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Quadratic Equations

Chapter 4 · Previous Year Questions with Answers · Class X Mathematics Basic (241)

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** – 430/4/1, 430/4/2, 430/4/3

A quadratic equation whose one root is 2 and the sum of whose roots is zero, is :

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

ANSWER *

Roots $2,\ -2$: $x^2 - 4 = 0$

(D) $x^2 - 4 = 0$

Q2 MCQ · 1 mark — **2024** – 430/S/1, 430/S/2, 430/S/3

If one root of the quadratic equation $x^2 - 4x + 3 = 0$ is 1, then the other root is :

(A) 4 (B) -4
(C) 3 (D) -3

ANSWER (C) 3

Q3 MCQ · 1 mark — **2024** – 430/2/1, 430/2/3

Which of the following equations has 2 as a root ?

(A) $x^2 - 4x + 5 = 0$ (B) $x^2 + 3x - 12 = 0$
(C) $2x^2 - 7x + 6 = 0$ (D) $3x^2 - 6x - 2 = 0$

ANSWER *

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

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

Q4 MCQ · 1 mark — **2024** – 430/2/2

Which of the following quadratic equations has -1 as a root ?

(A) $x^2 - 4x - 5 = 0$ (B) $-x^2 - 4x + 5 = 0$

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(C) $x^2 + 3x + 4 = 0$
(D) $x^2 - 5x + 6 = 0$

ANSWER *
$(-1)^2 - 4(-1) - 5 = 1 + 4 - 5 = 0$
(A) $x^2 - 4x - 5 = 0$

Q5 MCQ · 1 mark — **2024** – 430/4/1, 430/4/3

The roots of the quadratic equation $x^2 - 4 = 0$ is/are :

(A) 2 only
(B) $-2,\ 2$
(C) 4 only
(D) $-4,\ 4$

ANSWER *
$x^2 = 4 \Rightarrow x = \pm 2$
(B) $-2,\ 2$

Q6 MCQ · 1 mark — **2024** – 430/4/2

The root(s) of the quadratic equation $x^2 - 25 = 0$ is/are :

(A) 5
(B) $-5,\ 5$
(C) 25
(D) $-25,\ 25$

ANSWER *
$x^2 = 25 \Rightarrow x = \pm 5$
(B) $-5,\ 5$

Q7 MCQ · 1 mark — **2024** – 430/5/1, 430/5/3

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

(A) $5,\ 2$
(B) $-5,\ 2$
(C) $5,\ -2$
(D) $-5,\ -2$

ANSWER *
$(x + 5)(x - 2) = 0$
(B) $-5,\ 2$

Q8 MCQ · 1 mark — **2024** – 430/5/2

The roots of the quadratic equation $x^2 + 3x + 2 = 0$, are :

(A) $-1,\ -2$
(B) $1,\ 2$
(C) $1,\ -2$
(D) $-1,\ 2$

ANSWER *
$(x + 1)(x + 2) = 0$
(A) $-1,\ -2$

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Q9 MCQ · 1 mark — **2025** – 430/1/1, 430/1/2, 430/1/3

The equation $x + \frac{1}{x} = 3\ (x \neq 0)$ is expressed as a quadratic equation in the form of $ax^2 + bx + c = 0$. The value of $a - b + c$ is :

(A) 5 (B) 2
(C) 1 (D) -1

ANSWER *
$x^2 - 3x + 1 = 0$: $a - b + c = 1 + 3 + 1 = 5$

(A) 5

Q10 MCQ · 1 mark — **2025** – 430/3/1, 430/3/2

If $x = \sqrt{x},\ (x \neq 0)$ is expressed as a quadratic equation in the form $ax^2 + bx + c = 0$, then the value of $a + b + c$ is :

(A) 0 (B) 1
(C) 2 (D) 3

ANSWER *
Squaring: $x^2 = x \Rightarrow x^2 - x = 0$; $a + b + c = 1 - 1 + 0 = 0$

(A) 0

Q11 MCQ · 1 mark — **2025** – 430/3/3

If $(x + 1)^3 = x^3 + 1$ is expressed as a quadratic equation in the form $px^2 + qx + r = 0$, then the value of $p - q + r$ is :

(A) 0 (B) 1
(C) 3 (D) 6

ANSWER *
$x^3 + 3x^2 + 3x + 1 = x^3 + 1 \Rightarrow 3x^2 + 3x = 0$; $p - q + r = 3 - 3 + 0 = 0$

(A) 0

Q12 MCQ · 1 mark — **2026 (I)** – 430(B)

If $x = \sqrt{3}$ is a solution of the equation $ax^2 + \sqrt{3}x - 12 = 0$, then

(A) $a = 3$ (B) $a = 2$
(C) $a = 1$ (D) $a = \sqrt{3}$

ANSWER *
$3a + 3 - 12 = 0 \Rightarrow a = 3$

(A) $a = 3$

Q13 MCQ · 1 mark — **2026 (II)** – 430/8/1, 430/8/3

The product of the roots of the quadratic equation $kx^2 + 3x + 2k^2 = 0$ in x is 1, then the value of k is

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(A) $-\frac{1}{2}$
(B) $\frac{1}{2}$
(C) $\frac{3}{2}$
(D) 0

ANSWER **(B) $\frac{1}{2}$**

Q14 MCQ · 1 mark — **2026 (II)** – 430/8/2

If α and β are the roots of quadratic equation $x^2 - 7x + 11 = 0$, then the value of $(\alpha^2 + \beta^2)$ is

(A) 27
(B) 29
(C) 31
(D) 33

ANSWER **(A) 27**

Q15 Very Short Answer · 2 marks · Internal choice (OR) part — **2022** – 430/6/1, 430/6/2

Solve for $x : 6x^2 - 2x + \frac{1}{6} = 0$

ANSWER

$36x^2 - 12x + 1 = 0$ ½
$(6x - 1)(6x - 1) = 0$ 1
$x = \frac{1}{6}, \frac{1}{6}$ ½

$x = \frac{1}{6}, \frac{1}{6}$

Q16 Very Short Answer · 2 marks · Internal choice (OR) part — **2022** – 430/6/3

Solve for $y : 9y^2 - 64 = 0$

ANSWER

$y^2 = \frac{64}{9}$ 1
$y = \frac{8}{3}, -\frac{8}{3}$ 1

$y = \frac{8}{3}, -\frac{8}{3}$

Q17 Very Short Answer · 2 marks · Internal choice (OR) part — **2022** – 430/6/3

Write a quadratic equation whose roots are -7 and 9.

ANSWER

Sum of roots $= -7 + 9 = 2$ ½
Product of roots $= -63$ ½
Quadratic equation: $x^2 - (\text{sum})x + \text{product} = 0$, i.e. $x^2 - 2x - 63 = 0$ 1

$x^2 - 2x - 63 = 0$

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Q18 Very Short Answer · 2 marks · Internal choice (OR) part — **2022** – 430/1/1, 430/1/2, 430/1/3

Write a quadratic equation with roots -3 and 5.

ANSWER *

Sum of roots $= -3 + 5 = 2$, product $= -15$

Equation: $x^2 - 2x - 15 = 0$

$$\boxed{x^2 - 2x - 15 = 0}$$

Q19 Very Short Answer · 2 marks — **2022** – 430/1/1, 430/1/2, 430/1/3

Solve the quadratic equation $2x^2 - 5x - 1 = 0$ for x.

ANSWER *

$a = 2,\ b = -5,\ c = -1;\ D = 25 + 8 = 33$

$$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{5 \pm \sqrt{33}}{4}$$

$$\boxed{x = \frac{5 \pm \sqrt{33}}{4}}$$

Q20 Very Short Answer · 2 marks — **2022** – 430/2/2

Solve the equation : $3x^2 - 8x - 1 = 0$ for x.

