Quadratic Equations

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Quadratic Equations

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Class 10

Comprehensive study notes for

Quadratic Equations

by

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(Math King of Katargam). Master every concept with clear explanations, solved examples, and practice problems.

Key Concepts

Standard Form

A

quadratic equation

in x is of the form

ax2 + bx + c = 0

where a != 0. The highest power of the variable is 2.

Solving by Factorization

Write ax2 + bx + c as (px + q)(rx + s) = 0. Then set each factor to zero: px + q = 0 or rx + s = 0. This gives the roots.

Solving by Completing the Square

Rewrite ax2 + bx + c = 0 as (x + b/2a)2 = (b2 - 4ac)/4a2. Take square root on both sides. This method derives the quadratic formula.

Quadratic Formula

x = (-b +- ?(b2 - 4ac))/2a

. The expression D = b2 - 4ac is called the

discriminant

.

Nature of Roots

D > 0: Two distinct real roots. D = 0: One real root (repeated). D < 0: No real roots (complex conjugates).

Word Problems

Quadratic equations model many real-world situations: area problems, number problems, time-speed-distance, age problems, and profit-loss scenarios.

Important Formulas

Standard Form

ax2 + bx + c = 0, a != 0

Quadratic Formula

x = (-b +- ?D)/2a where D = b2 - 4ac

Discriminant

D = b2 - 4ac

D > 0

Two distinct real roots

D = 0

One real root (repeated)

D < 0

No real roots

Solved Examples

Example 1:

Solve x2 - 5x + 6 = 0 by factorization.

Solution:

x2 - 5x + 6 = (x-2)(x-3) = 0.

x = 2 or x = 3

.

Example 2:

Solve 2x2 - 5x + 3 = 0 using the formula.

Solution:

a=2, b=-5, c=3. D = 25 - 24 = 1. x = (5 +- 1)/4.

x = 3/2 or x = 1

.

Example 3:

Find the discriminant of x2 + 4x + 5 = 0.

Solution:

D = 16 - 20 =

-4

. Since D < 0,

no real roots exist

.

Practice Questions

Solve: 2x2 - 7x + 3 = 0.

Find k such that x2 + kx + 4 = 0 has equal roots.

The area of a rectangle is 240 cm2. Its length is 8 cm more than width. Find dimensions.

Solve: 9x2 + 7x - 2 = 0 using the quadratic formula.

If the sum of two numbers is 15 and sum of squares is 113, find the numbers.

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