CBSE Class 10- Mathematics: Chapter – 4 Quadratic Equations Part 1

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Question 1:

Solve by factorization

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

Answer:

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

$$4x^2 - \left[2\left(a^2 + b^2\right) + 2\left(a^2 - b^2\right)\right] x + \left(a^2 - b^2\right)\left(a^2 + b^2\right) = 0$$

$$\Rightarrow 2x\left[2x - \left(a^2 + b^2\right)\right] - \left(a^2 - b^2\right)\left[2x - \left(a^2 + b^2\right)\right] = 0.$$

$$\Rightarrow x = \frac{a^2 + b^2}{2}$$

$$x = \frac{a^2 - b^2}{2}$$

b. $x^2 + \left(\dfrac{a}{a + b} + \dfrac{a + b}{a}\right) x + 1 = 0$

Answer

$$x^2 + \left(\frac{a}{a + b} + \frac{a + b}{a}\right) x + 1$$

$$\Rightarrow x^2 + \left(\frac{a}{a + b} x + \frac{a + b}{a} x + \frac{a}{a + b} \cdot \frac{a + b}{a}\right)$$

$$\Rightarrow \left[x + \frac{a}{a + b}\right] + \frac{a + b}{a}\left[x + \frac{a}{a + b}\right] = 0$$

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

$$x = \frac{(-a + b)}{a} a + b \neq 0 \;,$$

c. $\dfrac{1}{a + b + x} = \dfrac{1}{a} + \dfrac{1}{b} + \dfrac{1}{x} a + b \neq 0$

Answer:

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

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

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

$$\Rightarrow (a + b)\left\{x\,(a + b + x) + ab\right\} = 0$$

$$\Rightarrow x\,(a + b + x) + ab = 0$$

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

$$\Rightarrow (x + a)\,(x + b) = 0$$

$$\Rightarrow x = -a$$

$$\Rightarrow x = -b$$

d. $(x - 3)\,(x - 4)\,\dfrac{34}{33^2}$

Answer:

$$(x - 3)\,(x - 4) = \frac{34}{33^2}$$

$$\Rightarrow x^2 - 7x + 12 = \frac{34}{33^2}$$

$$x^2 - 7x + \frac{13034}{33^2} = 0$$

$$x^2 - 7x + \frac{98}{33}x\frac{133}{33} = 0$$

$$x^2 - \frac{231}{33}x + \frac{98}{33}x\frac{133}{33} = 0$$

$$x^2\left(\frac{98}{33} + \frac{133}{33}\right)x + \frac{98}{33}x\frac{133}{33} = 0$$

$$\Rightarrow \left(x - \frac{98}{33}\right)\left(x = \frac{133}{33}\right) = 0$$

$$\Rightarrow x = \frac{98}{33}\,or\,x = \frac{133}{33}$$

$$e.\,x = \frac{1}{2 - \dfrac{1}{2 - \frac{1}{2 - x}}}\, x \ne 2$$

Answer:

$$x = \frac{1}{2 - \dfrac{1}{2 - \frac{1}{2 - x}}}\, x \ne 2$$

$$x = \frac{1}{2 - \dfrac{1}{2 - \frac{(2 - x)}{4 - 2b - 1}}}$$

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

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

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

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

$$\Rightarrow 3x^2 - 6x + 3 - 0$$

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

$$x = 1$$

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

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

$$\Rightarrow 3x^2 - 6x + 3 - 0$$

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

$$x = 1$$