Perfect Squares and Factoring

- I can factor perfect square trinomials.

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

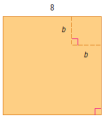
Factor each polynomial, if possible. If the polynomial cannot be factored, write *prime*.

1. $x^2 - 121$
2. $-36x^2 + 1$

Solve each equation by factoring.

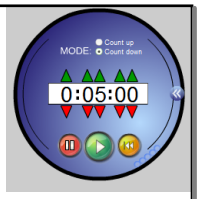
3. $4c^2 = 49$
4. $25x^3 - 9x = 0$

5. A square with sides of length b is removed from a square with sides of length 8. Write an expression to compare the area of the remaining figure to the area of the area of the original square.



6. **Standardized Test Practice** Which of the following is *not* a solution of $x^3 = \frac{1}{4}x$?

Ⓐ $\frac{1}{16}$ Ⓑ $\frac{1}{2}$ Ⓒ 0 Ⓓ $-\frac{1}{2}$



answer

Warm Up

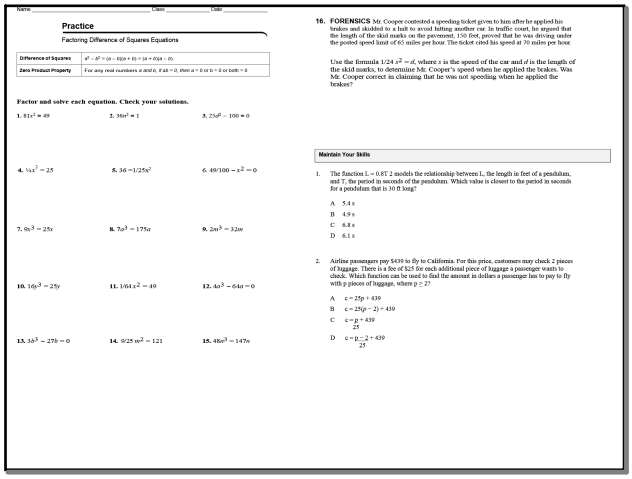
Practice Answers

1. {7/9, 7/9}
2. {-1/6, 1/6}
3. {2, -2}
4. {10, -10}
5. {-30, 30}
6. {-7/10, 7/10}
7. {0, -5/3, 5/3}
8. {0, -5, 5}
9. {0, -4, 4}
10. {0, -5/4, 5/4}
11. {-56, 56}
12. {0, -4, 4}
13. {0, -3, 3}
14. {-55/3, 55/3}
15. {0, -7/4, 7/4}
16. 60 mi/h; yes

Maintain Your Skills

1. D
2. B

Homework Answers



Name _____ Class _____ Date _____

Practice

Factoring Difference of Squares Equations

Difference of Squares	$a^2 - b^2 = (a - b)(a + b) = (a + b)(a - b)$.
Zero Product Property	For any real numbers a and b, if $ab = 0$, then $a = 0$ or $b = 0$ or both $= 0$.

Factor and solve each equation. Check your solutions.

1. $81x^2 = 49$
2. $36n^2 = 1$
3. $25d^2 - 100 = 0$
4. $\frac{1}{4}x^2 = 25$
5. $36 = 1/25x^2$
6. $49/100 - x^2 = 0$
7. $9v^3 = 25v$
8. $7v^3 = 175v$
9. $2m^3 = 32m$
10. $16y^3 = 25y$
11. $1/64\,x^2 = 49$
12. $4a^3 - 64a = 0$
13. $3b^3 - 27b = 0$
14. $9/25\,m^2 = 121$
15. $48w^3 = 147w$

16. **FORENSICS** Mr. Cooper contested a speeding ticket given to him after he applied his brakes and skidded to a halt to avoid hitting another car. In traffic court, he argued that the length of the skid marks on the pavement, 150 feet, proved that he was driving under the posted speed limit of 65 miles per hour. The ticket cited his speed at 70 miles per hour.

Use the formula $1/24\,s^2 = d$, where s is the speed of the car and d is the length of the skid marks, to determine Mr. Cooper's speed when he applied the brakes. Was Mr. Cooper correct in claiming that he was not speeding when he applied the brakes?

Maintain Your Skills

1. The function $L = 0.8T^2$ models the relationship between L, the length in feet of a pendulum, and T, the period in seconds of the pendulum. Which value is closest to the period in seconds for a pendulum that is 30 ft long?

A 5.4 s
B 4.9 s
C 6.8 s
D 6.1 s

2. Airline passengers pay $439 to fly to California. For this price, customers may check 2 pieces of luggage. There is a fee of $25 for each additional piece of luggage a passenger wants to check. Which function can be used to find the amount in dollars a passenger has to pay to fly with p pieces of luggage, where $p > 2$?

A $c = 25p + 439$
B $c = 25(p - 2) + 439$
C $c = p + \frac{439}{25}$
D $c = p - 2 + \frac{439}{25}$

Practice Worksheet

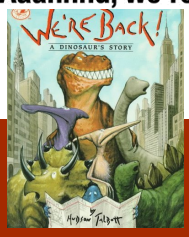
Math Humor

What do Martians who use the Metric System say?

Take me to our liter.

Math Humor

Aaannnd, we're back.



