

# Lesson 21

## Introduction to Factoring Polynomials

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### Outline

#### Part A

##### Greatest Common Monomial Factors

- Greatest Common Monomial Factors
- Factoring Out the GCF

#### Part B

##### Factoring by Grouping

- Finding a Common Binomial
- Factor by Grouping

### Targeted Review

### Vocabulary

- greatest common factor (GCF)
- factoring



Check out **More to Explore** in the Digital Pack to see if there are additional activities for this part of the lesson.

### Warm Up

Your student should spend no more than 5 minutes on the Warm Up. This should be a quick review to activate prior knowledge.

Q: What are factors?

A: *Whole number parts of a term that make the product when multiplied together.*

Q: What is a product?

A: *The answer to a multiplication problem.*

## Part A: Greatest Common Monomial Factors

### Objectives

In this part of the lesson, you will learn about the greatest common monomial factor.

By the end of this lesson, you will be able to do the following:

- ☑ Determine the greatest common monomial factor of a polynomial expression using the inverse of the Distributive Property.
- ☑ Write a polynomial expression as the product of its greatest common monomial factor and another factor.

### Why?

Finding the GCF of a polynomial expression is the first step in factoring it. Learning this will allow you to look for commonalities among terms for the rest of the course.

### Warm Up

Write the prime factorization of the given numbers without exponents.

- 1) 45    $3 \cdot 3 \cdot 5$
- 2) 24    $2 \cdot 2 \cdot 2 \cdot 3$
- 3) 27    $3 \cdot 3 \cdot 3$
- 4) What is the greatest common factor of 45, 24, and 27?   **3**
- 5) What is the greatest common factor of 45 and 27?   **9**

### ▶ **Greatest Common Monomial Factors**

- The greatest common factor (GCF) is the largest term that you can factor out of a set of terms or an expression.
- The next set of problems will have a GCF that contains a number, a variable, or the product of a number and variable.

**Example 1**

Find the monomial that will make the following statement true.

$$6ab^2(\quad) = 90a^2b^2$$

**Plan** Ask questions about each part of the given factor to find the term that completes the statement.

**Implement**

"6" times what will be 90?

$$6 \cdot 15 = 90$$

**Check**

$$6ab^2(15a) = 90a^2b^2$$

"a" times what will be "a-squared"?

$$a \cdot a = a^2$$

"b-squared" times what will be "b-squared"?

$$b^2 \cdot 1 = b^2$$

This means that the missing term is:

$$15a$$

- When determining the greatest common monomial factor, the terms can all be written out using their prime **factorization**.
- You can make a factor **tree** to do this, or you can write out the prime factors of the numbers.

**Example 2**

Find the greatest common monomial factor for each group of terms.

A)  $30x^2y^4, 18xy^2, 12xy^2$

B)  $-15xy, -7$

$$30x^2y^4 = 2 \cdot 3 \cdot 5 \cdot \bar{x} \cdot x \cdot \bar{y} \cdot \bar{y} \cdot y \cdot y$$

$$-15xy = -1 \cdot 3 \cdot 5 \cdot \bar{x} \cdot y$$

$$18xy^2 = 2 \cdot 3 \cdot 3 \cdot \bar{x} \cdot \bar{y} \cdot \bar{y}$$

$$-7 = -1 \cdot 7$$

$$12xy^2 = 2 \cdot 2 \cdot 3 \cdot \bar{x} \cdot \bar{y} \cdot \bar{y}$$

$$\text{GCF: } -1$$

$$\text{GCF: } 6xy^2$$

**Example 3**

Find the greatest common monomial factor of the group of terms.

$$y^{n+a}, y^{n+b}, y^{n+c}$$

$$y^{n+a} = y^n \cdot y^a$$

$$y^{n+b} = y^n \cdot y^b$$

$$y^{n+c} = y^n \cdot y^c$$

$$\text{GCF: } y^n$$

 **Checkpoint**

Find the greatest common monomial factor.

$$66x^3, 18x^2$$

$$6x^2$$

 **Checkpoint**

To continue past this checkpoint, students should confidently and correctly answer this question.

