8

Mathematics

Quarter 1 – Module 2:
Lesson 1: Factoring Perfect Square Trinomials
Lesson 2: Factoring General Trinomials
Lesson 3: Solving Problems Involving Factors of Polynomials

ALTERNATIVE DELIVERY MODE

Mathematics – Grade 8
Alternative Delivery Mode
Quarter 1 – Module 2: Factoring Perfect Square Trinomials, Factoring General Trinomials and Solving Problems Involving Factors of Polynomials
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Mathematics

Quarter 1 – Module 2:
Factoring Perfect Square Trinomials
Factoring General Trinomials
Solving Problems Involving Factors of Polynomials

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Introductory Message

For the facilitator:

Welcome to the Mathematics 8 Alternative Delivery Mode (ADM) Module on Factoring Perfect Square Trinomials, Factoring General Trinomials and Solving Problems Involving Factors of Polynomials!

This module was collaboratively designed, developed and reviewed by educators from both public and private institutions to assist you, the teacher or facilitator in helping learners meet the standards set by the K to 12 Curriculum while overcoming their personal, social, and economic constraints in schooling.

This learning resource hopes to engage students into guided and independent learning activities at their own pace. Furthermore, this also aims to help learners acquire the needed 21st Century Skills while taking into consideration their needs and circumstances.

In addition to the material in the main text, you will also see this box in the body of the module:

Notes to the Teacher

This contains helpful tips or strategies that will help you in guiding the learners.

As a facilitator, you are expected to orient the learners on how to use this module. You also need to keep track of the learners' progress while allowing them to manage their own learning. Furthermore, you are expected to encourage and assist learners as they do the tasks included in the module.

For the learner:

Welcome to the Mathematics 8 Alternative Delivery Mode (ADM) Module on Factoring Perfect Square Trinomials, Factoring General Trinomials and Solving Problems Involving Factors of Polynomials!

The hand is one of the most symbolized parts of the human body. It is often used to depict skill, action and purpose. Through our hands we may learn, create and accomplish many things. Hence, the hand in this learning resource signifies that you as a learner are capable and empowered to successfully achieve the relevant competencies and skills at your own pace and time. Your academic success lies in your own hands!

This module was designed to provide you with fun and meaningful opportunities for guided and independent learning at your own pace. You will be enabled to process the contents of the learning resource while being an active learner.

This module has the following parts and corresponding icons:

What I Need to Know

This will give you an idea of the skills or competencies you are expected to learn in the module.

What I Know

This part includes an activity that aims to check what you already know about the lesson you are to take. If you get all the answers correctly (100%), you may skip this module.

What's In

This is a brief drill or review to help you link the current lesson with the previous one.

What's New

In this portion, the new lesson will be introduced to you in various ways such as a story, a song, a poem, a problem opener, an activity or a situation.

What is It

This section provides a brief discussion of the lesson to help you discover and understand new concepts and skills.

What's More

This comprises activities for independent practice to solidify your understanding and skills of the topic. You may check the answers to the exercises using the Answer Key at the end of the module.

What I Have Learned

This part offers questions, or a fill-in-the-blank sentence/paragraph, to enable you to process what you have learned from the lesson.

What I Can Do

This section provides an activity which will help you transfer your new knowledge or skill into real life situations or concerns.

 ***Assessment***	This is a task which aims to evaluate your level of mastery in achieving the learning competency.
 ***Additional Activities***	In this portion, other activities will be given to you to enrich your knowledge or skill of the lesson learned. This also aids in the retention of learned concepts.
 ***Answer Key***	This contains answers to all activities in the module.

At the end of this module you will also find:

References	This is a list of all sources used in developing this module.

The following are some reminders in using this module:

1. Use the module with care. Do not put unnecessary mark/s on any part of the module. Use a separate sheet of paper in answering the exercises.
2. Don't forget to answer ***What I Know*** before moving on to the other activities included in the module.
3. Read the instructions carefully before doing each task.
4. Observe honesty and integrity in doing the tasks and checking your answers.
5. Finish the task at hand before proceeding to the next.
6. Return this module to your teacher/facilitator once you are through with it.

