

Polynomials 6.19 Factoring a Difference of Squares Equations.notebook

Factoring Differences of Squares

- I can solve equations involving differences of squares.

TEKS

10.E - Factor, if possible, trinomials with real factors in the form $ax^2 + bx + c$, including perfect square trinomials of degree two

10.F - Decide if a binomial can be written as the difference of two squares and, if possible, use the structure of a difference of two squares to rewrite the binomial.

Title Page

5-Minute Check

Polynomials

Count up

Count down

0:05:00

11

11

Factor each polynomial, if possible.

1. $k^2 - 100$

2. $81 - r^2$

3. $16p^2 - 36$

4. $4x^2 + 25$

5. $144 - 9f^2$

6. **EROSION** A rock breaks loose from a cliff and plunges toward the ground 400 feet below. The distance d that the rock falls in t seconds is given by the equation $d = 16t^2$. How long does it take the rock to hit the ground?

A 15 seconds

B 5 seconds

C 4.5 seconds

D 22 seconds

Answer

Warm Up

1. $(x + 9)(x - 9)$

2. $(m + 10)(m - 10)$

3. $(4n - 5)(4n + 5)$

4. $(6x + 10y)(6x - 10y)$

5. prime

6. $(4a - 3b)(4a + 3b)$

7. $(15c - a)(15c + a)$

8. $2(6p + 5)(6p - 5)$

9. $2(x - 1)(x + 1)$

10. $(a - 3)(a + 3)(a^2 + 9)$

11. $6(1 + 3a)(1 - 3a)$

12. $8(y + 5)(y - 5)$

13. $4x(x + 5)(x - 5)$

14. $2y^2(y + 4)(y - 4)$

15. $8m(m + 4)(m - 4)$

16. prime

17. $2a(a - 7b)(a + 7b)$

18. $18y^2(1 - 2y)(1 + 2y)$

19. $x(13x + 1)(13x - 1)$

20. $3a^2(a + 1)(a - 1)$

21. $3x(x - 1)(x + 1)(x + 2)$

22. 5 seconds

Practice Answers

Maintain Your Skills

1. A

2. C

Homework Answers

Name _____ Class _____ Date _____

Practice

Factoring Difference of Squares

Difference of Squares

$a^2 - b^2 = (a + b)(a - b)$

Factor each polynomial if possible. If the polynomial cannot be factored, write prime.

1. $x^2 - 81$

2. $u^2 - 100$

3. $16v^2 - 25$

4. $36w^2 - 100y^2$

5. $49z^2 - 32$

6. $16u^2 - 9v^2$

7. $225x^2 - y^2$

8. $72y^2 - 50$

9. $-2 + 3z^2$

10. $-81 + u^4$

11. $6 - 54v^2$

12. $9y^2 - 200$

13. $4x^3 - 100u$

14. $2y^4 - 32y^2$

15. $8m^3 - 128w$

16. $6x^3 - 25$

17. $3a^3 - 98ab^2$

18. $18y^2 - 72y^4$

19. $160x^3 - x$

20. $3x^4 - 3x^2$

21. $3x^4 + 6x^3 - 3x^2 - 6x$

22. **EROSION** A rock breaks loose from a cliff and plunges toward the ground 400 feet below. The distance d that the rock falls in t seconds is given by the equation $d = 16t^2$. How long does it take the rock to hit the ground?

Maintain Your Skills

1. A new spiral notebook contains 50 more sheets of paper than a new memo book. The total number of sheets of paper in 3 new spiral notebooks and 7 new memo books is 810. Which system of equations can be used to find s , the number of sheets of paper in one new spiral notebook, and m , the number of sheets of paper in one new memo book?

A $s - m = 50$
 $3s + 7m = 810$

B $s + m = 50$
 $3s + 7m = 810$

C $s - m = 50$
 $5s + 3m = 810$

D $s + m = 50$
 $5s + 3m = 810$

2. A customer pays an annual membership fee of \$85 to a neighborhood car wash. Each time he takes his car to the car wash, he pays only \$5. The total amount of money he spends at the car wash in one year in dollars can be found using the function $y = -5x + 85$. What does the variable x represent in this function?

A The total amount of money the customer spends each month at the car wash

B The number of months the customer has been a member at the car wash

C The number of times the customer takes his car to the car wash in one year

D The cost each time the customer takes his car to the car wash

Practice Worksheet

Perfect Square

$1^2 = 1$ $\square \sqrt{1} = 1$

$2^2 = 4$ $\square \sqrt{4} = 2$

$3^2 = 9$ $\square \sqrt{9} = 3$

$4^2 = 16$ $\square \sqrt{16} = 4$

$5^2 = 25$ $\square \sqrt{25} = 5$

$\sqrt{1} = 1$ since $1^2 = 1$

$\sqrt{4} = 2$ since $2^2 = 4$

$\sqrt{9} = 3$ since $3^2 = 9$

$\sqrt{16} = 4$ since $4^2 = 16$

$\sqrt{25} = 5$ since $5^2 = 25$

$\sqrt{36} = 6$ since $6^2 = 36$

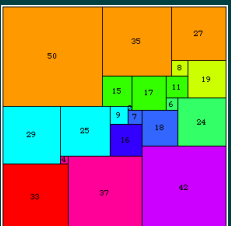
$\sqrt{49} = 7$ since $7^2 = 49$

$\sqrt{64} = 8$ since $8^2 = 64$

$\sqrt{81} = 9$ since $9^2 = 81$

$\sqrt{100} = 10$ since $10^2 = 100$


"Can a square be partitioned into a number of smaller squares such that no two of the smaller are the same size? Casual pondering might lead one to think this geometrically impossible. However, in 1939, the first such example was found (R. Sprague, 1939—using 55 squares).



