



UDAAN



2026

Quadratic Equations

MATHS

LECTURE-4

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Topics *to be covered*



A

More Questions on factorization method

B

Quadratic Formula

#Q. Solve the following quadratic equations by factorization method:

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

$$4x^2 - 2a^2x - 2b^2x + a^2b^2 = 0$$

$$2x[2x - a^2] - b^2[2x - a^2] = 0$$

$$(2x - a^2)(2x - b^2) = 0$$

$$2x - a^2 = 0, \quad 2x - b^2 = 0$$

$$2x = a^2$$

$$x = a^2/2$$

$$2x = b^2$$

$$x = b^2/2$$

#Q. Solve the following quadratic equations by factorization method :

$$a^2b^2x^2 + b^2x - a^2x - 1 = 0$$

$$b^2x[a^2x+1] - 1[a^2x+1] = 0$$

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

$$x = -1/a^2, 1/b^2$$

#Q. Solve the following quadratic equations by factorization method :

$$\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}, a+b \neq 0$$

$$\frac{1}{a+b+x} - \frac{1}{x} = \frac{1}{a} + \frac{1}{b}$$

$$\frac{x - 1(a+b+x)}{(a+b+x)(x)} = \frac{b+a}{ab}$$

$$\frac{x - a - b - x}{ax + bx + x^2} = \frac{a+b}{ab}$$

$$\frac{-a-b}{ax+bx+x^2} = \frac{a+b}{ab}$$

$$\frac{-(a+b)}{ax+bx+x^2} = \frac{a+b}{ab}$$

$$\frac{-1}{ax+bx+x^2} = \frac{1}{ab}$$

$$-ab = ax + bx + x^2$$

$$0 = x^2 + ax + bx + ab$$

$$\underbrace{x^2 + ax} + \underbrace{bx + ab} = 0$$

$$x(x+a) + b(x+a) = 0$$

$$(x+a)(x+b) = 0$$

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

#Q. $\frac{1}{2a + b + 2x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{2x}$

#GPH

A

$$-a, \frac{-b}{2}$$

B

$$-a, \frac{b}{2}$$

C

$$a, \frac{b}{2}$$

D

$$a, \frac{-b}{2}$$

#Q. Solve :

$$x = \frac{1}{2 - \frac{1}{2 - \frac{1}{2 - x}}}, x \neq 2$$

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

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

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

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

$$x = \frac{3 - 2x}{6 - 4x - 2 + x}$$

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

$$x(4 - 3x) = 3 - 2x$$

$$4x - 3x^2 = 3 - 2x$$

$$-3x^2 + 6x - 3 = 0$$

$$-3[x^2 - 2x + 1] = 0$$

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

#HOT



#Q. Solve the following quadratic equations by factorization method:

$$\sqrt{2 + \sqrt{2 + \sqrt{2 + \dots}}} = x$$

$$2 + x = x^2$$

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

Sum = -1, product = -2

$$(-2, 1)$$

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

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

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

$$x = 2, -1$$

$$\sqrt{2+x} = x$$

S.B.S

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

A 1, 2

B 2

C -1, -2

D None of the above

$$\sqrt{4} = 2$$

~~$$\begin{aligned}(2)^2 &= 4 \\ (-2)^2 &= 4\end{aligned}$$~~

$$\sqrt{0}$$

$$= \frac{0}{0}$$



Solution of a Quadratic Equation by Quadratic Formula

Shreedharacharya's

$$ax^2 + bx + c = 0$$

$$\begin{array}{l} a \neq 0 \\ a, b, c \in \mathbb{R} \end{array}$$

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

$$D = b^2 - 4ac$$

Discriminant

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Nature of roots

$D > 0$ $(D = +ve)$	Real & distinct
$D = 0$	Real & equal
$D < 0$ $(D = -ve)$	no real roots.



not a real no.

#Q. Determine the nature of the roots of the following quadratic equations:

CBSE 2023

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

$$ax^2 + bx + c = 0$$

$$a = 1, b = -4, c = 4$$

$$\begin{aligned} D &= b^2 - 4ac \\ &= (-4)^2 - 4(1)(4) \\ &= 16 - 16 \end{aligned}$$

$$D = 0$$

N = Real and equal.