If you encounter any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator. Always bear in mind that you are not alone.

We hope that through this material, you will experience meaningful learning and gain deep understanding of the relevant competencies. You can do it!

FACTORING PERFECT SQUARE TRINOMIALS, FACTORING GENERAL TRINOMIALS AND SOLVING PROBLEMS INVOLVING FACTORS OF POLYNOMIALS

Each tourist destination in our country has unique characteristics to a particular place. The tarsier and Chocolate Hills of Bohol, the windmills of Ilocos, the Underground River in Palawan, Mayon Volcano of Bicol, and Taal Volcano of Batangas are some of the most scenic spots our country has to offer.

Factors, in the same manner, have distinct arrangements that should be understood and recognized for easy calculation. Factoring touches on looking for, recognizing, and sometimes estimating patterns. Problem-solving, on the other hand, encourages us to believe in our ability to think critically and logically.

This module includes

Factoring Perfect Square Trinomials

Factoring General Trinomials

Solving Problems Involving Factors of Polynomials.

What I Need to Know

This module was designed and written with you in mind. It is here to help you master factoring perfect square trinomials, factoring general trinomials, and solving problems involving factors of polynomials. The scope of this module permits it to be used in different learning situations. The language used recognizes the diverse vocabulary

level of students as the lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

The module is divided into three lessons, namely:

Lesson 1 – Factoring Perfect Square Trinomials
Lesson 2 – Factoring General Trinomial
Lesson 3 – Solving Problems Involving Factors of Polynomials

After going through this module, you are expected to:

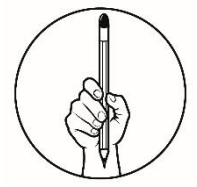
1. factor perfect square trinomials;
2. factor general trinomials;
3. solve problems involving factors of polynomials; and
4. exhibit patience in working with each topic, show interest, and willingness to learn by answering questions in this module.

Lesson 1 Factoring Perfect Square Trinomials

You may recall that $(x+3)^2 = x^2 +2(x)(3) +3^2$

$$(x+3)^2 = x^2 + 6x + 9.$$

When you square a binomial, whether it is a square of a sum or a square of a difference of 2 terms, the result is a perfect square trinomial.



What I Know

Choose the letter of the best answer and write it on a separate sheet of paper.

1. Which of the following is NOT a perfect square trinomial?
   A. $x^2+ 4x + 16$
   B. $y^2 + 10y + 25$
   C. $4m^2 + 4m + 1$
   D. $4b^2 - 12b + 9$

2. The factored form of $m^2 + 6m + 9$ is _____

A. (m+3)(m-3).
C. (m+3)(m+3).
B. (m-3)(m-3).
D. (m+6)(m+3).

3. The factors of $b^2 + 12b + 36$ are _____

A. (b +12) and (b+12).
C. (b-6) and (b-6).
B. (b+6) and (b+6).
D. (b+36) and (b+ 36).

4. Which of the following is the factored form of $9n^2 - 12n + 4$?

A. (3n+2)(3n+2)
C. (2n+3)(2n+3)
B. (3n-2)(3n-2)
D. (2n-3)(2n+3)

5. The area of a square piece of paper is $(9x^2 + 42x + 49)$ square cm. How long is one side of the piece of paper?

A. (3x -49) cm
C. (9x + 7) cm
B. (3x + 49) cm
D. (3x + 7) cm

What's In

How can you determine if the trinomial, like $a^2 + 10a + 25$, is a perfect square?

a^2 is a perfect square since $a \bullet a = a^2$

25 is a perfect square since $5 \bullet 5 = 25$

$10a = 2(\sqrt{a^2})(\sqrt{25})$, so $10a = 2(a)(5)$, regardless of the sign of the middle term

Look at each of the following trinomials. Write in your paper those trinomials which are perfect squares.

1. $m^2 + 4m + 4$
2. $n^2 - 2n + 4$
3. $a^2 + 6a + 6$
4. $4b^2 - 12b + 9$
5. $9c^2 - 6c + 1$

What's New

In some cases, recognizing some common patterns to multiply two binomials will help you to factor a trinomial faster. Whenever you multiply a binomial by itself, which is the same as squaring it, the result is always a perfect square trinomial.

