

UPDAAN

2025

Quadratic Equation

Mathematics

Lecture - 05

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Topics

to be covered



1

Word Problems

(Part - 01)





WORK HARD
DREAM BIG
NEVER GIVE UP !!



Topic : Roots of Quadratic Equation



#Q. If $x = 1$ is a common root of the equations $ax^2 + ax + 3 = 0$ and $x^2 + x + b = 0$, then $ab =$

- ☒ A 3
- ☐ B 3.5
- ☐ C 6
- ☐ D -3

$$ab = -3 \times -2$$

$$ab = 3$$

$$a(1)^2 + a(1) + 3 = 0$$

$$a + a + 3 = 0$$

$$2a + 3 = 0$$

$$a = -\frac{3}{2}$$

$$(1)^2 + (1) + b = 0$$

$$1 + 1 + b = 0$$

$$b = -2$$

#Q. For what value of k , $(4 - k)x^2 + (2k + 4)x + (8k + 1)$ is a perfect square?

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

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

$$D = 4k^2 + 16 + 16k - 4(32k + 4 - 8k^2 - k)$$

$$0 = 4k^2 + 16k + 16 - 128k - 16 + 32k^2 + 4k$$

$$0 = 36k^2 - 108k$$

$$0 = 36k(k - 3)$$

$$\Rightarrow k = 0$$

$$k - 3 = 0$$

$$\Rightarrow k = 3$$

$$D = 0$$

$$4x^2 + 4x + 1 = 0$$

$$x^2 + 10x + 25 = 0$$

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

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

#Q. Find the values of p so that the equation $x^2 + 4px + p^2 - p + 2 = 0$ has equal roots.

$$D=0$$

$$b^2 - 4ac = 0$$

$$(4p)^2 - 4(1)(p^2 - p + 2) = 0$$

$$16p^2 - 4p^2 + 4p - 8 = 0$$

$$12p^2 + 4p - 8 = 0$$

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

H.W

$$P = -6, S = 2$$

$$3, -2$$

#Q. Given, solve for x :

$$\left(\frac{2x}{x-5}\right)^2 + 5\left(\frac{2x}{x-5}\right) - 24 = 0, x \neq 5$$