#Q. Determine the nature of the roots of the following quadratic equations:

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

$$a=1, b=1, c=1$$

$$\begin{aligned} D &= b^2 - 4ac \\ &= (1)^2 - 4(1)(1) \\ &= 1 - 4 \end{aligned}$$

$$D = -3$$

CBSE 2023

N = No real roots / imaginary roots.

#Q. Determine the nature of the roots of the following quadratic equations:

CBSE 2023

(iii) $4x^2 - 5 = 0$

$$a=4, b=0, c=-5$$

$$D = b^2 - 4ac$$

$$D = (0)^2 - 4(4)(-5)$$

$$= 0 + 80$$

$$D = 80$$

Real & distinct

#Q. Write the discriminant of the following quadratic equation:

CBSE 2019

$$(x + 5)^2 = 2(5x - 3)$$

$$x^2 + 25 + 10x = 10x - 6$$

$$x^2 + 31 = 0$$

$$D = b^2 - 4ac$$

$$= (0)^2 - 4(1)(31)$$

$$= 0 - 124$$

$$D = -124$$

#Q. Solve for x:

$$\frac{1}{x-3} - \frac{1}{x+5} = \frac{1}{6}, \quad x \neq 3, -5$$

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

$$\frac{\cancel{x}+5 - \cancel{x}+3}{x^2+5x-3x-15} = \frac{1}{6}$$

$$\frac{8}{x^2+2x-15} = \frac{1}{6}$$

$$48 = x^2 + 2x - 15$$

CBSE 2016

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

$$a=1, b=2, c=-63$$

$$D = b^2 - 4ac$$

$$D = (2)^2 - 4(1)(-63)$$

$$D = 4 + 252$$

$$D = 256$$

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

$$x = \frac{-2 \pm \sqrt{256}}{2(1)}$$

$$x = \frac{-2 \pm 16}{2}$$

$$x = \frac{-2+16}{2}, \frac{-2-16}{2}$$

$$x = \frac{14}{2}, \frac{-18}{2}$$

$$x = 7, -9$$

$$\sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2}$$

$$= 2 \times 2 \times 2 \times 2$$

$$= 16$$

2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
2	1



#Q. In the following, determine whether the given quadratic equations have real roots and if so, find the roots:

CBSE 2013

$$\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$$

$$a = \sqrt{2}, b = 7, c = 5\sqrt{2}$$

$$D = b^2 - 4ac$$

$$= (7)^2 - 4(\sqrt{2})(5\sqrt{2})$$

$$= 49 - 40$$

$$D = 9$$

Nature of roots = Real & distinct

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

$$x = \frac{-7 \pm \sqrt{9}}{2(\sqrt{2})}$$

$$x = \frac{-7 \pm 3}{2\sqrt{2}}$$

$$x = \frac{-7+3}{2\sqrt{2}}, \frac{-7-3}{2\sqrt{2}}$$

$$x = \frac{-4}{2\sqrt{2}}, \frac{-10}{2\sqrt{2}}$$

$$x = -\frac{2}{\sqrt{2}}, -\frac{5}{\sqrt{2}}$$

$$x = \frac{-2 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}}, \frac{-5 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}}$$

$$x = \frac{-2\sqrt{2}}{2}, \frac{-5\sqrt{2}}{2}$$

$$x = -\sqrt{2}, -\frac{5\sqrt{2}}{2}$$

#Q. Solve for x:

$$\frac{16}{x} - 1 = \frac{15}{x+1}, x \neq 0, -1$$

#Gp

CBSE 2014

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

$$\sqrt{+} \text{ — Real.}$$

$$\sqrt{0} \text{ — Real.}$$

$$\sqrt{-} \text{ — not real.}$$

class 11th

$$i \rightarrow i^2 = -1 \rightarrow \sqrt{-1}$$

$$\sqrt{9}$$

$$(3)^2 = 9$$

$$\sqrt{9} = 3$$

$$\sqrt{-9} \text{ — mattab?}$$

$$\bigcirc^2 = -9$$

#Q. Using quadratic formula, solve the $abx^2 + (b^2 - ac)x - bc = 0$ equation for x.

