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Changing your Tomorrow

QUADRATIC EQUATIONS

PPT2

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

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Website: www.odmegroup.org
Email: info@odmps.org
Toll Free: **1800 120 2316**
Sishu Vihar, Infocity Road, Patia, Bhubaneswar- 751024

PREVIOUS KNOWLEDGE TEST

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.

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LEARNING OUTCOME

1.Students will be able to find Solutions of a quadratic equation by factorization
3. Students will be able to represent situations in the form of Quadratic Equations and hence find Solutions .

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)

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- **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.

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

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

= 6 x^2 + 3 x – 4 x – 2

= 3 x (2 x + 1) – 2 (2 x + 1)

= (3 x – 2)(2 x + 1)

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

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

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

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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 $\sqrt{\frac{2}{3}}$., $\sqrt{\frac{2}{3}}$.

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. 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 $\mathbf{\frac{1}{10}, \frac{1}{10}}$.

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,

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

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

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

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

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

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

$\Rightarrow$ Either $x+a=0$ $\Rightarrow$ $x=-a$

or $x+b=0$ $\Rightarrow$ $x=-b$

Hence, $x = -\boldsymbol{a}$ and $x = -\boldsymbol{b}$

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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