ANSWER *

$D = 64 + 12 = 76$

$$x = \frac{8 \pm \sqrt{76}}{6} = \frac{8 \pm 2\sqrt{19}}{6} = \frac{4 \pm \sqrt{19}}{3}$$

$$\boxed{x = \frac{4 \pm \sqrt{19}}{3}}$$

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Q21 Very Short Answer · 2 marks · Internal choice (OR) part — **2022** – 430/3/1, 430/3/2, 430/3/3

Solve the quadratic equation for x : $6 - x - x^2 = 0$

ANSWER *

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

$x = 2,\ -3$

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

Q22 Very Short Answer · 2 marks — **2022** – 430/4/3

Solve for x : $2x^2 + \frac{7}{2}x + \frac{3}{4} = 0$

ANSWER *

Multiplying by 4: $8x^2 + 14x + 3 = 0$

$8x^2 + 12x + 2x + 3 = 0 \Rightarrow (2x + 3)(4x + 1) = 0$

$x = -\frac{3}{2}, -\frac{1}{4}$

$\boxed{x = -\frac{1}{4}, -\frac{3}{2}}$

Q23 Very Short Answer · 2 marks — **2022** – 430/B/5

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

ANSWER *

$3x^2 - 3x - 2x + 2 = 0 \Rightarrow (x - 1)(3x - 2) = 0$

$x = 1, \frac{2}{3}$

$\boxed{x = 1, \frac{2}{3}}$

Q24 Very Short Answer · 2 marks | Internal choice (OR) part — **2023** – 430/4/1, 430/4/2, 430/4/3

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

ANSWER *

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

$x = 2, -1$

$\boxed{x = 2, -1}$

Q25 Very Short Answer · 2 marks — **2024** – 430/5/1, 430/5/2, 430/5/3

If $\frac{2}{3}$ is a root of the quadratic equation $kx^2 - x - 2 = 0$, then find the value of k.

ANSWER *

$k\left(\frac{4}{9}\right) - \frac{2}{3} - 2 = 0$

$\frac{4k}{9} = \frac{8}{3} \Rightarrow k = 6$

$\boxed{k = 6}$

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Q26 Very Short Answer · 2 marks | Internal choice (OR) part | **2025** – 430/6/1, 430/6/2

Solve the equation $4x^2 - 9x + 3 = 0$, using quadratic formula.

ANSWER *

$D = 81 - 48 = 33$

$x = \dfrac{9 \pm \sqrt{33}}{8}$

$\boxed{x = \dfrac{9 \pm \sqrt{33}}{8}}$

Q27 Very Short Answer · 2 marks | Internal choice (OR) part | **2025** – 430/6/3

Solve the quadratic equation $\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$ using quadratic formula.

ANSWER *

$D = 100 - 4(\sqrt{3})(7\sqrt{3}) = 100 - 84 = 16$

$x = \dfrac{-10 \pm 4}{2\sqrt{3}}$, i.e. $x = -\sqrt{3}$ or $-\dfrac{7}{\sqrt{3}}$

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

Q28 Short Answer · 3 marks | Internal choice (OR) part | **2022** – 430/4/1, 430/4/2, 430/4/3

If $x = 3$ is one root of the quadratic equation $2x^2 + px + 30 = 0$, find the value of p and the other root of the quadratic equation.

ANSWER *

Putting $x = 3$: $2(9) + 3p + 30 = 0 \Rightarrow 3p = -48 \Rightarrow p = -16$

Equation: $2x^2 - 16x + 30 = 0 \Rightarrow x^2 - 8x + 15 = 0$

$(x - 3)(x - 5) = 0$; the other root is 5

$\boxed{p = -16;\ \textbf{other root} = 5}$

Q29 Short Answer · 3 marks | **2023** – 430/6/3

Solve for x : $\dfrac{1}{x} - \dfrac{1}{x-2} = 3;\ x \neq 0,\ 2$

ANSWER *

$\dfrac{(x-2) - x}{x(x-2)} = 3 \Rightarrow -2 = 3x^2 - 6x$

$3x^2 - 6x + 2 = 0$; $D = 36 - 24 = 12$

$x = \dfrac{6 \pm 2\sqrt{3}}{6} = \dfrac{3 \pm \sqrt{3}}{3}$

$\boxed{x = 1 \pm \dfrac{1}{\sqrt{3}},\ \textbf{i.e.}\ \dfrac{3 \pm \sqrt{3}}{3}}$

Q30 Long Answer · 5 marks — **2023** – 430/C/B

Find the roots of the equation : $\frac{1}{x+4}-\frac{1}{x-7}=\frac{11}{30}, x \neq -4,\ 7$

ANSWER

$\frac{1}{x+4}-\frac{1}{x-7}=\frac{11}{30} \Rightarrow x^2-3x+2=0$ — 2

$\Rightarrow (x-1)(x-2)=0$ — 2

$\Rightarrow x=1,\ 2$ — ½+½

$x=1,\ 2$

Q31 Long Answer · 5 marks — **2024** – 430/S/1

Check whether the following equation is quadratic or not. If yes, find its roots. $(x^3-4x^2+3x+1)=(x-2)^3$

ANSWER

$x^3-4x^2+3x+1=x^3-6x^2+12x-8 \Rightarrow 2x^2-9x+9=0$ — 1

Yes, the given equation is a quadratic equation. — 1

$2x^2-9x+9=0 \Rightarrow (x-3)(2x-3)=0$ — 2

$\Rightarrow x=3$ and $x=\frac{3}{2}$ — ½+½

Yes; $x=3,\ \frac{3}{2}$

Q32 Long Answer · 5 marks — **2024** – 430/S/2

Solve for x : $\frac{3}{x+1}-\frac{2}{3x-1}=\frac{1}{2}\left(x \neq -1,\ \frac{1}{3}\right)$

ANSWER

$\frac{3(3x-1)-2(x+1)}{(x+1)(3x-1)}=\frac{1}{2}$ — 1½

$\Rightarrow 14x-10=3x^2+2x-1$ — 1½

$\Rightarrow x^2-4x+3=0 \Rightarrow (x-1)(x-3)=0$ — 1

$\Rightarrow x=1,\ x=3$ — ½+½

$x=1,\ 3$

Q33 Long Answer · 5 marks · Internal choice (OR) part — **2024** – 430/S/3

Solve for x : $\frac{1500}{x}-\frac{1}{2}=\frac{1500}{x+250}$

ANSWER

$\frac{1500(x+250)-1500(x)}{x(x+250)}=\frac{1}{2}$ — 1½

$\Rightarrow x^2+250x-750000=0$ — 1½

$\Rightarrow (x-750)(x+1000)=0$ — 1

$\Rightarrow x=750,\ x=-1000$ — ½+½

$x=750,\ x=-1000$

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Q34 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 430/2/1, 430/2/2, 430/2/3

Express the equation $\frac{1}{x} - \frac{1}{x-2} = 3, (x \neq 0,\ 2)$ as a quadratic equation in standard form. Hence, find the roots of the quadratic equation so obtained.

ANSWER *

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

Standard form: $3x^2 - 6x + 2 = 0$

$D = 36 - 24 = 12$

$x = \frac{6 \pm 2\sqrt{3}}{6} = \frac{3 \pm \sqrt{3}}{3}$

$3x^2 - 6x + 2 = 0; x = \frac{3 \pm \sqrt{3}}{3}$

Q35 Long Answer · 5 marks | Internal choice (OR) part | **2026 (I)** – 430(B)

Solve for x : $\frac{x-2}{x-3} + \frac{x-4}{x-5} = \frac{10}{3}; x \neq 3,\ 5$

ANSWER *

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

$6x^2 - 42x + 66 = 10x^2 - 80x + 150$

$4x^2 - 38x + 84 = 0 \Rightarrow 2x^2 - 19x + 42 = 0$

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

$x = 6, \frac{7}{2}$

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Q36 Long Answer · 5 marks | Internal choice (OR) part | **2026 (II)** – 430/8/1, 430/8/2, 430/8/3

Express the equation $\frac{1}{x-3} - \frac{1}{x+5} = \frac{1}{6}; (x \neq 3,\ -5)$ as a quadratic equation in standard form. Hence, solve the equation so formed.

