

UPDAAN



2025

Quadratic Equation

Mathematics

Lecture – 03

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Topics

to be covered



Quadratic Formula

(Shreedharacharya's Formula)

Nature of roots of a quadratic equation

Badhiya Questions





WORK HARD
DREAM BIG
NEVER GIVE UP !!



Topic : Solution of a Quadratic Equation By Using The Quadratic Formula (Shreedharaacharya's Rule)



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

$a, b, c \in \mathbb{R}$

belongs to

$a \neq 0$

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

$D = \text{Discriminant}$

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

D ka nature of roots batata.

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

$$D > 0$$

(D = +ve)



Real and distinct

ala-ala.

$$D = 0$$



Real and equal.

$$D < 0$$

(D = -ve)



imaginary roots.
non-real roots



Topic : Nature of Roots



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

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

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

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

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

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

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

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

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

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

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

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

$$= 1 + 8$$

$$D = 9$$

$D > 0$ → Real and distinct.

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

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

$$= 16 - 16$$

$$D = 0$$

→ Real and equal.

(iii) $x^2 + x + 1 = 0$
 $ax^2 + bx + c = 0$

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

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

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

$$= 1 - 4$$

$$D = -3$$

$D < 0$

imaginary roots.

imaginary roots.

$$\sqrt{4} = 2 \quad \sqrt{81} = 9$$

$$\sqrt{3} = 4$$

$$\sqrt{-4} = \text{not a real ans.}$$

imaginary no.

$$\sqrt{\textcircled{D}} \textcircled{-4}$$

class 11th

$$i = \text{iota}$$

$$i = \sqrt{-1}$$

Topic : Discriminant



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

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

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

$$a = \sqrt{3}, b = -2\sqrt{2}, c = -2\sqrt{3}$$

$$\begin{aligned} D &= b^2 - 4ac \\ &= (-2\sqrt{2})^2 - 4(\sqrt{3})(-2\sqrt{3}) \\ &= (4)(2) + (8)(3) \\ &= 8 + 24 \\ &= 32 \end{aligned}$$

Topic : Discriminant



#Q. Write the discriminant of the quadratic equation $(x + 5)^2 = 2(5x - 3)$.

[CBSE 2019]

$$\begin{aligned} D &= b^2 - 4ac \\ &= (0)^2 - 4(1)(31) \\ &= 0 - 124 \end{aligned}$$

$$D = -124 //$$

$$\begin{aligned} x^2 + 25 + 10x &= 10x - 6 \\ x^2 + 25 + \cancel{10x} - \cancel{10x} + 6 &= 0 \end{aligned}$$

$$x^2 + 31 = 0$$

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

$$a = 1, b = 0, c = 31$$

Topic : Quadratic Formula



#Q. Solve for x: $\frac{1}{x} - \frac{1}{x-2} = 3, x \neq 0, 2$

[NCERT, CBSE 2010]

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

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

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

$$a = 3, b = -6, c = 2$$

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

$$D = (-6)^2 - 4(3)(2)$$

$$D = 36 - 24$$

$$D = 12$$

$$x = \frac{-(-6) \pm \sqrt{12}}{2(3)}$$

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

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

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

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

$$\frac{\cancel{x} - 2 - \cancel{x}}{x^2 - 2x} = 3$$

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

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

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

$$x = \frac{\cancel{2}(3 \pm \sqrt{3})}{\cancel{6}_3}$$

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

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



Topic : Quadratic Formula



#Q. $x - \frac{1}{x} = 3, x \neq 0$

[NCERT, CBSE 2010]