Special Products $(x-5)^2$

Introduction

Date

Perfect Squares and Factoring

1. What is the square of a sum or difference?

$a^2 - 2ab + b^2 \rightarrow (a-b)^2$

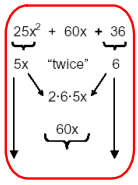
$a^2 + 2ab + b^2 \rightarrow (a+b)^2$

- $(a-b)^2$ factors to $(a-b)(a-b)$ FOILs to $a^2 - 2ab + b^2$
- $(a+b)^2$ factors to $(a+b)(a+b)$ FOILs to $a^2 + 2ab + b^2$

Don't confuse with a difference of squares $(a^2-b^2) = (a+b)(a-b)$

Notes

2. How to identify a Perfect Square Trinomial?



- must have 3 conditions:
  - ~ first term must be a perfect square
  - ~ last term must be a perfect square
  - ~ middle term - two times the square ro first and last terms
- **last term must be positive**

$m^2 + 16m + 64$

perfect square (2)(1)(8) perfect square

$(m + 8)^2$

Notes

3. How to factor a Perfect square trinomial?

$(a+b)^2 = (a+b)(a+b)$
$= a^2 + ab + ba + b^2$
$= a^2 + 2ab + b^2$

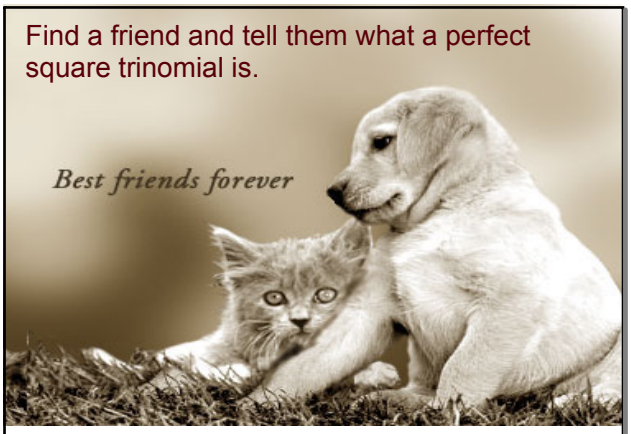
- look for GCF
- square root of first term, + or - the square root of last term
- sign of middle term decides if positive or negative

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

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

Notes

Find a friend and tell them what a perfect square trinomial is.



Find a Friend

Watch your dad belly dance...

your mom sing in front of the whole school?

Would You Rather?

Examples

1. Determine if trinomial is perfect square.

a. $x^2 + 12x + 36$

b. $4n^2 - 13n + 49$

-is 1st term perfect square?
-is last term perfect square?
-is middle term two times square root of 1st and last terms?
-is last term positive?

a. yes; $(x+6)^2$
b. no

Examples

2. Factor completely

a. $n^2 - 8n + 16$

b. $4p^2 + 12pr + 9r^2$

c. $4a^2 - 2a + 49$

answer

Yes $(n-4)^2$

Yes $(2p+3r)^2$

No, Prime

Examples

3. Factor completely

a. $18x^2 + 12x + 2$

b. $12h^2 - 60h + 75$

answer

$2(9x^2 + 6x + 1)$

$2(3x + 1)^2$

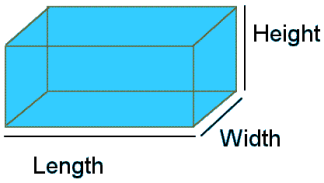
$3(4h^2 - 20h + 25)$

$3(2h - 5)^2$

Examples

Application

The volume of the rectangular prism is $2x^3 + 5x^2 - 8x - 20$ cubic meters. Find the dimensions of the prism.



Rectangular prism

answer

Factor by grouping:

$(x^2)(2x+5)$ and $-4(2x+5)$

$(x^2-4)(2x+5)$

$(x+2)(x-2)(2x+5)$

Application

Is the Trinomial a Perfect Square?

$c^2 - 6c + 9$

$g^2 - 14g + 49$

$r^2 + 4r + 4$

$2w^2 - 4w + 9$

$4d^2 - 4d + 1$

$9n^2 + 30n + 25$

$9s^2 - 6s + 1$

$m^2 + 16m + 64$

$4y^2 - 20y + 25$

$25b^2 - 4b + 16$

$16p^2 + 24p + 9$

$49k^2 - 56k + 16$

Activity

Is the Trinomial a Perfect Square?

$c^2 - 6c + 9$

$g^2 - 14g + 49$

$r^2 + 4r + 4$

$2w^2 - 4w + 9$

$4d^2 - 4d + 1$

$9n^2 + 30n + 25$

$9s^2 - 6s + 1$

$m^2 + 16m + 64$

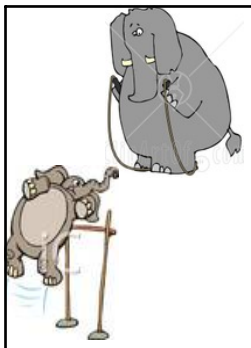
$4y^2 - 20y + 25$

$25b^2 - 4b + 16$

$16p^2 + 24p + 9$

$49k^2 - 56k + 16$

Activity Answer



Fun Fact of the Day!

The elephant is the only mammal that can't jump!

Practice

Perfect Squares and Factoring Worksheet

Homework

Closing Questions

What does Prime mean?
(Only 2 factors, 1 and itself)

What is the difference between difference of squares and square of a difference? $(x^2 - 4)$ and $(x - 6)^2$

Closing Questions