ANSWER

$\frac{1}{x-3} - \frac{1}{x+5} = \frac{1}{6} \Rightarrow x^2 + 2x - 63 = 0$ — 2

$(x+9)(x-7) = 0$ — 2

$x = -9,\ 7$ — 1

$x^2 + 2x - 63 = 0; x = -9,\ 7$

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.

Q37 MCQ · 1 mark — **2023** – 430/C/1, 430/C/2, 430/C/3

The roots of the quadratic equation $x^2 + px - q = 0$ are equal, if :

(A) $p^2 = 4q$
(B) $p^2 = -4q$
(C) $p^2 = 2q$
(D) $p^2 = -2q$

ANSWER **(B) $p^2 = -4q$**

Q38 MCQ · 1 mark — **2023** – 430/C/B

The non-zero value of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots, is :

(A) 1
(B) 8
(C) 4
(D) -8

ANSWER **(B) 8**

Q39 MCQ · 1 mark — **2023** – 430(B)

If the equation $9x^2 + 12x + k = 0$ has equal roots, then both the roots are equal to :

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

ANSWER *

Equal roots: each root $= -\frac{b}{2a} = -\frac{12}{18} = -\frac{2}{3}$

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

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Q40 MCQ · 1 mark — **2023** – 430/1/1, 430/1/2, 430/1/3

The discriminant of the quadratic equation $2x^2 - 5x - 3 = 0$ is

(A) 1
(B) 49
(C) 7
(D) 19

ANSWER *

$D = (-5)^2 - 4(2)(-3) = 25 + 24 = 49$

(B) 49

Q41 MCQ · 1 mark — **2023** – 430/2/1, 430/2/2, 430/2/3

If the quadratic equation $9x^2 + bx + \frac{1}{4} = 0$ has equal roots, then the value of b is :

(A) 0
(B) -3 only
(C) 3 only
(D) ± 3

ANSWER *

$D = b^2 - 4(9)\left(\frac{1}{4}\right) = b^2 - 9 = 0 \Rightarrow b = \pm 3$

(D) ± 3

Q42 MCQ · 1 mark — **2023** – 430/4/1, 430/4/2, 430/4/3

Which of the following is **not** a quadratic equation ?

(A) $2(x-1)^2 = 4x^2 - 2x + 1$
(B) $2x - x^2 = x^2 + 5$
(C) $(\sqrt{2}x + \sqrt{3})^2 + x^2 = 3x^2 - 5x$
(D) $(x^2 + 2x)^2 = x^4 + 3 + 4x^3$

ANSWER *
(c): $2x^2 + 2\sqrt{6}x + 3 + x^2 = 3x^2 - 5x \Rightarrow (2\sqrt{6} + 5)x + 3 = 0$, which is linear.
(C) $(\sqrt{2}x + \sqrt{3})^2 + x^2 = 3x^2 - 5x$

Q43 MCQ · 1 mark — **2023** – 430/5/1, 430/5/2, 430/5/3

The value(s) of k for which the roots of quadratic equation $x^2 + 4x + k = 0$ are real, is :

(A) $k \geq 4$
(B) $k \leq 4$
(C) $k \geq -4$
(D) $k \leq -4$

ANSWER *
$D = 16 - 4k \geq 0 \Rightarrow k \leq 4$
(B) $k \leq 4$

Q44 MCQ · 1 mark — **2023** – 430/5/1, 430/5/2, 430/5/3

The two roots of the equation $3x^2 - 2\sqrt{6}x + 2 = 0$ are :

(A) real and distinct
(B) not real
(C) real and equal
(D) rational

ANSWER *
$D = (2\sqrt{6})^2 - 4(3)(2) = 24 - 24 = 0$
(C) real and equal

Q45 MCQ · 1 mark — **2024** – 430/S/1

The equation $3x^2 + 12 = 0$ has :

(A) real and distinct roots
(B) no real roots
(C) real and equal roots
(D) roots which are reciprocal of each other

ANSWER **(B) no real roots**

Q46 MCQ · 1 mark — **2024** – 430/S/3

The equation $4x^2 - 25 = 0$ has :

(A) no real roots
(B) real and equal roots
(C) real and distinct roots
(D) real roots of same sign

ANSWER **(C) real and distinct roots**

Q47 MCQ · 1 mark — **2024** – 430(B)/S

Which one of the following equations does **not** have real roots ?

(A) $x^2 - 2x - 2\sqrt{3} = 0$
(B) $x^2 - 4x + 4\sqrt{2} = 0$
(C) $3x^2 + 4\sqrt{3}x + 3 = 0$
(D) $x^2 - 4x - 2\sqrt{2} = 0$

ANSWER **(B) $x^2 - 4x + 4\sqrt{2} = 0$**

Q48 MCQ · 1 mark — **2024** – 430(B)

The discriminant of the quadratic equation $8x^2 + 2x - 3 = 0$, is :

(A) 100
(B) 92
(C) -92
(D) 96

ANSWER *
$D = 4 + 96 = 100$
(A) 100

Q49 MCQ · 1 mark — **2024** – 430/1/1, 430/1/2, 430/1/3

If the roots of quadratic equation $4x^2 - 5x + k = 0$ are real and equal, then value of k is :

(A) $\frac{5}{4}$
(B) $\frac{25}{16}$
(C) $-\frac{5}{4}$
(D) $-\frac{25}{16}$

ANSWER *
$25 - 16k = 0 \Rightarrow k = \frac{25}{16}$
(B) $\frac{25}{16}$

Q50 MCQ · 1 mark — **2024** – 430/3/2, 430/3/3

The value(s) of k for which the quadratic equation $5x^2 - 9kx + 5 = 0$ has real and equal roots, is/are :

(A) $\frac{-10}{9}$
(B) $\pm\frac{9}{10}$
(C) $\frac{10}{9}$
(D) $\pm\frac{10}{9}$

ANSWER *
$81k^2 - 100 = 0 \Rightarrow k = \pm\frac{10}{9}$
(D) $\pm\frac{10}{9}$

Q51 MCQ · 1 mark — **2024** – 430/4/1, 430/4/2, 430/4/3

Which of the following is **not** a quadratic equation ?

(A) $(x-2)^2 + 1 = 2x - 3$
(B) $(2x-1)(x-3) = (x+5)(x-1)$

(C) $x(x+1)+8=(x+2)(x-2)$
(D) $2x+\frac{3}{x}=5$

ANSWER *
(C): $x^2+x+8=x^2-4 \Rightarrow x+12=0$, which is linear.
(C) $x(x+1)+8=(x+2)(x-2)$

Q52 MCQ · 1 mark — **2024** – 430/5/1, 430/5/2

The discriminant of the quadratic equation $x^2-4x+3=0$ is :

(A) 28
(B) -8
(C) 4
(D) 2

ANSWER *
$D=16-12=4$
(C) 4

Q53 MCQ · 1 mark — **2024** – 430/5/3

The roots of the quadratic equation $ax^2+bx+c=0$ are real and distinct, if :

(A) $b^2-4ac>0$
(B) $b^2-4ac=0$
(C) $b^2-4ac<0$
(D) $b^2-4ac\geq 0$

ANSWER *
Real and distinct roots when $D>0$.
(A) $b^2-4ac>0$

Q54 MCQ · 1 mark — **2025** – 430(B)

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

(A) 2
(B) 3
(C) 4
(D) 5

ANSWER *
$x^2+2kx+(k^2-k+2)=0$; $D=4k^2-4(k^2-k+2)=4k-8=0 \Rightarrow k=2$
(A) 2

Q55 MCQ · 1 mark — **2025** – 430(B)

The number of possible solutions of a quadratic equation are

(A) exactly two
(B) atmost two
(C) atleast two
(D) atleast one

ANSWER *
A quadratic equation has at most two roots.
(B) atmost two

Q56 MCQ · 1 mark — **2025** – 430/1/1

The discriminant of the quadratic equation $x^2 - 3x - 2 = 0$ is :

(A) 1
(B) 17
(C) $\sqrt{17}$
(D) $-\sqrt{17}$

ANSWER *
$D = 9 + 8 = 17$

(B) 17

Q57 MCQ · 1 mark — **2025** – 430/1/2

The discriminant of the quadratic equation $-x^2 - 5x + 6 = 0$ is :

(A) 1
(B) -1
(C) 49
(D) 7

ANSWER *
$D = 25 - 4(-1)(6) = 25 + 24 = 49$

(C) 49

Q58 MCQ · 1 mark — **2025** – 430/1/3

The discriminant of the quadratic equation $2x^2 - 3x - 5 = 0$ is :

(A) -31
(B) 49
(C) 7
(D) $\sqrt{-31}$

ANSWER *
$D = 9 + 40 = 49$

(B) 49

Q59 MCQ · 1 mark — **2025** – 430/2/1

The value of 'a' for which $ax^2 + 3x + 1 = 0$ has real and equal roots is :

(A) $\frac{4}{9}$
(B) $\frac{9}{4}$
(C) $\frac{3}{2}$
(D) $\frac{2}{3}$

ANSWER *
$9 - 4a = 0 \Rightarrow a = \frac{9}{4}$

(B) $\frac{9}{4}$

Q60 MCQ · 1 mark — **2025** – 430/2/1, 430/2/2, 430/2/3

Which of the following equations is a quadratic equation ?

