

FACTORING

To Solve Quadratic Equations

Many sports involve throwing, kicking, or striking a ball. Each time a ball sails through the air, it follows a trajectory that can be modelled by a ***quadratic function***.



Sports such as football, basketball, volleyball, soccer, and tennis are played on rectangular playing areas which can be modelled by ***quadratic equations***.

FACTORING PRACTICE

$$x^2 - 11x + 30$$

$$4x^2 - 2x - 12$$

Solving Quadratic Equations by Factoring

$$4x^2 + 12x + 9$$

$$9x^2 - 24x + 16$$

Solving Quadratic Equations by Factoring

$$\frac{4}{9}x^2 - 16y^2$$

$$-50m^2 + 18$$

Solving Quadratic Equations by Factoring

$$3(x+2)^2 - 13(x+2) + 12$$

Solving Quadratic Equations by Factoring

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

Example 1

Factor Quadratic Expressions

Factor.

a) $2x^2 - 2x - 12$

b) $\frac{1}{4}x^2 - x - 3$

c) $9x^2 - 0.64y^2$

Your Turn

Factor.

a) $3x^2 + 3x - 6$

b) $\frac{1}{2}x^2 - x - 4$

c) $0.49j^2 - 36k^2$

Example 2

Factor Polynomials of Quadratic Form

Factor each polynomial.

- a) $12(x + 2)^2 + 24(x + 2) + 9$
- b) $9(2t + 1)^2 - 4(s - 2)^2$

Your Turn

Factor each polynomial.

- a) $-2(n + 3)^2 + 12(n + 3) + 14$
- b) $4(x - 2)^2 - 0.25(y - 4)^2$

Solving Quadratic Equations by Factoring



- Some quadratic equations that have real-number solutions can be factored easily.
- The zero product property states that if the product of two real numbers is zero, then one or both of the numbers must be zero.

Ex. if $xy = 0$ then at least one of x and y is 0.

- The roots of a quadratic equation occur when the product of the factors is equal to zero.

Solving Quadratic Equations by Factoring

Example:

Write $3x^2 - 2x - 5 = 0$ in factored form.



Example 3

Solve Quadratic Equations by Factoring

Determine the roots of each quadratic equation. **Verify** your solutions.

a) $x^2 + 6x + 9 = 0$

b) $x^2 + 4x - 21 = 0$

c) $2x^2 - 9x - 5 = 0$

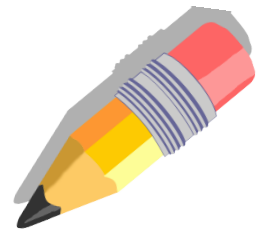
Your Turn

Determine the roots of each quadratic equation.

a) $x^2 - 10x + 25 = 0$

b) $x^2 - 16 = 0$

c) $3x^2 - 2x - 8 = 0$



Sometimes we'd like to know if a binomial is a factor of a trinomial without factoring in entirety.


The **Factor Theorem** is a tool that helps us to do just that!

FACTOR THEOREM

The **Factor Theorem** tells us that $x - a$ is a factor of $f(x)$ if $x = a$ is substituted into the trinomial expression and it equals zero. (ie. $f(a) = 0$) If this equals zero, then the solution is the root of the expression and the binomial is a factor of the trinomial.

FACTOR THEOREM

Symbolically, we show it like so...

$(x + m)$ is a factor of $ax^2 + bx + c$ iff
 $f(-m) = 0$, where $f(x) = ax^2 + bx + c$.  This means
"if and only if".



EXAMPLES

a) Is $(x - 5)$ a factor of $x^2 + 2x - 35$?



b) Is $(x + 3)$ a factor of $2x^2 - 5x - 1$?



YOU TRY...

Is $(2x - 1)$ a factor of $6x^2 + 5x - 4$?

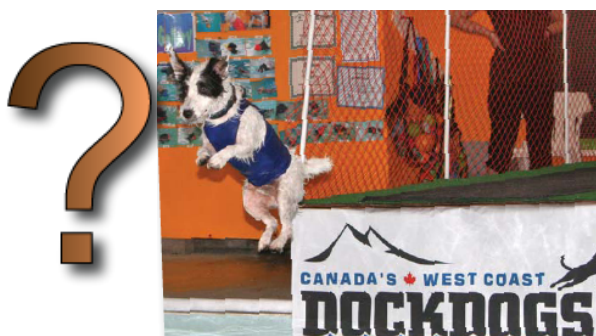
Is $3x + 2$ a factor of $9x^2 + 3x - 4$?

Solving Quadratic Equations by Factoring

Example 4

Apply Quadratic Equations

Dock jumping is an exciting dog event in which dogs compete for the longest jumping distance from a dock into a body of water. The path of a Jack Russell terrier on a particular jump can be approximated by the quadratic function $h(d) = -\frac{3}{10}d^2 + \frac{11}{10}d + 2$, where h is the height above the surface of the water and d is the horizontal distance the dog travels from the base of the dock, both in feet. All measurements are taken from the base of the dog's tail. Determine the horizontal distance of the jump.



Do both of these solutions make sense?

Solving Quadratic Equations by Factoring

Your Turn

A waterslide ends with the slider dropping into a deep pool of water. The path of the slider after leaving the lower end of the slide can be approximated by the quadratic function

$h(d) = -\frac{1}{6}d^2 - \frac{1}{6}d + 2$, where h is the height above the

surface of the pool and d is the horizontal distance the slider travels from the lower end of the slide, both in feet. What is the horizontal distance the slider travels before dropping into the pool after leaving the lower end of the slide?

Example 5

Write and Solve a Quadratic Equation

The length of an outdoor lacrosse field is 10 m less than twice the width. The area of the field is 6600 m^2 . Determine the dimensions of an outdoor lacrosse field.



Solving Quadratic Equations by Factoring

Your Turn

The area of a rectangular Ping-Pong table is 45 ft^2 . The length is 4 ft more than the width. What are the dimensions of the table?



Attachments

1 Factoring FunWorksheet.docx