let $\boxed{\frac{2x}{x-5} = y}$

$$\boxed{y^2 + 5y - 24 = 0}$$

$$y^2 + 8y - 3y - 24 = 0$$

$$y(y+8) - 3(y+8) = 0$$

$$(y+8)(y-3) = 0$$

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

$$\frac{2x}{x-5} = -8$$

$$2x = -8x + 40$$

$$10x = 40$$

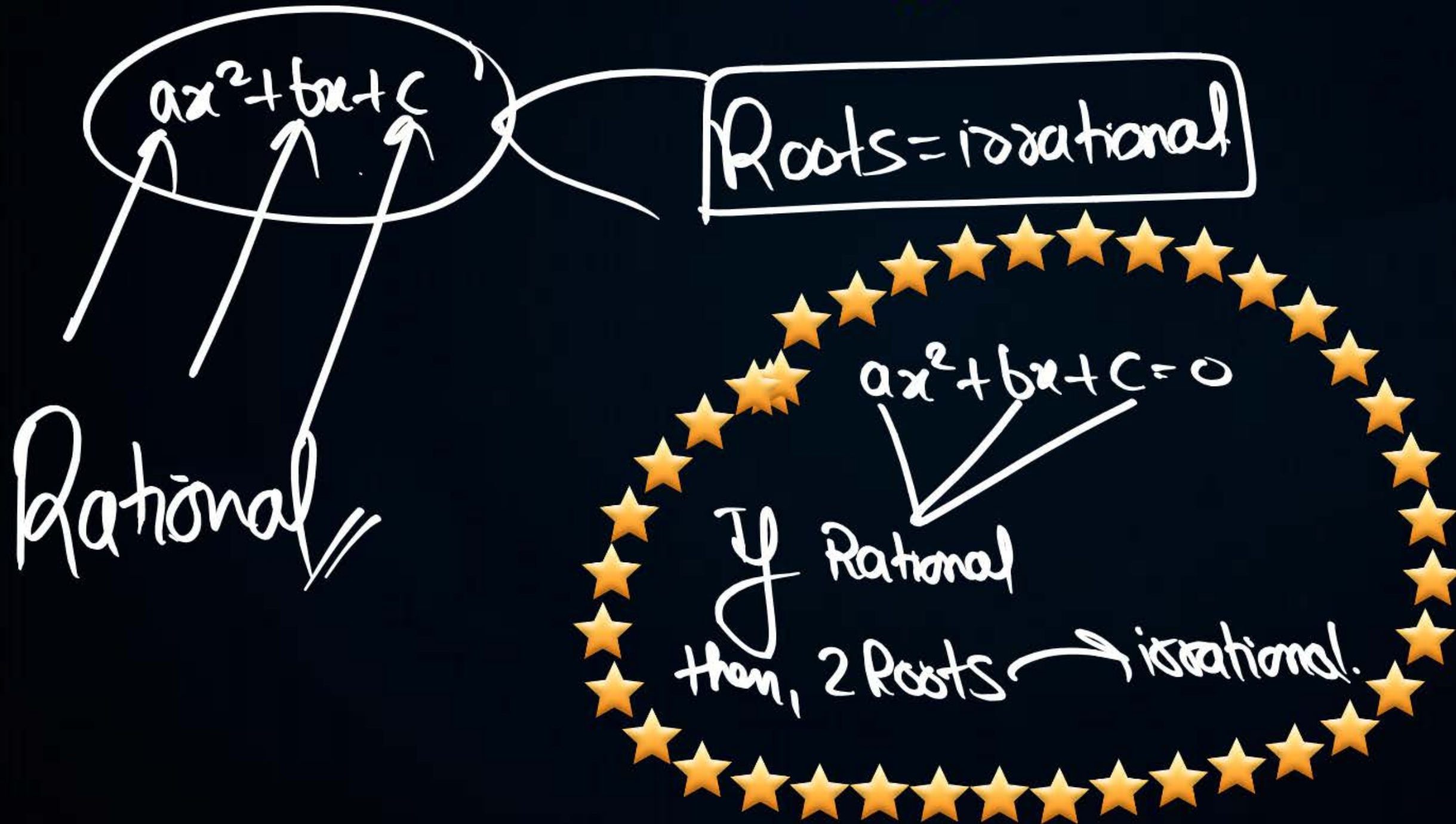
$$\boxed{x = 4}$$

$$\frac{2x}{x-5} = 3$$

$$2x = 3x - 15$$

$$\boxed{15 = x}$$

#Q. Does there exist a quadratic equation whose coefficients are rational but both of its roots are irrational? Justify your answer.



Topic : Word Problems on Number Line



#Q. The sum of the squares of two consecutive natural numbers is 313. Find the numbers.

Let the natural no's be x and $x+1$.

$$x^2 + (x+1)^2 = 313$$

$$x^2 + x^2 + 1^2 + 2x = 313$$

$$2x^2 + 2x - 312 = 0$$

$$2(x^2 + x - 156) = 0$$

$$x^2 + x - 156 = 0$$

$$P = -156, S = 1$$

$$13, -12$$

$$x^2 + 13x - 12x - 156 = 0$$

$$x(x+13) - 12(x+13) = 0$$

$$(x+13)(x-12) = 0$$

$$x = -13$$

$$x = 12$$

Ans: 12, 13

$$= 12^2 + 13^2$$

$$= 144 + 169$$

$$= 313$$

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

[NCERT]

Let two no. be x and $x+2$.

$$(x)^2 + (x+2)^2 = 290$$

$$x^2 + x^2 + 4 + 4x = 290$$

$$2x^2 + 4x - 286 = 0$$

$$x^2 + 2x - 143 = 0$$

Topic : Word Problems on Number Line



#Q. The sum of two numbers is 15. If the sum of their reciprocals is $\frac{3}{10}$, find the numbers.
[CBSE 2000, 2005]

N.I let the no be x and y .

$$\begin{array}{l} x+y=15 \\ \frac{1}{x}+\frac{1}{y}=\frac{3}{10} \end{array} \rightarrow \begin{array}{l} y=15-x \\ \frac{1}{x}+\frac{1}{15-x}=\frac{3}{10} \end{array}$$

Topic : Word Problems on Number Line



#Q. The sum of two numbers is 15. If the sum of their reciprocals is $\frac{3}{10}$, find the numbers.
[CBSE 2000, 2005]

Let the nos be x and $15-x$.