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

ANSWER *

(B): $x^2 + x - 2 = 2x + 1 \Rightarrow x^2 - x - 3 = 0$, a quadratic equation.

(B) $(x-1)(x+2) = 2x+1$

Q61 MCQ · 1 mark **2025** – 430/2/2

The value of 'a' for which the equation $x^2 + 3x + a = 0$ has real and equal roots is :

(A) $\frac{4}{9}$ (B) $\frac{9}{4}$

(C) $\frac{3}{2}$ (D) $\frac{2}{3}$

ANSWER *

$9 - 4a = 0 \Rightarrow a = \frac{9}{4}$

(B) $\frac{9}{4}$

Q62 MCQ · 1 mark **2025** – 430/2/3

One of the values of 'p' for which $px^2 + 4x + p = 0$ has real and equal roots is :

(A) 4 (B) -4

(C) 2 (D) 0

ANSWER *

$16 - 4p^2 = 0 \Rightarrow p = \pm 2$; of the options, 2

(C) 2

Q63 MCQ · 1 mark **2025** – 430/5/1, 430/5/3

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

(A) 0 (B) $\frac{3}{4}$

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

ANSWER *

$D = 16k^2 - 24k = 8k(2k-3) = 0 \Rightarrow k = 0$ or $\frac{3}{2}$; of the options, 0

(A) 0

Q64 MCQ · 1 mark **2025** – 430/5/2

The value of k for which roots of quadratic equation $kx(x-2) + 6 = 0$ are real and equal, is

(A) 0 only (B) 0, 6

(C) 6 only (D) -6 only

ANSWER *

$kx^2 - 2kx + 6 = 0$; $4k^2 - 24k = 0 \Rightarrow k = 0$ or 6; $k \neq 0$ (else not quadratic)

(C) 6 only

Q65 MCQ · 1 mark **2026 (I)** – 430/4/1, 430/4/3

The value of k for which the equation $2kx^2 - 6x + 3 = 0$ has real and equal roots, is :

(A) $\frac{3}{2}$
(B) $\frac{1}{2}$
(C) $-\frac{3}{2}$
(D) 2

ANSWER *

$36 - 24k = 0 \Rightarrow k = \frac{3}{2}$

(A) $\frac{3}{2}$

Q66 MCQ · 1 mark **2026 (I)** – 430/4/2

The value of k for which the equation $5x^2 - 2x + k = 0$ has equal real roots, is :

(A) 5
(B) $-\frac{1}{5}$
(C) $\frac{1}{5}$
(D) 0

ANSWER *

$4 - 20k = 0 \Rightarrow k = \frac{1}{5}$

(C) $\frac{1}{5}$

Q67 MCQ · 1 mark **2026 (I)** – 430/5/1, 430/5/2, 430/5/3

The roots of the quadratic equation $x^2 + 9 = 0$ are

(A) real and equal
(B) not real
(C) real and negative of each other
(D) rational numbers

ANSWER *

$D = 0 - 36 < 0$

(B) not real

Q68 MCQ · 1 mark **2026 (II)** – 430/7/1, 430/7/2, 430/7/3

The quadratic equation $4x^2 + 8n = 0$ has real and distinct roots. Which of the following is true for the value of n ?

(A) $n = \frac{1}{2}$
(B) $n > 4$
(C) $n = 2$
(D) $n < 0$

ANSWER **(D) $n < 0$**

Q69 MCQ · 1 mark **2026 (II)** – 430/8/1, 430/8/2, 430/8/3

The quadratic equation $2x^2 - \sqrt{5}x + 1 = 0$ has

(A) two distinct real roots.
(B) two equal real roots.
(C) no real roots.
(D) more than two real roots.

ANSWER **(C) no real roots.**

Q70 MCQ · 1 mark — **2026 (II)** – 430(B)

The value of 'a' for which the quadratic equation $(a+1)x^2+2(a-1)x+(a-2)=0$ has real and equal roots, is :

(A) 2 (B) 3
(C) 0 (D) -3

ANSWER **(B) 3**

Q71 Assertion–Reason · 1 mark — **2023** – 430/4/1, 430/4/2, 430/4/3

Assertion (A) : If one root of the quadratic equation $4x^2-10x+(k-4)=0$ is reciprocal of the other, then value of k is 8.
Reason (R) : Roots of the quadratic equation $x^2-x+1=0$ are real.

(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 *
Product of roots $=1 \Rightarrow \frac{k-4}{4}=1 \Rightarrow k=8$: A is true.
For $x^2-x+1=0$, $D=1-4=-3<0$: roots are not real, R is false.

(C) Assertion (A) is true, but Reason (R) is false.

Q72 Assertion–Reason · 1 mark — **2025** – 430/3/1, 430/3/2, 430/3/3

Assertion (A) : Every quadratic equation has two real roots.
Reason (R) : A quadratic polynomial can have at most two zeroes.

(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 *
E.g. $x^2+1=0$ has no real roots, so A is false; R is true.

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

Q73 Very Short Answer · 2 marks · Internal choice (OR) part — **2022** – 430/6/1, 430/6/2

Find the value of 'k' for which the quadratic equation $9x^2+8kx+16=0$ has real and equal roots.

ANSWER
$D=64k^2-576$ ½
For real and equal roots, $D=0 \Rightarrow 64k^2-576=0$ ½
$k=\pm 3$ 1

$k=\pm 3$

Q74 Very Short Answer · 2 marks **2022** – 430/B/6

Find the value of k for the quadratic equation $kx^2 - 4kx + 12 = 0$ to have two real and equal roots.

ANSWER

For two real and equal roots, $D = 0$: $16k^2 - 48k = 0$ or $k^2 - 3k = 0$ — 1

$k = 3,\ k = 0$ — ½

Rejecting $k = 0$, $k = 3$ — ½

$k = 3$

Q75 Very Short Answer · 2 marks | Internal choice (OR) part **2022** – 430/1/1, 430/1/2, 430/1/3

Find the nature of the roots of the quadratic equation $x^2 - 5x + 9 = 0$.

ANSWER *

$D = b^2 - 4ac = (-5)^2 - 4(1)(9) = 25 - 36 = -11$

$D < 0$, so the equation has no real roots.

No real roots

Q76 Very Short Answer · 2 marks **2022** – 430/2/1, 430/2/3

Find the nature of the roots of the quadratic equation : $4x^2 - 5x - 1 = 0$

ANSWER *

$D = (-5)^2 - 4(4)(-1) = 25 + 16 = 41$

$D > 0$, so the equation has two distinct real roots.

Two distinct real roots

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Q77 Very Short Answer · 2 marks | Internal choice (OR) part **2022** – 430/3/1, 430/3/2, 430/3/3

For what value of p, does the quadratic equation $px^2 + 2x + p = 0$ have real and equal roots ?

