ — 1

$x \neq -2, x = 2$ — 1

Speed of stream is 2 km/h.

Q143 Case Study · 4 marks — **2022** – 30/3/1, 30/3/2, 30/3/3

Case study: In the picture given below, one can see a rectangular in-ground swimming pool installed by a family in their backyard. There is a concrete sidewalk around the pool of width x m. The outside edges of the sidewalk measure 7 m and 12 m. The area of the pool is 36 sq. m.

INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

(a) Based on the information given above, form a quadratic equation in terms of x. **[2]**
(b) Find the width of the sidewalk around the pool. **[2]**



ANSWER *

(a) Pool: $(12-2x)$ m by $(7-2x)$ m; $(12-2x)(7-2x)=36 \Rightarrow 4x^2-38x+48=0 \Rightarrow 2x^2-19x+24=0$

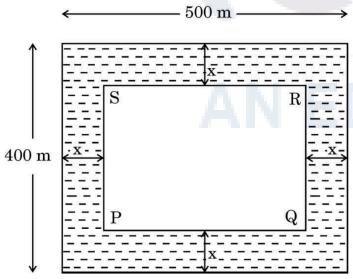
(b) $(2x-3)(x-8)=0 \Rightarrow x=\frac{3}{2}$ or 8

$x=8$ is not possible $(7-2x<0)$, so width $=1.5$ m

(a) $2x^2-19x+24=0$ (b) 1.5 m

Q144 Case Study · 4 marks **2022** – 30/6/1, 30/6/2, 30/6/3

Case study: Social work aims at fulfilment of human needs. Rohan, being a social worker, wants to donate his land to the Village Panchayat for opening of a school. Rohan\'s land is in the form of a rectangle of dimensions 500 m × 400 m. The Village Panchayat decides to leave the area on all the four sides of the land for grass and flowers. If width of x m land is kept for grass and flowers on all the four sides (as shown in the figure);
(a) find the lengths PQ and QR if area of grass and flowers region surrounding PQRS is 118400 m^2. **[2]**
(b) Also, find the perimeter of the rectangle PQRS. **[2]**



ANSWER *

(a) $500\times400-(500-2x)(400-2x)=118400 \Rightarrow (500-2x)(400-2x)=81600$

$\Rightarrow x^2-450x+29600=0 \Rightarrow (x-80)(x-370)=0$; $x=370$ is not possible, so $x=80$

PQ $=500-160=340$ m, QR $=400-160=240$ m

(b) Perimeter $=2(340+240)=1160$ m

(a) PQ = 340 m, QR = 240 m (b) 1160 m

Q145 Case Study · 4 marks **2022** – 30/B/6

Case study: In an auditorium, the sloping floor allows the seats to be arranged to give a clear view of the stage. The seats are arranged in such a way that the number of rows are equal to the number of seats in each row. When the number of rows are doubled and the number of seats in each row is reduced by 16, then the total number of seats increases by 320.
(a) If x is taken as the number of rows in the original arrangement, describe the above situation by a

quadratic equation. **[2]**
(b) Find the number of rows and hence the total number of seats in the original arrangement. **[2]**

ANSWER *

(a) $2x(x-16) = x^2 + 320 \Rightarrow x^2 - 32x - 320 = 0$

(b) $(x-40)(x+8) = 0 \Rightarrow x = 40$ rows

Total seats $= 40^2 = 1600$

(a) $x^2 - 32x - 320 = 0$ (b) 40 rows; 1600 seats

Q146 Case Study · 4 marks — **2023** – 30/C/B

Case study: In an auditorium, seats are arranged in rows and columns. The number of rows are equal to the number of seats in each row in the beginning. When the number of rows are doubled and the number of seats in each row is reduced by 10, the total number of seats increases by 300.
(a) Taking x as the number of rows in the beginning, represent the above situation by a quadratic equation. **[1]**
(b) (i) How many rows are there in the original arrangement ? **[2] OR** (ii) How many seats are there in the auditorium in the beginning ? **[2]**
(c) How many seats are there in the auditorium after re-arrangement ? **[1]**