☒ A $\frac{3 \pm \sqrt{13}}{2}$

☐ B $\frac{2 \pm \sqrt{13}}{2}$

☐ C 1, 2

☐ D $\frac{3 \pm \sqrt{15}}{2}$

$$D = b^2 - 4ac$$
$$D = (-3)^2 - 4(1)(-1)$$
$$= 9 + 4$$

$$D = 13$$

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

$$x = \frac{-(-3) \pm \sqrt{13}}{2(1)}$$

$$x = \frac{3 \pm \sqrt{13}}{2}$$

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

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

$$x^2 - 1 = 3x$$

$$x^2 - 3x - 1 = 0$$

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

$$a = 1, b = -3, c = -1$$

Topic : Quadratic Formula



#Q. Find the roots of the quadratic equation:

$$3x^2 + 2\sqrt{5}x - 5 = 0$$

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

$$a=3, b=2\sqrt{5}, c=-5$$

$$\begin{aligned} D &= b^2 - 4ac \\ &= (2\sqrt{5})^2 - 4(3)(-5) \\ &= 20 + 60 \end{aligned}$$

$$D = 80$$

$$\begin{array}{r} 2\sqrt{80} \\ \hline 2\sqrt{40} \\ 2\sqrt{20} \\ 2\sqrt{10} \\ 5\sqrt{1} \end{array}$$

$$\begin{aligned} \sqrt{80} &= \sqrt{2 \times 2 \times 2 \times 2 \times 5} \\ &= 2 \times 2\sqrt{5} \end{aligned}$$

$$\sqrt{80} = 4\sqrt{5}$$

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

$$x = \frac{-2\sqrt{5} \pm \sqrt{80}}{2(3)}$$

$$x = \frac{-2\sqrt{5} \pm 4\sqrt{5}}{6}$$

$$x = \frac{-2\sqrt{5} + 4\sqrt{5}}{6}$$

$$x = \frac{2\sqrt{5}}{6}$$

$$x = \frac{\sqrt{5}}{3}$$

$$, x = \frac{-2\sqrt{5} - 4\sqrt{5}}{6}$$

$$, x = \frac{-6\sqrt{5}}{6}$$

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

Topic : Quadratic Formula



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

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

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

$$a = p^2, b = p^2 - q^2, c = -q^2$$

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

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

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

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

$$D = (p^2)^2 + (q^2)^2 + 2p^2q^2$$

$$D = (p^2 + q^2)^2$$

[CBSE 2004]

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

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

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

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

$$x = \frac{\cancel{-p^2} + q^2 + \cancel{p^2} + q^2}{2p^2}$$

$$x = \frac{2q^2}{2p^2}$$

$$x = \frac{q^2}{p^2}$$

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

$$x = \frac{-p^2 + \cancel{q^2} - p^2 - \cancel{q^2}}{2p^2}$$

$$x = \frac{-2p^2}{2p^2}$$

$$x = -1$$

Topic : Quadratic Formula



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

(ii) $9x^2 - 9(a+b)x + (2a^2 + 5ab + 2b^2) = 0$

[CBSE 2004, 2009]