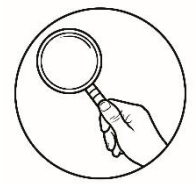
$(a+b)^2 = a^2 + 2ab + b^2$

$(a - b)^2 = a^2 – 2ab + b^2$

Using symmetric property of equality, if a = b, then b = a, you can rewrite the formula for squaring a binomial in a form useful for factoring a perfect square trinomial.

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

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



What is It

How are perfect square trinomials factored? Look at the following examples and find out that the process is easy.

Example 1. Factor $a^2 + 12a + 36$

Solution: Is it a perfect square trinomial?

Yes, because it can be expressed as $(a)^2 + 2(a)(6) + 6^2$, since $\sqrt{a^2} = a$, $\sqrt{36} = 6$ and $12a = 2(a)(6)$.

So $a^2 + 12a + 36 = (a+6)(a+6)$ or $(a+6)^2$.

Take note that in $(a+6)^2$, the sign of the second term of the factor follows the sign of the middle term, ^+12a, of the given trinomial.

Example 2. Factor $9c^2 – 6c + 1$

Solution: Is it a perfect square trinomial?

Yes, because you can express

the trinomial as $(3c)^2 – 2(3c)(1)+1^2$ since

$\sqrt{9c^2}$ = 3c, $\sqrt{1}$ = 1 and 6c = 2(3c)(1)

Hence, $9c^2 - 6c + 1 = (3c - 1)(3c -1)$ or $(3c - 1)^2$

Take note that in $(3c-1)^2$, the sign of the second term of the factor follows the sign of the middle term, -6c, of the given trinomial.

Example 3. Factor $4m^2 + 20m + 25$

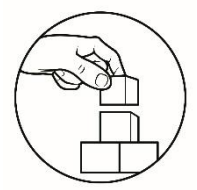
Solution: Does it fit the pattern?

Yes, because it can be expressed as

$(2m)^2 + 2(2m)(5) + 5^2$ since $\sqrt{4m^2}$ = 2m, $\sqrt{25}$ = 5 and

20m = 2(2m)(5)

Therefore, $4m^2 + 20m + 25 = (2m+5)^2$ or (2m+5)(2m+5).



What's More

A. Decide whether each polynomial is a perfect square trinomial. If it is a perfect square trinomial, write YES. If not, write NO.

1. $x^2 + 14x + 49$
2. $y^2 + 2y + 4$
3. $z^2 – 8z + 64$
4. $25w^2 + 20w + 4$
5. $9 + 12h + 4h^2$

B. Factor all the perfect square trinomials you found in A.

What I Have Learned

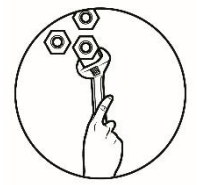
To determine whether a trinomial is a perfect square, take note of the following:

- Is the first term a perfect square?
- Is the last term a perfect square?
- Is the middle term, disregarding the sign, twice the product of the square roots of the first and last terms?

In general, polynomials that are perfect squares can be factored as

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

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



What I Can Do

On a separate sheet of paper, write the letter that corresponds to the correct answer for each number.

1. If the area of a square piece of paper is $(x^2 + 6x + 9)$ square cm, how long is one side of the piece of paper?
   A. (x+9) cm
   B. (x+6) cm
   C. (x+3) cm
   D. (x+15) cm

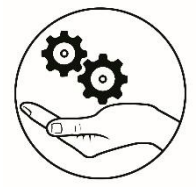
2. The area of a square tablecloth is $(4y^2 - 28y + 49)$ square cm. What is the length of one side of the tablecloth?
   A. (2y – 49) cm
   B. (2y – 7) cm
   C. (4y – 7) cm
   D. (4y – 49) cm

3. A writing pen costs (c – d) pesos. If Margarita bought some writing pens and paid $(c^2 - 2cd + d^2)$ pesos, how many writing pens did she buy?
   A. (c+d) writing pens
   B. (c – 2d) writing pens
   C. (c + 2d) writing pens
   D. (c – d) writing pens

Assessment

Match column A with column B. On a separate sheet of paper, write the letter of the corresponding factor of each polynomial.