Q: What is the smallest degree among the terms?

A: 2

Q: Can you factor out  $x^2$  or  $x^5$  from the given terms? Why?

A: You can only factor out  $x^2$  since the second term does not contain  $x^5$ .

### Factoring Out the GCF

- Factoring is the **inverse** of the Distributive Property.
- Factoring means you are dividing the product by a specific factor, which is usually the GCF, to find **the other factor or factors**.
- When factoring an expression, finding the GCF should be the **first step**. This will make the remaining terms smaller unless the GCF is one.
- When you factor out the GCF, write the expression as the GCF **multiplied** by the remaining factors.

#### Example 4

##### Factor.

A)  $10x^2y - 30xy + 10xy^2$

- Plan** Factor out the GCF from each term in the expression. Determine what remaining factors create the original expression. Write the remaining factors as an expression in parentheses. Write the GCF in front of the parentheses.

##### Implement

10, -30, 10

$x^2, x, x$

$y, y, y^2$

$10xy(? - ? + ?) = 10x^2y - 30xy + 10xy^2$

$10xy(x - 3 + y)$

##### Explain

- Factor out the coefficient, or 10
- Factor out the smallest degree term, or  $x$
- Factor out the smallest degree term, or  $y$
- Inverse of the Distributive Property
- Factored answer

##### Check

Find the product of the GCF and the remaining terms. You should end up with the original expression as your product.

B)  $-3x^3 - 3x^2$

**-3, -3**

**$x^2, x^2$**

**$-3x^2(? + ?) = -3x^3 - 3x^2$**

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

Writing the prime factorization of each term in the expression is not necessary if you can determine the GCF using mental math.

### Checkpoint

To continue past this checkpoint, students should confidently and correctly answer this problem.

Remind your student that the GCF will include a negative term if the leading coefficient is negative. A polynomial expression written in standard form cannot have a negative leading coefficient.

Q: What are the classifications by the number of terms for the factors you found?

A: *The factors are a monomial and a binomial.*

Q: How would your answer change if  $15x$  was positive?


A: *After the GCF is factored out, the expression would be  $-3x(6y - 5)$ .*

### Checkpoint

##### Factor.

$-18xy - 15x$

**$-3x(6y + 5)$**

 Practice 1

Complete the practice problems on a separate sheet of paper.

Write the missing monomial that will make the statement true.

1)  $-10x^2y(-3y) = 30x^2y^2$     2)  $8p(5pq) = 40p^2q$     3)  $(5x)3x^2y = 15x^3y$

Find the greatest common monomial factor.

4)  $3x^5, 18x^4y$     **GCF:  $3x^4$**     5)  $15x^2, 105xy, 45x$     **GCF:  $15x$**     6)  $12xy^2, 23xy^3, 12y^4$     **GCF:  $y^2$**

Factor the expression by finding the GCF.

7)  $5x^3 - 55x$      **$5x(x^2 - 11)$**     8)  $2x^4 - x^4y + 7x^3y$      **$x^3(2x - xy + 7y)$**   
 9)  $56x^2 - 64x$      **$8x(7x - 8)$**     10)  $y^{n+g} - y^{n+h}$      **$(y^n y^g - y^h)$**   
 11)  $y^{6n} + y^{12n}$      **$y^{6n}(1 + y^{6n})$**     12)  $-10x^3 + 4x^2 + 18x$      **$-2x(5x^2 - 2x - 9)$**

 Practice 1

 Worked solutions for these problems are located in the Digital Pack.

- 1) Q: How do you determine the missing monomial?  
 A: *Think about what term would create the given product when multiplied by the given factor.*
- 4) Q: Why do you need to take out the smallest degree rather than the greatest?  
 A: *You cannot take out  $x^6$  from a term that only contains  $x^4$ . Finding the greatest common factor means the value must be common to all the terms, not just one of them.*
- 6) Q: What is the greatest number that all the terms have in common?  
 A: 1
- 7) Q: How can you tell that you have found the GCF?  
 A: *The terms no longer have any common factors.*
- 9) Q: If all of the coefficients are even, the GCF must be at least what number?  
 A: 2
- 10) Q: What do you do to the exponents when you multiply bases?  
 A: Add
- 12) Remind your student that the GCF will be negative when the first term (leading coefficient) is negative due to standard form.

