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QUADRATIC EQUATIONS

PPT2

SUBJECT: MATHEMATICS
CHAPTER NUMBER: 04
CHAPTER NAME : QUADRATIC EQUATIONS

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PREVIOUS KNOWLEDGE TEST

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Quadratic Equation

When we equate a quadratic polynomial to a constant, we get a quadratic equation.

Any equation of the form $p(x)= ax^2+bx+c$, where $p(x)$ is a polynomial of degree 2 and c is a constant, is a quadratic equation.

The standard form of a Quadratic Equation

The standard form of a quadratic equation is $ax^2+bx+c=0$, where a,b and c are real numbers and $a\neq0$.
'a' is the coefficient of x^2. It is called the quadratic coefficient. 'b' is the coefficient of x. It is called the linear coefficient. 'c' is the constant term.

LEARNING OUTCOME

1.Students will be able to find roots of a quadratic equation by factorization

2. Students will be able to represent situations in the form of Quadratic Equations.

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Roots of a Quadratic equation

The values of x for which a quadratic equation is satisfied are called the roots of the quadratic equation.

If α is a root of the quadratic equation $ax^2 + bx + c = 0$, then $a\alpha^2 + b\alpha + c = 0$.

: https://youtu.be/UtReXKgmQ10(4.11)

- **Solving a Quadratic Equation by Factorization method**

- Consider a quadratic equation $2x^2 - 5x + 3 = 0$

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

  This step is splitting the middle term

  We split the middle term by finding two numbers (-2 and -3) such that their sum is equal to the coefficient of x and their product is equal to the product of the coefficient of x^2 and the constant.

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

  And $(-2) \times (-3) = 6$

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

  $\Rightarrow 2x(x - 1) - 3(x - 1) = 0$

  $\Rightarrow (x - 1)(2x - 3) = 0$

  In this step, we have expressed the quadratic polynomial as a product of its factors.

  Thus, $x = 1$ and $x = 3/2$ are the roots of the given quadratic equation.

  This method of solving a quadratic equation is called the factorization method.

: Find the roots of the quadratic equation $6x^2 - x - 2 = 0$.

Solution : We have $6x^2 - x - 2$

$= 6x^2 + 3x - 4x - 2$

$= 3x(2x + 1) - 2(2x + 1)$

$= (3x - 2)(2x + 1)$

The roots of $6x^2 - x - 2 = 0$ are the values of x for which $(3x - 2)(2x + 1) = 0$

Therefore, $3x - 2 = 0$ or $2x + 1 = 0$, i.e., $x = 2/3$ or $x = -1/2$ Therefore, the roots of $6x^2 - x - 2 = 0$ are $2/3$ and $-1/2$

We verify the roots, by checking that $2/3$ and $-1/2$ satisfy $6x^2 - x - 2 = 0$

Find the roots of the quadratic equation $3x^2 - 2\sqrt{6}\,x + 2 = 0$.

Solution : $3x^2 - 2\sqrt{6}\,x + 2$

$= 3x^2 - \sqrt{6}\,x - \sqrt{6}\,x + 2$

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

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

So, the roots of the equation are the values of x for which

$(\sqrt{3}\,x - \sqrt{2})(\sqrt{3}\,x - \sqrt{2}) = 0$

Now, $\sqrt{3}\,x - \sqrt{2} = 0$ for $x = \sqrt{\frac{2}{3}}.$

So, this root is repeated twice, one for each repeated factor $\sqrt{3}\,x - \sqrt{2}$.

Therefore, the roots of $3x^2 - 2\sqrt{6}\,x + 2 = 0$ are $\sqrt{\frac{2}{3}}.\,,\sqrt{\frac{2}{3}}.$

. Find the roots of the following quadratic equations by factorization

(ii) $2x^2 + x - 6 = 0$

(v) $100x^2 - 20x + 1 = 0$

(ii) We have,

$$2x^2 + x - 6 = 0 \quad \Rightarrow \quad 2x^2 + 4x - 3x - 6 = 0$$

$$\Rightarrow \quad 2x(x+2) - 3(x+2) = 0 \quad \Rightarrow \quad (x+2)(2x-3) = 0$$

If $x + 2 = 0$ then $x = -2$

If $2x - 3 = 0$ then $x = \frac{3}{2}$

Hence, the roots of the equation $2x^2 + x - 6 = 0$ are $\mathbf{-2}$ and $\mathbf{\frac{3}{2}}$.

(v) $100x^2 - 20x + 1 = 0 \Rightarrow 100x^2 - 10x - 10x + 1 = 0$

$\Rightarrow 10x(10x - 1) - 1(10x - 1) = 0 \Rightarrow (10x - 1)(10x - 1) = 0$

$\Rightarrow (10x - 1)^2 = 0 \Rightarrow x = \frac{1}{10}$

Hence, both the roots of equation $100x^2 - 20x + 1 = 0$ are $\frac{1}{10}, \frac{1}{10}$.

5. *Solve for x:* $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$ $(a \neq 0, b \neq 0, x \neq 0)$

SOLUTION. We have,

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

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

$$\Rightarrow \quad \frac{-(a+b)}{x(a+b+x)} = \frac{(a+b)}{ab} \qquad \textit{(Cancelling } (a+b) \textit{ from both sides)}$$

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

$$\Rightarrow \quad x(a+b+x) + ab = 0 \quad \Rightarrow \quad x^2 + ax + bx + ab = 0$$

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

$$\Rightarrow \text{ Either } \quad x + a = 0 \quad \Rightarrow \quad x = -a$$

$$\text{or} \quad x + b = 0 \quad \Rightarrow \quad x = -b$$

Hence, $x = -a$ and $x = -b$

HOME ASSIGNMENT Ex. 4.2 Q. No 1 to Q2

AHA

- 1 . If 1 is a root of the equations $ay^2 + ay + 3 = 0$ and $y^2 + y + b = 0$, then find the value of ab.

2. If $x = -1/2$, is a solution of the quadratic equation $3x^2 + 2kx - 3 = 0$, find the value of k.

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THANKING YOU

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