Column A	Column B
1. $a^2 + 16a + 64$	A. $(a +10)^2$
2. $a^2 + 20a + 100$	B. $(2a-3)(2a-3)$
3. $a^2 – 18a + 81$	C. $(a – 9)^2$
4. $16a^2 + 24a + 9$	D. $(4a +3)(4a+3)$
5. $4a^2 - 6a + 9$	E. $(a + 8)^2$
	F. $(4a -3)^2$



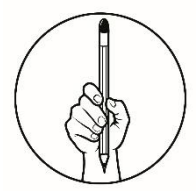
Additional Activity

Factor each of the following completely.

1. $3x^2 + 30x + 75$ 2. $2z^2 – 8z + 8$ 3. $x^4 + 10x^2 + 25$

Lesson 2 Factoring General Trinomials

If we get the product of (d+2) and (d+4), we obtain $d^2 + 6d + 8$. This trinomial is known as a quadratic or in this module a general trinomial. An expression in the form $ax^2 + bx + c$ where a, b, c are integers, is called **quadratic trinomial**.



What I Know

Write the letter corresponding to the correct answers on a separate sheet of paper.

1.Which are the factors of $x^2 + 8x + 15$?

A. (x+3) and (x+5)
B. (x+3) and (x-5)
C. (x-3) and (x+5)
D. (x-3) and (x-5)

2. The factored form of $h^2 – 12h + 35$ is _____

A. (h+7)(h-5).
B. (h-7)(h+5).
C. (h+7)(h+5).
D. (h-7)(h-5).

3. One factor of $v^2 + 4v – 12$ is (v + 6). The other factor is

A. (v+2).
B. (v+6).
C. (v – 2).
D. (v – 6).

4. Which of the following is the factored form of $6n^2 – 7n - 3$?

A. (3n-1)(2n+3)
B. (3n+1)(2n-3)
C. (3n-1)(2n- 3)
D. (3n+1)(2n+3)

5. The area of a rectangular vegetable garden is $(2x^2 + x - 10)$ square meters. How long is the garden if it is (x- 2) meters wide?

A. (2x + 5) m
B. (2x - 5) m
C. (5x + 2) m
D. (5x - 2) cm

What's In

In the previous lesson, remember that a perfect square trinomial has two identical binomial factors. But when you multiply two binomial factors which are not identical, the result is a **general trinomial**.

Let us multiply each pair of binomials below.

1. $(x+5)(x+2) = x^2 +7x + 10$
2. $(x-5)(x-2) = x^2 – 7x + 10$
3. $(x+5)(x-2) = x^2 + 3x -10$
4. $(2x+1)(x+2) = 2x^2 + 5x + 2$

Trinomials like $x^2 + 7x + 10$, $x^2 – 7x + 10$, $x^2 + 3x -10$ and $2x^2 + 5x + 2$ will be factored in this lesson.

Factoring the common monomial factor will also be useful in this lesson, together with factoring by grouping.

Look at the following examples:

1. Factor $y^2 +7y + 2y+14$	Do we have a common monomial factor? None. But if we will group the first two terms and the last two terms, each group will have a common factor.
$(y^2 + 7y) + (2y + 14)$	Factor out the greatest common factor from each group.
$y (y+7) + 2(y+7)$	Factor out the common binomial factor from each group
$(y+7) (y+2)$	

Therefore, $y^2 +7y + 2y+14 = (y+7) (y+2)$

2. Factor $a^2 – 10a - 2a + 20$	Do we have a common monomial factor? None. But if we will group the first two terms and the last two terms, each group will have a common factor.
$(a^2 – 10a)$ **+** $(- 2a + 20)$	Insert a **plus sign before (-2a + 20)** to maintain the original signs of the last two 2 terms.
$a(a -10) + 2(- a + 10)$	After factoring out the common factor from each group, we cannot see a common binomial factor. Factor out -1 from the second group.
$a(a-10) +2 (-1) (a-10)$	Multiply 2 and (-1).
$a(a-10) – 2(a-10)$	Factor out the common binomial factor.
$(a-10)(a-2)$	

Hence $a^2 – 10a - 2a + 20 = (a-10)(a-2)$.