## Mastery Check

### Show What You Know

Remind students that some formulas in math have more than one common representation.

Q: Can a GCF contain a number and a variable?

A: Yes.

Q: Why is it helpful that you can write these formulas in more than one way?

A: *One form may be more useful than the other based on the given information.*

### Say What You Know

Your student should be able to restate the objectives of the lesson in their own words. If your student is unable to restate the lesson objectives, have them go back and reread the objectives and then explain them.

- ☑ Determine the greatest common monomial factor of a polynomial expression using the inverse of the Distributive Property.
- ☑ Write a polynomial expression as the product of its greatest common monomial factor and another factor.

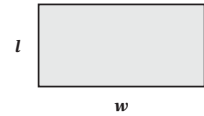
## Mastery Check

### Show What You Know

- A) Rewrite the formula for the perimeter of a rectangle as the product of the GCF and another factor.

$$P = 2L + 2w$$

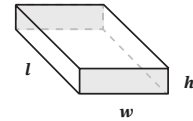
$$P = 2(L + w)$$



- B) Rewrite the formula for the surface area of a rectangular prism as the product of the GCF and another factor.

$$SA = 2lw + 2lh + 2wh$$

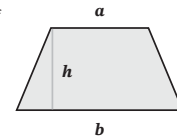
$$SA = 2(lw + lh + wh)$$



- C) Rewrite the formula for the area of a trapezoid as the product of the GCF and another factor.

$$A = \frac{1}{2}ha + \frac{1}{2}hb$$

$$A = \frac{1}{2}h(a + b)$$



### Say What You Know

In your own words, talk about what you have learned using the objectives for this part of the lesson and your work on this page.

 Practice 2

Complete the practice problems on a separate sheet of paper.

Write the missing monomial that will make the statement true.

$$1) \quad 9b(8a^6) = 72a^6b \qquad 2) \quad -11x(12xy^2) = -132x^2y^2$$

Find the greatest common monomial factor.

$$3) \quad -6x^2, -10x, -12xy \quad \text{GCF: } -2x \qquad 4) \quad 20x^2, 32x, 20xy \quad \text{GCF: } 4x$$

$$5) \quad -x^3, -11x^2, -6x^2y \quad \text{GCF: } -x^2 \qquad 6) \quad x^3, -7x^3y \quad \text{GCF: } x^3$$

Find the greatest common monomial factor.

$$7) \quad 18x^2 - 18x \quad 18x(x - 1) \qquad 8) \quad -x^2 + 2x - 29 \quad -1(x^2 - 2x + 29)$$

$$9) \quad y^{n+b} + y^{n+c} \quad y^n(y^b + y^c) \qquad 10) \quad 2x^2 + 10x + 14 \quad 2(x^2 + 5x + 7)$$

$$11) \quad x^5y^2 + x^3y^3 + 5x^3y^2 \quad x^3y^2(x^2 + y + 5) \qquad 12) \quad 26x^2y - 39xy \quad 13xy(2x - 3)$$

 Practice 2

 Worked solutions for these problems are located in the Digital Pack.

- 6) Your student does not need to factor out a negative since the terms are not part of an expression.

If needed, have your student go back to the Mastery Check and reapply what they have learned to say and show what they know.



Check out **More to Explore** in the Digital Pack to see if there are additional activities for this part of the lesson.

## Warm Up

Your student should spend no more than 5 minutes on the Warm Up. This should be a quick review to activate prior knowledge.

**Q:** How do you know when an expression is simplified?

**A:** *There are no more like terms, and the degree of each variable is different.*

Your student may choose to build these problems with the digital manipulatives found in the Digital Pack.

## Part B: Factoring by Grouping

### Objectives

In this part of the lesson, you will learn about factoring by grouping.

By the end of this lesson, you will be able to do the following:

- Factor polynomials by grouping.

### Why?

The inverse of the Distributive Property is factoring. Factoring by grouping is the foundation for the remainder of the lessons on factoring.