ANSWER *

For real and equal roots, $D = 0$: $4 - 4p^2 = 0$

$p^2 = 1 \Rightarrow p = \pm 1$

$p = \pm 1$

Q78 Very Short Answer · 2 marks **2022** – 430/4/1

Find the value of 'k' so that the quadratic equation $3x^2 - 5x - 2k = 0$ has real and equal roots.

ANSWER *

$D = 25 - 4(3)(-2k) = 25 + 24k$

$D = 0 \Rightarrow k = -\frac{25}{24}$

$k = -\frac{25}{24}$

Q79 Very Short Answer · 2 marks **2022** – 430/4/2

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

ANSWER *

$D = a^2 - 4 = 0$

$a = \pm 2$

$a = \pm 2$

Q80 Very Short Answer · 2 marks Internal choice (OR) part **2023** – 430/4/1, 430/4/2, 430/4/3

Find the discriminant of the quadratic equation $3x^2 - 2x + \frac{1}{3} = 0$ and hence find the nature of its roots.

ANSWER *

$D = (-2)^2 - 4(3)\left(\frac{1}{3}\right) = 4 - 4 = 0$

$D = 0$: the roots are real and equal.

$D = 0$; **two equal real roots**

Q81 Very Short Answer · 2 marks Internal choice (OR) part **2023** – 430/6/1, 430/6/2, 430/6/3

Find the value of k for which the roots of the quadratic equation $5x^2 - 10x + k = 0$ are real and equal.

ANSWER *

$D = 100 - 20k = 0$

$k = 5$

$k = 5$

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Q82 Very Short Answer · 2 marks Internal choice (OR) part **2023** – 430/6/1, 430/6/2, 430/6/3

If one root of the quadratic equation $3x^2 - 8x - (2k + 1) = 0$ is seven times the other, then find the value of k.

ANSWER *

Let the roots be $\alpha,\ 7\alpha$: $8\alpha = \frac{8}{3} \Rightarrow \alpha = \frac{1}{3}$

Product $7\alpha^2 = \frac{7}{9} = -\frac{2k+1}{3} \Rightarrow 2k + 1 = -\frac{7}{3} \Rightarrow k = -\frac{5}{3}$

$k = -\frac{5}{3}$

Q83 Very Short Answer · 2 marks Internal choice (OR) part **2025** – 430/6/1, 430/6/2

Find the nature of roots of the equation $3x^2 - 4\sqrt{3}x + 4 = 0$.

ANSWER *

$D = (4\sqrt{3})^2 - 4(3)(4) = 48 - 48 = 0$

The roots are real and equal.

Two equal real roots

Q84 Very Short Answer · 2 marks | Internal choice (OR) part | **2025** – 430/6/3

Find the nature of roots of the equation $4x^2 - 4a^2x + a^4 - b^4 = 0, b \neq 0$

ANSWER *

$D = 16a^4 - 16(a^4 - b^4) = 16b^4$

$b \neq 0 \Rightarrow D > 0$: two distinct real roots

Two distinct real roots

Q85 Short Answer · 3 marks | Internal choice (OR) part | **2024** – 430/4/1, 430/4/2, 430/4/3

Using quadratic formula, find the real roots of the equation $2x^2 + 2x + 9 = 0$, if they exist.

ANSWER *

$a = 2,\ b = 2,\ c = 9$

$D = b^2 - 4ac = 4 - 72 = -68 < 0$

Since $D < 0$, real roots do not exist.

No real roots exist

Q86 Short Answer · 3 marks | Internal choice (OR) part | **2024** – 430/4/1, 430/4/2, 430/4/3

Find the values of 'k' for which the quadratic equation $kx^2 - 2kx + 6 = 0$ has real and equal roots. Also, find the roots.

ANSWER *

$D = 4k^2 - 24k = 0 \Rightarrow 4k(k - 6) = 0$

$k \neq 0$ (else not quadratic), so $k = 6$

$6x^2 - 12x + 6 = 0 \Rightarrow (x - 1)^2 = 0 \Rightarrow x = 1,\ 1$

$k = 6$; **roots** $1,\ 1$

Q87 Long Answer · 5 marks | Internal choice (OR) part | **2023** – 430/5/1

Find all the values of k for which the quadratic equation $2x^2 + kx + 8 = 0$ has equal roots. Also, find the roots.

ANSWER *

Equal roots: $D = k^2 - 64 = 0 \Rightarrow k = \pm 8$

$k = 8$: $2x^2 + 8x + 8 = 0 \Rightarrow (x + 2)^2 = 0 \Rightarrow x = -2,\ -2$

$k = -8$: $2x^2 - 8x + 8 = 0 \Rightarrow (x - 2)^2 = 0 \Rightarrow x = 2,\ 2$

$k = \pm 8$; **roots** $-2, -2$ **(for** $k = 8$**) and** $2, 2$ **(for** $k = -8$**)**

Q88 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 430/1/1, 430/1/2, 430/1/3

Find the value(s) of k for which the equation $2x^2 + kx + 3 = 0$ has real and equal roots. Hence, find the

roots of the equations so obtained.

ANSWER *

$D = k^2 - 24 = 0 \Rightarrow k = \pm 2\sqrt{6}$

Equal roots: $x = -\frac{k}{2a} = -\frac{k}{4}$

$k = 2\sqrt{6}$: $x = -\frac{\sqrt{6}}{2}, -\frac{\sqrt{6}}{2}$

$k = -2\sqrt{6}$: $x = \frac{\sqrt{6}}{2}, \frac{\sqrt{6}}{2}$

$k = \pm 2\sqrt{6}$; **roots** $-\frac{\sqrt{6}}{2}, -\frac{\sqrt{6}}{2}$ **(for** $k = 2\sqrt{6}$**) and** $\frac{\sqrt{6}}{2}, \frac{\sqrt{6}}{2}$ **(for** $k = -2\sqrt{6}$**)**

Q89 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 430/4/1, 430/4/2, 430/4/3

It is given that $p^2x^2 + (p^2 - q^2)x - q^2 = 0; (p \neq 0)$ (i) Show that the discriminant (D) of above equation is a perfect square. (ii) Find the roots of the equation.

ANSWER *

(i) $D = (p^2 - q^2)^2 + 4p^2q^2 = (p^2 + q^2)^2$, a perfect square

(ii) $x = \frac{-(p^2 - q^2) \pm (p^2 + q^2)}{2p^2}$

$x = \frac{2q^2}{2p^2} = \frac{q^2}{p^2}$ or $x = \frac{-2p^2}{2p^2} = -1$

$D = (p^2 + q^2)^2$; **roots** $\frac{q^2}{p^2}, -1$

Q90 Long Answer · 5 marks | **2026 (II)** – 430(B)

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

ANSWER

For real and equal roots, $D = 0$: $36 - 12\frac{(a+9)}{(a+1)} = 0$ — 2

$a = 3$ — 1

Now, $x^2 - 6x + 9 = 0 \Rightarrow (x - 3)(x - 3) = 0$ — 1

$x = 3, 3$ — 1

$a = 3$; **roots** $3, 3$

03 TOPIC 3 Word Problems on Quadratic Equations

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 $2x + 1, 2x + 3$.

Q91 Short Answer · 3 marks · Internal choice (OR) part — **2022** – 430/B/6

The difference of squares of two numbers is 192. The square of the smaller number is 4 times the greater number. Find the two numbers.

ANSWER

Let the numbers be x and y, $x > y$. $x^2 - y^2 = 192$, $y^2 = 4x$ — 1

$x^2 - 4x - 192 = 0$ — 1

$(x + 12)(x - 16) = 0 \Rightarrow x = 16$ (rejecting -12); $x = 16,\ y = 8$ — 1

The numbers are 16 and 8.

Q92 Short Answer · 3 marks · Internal choice (OR) part — **2022** – 430/B/6

Find the two numbers whose sum is 20 and product is 96, by formulating a quadratic equation.

ANSWER

Let the numbers be x and y: $x + y = 20$, $xy = 96$ — ½

$x(20 - x) = 96 \Rightarrow x^2 - 20x + 96 = 0$ — 1

$(x - 12)(x - 8) = 0$ — 1

The numbers are 12 and 8 — ½

The numbers are 12 and 8.