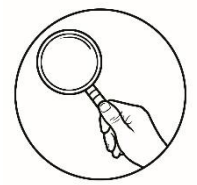
What's New

In this lesson, instead of multiplying two binomials, we will reverse the procedure by factoring a general trinomial. To factor a general trinomial means to write it as a product of two binomials. Since

1. $(x+5)(x+2) = x^2 + 7x + 10$;
2. $(x-5)(x-2) = x^2 - 7x + 10$;
3. $(x+5)(x-2) = x^2 + 3x - 10$ and
4. $(2x+1)(x+2) = 2x^2 + 5x + 2$

Using symmetric property of equality, we have

1. $x^2 + 7x + 10 = (x+5)(x+2)$;
2. $x^2 - 7x + 10 = (x-5)(x-2)$;
3. $x^2 + 3x - 10 = (x+5)(x-2)$ and
4. $2x^2 + 5x + 2 = (2x+1)(x+2)$.



What is It

Example 1 Factor $y^2 + 9y + 14$.

Solution: Step 1. Multiply the coefficient of y^2 and the constant term.

$1(14) = 14$

Step 2. Find two factors whose product is equal to the number obtained in step 1 and whose sum is equal to the middle term of the trinomial.

$7(2) = 14$ and $7 + 2 = 9$

Step 3. Rewrite the given trinomial by replacing the coefficient of the middle term with the pairs of numbers from step 2.

$y^2 + 9y + 14$ is the same as $y^2 + 7y + 2y + 14$

Step 4. Group the first two terms and the last 2 terms. Factor each group to obtain a common binomial factor.

$y^2 + 9y + 14 = (y^2 + 7y) + (2y+14)$

$= y(y + 7) + 2(y+7)$

$= (y+7)(y+2)$

So $y^2 + 9y + 14 = (y+7)(y+2)$ or $(y+2)(y+7)$

Example 2. Factor $a^2 - 12a + 20$

Solution: Step 1. $1(20) = 20$
Step 2. $-10(-2) = 20$ and $-10 + (-2) = -12$
Step 3. $a^2 - 12a + 20$ is the same as $a^2 - 10a + (-2a) + 20$
Step 4. $a^2 - 12a + 20 = (a^2 - 10a) + (-2a + 20)$
$= a(a - 10) + 2(-a + 10)$, to have a common binomial factor out -1 from $(-a + 10)$
$= a(a - 10) + 2(-1)(a - 10)$
$= a(a - 10) - 2(a - 10)$
$= (a - 10)(a - 2)$
So $a^2 - 12a + 20 = (a - 10)(a - 2)$ or $(a - 2)(a - 10)$

Example 3. Factor $c^2 - 3c - 18$

Solution: Step 1. $1(-18) = -18$
Step 2. $-6(3) = -18$ and $-6 + 3 = -3$
Step 3. $c^2 - 3c - 18$ is the same as $c^2 - 6c + 3c - 18$
Step 4. $c^2 - 3c - 18 = (c^2 - 6c) + (3c - 18)$
$= c(c - 6) + 3(c - 6)$
$= (c - 6)(c + 3)$
So $c^2 - 3c - 18 = (c - 6)(c + 3)$ or $(c + 3)(c - 6)$

Example 4. Factor $3k^2 + 8k + 4$

Solution: Step 1. $3(4) = 12$
Step 2. $6(2) = 12$ and $6 + 2 = 8$
Step 3. $3k^2 + 8k + 4$ is the same as $3k^2 + 6k + 2k + 4$
Step 4. $3k^2 + 8k + 4 = (3k^2 + 6k) + (2k + 4)$
$= 3k(k + 2) + 2(k + 2)$
$= (k + 2)(3k + 2)$
So $3k^2 + 8k + 4 = (k + 2)(3k + 2)$ or $(3k + 2)(k + 2)$

What's More

Factor each trinomial. Using a pencil, write the letter, found before each trinomial, on the blank above the matching factors . These letters will complete and reveal the required word below.