$$\frac{1}{x} + \frac{1}{15-x} = \frac{3}{10}$$

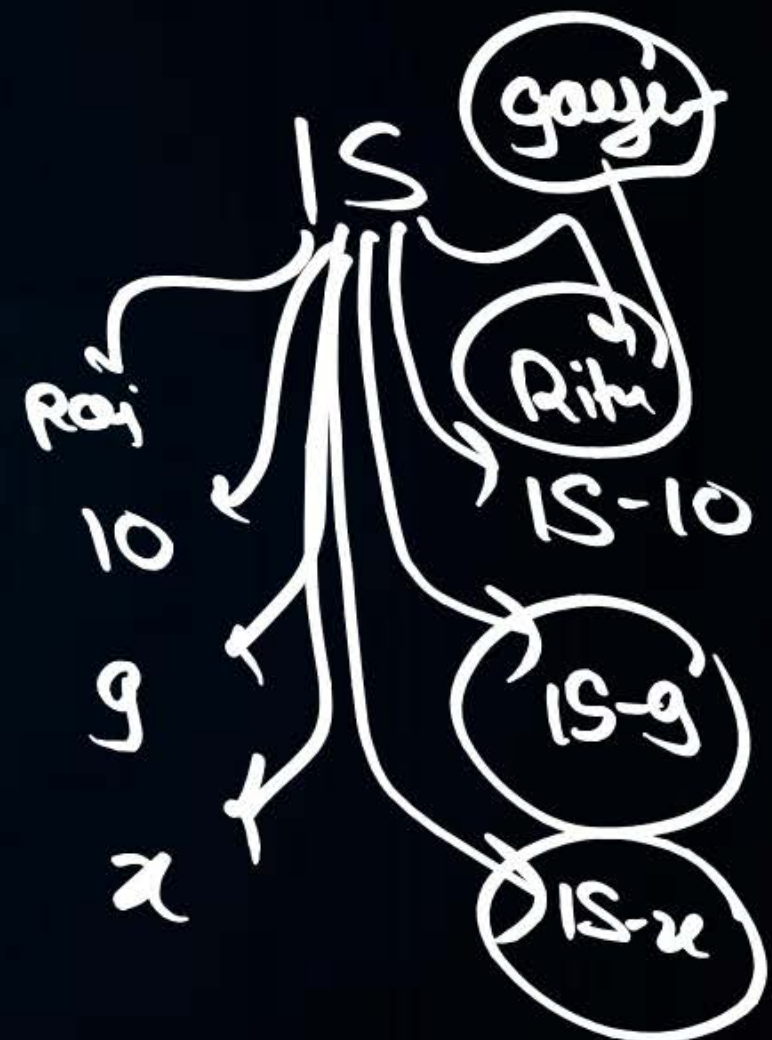
$$\frac{1(15-x) + 1(x)}{x(15-x)} = \frac{3}{10}$$

$$\frac{15 - \cancel{x} + \cancel{x}}{15x - x^2} = \frac{3}{10}$$

$$\frac{15}{15x - x^2} = \frac{3}{10}$$

$$50 = 15x - x^2$$

$$x^2 - 15x + 50 = 0$$



#Q. Find a natural number whose square diminished by 84 is equal to thrice of 8 more than the given number.

$$x^2 - 84 = 3(8 + x)$$

#Q. A two digit number is such that the product of its digits is 18. When 63 is subtracted from then number, the digits interchange their places. Find the number.
[CBSE 2006 C]

$$xy = 18 \quad \text{--- (1)}$$

$$10y + x - 63 = 10x + y$$

$$9y - 9x - 63 = 0$$

$$9(y - x - 7) = 0$$

$$y - x = 7 \quad \text{--- (2)}$$

$$y = 7 + x$$

Put in (1)

Unit's digit = x
Ten's digit = y
Original no. / two digit /
no. = $10y + x$
Reversed no. /
Interchanged = $10x + y$

$$xy = 18$$

$$x(7+x) = 18$$

$$7x + x^2 - 18 = 0$$

$$x^2 + 7x - 18 = 0$$

$$x^2 + 9x - 2x - 18 = 0$$

$$x(x+9) - 2(x+9) = 0$$

$$(x+9)(x-2) = 0$$

$$x = -9$$

$$x = 2$$

$$\text{no.} = 10y + x$$

$$= 10(9) + 2$$

$$= 92 \text{ Ans.}$$

$$2y = 18$$

$$y = 9$$

#Q. The numerator of a fraction is 3 less than its denominator. If 2 is added, to both the numerator and the denominator, then the sum of the new fraction and original fraction is $\frac{29}{20}$. Find the original fraction.

[CBSE Delhi Set - I, III, 2015]

Let

$N = x - 3$	\rightarrow	$N = x - 3 + 2$
$D = x$	\rightarrow	$D = x + 2$
$F = \frac{x-3}{x}$	\rightarrow	$F' = \frac{x-1}{x+2}$

$$\frac{x-1}{x+2} + \frac{x-3}{x} = \frac{29}{20}$$

$$\frac{x(x-1) + (x+2)(x-3)}{(x+2)(x)} = \frac{29}{20}$$

$$\frac{x^2 - x + x^2 - 3x + 2x - 6}{x^2 + 2x} = \frac{29}{20}$$

$$\frac{2x^2 - 2x - 6}{x^2 + 2x} = \frac{29}{20}$$

$$20(2x^2 - 2x - 6) = 29(x^2 + 2x)$$

$$40x^2 - 40x - 120 = 29x^2 + 58x$$

$$11x^2 - 98x - 120 = 0$$

Quadratic
Formula

H.W

Ans $\frac{7}{10}$



Homework

No DPP

Revision //



THANK
YOU