Q93 Short Answer · 3 marks · Internal choice (OR) part — **2022** – 430/4/1, 430/4/2, 430/4/3

The length of a rectangular park is 5 metres more than twice its breadth. If the area of the park is 250 sq m, find the length and breadth of the park.

ANSWER *

Let the breadth be x m; length $= (2x + 5)$ m. $x(2x + 5) = 250$

$2x^2 + 5x - 250 = 0 \Rightarrow (2x + 25)(x - 10) = 0$

$x = 10$ (rejecting $-\frac{25}{2}$); breadth $= 10$ m, length $= 25$ m

Breadth = 10 m, length = 25 m

Q94 Short Answer · 3 marks — **2022** – 430/B/5

The altitude of a right triangle is 7 cm less than its base. If the length of the hypotenuse is 13 cm, then find the length of the other two sides.

ANSWER *

Let the base be x cm; altitude $= (x - 7)$ cm. $x^2 + (x - 7)^2 = 13^2$

$2x^2 - 14x - 120 = 0 \Rightarrow x^2 - 7x - 60 = 0 \Rightarrow (x - 12)(x + 5) = 0$

$x = 12$ (rejecting -5); base $= 12$ cm, altitude $= 5$ cm

Base = 12 cm, altitude = 5 cm

Q95 Short Answer · 3 marks — **2023** – 430/C/1, 430/C/3

Sum of the areas of two squares is 468 m^2. If the difference between their sides is 6 m, then find the sides

of the two squares.

ANSWER

Let the sides of the two squares be x and $x+6$. $x^2+(x+6)^2=468$ — 1

$\Rightarrow 2x^2+12x-432=0$ or $x^2+6x-216=0 \Rightarrow (x+18)(x-12)=0$

$\Rightarrow x=12$ or $x=-18$ (rejecting) — 1½

Sides of two squares are 12 m and 18 m. — ½

Sides of two squares are 12 m and 18 m.

Q96 Short Answer · 3 marks — **2023** – 430/C/2

The length of a rectangular field is 30 m more than its breadth and the diagonal is 60 m more than its breadth. Find the dimensions of the field.

ANSWER

Let breadth of the field $= x$ m. $\therefore$ Length $= (x+30)$ m and diagonal $= (x+60)$ m — 1

By Pythagoras theorem, $(30+x)^2+x^2=(60+x)^2$ — ½

$\Rightarrow x^2-60x-2700=0$ — ½

$\Rightarrow (x-90)(x+30)=0$ — ½

$\Rightarrow x=90$ (rejecting $x=-30$); $\therefore$ Length $=120$ m and breadth $=90$ m — ½

Length = 120 m and breadth = 90 m

Q97 Short Answer · 3 marks — **2023** – 430/6/1, 430/6/2

The sum of the reciprocals of Varun's age (in years) 3 years ago and 5 years from now is $\frac{1}{3}$. Find his present age.

ANSWER *

Let the present age be x years: $\frac{1}{x-3}+\frac{1}{x+5}=\frac{1}{3}$

$x^2-4x-21=0 \Rightarrow (x-7)(x+3)=0$

$x=7$ (age cannot be negative)

Present age = 7 years

Q98 Short Answer · 3 marks — **2024** – 430(B)/S

The product of the digits of a 2-digit number is 18. When 27 is subtracted from the number, the digits interchange their places. Find the number.

ANSWER

Let one's digit be x and ten's digit be y. $xy=18$ ...(i) — ½

Original number $=10y+x$; number obtained on reversing the digits $=10x+y$. $10y+x-27=10x+y \Rightarrow y-x=3$ ...(ii) — ½

From (i) and (ii), $x^2+3x-18=0 \Rightarrow (x+6)(x-3)=0$ — 1

Solving to get, $x=3$ (rejecting $x=-6$) and $y=6$ — ½

Required number = 63 — ½

Required number = 63

Q99 Short Answer · 3 marks — **2024** – 430/3/2, 430/3/3

The altitude of a right-angled triangle is 7 cm less than its base. If its hypotenuse is 17 cm long, then (a) represent the above information in the form of a quadratic equation; (b) find the length of the sides of the triangle.

ANSWER *

(a) Let the base be x cm; altitude $(x-7)$ cm: $x^2+(x-7)^2=17^2 \Rightarrow x^2-7x-120=0$

(b) $(x-15)(x+8)=0 \Rightarrow x=15$

Base = 15 cm, altitude = 8 cm, hypotenuse = 17 cm

Base 15 cm, altitude 8 cm

Q100 Short Answer · 3 marks — **2025** – 430(B)

A takes 6 days less than the time taken by B to finish a piece of work. If both A and B together can finish the work in 4 days, find the time taken by B alone to finish the work.

ANSWER *

Let B take x days; A takes $(x-6)$ days: $\frac{1}{x}+\frac{1}{x-6}=\frac{1}{4}$

$4(2x-6)=x^2-6x \Rightarrow x^2-14x+24=0 \Rightarrow (x-12)(x-2)=0$

$x=2$ gives A a negative time, so $x=12$ days

B alone takes 12 days.

Q101 Short Answer · 3 marks — **2025** – 430/5/2

A rectangular field is 16 m long and 10 m wide. There is a path of equal width all around it, having an area of 120 sq.m. Find the width of the path.

ANSWER *

Let the width be x m: $(16+2x)(10+2x)-160=120$

$4x^2+52x-120=0 \Rightarrow x^2+13x-30=0$

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

Width of the path = 2 m

Q102 Short Answer · 3 marks — **2025** – 430/5/3

The sum of the squares of two consecutive odd numbers is 514. Find the numbers.

ANSWER *

Let the numbers be x and $x+2$: $x^2+(x+2)^2=514 \Rightarrow x^2+2x-255=0$

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

Numbers: 15 and 17, or -17 and -15

15 and 17, or -17 and -15

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Q103 Short Answer · 3 marks — **2025** – 430/5/1

The sum of the squares of two consecutive even numbers is 452. Find the numbers.

ANSWER *

Let the numbers be x and $x+2$: $x^2+(x+2)^2=452 \Rightarrow x^2+2x-224=0$

$(x+16)(x-14)=0 \Rightarrow x=14$ or -16

Numbers: 14 and 16, or -16 and -14

14 and 16, or -16 and -14

Q104 Short Answer · 3 marks — **2025** – 430/6/1, 430/6/3

Find length and breadth of a rectangular park whose perimeter is 100 m and area is 600 m^2.

ANSWER *

Let the length be x m; breadth $=(50-x)$ m: $x(50-x)=600$

$x^2-50x+600=0 \Rightarrow (x-30)(x-20)=0$

Length = 30 m, breadth = 20 m

Length 30 m, breadth 20 m

Q105 Short Answer · 3 marks — **2025** – 430/6/2

The sum of a number and its reciprocal is $\frac{13}{6}$. Find the number.

ANSWER *

$x+\frac{1}{x}=\frac{13}{6} \Rightarrow 6x^2-13x+6=0$

$(3x-2)(2x-3)=0$

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

$\frac{3}{2}$ or $\frac{2}{3}$

Q106 Long Answer · 4 marks — **2022** – 430/2/1, 430/2/2

The sum of the ages of a boy and his sister (in years) is 25 and product of their ages is 150. Find their present ages.

ANSWER *

Let the age of the boy be x years; sister $=(25-x)$ years

$x(25-x)=150 \Rightarrow x^2-25x+150=0$

$(x-10)(x-15)=0 \Rightarrow x=10$ or 15

Ages are 10 years and 15 years (either may be the boy's age)

Their present ages are 10 years and 15 years.

Q107 Long Answer · 4 marks — **2022** – 430/2/3

The sum of two numbers is 45. If 5 is subtracted from each of them, the product of these numbers

becomes 124. Find the numbers.

ANSWER *

Let the numbers be x and $45 - x$. $(x - 5)(40 - x) = 124$

$\Rightarrow -x^2 + 45x - 200 = 124 \Rightarrow x^2 - 45x + 324 = 0$

$(x - 36)(x - 9) = 0 \Rightarrow x = 36$ or 9

The numbers are 36 and 9

The numbers are 36 and 9.