E. $d^2 + 9d + 18$
H. $d^2 - 13d + 42$
I. $d^2 - 3d - 10$
L. $d^2 + 3d - 28$
P. $2d^2 + 11d + 15$

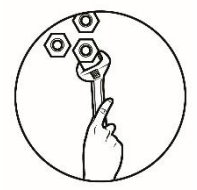
What do you call a person who loves photography?

P H O T O _____ _____ _____ _____ _____

(2d+5)(d+3) (d - 6)(d - 7) (d-5)(d+2) (d+7)(d-4) (d+3)(d+6)

What I Have Learned

To factor the general trinomial of the form $ax^2 + bx + c$:
Step 1. Multiply the coefficient of the first, quadratic, term and the constant term.
Step 2. Find two factors whose product is equal to the number obtained in Step 1 and whose sum is equal to the middle term of the trinomial.
Step 3. Rewrite the given trinomial by replacing the coefficient of the middle term with the pairs of numbers from Step 2.
Step 4. Group the first two terms and the last two terms. Factor from each group the greatest common factor to obtain a common binomial factor. The result gives the factors of the general trinomial.



What I Can Do

On a separate sheet of paper, write the letter that corresponds to the correct answer for each number.

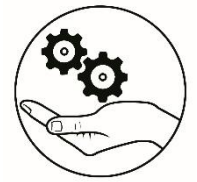
1. How much is a kilogram of bananas if you paid $(b^2 + 16b + 63)$ pesos for (b+7) kilograms?
   A. (b+7) pesos
   B. (b+9) pesos
   C. (b-7) pesos
   D. (b – 9) pesos

2. The area of a rectangular of paper is $(x^2 + 7x - 30)$ square cm. How long is the piece of paper if it is (x – 3) cm wide?
   A. (x+7) cm
   B. (x - 7) cm
   C. (x+10) cm
   D. (x - 10) cm

Assessment

Factor the following.

1. $x^2 + 6x + 8$
2. $p^2 – 11p + 30$
3. $y^2 – 6y – 27$
4. $r^2 + 4r - 32$
5. $5h^2 + 7h + 2$



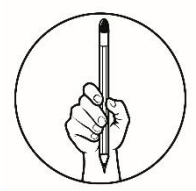
Additional Activity

Factor the following.

1. $w^4 – 5w^3 + 6w^2$
2. $4f^2 + 4f - 8$
3. $5c^2 + 15cd + 10d^2$

Lesson 3 Solving Problems Involving Factors of Polynomials

In this lesson, each problem will lead to a polynomial equation which can be solved by factoring. In most instances, word problems are based on real-life situations, which gives you the need to check if your answer makes sense in the context of the problem. For example, a negative number cannot be considered as length, width, or age. So, you need to reject an answer that does not satisfy the conditions stated in each problem.



What I Know

On a separate sheet of paper, write the letter corresponding to the correct answers.

1. A rectangular lot is 6 meters longer than it is wide. The area of the lot is 16 squares meters. Find the length of the lot.

   A. 12 m C. 8 m
   B. 10 m D. 6 m

2. The square of a positive number equals 9 times that number. Find the number.

   A. 9 C. 5
   B. 7 D. 0

3. The ages of two children are consecutive even integers. If the product of their ages is 224, how old is the younger child?

   A. 14 years old C. 10 years old
   B. 12 years old. D. 8 years old

4. Find two even consecutive integers whose product is 440.

   A. 16 and 28 C. 20 and 22
   B. 18 and 20 D. 22 and 24

What's In

Your skill in solving linear equation in one variable is as important as your ability to factor polynomials to solve problems in this lesson. Let us solve the following equations, using Addition Property of Equality.

1. w + 10 = 0
   w = -10

2. w – 6 = 0
   w = 6

3. n – 10 = 0
   n = 10

4. n + 2 = 0
   n = -2

What's New

The Zero Product Property will be useful to solve problems involving factors of polynomials.

