Quadratic Equations and Applications

A _____ is an equation that can be written in the form:

$ax^2 + bx + c = 0$ (this is called _____)

where a, b, and c are real #'s and $a \neq 0$.

ex: $x^2 - 12x + 27 = 0$

To solve, we'll make use of the _____:

If $AB = 0$, then _____ or _____.

ex: Here's how to solve $x^2 - 12x + 27 = 0$:
$(x - 3)(x - 9) = 0$ (factor LHS)
$x - 3 = 0$ or $x - 9 = 0$ (by the zero-product principle)
$x = 3$ or $x = 9$
So, the solution set is $\{3, 9\}$.

Ex 1.
Solve: $2x^2 - 9x = 5$

Ex 2.
Solve: $(x - 2)(x + 3) = 6$

Polynomial Equations

Ex 3.

Solve by factoring: $2x^3 + 3x^2 = 8x + 12$

Applications

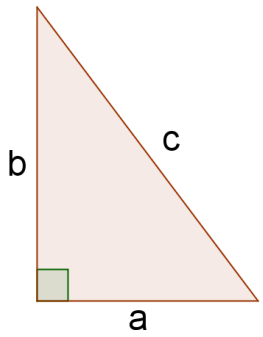
Ex 4.

A right triangle has one leg that is 3 m shorter than the other leg. The triangle has an area of 54 m^2. Find the lengths of the legs.

Ex 5.

The product of the second and third of three consecutive integers is 2 more than 7 times the first integer. Find the integers.

Pythagorean Theorem



The **Pythagorean Theorem** says that for right triangles:

(where a and b are the lengths of the legs, and c is the length of the hypotenuse)

Ex 6.
A guy wire runs from the top of a telephone pole to the ground. The length of the wire is 1 foot greater than the height of the pole. The distance from the base of the pole to the stake that holds the wire in the ground is 1 foot less than the height of the pole. What is the length of the wire?

Ex 7.

You throw a duck straight up from a rooftop 384 feet high with an initial speed of 32 feet per second. The function

$s(t) = -16t^2 + 32t + 384$

describes the duck's height above the ground, $s(t)$, in feet, t seconds after you throw it. How long will it take for the duck to hit the ground?

Practice

1. Solve: $3x^2 = 2x$
2. Solve: $x^2 + 7 = 10x - 18$
3. Solve: $x(x - 4) = 21$
4. A DVD case is 6 cm longer than it is wide. The area of the rectangular top of the case is 247 cm^2. Find the length and width of the case.
5. Find three consecutive odd integers such that the sum of all three is 42 less than the product of the second and third integers.
6. The longer leg of a right triangle is 1 m longer than the shorter leg. The hypotenuse is 1 m shorter than twice the shorter leg. Find the length of the shorter leg of the triangle.

Q: What is harder to catch the faster you run?