Q108 Long Answer · 5 marks Internal choice (OR) part **2023** – 430/C/B, 430/1/2

A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.

ANSWER

Let the speed of the train be x km/h. $\frac{360}{x} - \frac{360}{x+5} = 1$ 1½

$\Rightarrow x^2 + 5x - 1800 = 0$ 1½

$\Rightarrow (x + 45)(x - 40) = 0$ 1

$\Rightarrow x = -45,\ 40$ ½

Speed of train is 40 km/h (rejecting −45) ½

Speed of train is 40 km/h

Q109 Long Answer · 5 marks Internal choice (OR) part **2023** – 430/1/1, 430/1/3

The sum of the ages of a father and his son is 45 years. Five years ago, the product of their ages (in years) was 124. Determine their present age.

ANSWER *

Let the father's present age be x years; son's $= (45 - x)$ years

Five years ago: $(x - 5)(40 - x) = 124 \Rightarrow -x^2 + 45x - 200 = 124$

$x^2 - 45x + 324 = 0 \Rightarrow (x - 36)(x - 9) = 0$

$x = 36$ (father must be older); father 36 years, son 9 years

Father 36 years, son 9 years

Q110 Long Answer · 5 marks Internal choice (OR) part **2023** – 430/1/2

The sum of reciprocals of Roohi's age (in years) 3 years ago and 5 years hence from now is $\frac{1}{3}$. Find her present age.

ANSWER *

Let the present age be x years: $\frac{1}{x-3} + \frac{1}{x+5} = \frac{1}{3}$

$3(2x + 2) = (x - 3)(x + 5) \Rightarrow 6x + 6 = x^2 + 2x - 15$

$x^2 - 4x - 21 = 0 \Rightarrow (x - 7)(x + 3) = 0$

$x = 7$ (age cannot be negative)

Present age = 7 years

Q111 Long Answer · 5 marks · Internal choice (OR) part · **2023** – 430/5/1

The difference of two numbers is 5 and the difference of their reciprocals is $\frac{1}{10}$. Find the numbers.

ANSWER *

Let the numbers be x and $x-5$: $\frac{1}{x-5}-\frac{1}{x}=\frac{1}{10}$

$\frac{5}{x(x-5)}=\frac{1}{10} \Rightarrow x^2-5x-50=0$

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

Numbers are 10 and 5, or -5 and -10

10 and 5 (or -5 and -10)

Q112 Long Answer · 5 marks · Internal choice (OR) part · **2023** – 430/5/2

A 2-digit number is four times the sum of its digits and twice the product of its digits. Find the number.

ANSWER *

Let ten's digit be x and unit's digit y: $10x+y=4(x+y) \Rightarrow y=2x$

$10x+y=2xy \Rightarrow 12x=4x^2$

$x \neq 0 \Rightarrow x=3, y=6$

The number is 36

The number is 36.

Q113 Long Answer · 5 marks · Internal choice (OR) part · **2023** – 430/5/2

The length of the rectangle exceeds its breadth by 8 cm and the area of the rectangle is 240 cm^2. Find the dimensions of the rectangle.

ANSWER *

Let the breadth be x cm; length $=(x+8)$ cm: $x(x+8)=240$

$x^2+8x-240=0 \Rightarrow (x+20)(x-12)=0$

$x=12$ (breadth cannot be negative); length $=20$ cm, breadth $=12$ cm

Length 20 cm, breadth 12 cm

Q114 Long Answer · 5 marks · Internal choice (OR) part · **2023** – 430/5/3

Divide 16 into two parts such that twice the square of the greater part, exceeds the square of the smaller part by 164.

ANSWER *

Let the greater part be x; smaller $=16-x$: $2x^2-(16-x)^2=164$

$x^2+32x-420=0 \Rightarrow (x+42)(x-10)=0$

$x=10$; the parts are 10 and 6

The parts are 10 and 6.

Q115 Long Answer · 5 marks | Internal choice (OR) part | **2023** – 430/5/3

A motor boat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream, than to return to the same point. Find the speed of the stream and total time of the journey.

ANSWER *

Let the speed of the stream be x km/h: $\frac{24}{18-x} - \frac{24}{18+x} = 1$

$48x = 324 - x^2 \Rightarrow x^2 + 48x - 324 = 0$

$(x+54)(x-6) = 0 \Rightarrow x = 6$ km/h

Total time $= \frac{24}{12} + \frac{24}{24} = 2 + 1 = 3$ hours

Speed of the stream 6 km/h; total time 3 hours

Q116 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 430/S/1

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 reduced speed of the train. Also, find the original speed.

ANSWER

Let original speed of the train be x km/h; $\therefore$ reduced speed $= (x-8)$ km/h — ½

$\frac{480}{x-8} - \frac{480}{x} = 3$ — 1

$\Rightarrow x^2 - 8x - 1280 = 0$ — 1

$\Rightarrow (x-40)(x+32) = 0$ — 1

$\Rightarrow x = 40$ and $x = -32$ (rejected) — 1

Original speed = 40 km/h; Reduced speed = 32 km/h — ½

Original speed 40 km/h, reduced speed 32 km/h

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Q117 Long Answer · 5 marks | Internal choice (OR) part | **2024** – 430/S/2

The difference of squares of two positive integers is 400. Find the integers if twice of the smaller integer is 5 more than the greater integer.

ANSWER

Let the smaller positive integer be x; then the greater positive integer $= 2x - 5$ — 1

$(2x-5)^2 - x^2 = 400$ — 1

$\Rightarrow 3x^2 - 20x - 375 = 0 \Rightarrow (x-15)(3x+25) = 0$ — 1½

$\Rightarrow x = 15,\ x = -\frac{25}{3}$ (rejected) — 1

$\therefore$ numbers are 15 and 25 — ½

Numbers are 15 and 25

Q118 Long Answer · 5 marks **2024** – 430/S/3

Find two consecutive even positive integers, sum of whose squares is 884.

ANSWER

Let the consecutive even positive integers be x and $x+2$ — 1

$x^2+(x+2)^2=884$ — 1

$\Rightarrow x^2+2x-440=0 \Rightarrow (x-20)(x+22)=0$ — 1½

$\Rightarrow x=20,\ x=-22$ (Rejected) — 1

$\therefore$ Numbers are 20 and 22 — ½

Numbers are 20 and 22

Q119 Long Answer · 5 marks **2024** – 430/2/2

A cottage industry produces a certain number of pottery articles in a day. It was observed that on a particular day that the cost of production of each article (in rupees) was 3 more than twice the number of articles produced on that day. If the total cost of production on that day was ₹ 90, find the number of articles produced and the cost of each article.

ANSWER *

Let the number of articles be x; cost of each $= ₹(2x+3)$: $x(2x+3)=90$

$2x^2+3x-90=0 \Rightarrow 2x^2+15x-12x-90=0$

$(2x+15)(x-6)=0 \Rightarrow x=6$ (rejecting $-\frac{15}{2}$)

Articles $=6$; cost of each $=2(6)+3=₹15$

Number of articles = 6; cost of each article = ₹ 15

Q120 Long Answer · 5 marks Internal choice (OR) part **2025** – 430/1/1, 430/1/2, 430/1/3

The difference of the squares of two positive 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: $x^2-y^2=180$, $y^2=8x$

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

$x=18$ (positive); $y^2=144 \Rightarrow y=12$

The numbers are 18 and 12

The numbers are 18 and 12.

Q121 Long Answer · 5 marks Internal choice (OR) part **2025** – 430/2/1, 430/2/2, 430/2/3

The sum of areas of two squares is 2650 cm^2. If the sum of their perimeters is 280 cm, find the sides of the

two given squares.

ANSWER *

Let the sides be x and y: $x^2 + y^2 = 2650$, $4x + 4y = 280 \Rightarrow y = 70 - x$

$x^2 + (70 - x)^2 = 2650 \Rightarrow x^2 - 70x + 1125 = 0$

$(x - 45)(x - 25) = 0 \Rightarrow x = 45$ or 25

Sides are 45 cm and 25 cm

Sides are 45 cm and 25 cm.

