UDAAN

2026

Quadratic Equations

MATHS LECTURE-6

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Topics *to be covered*

A Word Problems Part-1 (Problems on Numbers)

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

$D = b^2 - 4ac$

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

$0 = 4k^2 + 16 + 16k - 4(32k + 4 - 8k^2 - k)$

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

$0 = 36k^2 - 108k$

$0 = 36k(k-3)$

$36k = 0$, $k - 3 = 0$

$k = 0$, $k = 3$

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

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

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

$(x+5)^2 = 0$

$(x-3)^2 = 0$

$x-3 = \pm\sqrt{0}$

$x-3 = 0$

$x = 3$

$x = 3, 3$

#Q. The sum of two numbers is 15. If the sum of their reciprocals is 3/10, find the numbers.

CBSE 2000, 05, 23

Let the two no.s be x and y.

$x + y = 15$

$\frac{1}{x} + \frac{1}{y} = \frac{3}{10}$

$y = 15 - x$

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

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

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

$\frac{15}{15x - x^2} = \frac{1}{10}$

$50 = 15x - x^2$

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

$S = -15, \quad P = 50$

$-10, -5$

$x = 10, 5$

If $x = 10$, $y = 15 - x$, $y = 5$

If $x = 5$, $y = 15 - x$, $y = 10$

Ans. 10 and 5

1 variable

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

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

15

9	15-9
8	15-8
3	15-3
x	$15-x$

#Q. The sum of a number and its reciprocal is $2\frac{1}{30}$. Find the number.

$$x + \frac{1}{x} = 2\frac{1}{30}$$

$$\frac{x^2+1}{x} = \frac{61}{30}$$

$$30x^2 + 30 = 61x$$

$$30x^2 - 61x + 30 = 0$$

Ans. 5/6 or, 6/5

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

Let the nos be x and $x+1$

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

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

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

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

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

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

$13, -12$

$x = -13, 12$

$x = 12$

Hence the two nos are 12, 13

Ans. 12 and 13

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

CBSE 2014

$x, x+2$

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

Ans. 11 and 13

#Q. The sum of the squares of two consecutive even numbers is 340. Find the numbers.

CBSE 2014

$x, x+2$

$$(x)^2 + (x+2)^2 = 340$$

Ans. 12, 14

#Q. The sum of the squares of two positive integers is 208. If the square of the larger number is 18 times the smaller number, find the numbers.

Let the nos be x and y. $(x>y)$

$x^2+y^2=208$ ①

$x^2=18y$ ②

$18y+y^2=208$

$y^2+18y-208=0$

Sum = 18, product = -208

26, -8

$y=-26, 8$

$y=-26$

$x^2=18y$

$x^2=18(-26)$

$x=\pm\sqrt{-ve}$

$y=8$

$x^2=18y$

$x^2=18(8)$

$x^2=144$

$x=\pm\sqrt{144}$

$x=12, -12$

Ans = 8, 12

Ans. 8 and 12

#Q. Three consecutive positive integers are such that the sum of the square of the first and the product of other two is 46, find the integers.

CBSE 2010

Let three consecutive integers be $x, x+1, x+2$.

$$(x)^2 + (x+1)(x+2) = 46$$

Ans. 4, 5, 6

#Q. The difference of squares of two numbers is 88. If the larger number is 5 less than twice the smaller number, then find the two numbers.

CBSE 2010

Let the two nos be x and y. $(x > y)$

$$x^2 - y^2 = 88 \quad (1)$$

$$x = 2y - 5 \quad (2)$$

$$(2y-5)^2 - y^2 = 88$$

$$4y^2 + 25 - 20y - y^2 = 88$$

$$3y^2 - 20y - 63 = 0$$

Ans. 13, 9

#Q. The sum of the squares of two consecutive multiples of 7 is 637.
Find the multiples.