But what is the Zero Product Property?

If the product of two factors is zero, then one or both factors must be zero.
In symbols, for all real numbers a and b, if ab = 0, then a = 0 or b = 0 or both a and b = 0.

Example 1: If (x- 2) (x+3) = 0, then

x-2 = 0 or x+3 = 0

which means that x = 2 or x = -3 , using Addition Property of Equality

Example 2: If x(x-5) = 0, then x = 0 or x – 5 = 0, hence

x = 0 or x = 5

What is It

Example 1. The length of a rectangular frame is 4 cm more than the width. If the area of the frame is 60 square cm, how long is the frame?

w

l

Let us represent the unknown quantities

If the width = w, then

length = _____

We may now form an equation:

The area is 60 sq cm

$Area_{rect}$ = 60

lw = 60 , but l = w + 4 then

(w+4)(w) = 60

The equation may now be solved:

(w+4)(w) = 60

w^2+ 4w = 60 by Distributive Property

w^2 + 4w - 60 = 0 using Addition Property of Equality you need to rewrite the equation in this form so that you can apply the Zero Product Property

(w+10) (w-6) = 0 factor the left – hand side of the equation
w+10 = 0 or w – 6 = 0 apply the Zero Product Property
w = - 10 or w = 6 solve each equation
We obtained two values of w. Why can't we use w = -10? You are right if you are thinking that there is NO negative length.
Since l = w+4, and w = 6 cm, the l = 10

What will be our answer? The frame is 10 cm long.

Let us check if our answer makes sense:
Length is 4 cm more than the width
l = 6 cm + 4cm
w = 6 cm
Area = 60 sq cm
10 cm(6 cm) = 60 sq cm

Example 2. The square of a number is 20 more than 8 times the number. Find the number

Representation:
Let n = the number

Equation:
The square of n is 20 more than 8 times n.
n^2 = 8n + 20

Solution:

$n^2 – 8n – 20 = 0$	by Addition Property of Equality
(n – 10)(n+2) = 0	factor the left – hand side of the equation
n – 10 = 0 or n + 2 = 0	apply the Zero Product Property
n = 10 or n = -2	solve for each equation

Answer: The number is 10 or – 2.

To check:
If the number is 10, then 10^2 should be = 8(10) + 20
100 = 100
If the number is -2, then $(-2)^2$ should be = 8(-2) + 20
4 = 4

Example 3. The ages of Rosita and Adelaida are consecutive even integers. Rosita is older than Adelaida. If the sum of the squares of their ages is 340, how old is Rosita?

Representation:
Let a = Adelaida's age
a + 2 = Rosita's age

Equation:

The sum of the squares of their ages is 340.

$a^2 + (a + 2)^2 = 340$

Solution:

$a^2 + (a^2 + 4a + 4) = 340$

$2a^2 + 4a + 4 = 340$

$2a^2 + 4a + 4 - 340 = 0$

$2a^2 + 4a - 336 = 0$

$2(a^2 + 2a - 168) = 0$ factor out 2 from the terms on the left – hand side of the equation

$a^2 + 2a - 168 = 0$ divide both sides by 2

$(a + 14)(a - 12) = 0$ factor the resulting trinomial

$a + 14 = 0$ or $a - 12 = 0$ use the Zero Product property

$a = -14$ $a = 12$

We obtained two values of a. Why can't we use a = -14? You are right if you are thinking that there is NO negative age. Since Rosita's age is a+2, then Rosita's age = 12 + 2

Answer: Rosita is 14 years old.

To check:

Their ages should be consecutive even integers.

12 and 14 are consecutive even integers.

The sum of the squares of their ages is 340.

$12^2 + 14^2 = 340$

What's More

Try solving these problems. You may go back to the examples if you encounter any difficulty at some point.

1. The sum of a **positive** number and its square is 72. Find the number.
2. The length of a rectangular piece of paper is 9 cm more than its width. Its area is 112 square centimeters. How long is the piece of paper?