Q122 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 430/3/1, 430/3/2, 430/3/3

Find two consecutive odd integers, sum of whose squares is 290.

ANSWER *

Let the integers be x and $x + 2$: $x^2 + (x + 2)^2 = 290$

$2x^2 + 4x - 286 = 0 \Rightarrow x^2 + 2x - 143 = 0$

$(x + 13)(x - 11) = 0 \Rightarrow x = 11$ or $x = -13$

Integers: 11 and 13, or -13 and -11

11 and 13, or -13 and -11

Q123 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 430/3/1, 430/3/2, 430/3/3

A charity trust decides to build a rectangular hall having an area of 300 m^2. The length of the hall is one metre more than twice its width. Find the length and breadth of the hall.

ANSWER *

Let the breadth be x m; length $= (2x + 1)$ m: $x(2x + 1) = 300$

$2x^2 + x - 300 = 0$; $D = 1 + 2400 = 2401 = 49^2$

$x = \dfrac{-1 + 49}{4} = 12$ (rejecting the negative root)

Breadth = 12 m, length = 25 m

Length 25 m, breadth 12 m

Q124 Long Answer · 5 marks | Internal choice (OR) part | **2025** – 430/4/1, 430/4/2, 430/4/3

Three consecutive positive integers are such that the sum of the square of smallest and product of other two is 67. Find the numbers, using quadratic equation.

ANSWER *

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

$2n^2 + 3n - 65 = 0$; $D = 9 + 520 = 529 = 23^2$

$n = \dfrac{-3 + 23}{4} = 5$ (positive)

The numbers are 5, 6 and 7

The numbers are 5, 6 and 7.

Q125 Long Answer · 5 marks · Internal choice (OR) part — **2026 (I)** – 430(B)

A motor boat, whose speed in still water is 20 km/h, takes 1 hour more to go 48 km upstream than to return downstream to the same point. Find the speed of the stream.

ANSWER *

Let the speed of the stream be x km/h: $\frac{48}{20-x} - \frac{48}{20+x} = 1$

$96x = 400 - x^2 \Rightarrow x^2 + 96x - 400 = 0$

$(x + 100)(x - 4) = 0$

$x = 4$ km/h

Speed of the stream = 4 km/h

Q126 Long Answer · 5 marks — **2026 (II)** – 430/7/1, 430/7/2

The length of the diagonal of a rectangular field is 60 m more than the length of its shorter side. If the larger side is 30 m longer than the shorter side, then find the dimensions of the field and hence its area.

ANSWER

Let the shorter side be x m; $\therefore$ longer side is $(x + 30)$ m — ½

Also $x^2 + (x + 30)^2 = (x + 60)^2$ — 1

$\Rightarrow x^2 - 60x - 2700 = 0$ — 1

$\Rightarrow (x - 90)(x + 30) = 0 \Rightarrow x = 90,\ x = -30$ (Rejected) — 1

Longer side = 120 m and Shorter side = 90 m — 1

Area of the field = 10800 m² — ½

Longer side 120 m, shorter side 90 m; area 10800 m²

Q127 Long Answer · 5 marks — **2026 (II)** – 430/8/1, 430/8/2, 430/8/3

The sum of ages of a father and his son is 45 years. Five years ago, the product of their ages (in years) was 124. Determine their ages respectively after five years.

ANSWER

Let Son's present age be x years and Father's present age be $(45 - x)$ years — 1

$(x - 5)(45 - x - 5) = 124$ — 1

$x^2 - 45x + 324 = 0$ — 1

$x = 9,\ 36$ (rejecting $x = 36$) — 1

Son's age after 5 years = 14 and Father's age after 5 years = 41 — 1

Son 14 years, father 41 years (after 5 years)

Q128 Long Answer · 5 marks · Internal choice (OR) part — **2026 (II)** – 430(B)

A motor boat whose speed is 12 km/h in still water goes 45 km downstream and comes back upstream in a

total of 8 hours. Find the speed of the stream.

ANSWER

Let x km/h be the speed of the stream. Downstream speed $= (12 + x)$ km/h — 1

and Upstream speed $= (12 - x)$ km/h — 1

$\frac{45}{12+x} + \frac{45}{12-x} = 8$ — 2

$x^2 = 9 \Rightarrow x = 3$; speed of the stream $= 3$ km/h — 1

Speed of the stream = 3 km/h

Q129 Case Study · 4 marks — **2022** – 430/3/1, 430/3/2, 430/3/3

Case study: The tradition of pottery making in India is very old. In fact, it is older than Indus Valley Civilization. The shaping and baking of clay articles has continued through the ages.
A potter makes a certain number of pottery articles in a day. It was observed on a particular day the cost of production of each article (in ₹) was one more than twice the number of articles produced on that day. The total cost of production on that day was ₹ 210.
(a) Taking number of articles produced on that day as x, form a quadratic equation in x. **[2]**
(b) Find the number of articles produced and the cost of each article. **[2]**

ANSWER *

(a) Cost of each article $= ₹(2x + 1)$; $x(2x + 1) = 210 \Rightarrow 2x^2 + x - 210 = 0$

(b) $2x^2 + 21x - 20x - 210 = 0 \Rightarrow (2x + 21)(x - 10) = 0 \Rightarrow x = 10$ (rejecting $-\frac{21}{2}$)

Number of articles $= 10$; cost of each article $= ₹21$

Q130 Case Study · 4 marks — **2024** – 430(B)/S

Case study: Ashok and Harish are very close friends. They decided to go on a long drive with their families in separate cars. Ashok's car travels at a speed of x km/h, while Harish was driving the car at a speed of 5 km/h faster than Ashok's car. Ashok took 4 hours more than Harish to complete the journey of 400 km.
(i) Find the distance covered by Harish's car in two hours (in terms of x). **[1]**
(ii) Make a quadratic equation describing the speed of Ashok's car. **[1]**
(iii) (a) Find the speed of Ashok's car (in km/h). **[2] OR** (b) Find the speed of Harish's car (in km/h). **[2]**

ANSWER

(i) Required distance covered $= 2(x + 5)$ km — 1

(ii) $\frac{400}{x} - \frac{400}{x+5} = 4 \Rightarrow x^2 + 5x - 500 = 0$ — 1

(iii)(a) $x^2 + 5x - 500 = 0 \Rightarrow (x + 25)(x - 20) = 0 \Rightarrow x = 20$ (Rejecting $x = -25$) — 1

Speed of Ashok's car = 20 km/h — 1

OR (iii)(b) $x^2 + 5x - 500 = 0 \Rightarrow (x + 25)(x - 20) = 0 \Rightarrow x = 20$ — 1½

Speed of Harish's car = 20 + 5 = 25 km/h — ½

(i) 2(x+5) km (ii) $x^2+5x-500=0$ (iii)(a) 20 km/h OR (b) 25 km/h

Q131 Case Study · 4 marks — **2024** – 430(B)

Case study: The speed of a motor boat in still water is 25 km/h. For covering a distance of 40 km, the boat took 40 minutes more to go upstream than downstream.
(i) Let the speed of the stream be x km/h. Express, in terms of x, the speed of the motor boat going

upstream. **[1]**
(ii) Express the above situation in terms of a quadratic equation in x. **[1]**
(iii) (a) Find the speed of the stream. **[2]**
OR
(iii) (b) If the speed of the stream is 10 km/h, how much time will the boat take to cover 40 km upstream ? **[2]**

ANSWER *

(i) Upstream speed $= (25 - x)$ km/h

(ii) $\frac{40}{25-x} - \frac{40}{25+x} = \frac{2}{3} \Rightarrow 240x = 2(625 - x^2) \Rightarrow x^2 + 120x - 625 = 0$

(iii)(a) $(x + 125)(x - 5) = 0 \Rightarrow x = 5$ km/h

OR (iii)(b) Time $= \frac{40}{25-10} = \frac{8}{3}$ h $= 2$ h 40 min

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