$x, x+7$

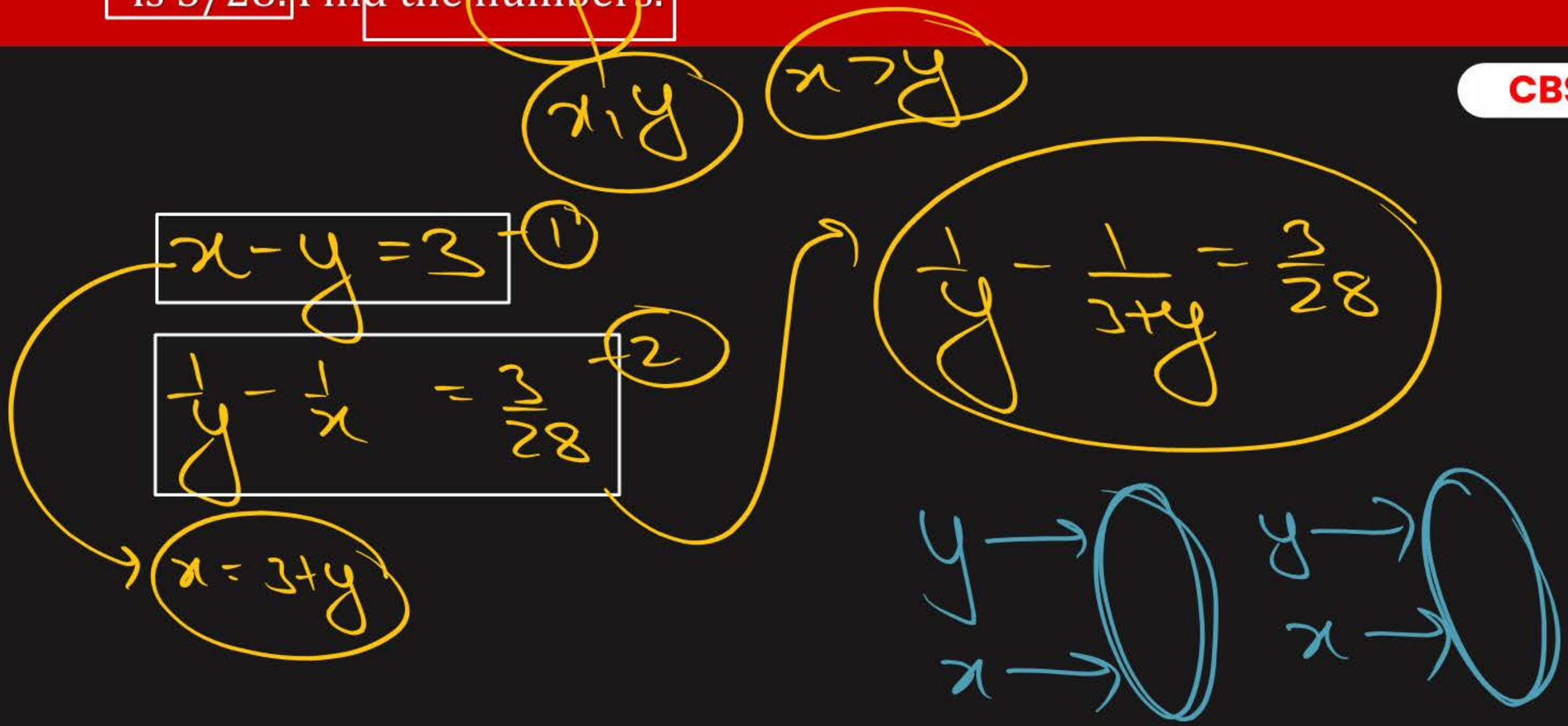
$$x^2 + (x+7)^2 = 637$$

CBSE 2014

Ans. 14, 21

#Q. The difference of two natural numbers is 3 and the difference of their reciprocals is 3/28. Find the numbers.

CBSE 2014



Ans. 7, 4

Num. Deno.