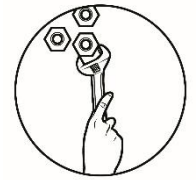
What I Have Learned

Zero – Product Property

If the product of two factors is zero, then one or both factors must be zero. In symbols, for all real numbers a and b, if ab = 0, then a = 0 or b = 0 or both a and b = 0.

To solve word problems involving Factors of Polynomials:

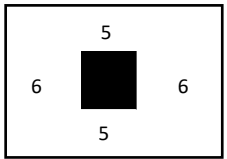
1. Understand the problem
   a. Represent the unknown quantities
2. Write an equation
3. Solve the equation
4. Interpret the results
   a. Verify if your answer makes sense. Please be reminded that a negative number cannot be considered as length, width, or age. So, you need to reject an answer that does not satisfy the conditions stated in each problem.



What I Can Do

Consider this problem and try to answer each question.

1. When Kristina draped a rectangular green tablecloth over a square table, 5 inches of cloth hung over each of two opposite sides and 6 inches hung over the other two sides. The area of the tablecloth is 1680 square inches.



A. One side of the table measures x inches and 5 inches of cloth hung over each of the opposite sides. What expression may represent the width of the tablecloth?

B. One side of the table measures x inches and 6 inches of cloth hung over each of the opposite sides. What expression may represent the length of the tablecloth?

C. What equation may be used to find the length and width of the tablecloth?

Assessment

Write the letter corresponding to the correct answers on a separate sheet of paper.

1. A rectangular lot is 3 meters longer than its width. The area of the lot is 88 square meters. Find the length of the lot.

A. 12 m C. 10 m
B. 11 m D. 8 m

2. The square of a positive number equals 4 times that number. Find the number.

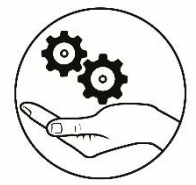
A. 9 C. 4
B. 5 D. 0

3. The ages of two children are consecutive even integers. If the product of their ages is 360. How old is the younger child?

A. 20 years old C. 16 years old
B. 18 years old. D. 14 years old

4. Find two even consecutive integers whose product is 168.

A. 18 and 16 C. 14 and 12
B. 16 and 14 D. 12 and 10



Additional Activity

Solve the following.

1. Find two consecutive odd integers whose product is 195.
2. The length of a rectangle is 6 times the width. If the perimeter of the rectangle is 70 cm, find its width.
   Note: Remember that Perimeter = 2 (l + w).

Answer Key

LESSON 1- Factoring Perfect Square Trinomials

What I Know

1. A
2. C
3. B
4. B
5. D

What's In

1. $m^2 + 4m + 4$
4. $4b^2 - 12b + 9$
5. $9c^2 - 6c + 1$

What's More

A.
1. YES
2. NO
3. NO
4. YES
5. YES

B.
1. $(x+7)^2$
4. $(5w+2)^2$
5. $(3+2h)^2$

What I Can Do

1. C
2. B
3. D

Assessment

1. e
2. a
3. c
4. d
5. b

Additional Activity

1. $3(x+5)^2$
2. $2(z-2)^2$
3. $(x^2 + 5)^2$

LESSON 2: Factoring General Trinomials

What I Know

1.A
2.D
3.C
4.B
5.A

What's More

P $(2d+5)(d+3)$
H $(d-6)(d-7)$
I $(d-5)(d+2)$
L $(d+7)(d-4)$
E $(d+3)(d+6)$

What I Can Do

1. B
2. C

Assessment

1. (x+2)(x +4)
2. (p-5) (p-6)
3. (y -9) (y + 3)
4. (r +8) (r-4)
5. (5h+2) (h+1)

Additional Activity

1. $w^2(w-3)$ (w-2)
2. 4(f + 2) (f – 1)
3. 5(c +2d) (c+d)

LESSON 3: Solving Problems Involving Factors of Polynomials

What I Know

1. C
2. A
3. A
4. C

What's More

1. 8
2. 16 cm

What I Can Do

a. x+10
b. x+12
c. (x+10)(x+12) = 1680

Assessment

1. B
2. C
3. B
4. C

Additional Activity

1. 13 and 15
2. 5 cm

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