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

$$a = 9, b = -9(a+b), c = 2a^2 + 5ab + 2b^2$$

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

$$= [-9(a+b)]^2 - 4(9)(2a^2 + 5ab + 2b^2)$$

$$= (-9)^2(a+b)^2 - 36(2a^2 + 5ab + 2b^2)$$

$$= 81(a^2 + b^2 + 2ab) - 72a^2 - 180ab - 72b^2$$

$$= 81a^2 + 81b^2 + 162ab - 72a^2 - 180ab - 72b^2$$

$$D = 9a^2 + 9b^2 - 18ab$$

$$D = 9(a^2 + b^2 - 2ab)$$

$$D = 9(a-b)^2$$

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

$$x = \frac{-[-9(a+b)] \pm \sqrt{9(a-b)^2}}{2(9)}$$

$$x = \frac{9a+9b \pm \sqrt{9(a-b)^2}}{18}$$

$$x = \frac{9a+9b \pm 3(a-b)}{18}$$

$$x = \frac{9a+9b \pm (3a-3b)}{18}$$

$$x = \frac{9a+9b+3a-3b}{18}$$

$$x = \frac{12a+6b}{18} = \frac{6(2a+b)}{18} = \frac{2a+b}{3}$$

$$\rightarrow x = \frac{9a+9b-(3a-3b)}{18}$$

$$x = \frac{9a+9b-3a+3b}{18}$$

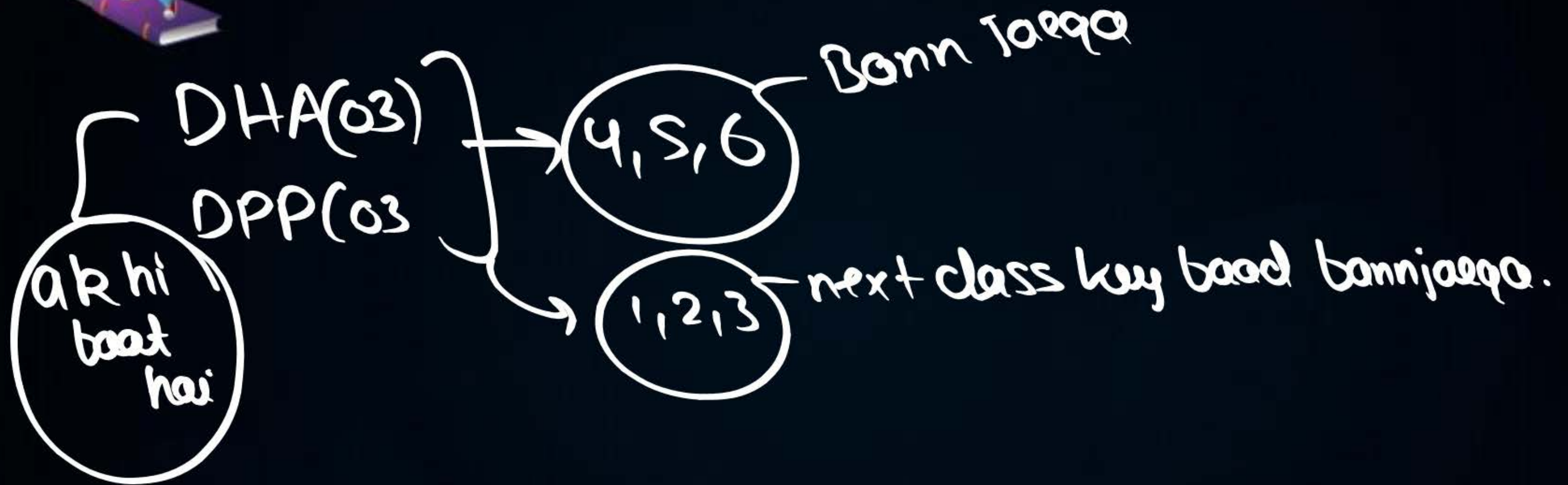