$N = x$

$D = y$

$F = \frac{x}{y}$

$N' = x+2$

$D' = y-3$

$F' = \frac{x+2}{y-3}$

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

CBSE 2015

Let the N = x and D = y

∴ Fraction = $\frac{x}{y}$

$x = y - 3$

After adding '2' to both,

$N' = x + 2$

$D' = y + 2$

New Fraction + original Fraction $= \frac{29}{20}$

$$\frac{x+2}{y+2} + \frac{x}{y} = \frac{29}{20}$$

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

Ans. 7/10

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

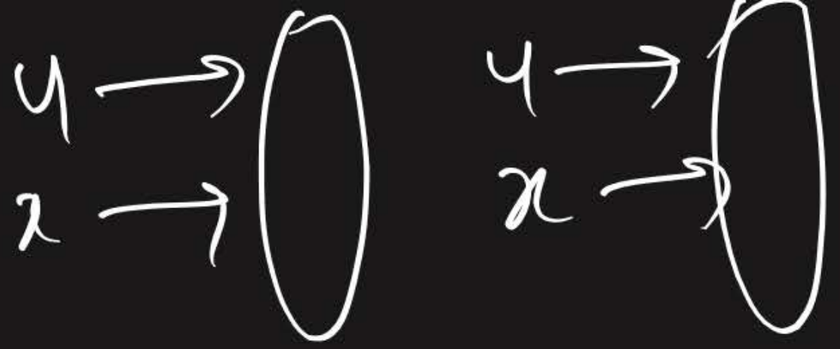
$$\frac{y(y-1)+(y-3)(y+2)}{(y+2)(y)}=\frac{29}{20}$$

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

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

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

$$\boxed{11y^2-98y-120=0}$$



#GPU

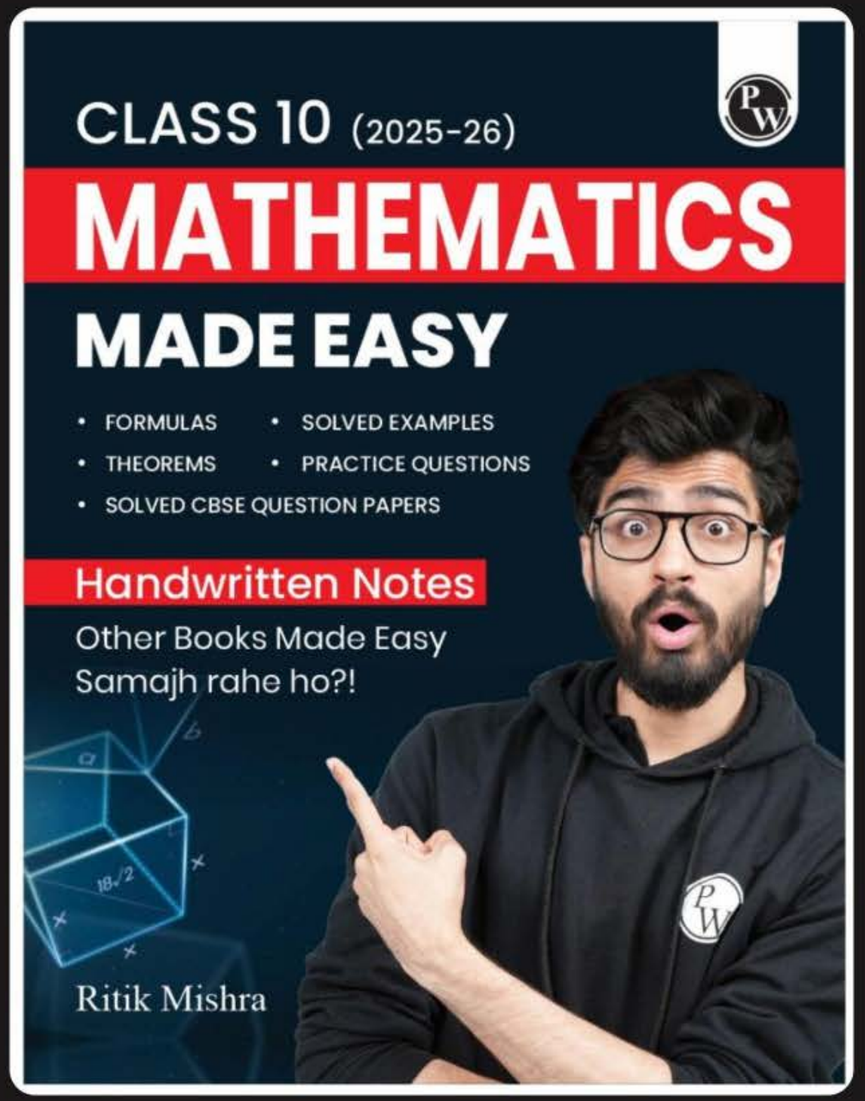
#Q. The roots of the equation $\sqrt{x^2 + 15} = 8$ are :