Introduction

Math Humor

I think teachers use those algebraic symbols when they don't know what they're talking about.



Math Humor

1

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Date

Factoring a Difference of Squares

1. Factoring with fractions?


$$\sqrt{\frac{4}{9}} = \frac{\sqrt{4}}{\sqrt{9}} = \frac{2}{3}$$

$$-\sqrt{\frac{25}{81}} = -\frac{\sqrt{25}}{\sqrt{81}} = -\frac{5}{9}$$

- fraction is perfect square when numerator and denominator are perfect squares
$$\sqrt{\frac{4t^2}{25}} = \frac{\sqrt{4t^2}}{\sqrt{25}} = \frac{2t}{5}$$
- fractions can be cleared by multiplying both sides of equation by denominator


Notes

2. What are the factoring strategies?



- Look for **GCF**
- Look at number of terms remaining
 - 4 terms → factor by **grouping**
 - 3 terms → find **product & sum**
 - 2 terms → difference of **squares**

0 ZERO



use zero product property to solve

Notes

3. How many solutions should there be?

DIFFERENCE OF SQUARES

1) Two Terms → $4x^2 - 9$

2) Coefficients are Perfect Squares → $4 = 2^2$ $9 = 3^2$

3) Minus Sign → $4x^2 - 9$

4) Degree is Even or Zero → **Deg = 2**

- Each binomial is solution
- GCF with a **variable** → zero is a solution
- GCF is only a **number** → not a solution

$$3y(y+2)(y-3) \quad \{0, -2, 3\}$$

$$3(y+2)(y-3) \quad \{-2, 3\}$$

Notes

Find a friend and list all of the options for factoring.

Best friends forever



Find a Friend

Always dress like a professional hockey player...





OR



a chef?


Would You Rather?

Examples

1. Solve Equations by Factoring

a. $9n^2 - 4 = 0$

b. $4x^2 = 16$

 $(3n-2)(3n+2); \{\pm 2/3\}$

$(2x - 4)(2x + 2); \{\pm 2\}$


Examples

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2. Solve Equations by Factoring (fractions)

a. $a^2 - \frac{25}{36} = 0$

b. $18 - \frac{1}{2}x^2 = 0$
(multiply both sides by 2)


 $(a - 5/6)(a + 5/6); \{\pm 5/6\}$
 $(36 - x^2)(6-x)(6+x) \{\pm 6\}$

Examples

3. Solve Equations by Factoring (GCF)

a. $2x^2 = 50$

b. $3r^3 = 48r$


 $2(x^2-25) = 2(x+5)(x-5); \{\pm 5\}$
 $3r(r^2-16) = 3(r+4)(r-4); \{-4, 0, 4\}$

Examples

4. Solve Equation by Factoring (grouping, GCF, difference of squares)

SUPER PROBLEM!

$$5x^3 + 15x^2 - 5x - 15 = 0$$

 $(5x^3 + 15x^2)(-5x-15)$
 $5x^2(x+3) - 5(x+3)$
 $(5x^2-5)(x+3)$
 $5(x^2-1)(x+3)$
 $5(x+1)(x-1)(x+3)$
 $\{-3, -1, 1\}$

Examples


Application

The US Coast Guard must decide how thick of a line to purchase based on its breaking strength. The basic breaking strength b in pounds for a natural fiber line is determined by the formula below, where c is the circumference of the line in inches.

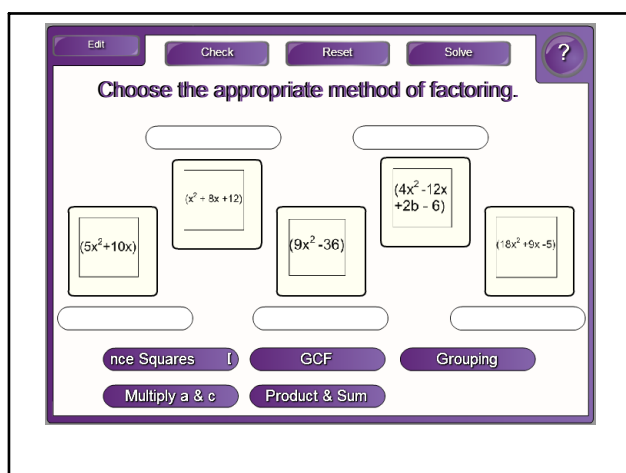
What circumference of natural line would have 8100 pounds of breaking strength?

$$900c^2 = b$$



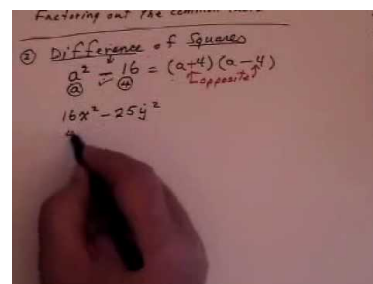
 $900c^2 = 8100$
 $c^2 = 9$
 $c = 3$

Application




Activity

How to Factor the Difference of Squares



Video



Fun Fact of the Day!
If you were to shave a zebra, you would see that it's skin is also striped!

Practice


Factoring A Difference of Squares Equations Worksheet

Homework

Closing Questions

What are the three techniques for factoring?
(GCF, Grouping & Difference of Squares)

Zero Product Property states that?
(If answer is zero, at least one of the factors must be zero)



Closing Questions

Attachments

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