$$x = \frac{6a+12b}{18}$$

$$x = \frac{6(a+2b)}{18} = \frac{a+2b}{3}$$

Ans

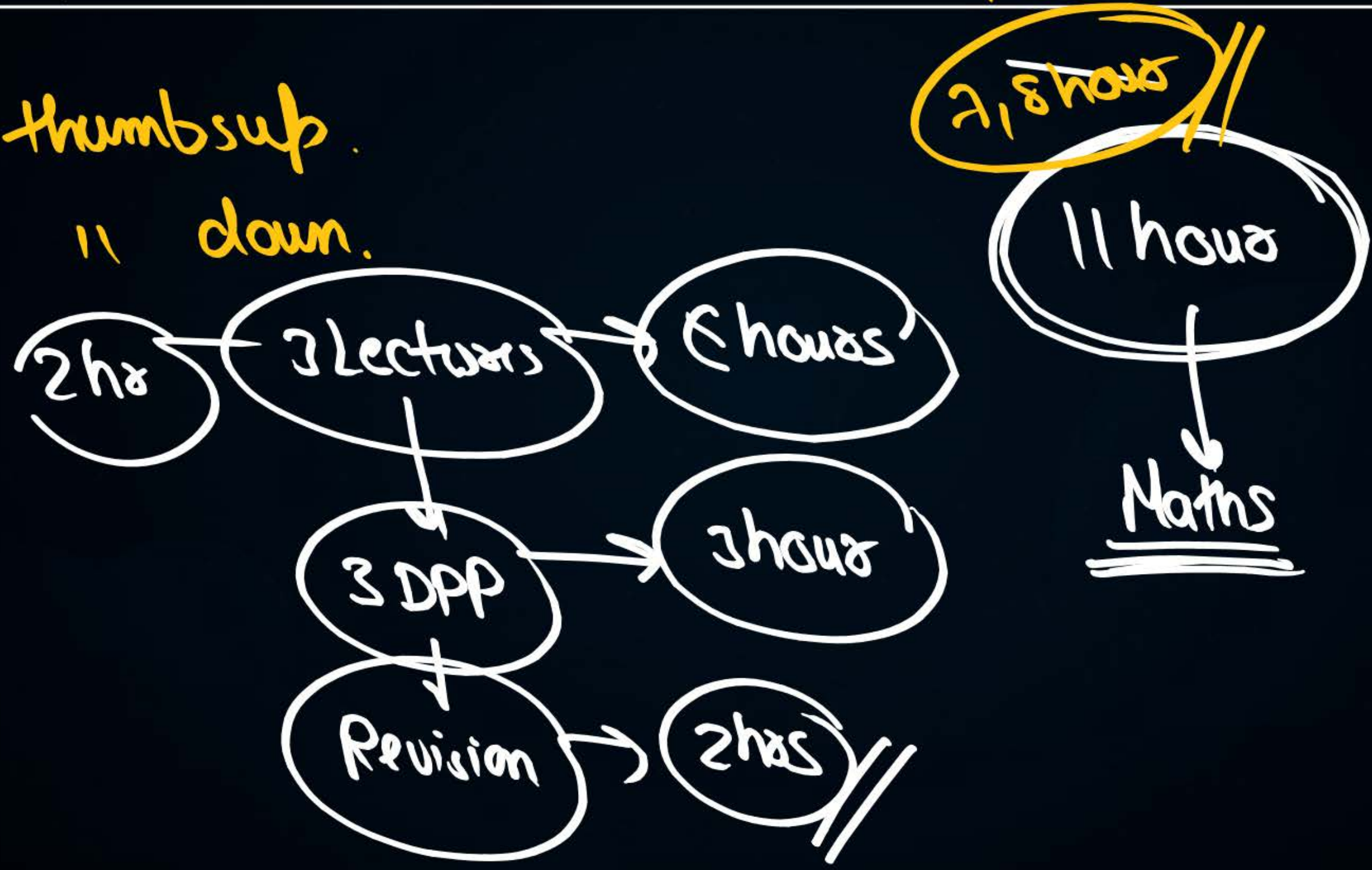


Homework



DPP's kon kon regularly karta hai?

thumbsup.
|| down.



Q.3

$$x^2 - 3x - m(m+3) = 0$$

$$P = -m(m+3), S = -3$$

$$-(-m), (m+3)$$

$$m, -(m+3)$$

x

x

$$Q \quad \frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$$

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

$$= \frac{x-7-x-4}{x^2-7x+4x-28} = \frac{11}{30}$$

$$\frac{-11}{x^2-3x-28} = \frac{11}{30}$$

$$-30 = x^2 - 3x - 28$$

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

Q $\frac{1}{x-1} - \frac{1}{x+5} = \frac{6}{7}$

↓

Same Q

DPP 2



$$Q \quad \frac{m}{n}x^2 + \frac{n}{m} = 1 - 2x$$

$$\frac{m}{n}x^2 + \frac{2x}{1} + \frac{n}{m} - \frac{1}{1} = 0$$

$$\frac{m^2x^2 + 2mnx + n^2 - nm}{nm} = 0$$

$$m^2x^2 + 2mnx + n^2 - nm$$

Try Raza



THANK
YOU