CBSE 2005

$$abx^2 + (b^2 - ac)x - bc = 0$$

$$\begin{aligned} a &= ab \\ b &= b^2 - ac \\ c &= -bc \end{aligned}$$

$$D = (b^2)^2 + (ac)^2 + 2b^2ac$$

$$D = (b^2 + ac)^2$$

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

$$D = b^2 - 4ac$$

$$D = (b^2 - ac)^2 - 4(ab)(-bc)$$

$$D = (b^2)^2 + (ac)^2 - 2b^2ac + 4b^2ac$$

$$x = \frac{-(b^2 - ac) \pm \sqrt{(b^2 - ac)^2}}{2(ab)}$$

Ans: $\frac{c}{b}, -\frac{b}{a}$

$$x = \frac{-b^2 + ac \pm (b^2 - ac)}{2ab}$$

$$x = \frac{-\cancel{b^2} + ac + (\cancel{b^2} - ac)}{2ab}, \frac{-b^2 + ac - (\cancel{b^2} - ac)}{2ab}$$

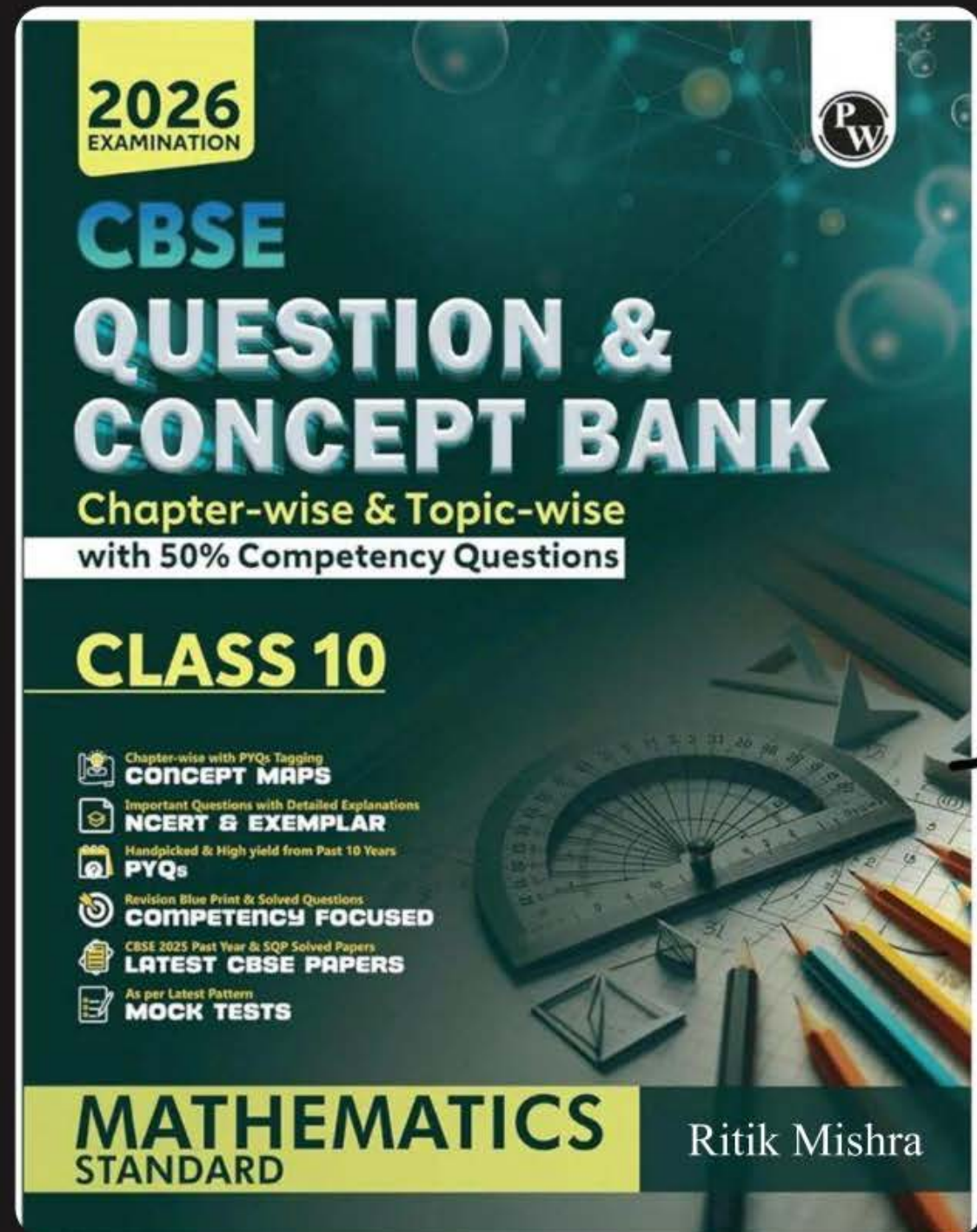
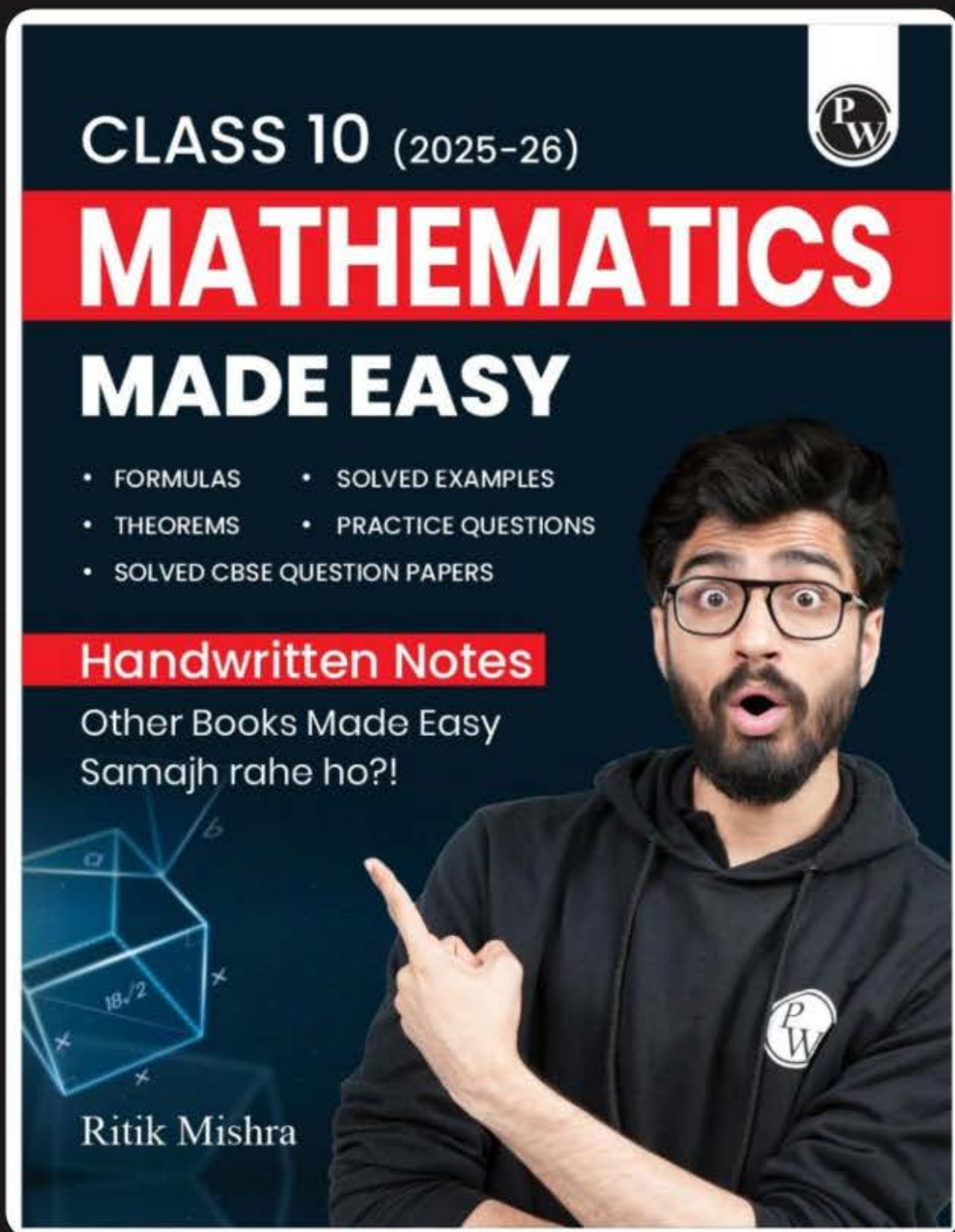
$$x = \frac{\cancel{b^2} ac}{\cancel{b^2} ab}, \frac{-\cancel{b^2}}{\cancel{b^2} ab}$$

#Q. Using quadratic formula solve the following quadratic equations :

$$p^2x^2 + (p^2 - q^2)x - q^2 = 0$$

CBSE 2004

#6plus



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RITIK SIR

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Thank
You