ANSWER

(a) $2x(x-10) - x^2 = 300$ or $x^2 - 20x - 300 = 0$ — 1

(b)(i) $(x-30)(x+10) = 0 \Rightarrow x = 30$ — 1+1

OR (ii) $(x-30)(x+10) = 0 \Rightarrow x = 30, \therefore x^2 = 900$ — 1+1

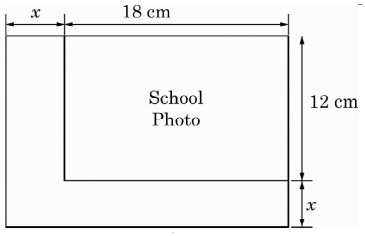
(c) $900 + 300 = 1200$ — 1

(a) $x^2 - 20x - 300 = 0$ (b)(i) 30 OR (ii) 900 (c) 1200

INFINITY THINK BEYOND.....
AN EDUCATIONAL INSTITUTE

Q147 Case Study · 4 marks — **2023** – 30/1/1, 30/1/2, 30/1/3

Case study: While designing the school year book, a teacher asked the student that the length and width of a particular photo is increased by x units each to double the area of the photo. The original photo is 18 cm long and 12 cm wide.
(I) Write an algebraic equation depicting the above information. **[1]**
(II) Write the corresponding quadratic equation in standard form. **[1]**
(III) What should be the new dimensions of the enlarged photo ? **[2]**
OR
Can any rational value of x make the new area equal to 220 cm^2 ? **[2]**



ANSWER *

(I) $(18+x)(12+x) = 2 \times 18 \times 12 = 432$

(II) $x^2 + 30x - 216 = 0$

(III) $(x+36)(x-6) = 0 \Rightarrow x = 6$ ($x \neq -36$); new dimensions 24 cm × 18 cm

OR $(18+x)(12+x) = 220 \Rightarrow x^2 + 30x - 4 = 0$; $D = 900 + 16 = 916$, not a perfect square, so no rational value of x is possible.

(I) $(18+x)(12+x) = 432$ (II) $x^2 + 30x - 216 = 0$ (III) 24 cm × 18 cm; OR No

Q148 Case Study · 4 marks — **2025** – 30/3/1, 30/3/2

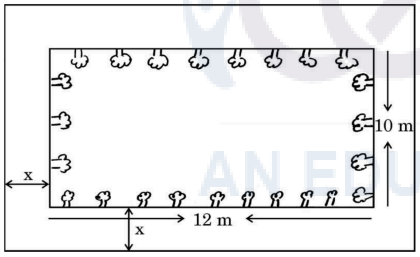
Case study: A garden designer is planning a rectangular lawn that is to be surrounded by a uniform walkway. The total area of the lawn and the walkway is 360 square metres. The width of the walkway is same on all sides. The dimensions of the lawn itself are 12 metres by 10 metres.

(i) Formulate the quadratic equation representing the total area of the lawn and the walkway, taking width of walkway $= x$ m. **[1]**

(ii)(a) Solve the quadratic equation to find the width of the walkway 'x'. **[2]** OR (b) If the cost of paving the walkway at the rate of ₹ 50 per square metre is ₹ 12,000, calculate the area of the walkway. **[2]**

(iii) Find the perimeter of the lawn. **[1]**





INFINITY THINK BEYOND..... AN EDUCATIONAL INSTITUTE

ANSWER *

(i) $(12+2x)(10+2x) = 360 \Rightarrow 4x^2 + 44x - 240 = 0 \Rightarrow x^2 + 11x - 60 = 0$

(ii)(a) $(x+15)(x-4) = 0 \Rightarrow x = 4$ m (width cannot be negative)

OR (b) Area of walkway $= \dfrac{12000}{50} = 240$ m²

(iii) Perimeter of lawn $= 2(12+10) = 44$ m

(i) $x^2 + 11x - 60 = 0$ (ii)(a) 4 m OR (b) 240 m² (iii) 44 m

MIND CURVE · INFINITY THINK BEYOND

Pre-Booster Test Series 2026–27

Class X · Mathematics Standard & Basic

Done with the PYQs? Put them to work. The **Mind Curve Pre-Booster Test Series 2026–27** gives Class X students chapter-wise and full-syllabus tests in the latest CBSE pattern, so every topic you practised here is tested again before the board exam.

Join the Test Series: infinitythinkbeyond.co.in/mind-curve-class-x-test-series-2026-27

MIND CURVE – THE MATHEMATICS FORUM

An open forum where Mathematics **students and teachers** learn together: free resources, chapter-wise practice material, test series and doubt discussions, all in one growing community of Maths learners.

WhatsApp Group:
chat.whatsapp.com/ICdBeP9GNOd4hOdZxC6C5W

INFINITY THINK BEYOND – WEBSITE

Mathematics help for **students** (notes, PYQs, worksheets, sample papers) and for **teachers** (ready test papers, answer keys and teaching resources), built around conceptual learning.

Website: www.infinitythinkbeyond.co.in

REFERENCES

Questions: CBSE Previous Year Question Papers – www.cbse.gov.in/cbsenew/question-paper.html

Answers: CBSE Marking Schemes – www.cbse.gov.in/cbsenew/marking-scheme.html