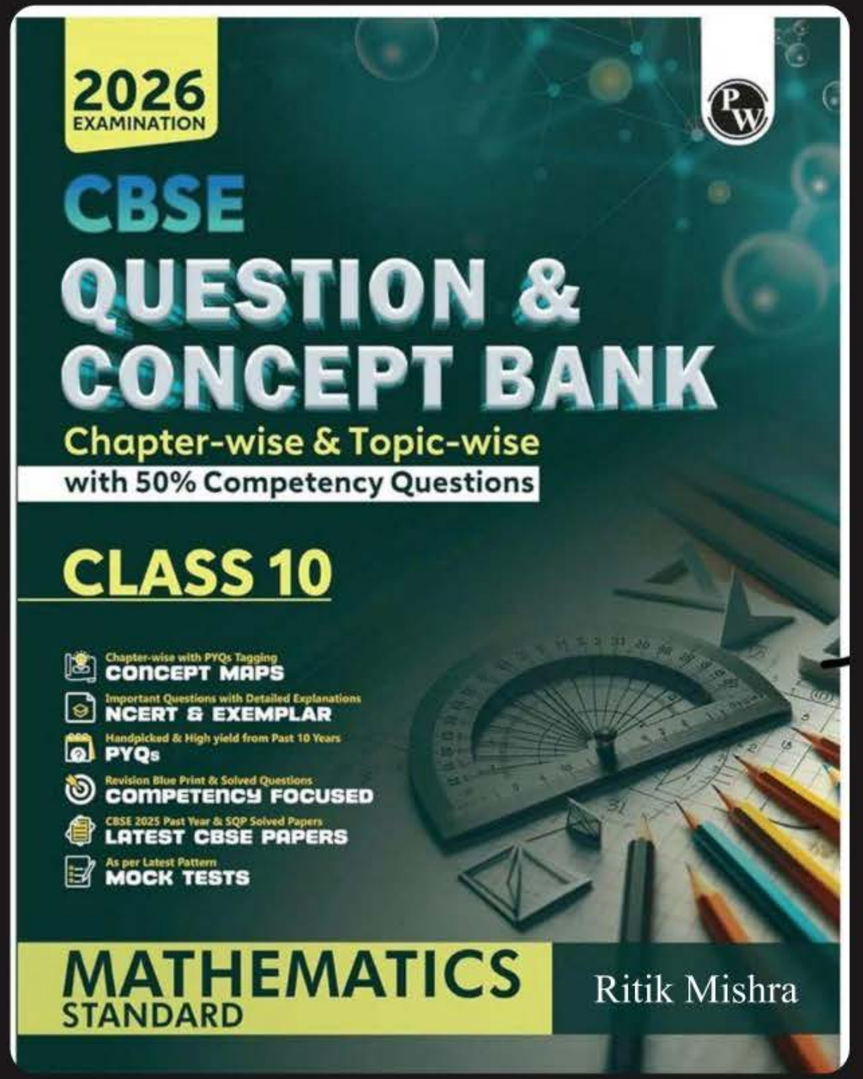
A $x = 7$

B $x = \pm 7$

C $x = -7$

D $x = 0$





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