### Warm Up

**Simplify using the Distributive Property.**

1)  $3x(x - 8)$

$3x^2 - 24x$

2)  $2x(x + 1) + 5(x + 1)$

$2x^2 + 2x + 5x + 5$   
 $2x^2 + 7x + 5$

### Finding a Common Binomial

- When factoring out common binomial factors, the goal is to write an expression as the **product** of two binomial expressions.

#### Example 1

**Factor.** Write the expression as the product of two binomials.

A)  $14m(x + 6) - 5y(x + 6)$

**Implement**

$(x + 6)$

$14m - 5y$

$(x + 6)(14m - 5y)$

B)  $8h(m - 4) + 3(m - 4)$

$(m - 4)(8h + 3)$

**Explain**

◀ Factor out the common binomial

◀ Identify what is left over

◀ Rewrite as the product of two expressions

**Example 2**

**Factor.** Write the expression as the product of two binomials.

$$5x(x - 3) + 8(3 - x)$$

**Implement**

$$5x(x - 3) + 8(-x + 3)$$

$$5x(x - 3) + 8(-1)(x - 3)$$

$$5x(x - 3) - 8(x - 3)$$

$$(5x - 8)(x - 3)$$

**Explain**

- ◀ Write the second binomial in standard form
- ◀ Factor out  $-1$  coefficient
- ◀ Simplify the monomials
- ◀ Factor out the common binomial and rewrite as the product of two expressions

 **Checkpoint**

**Factor.**

$$x(2x - 9) + 3(2x - 9)$$

$$(2x - 9)(x + 3)$$

**Ⓟ Factoring by Grouping**

- Factoring by grouping starts with an expression that has four terms.
- Steps to factor by grouping:
  - 1) Group the terms together in pairs using parentheses.
  - 2) Find the greatest common factor for each pair of terms.
  - 3) Make sure the remaining binomials are the same.
  - 4) Write the expression as two binomial factors multiplied together.
- One important thing to check before starting to factor is to make sure that the middle symbol is an addition symbol.

**Example 2**

Your student may choose to build more problems with the digital manipulatives found in the Digital Pack.

 **Checkpoint**

To continue past this checkpoint, students should confidently and correctly answer this problem.

Q: What is the common binomial in the expression?

A:  $2x - 9$

Q: Why should you not multiply the factors together to get a quadratic trinomial?

A: *The directions say to factor.*

**Example 3****Factor by grouping.**

$$21xy + 15x + 35wy + 25w$$

**Implement**

$$(21xy + 15x) + (35wy + 25w)$$

$$3x(7y + 5) + 5w(7y + 5)$$

$$(7y + 5)(3x + 5w)$$

**Explain**

◀ Group the terms in two pairs

◀ Find the GCF for each pair of terms and write the remaining binomial

◀ Rewrite as two binomial factors multiplied together

- When an expression contains a **subtraction** symbol between the two groups, you must rewrite the subtraction symbol as adding a **negative** term.
- The negative sign only applies to **the term it is in front of**, *not* the whole group.
- If the terms in the binomial expression are not in the same order, rewrite the expression by factoring out **negative one**.

**Example 4****Factor by grouping.**

$$5x^2 - 20x - 6mx + 24m$$

**Implement**

$$5x^2 - 20x + (-6mx + 24m)$$

$$(5x^2 - 20x) + (-6mx + 24m)$$

$$5x(x - 4) - 6m(x - 4)$$

$$(x - 4)(5x - 6m)$$

**Explain**

◀ Rewrite by adding a negative term

◀ Group the terms in pairs

◀ Find the GCF for each pair of terms (the remaining binomials are the same)

◀ Rewrite as two binomial factors multiplied together

 **Checkpoint**

To continue past this checkpoint, students should confidently and correctly answer this problem.

Q: How many terms must there be to factor by grouping?

A: *There must be four terms.*

Q: Will the GCF of the second set of terms be positive or negative? Explain.

A: *The GCF will be negative because all of the terms are negative and because it must match the binomial from the first set of parentheses.*


 **Checkpoint****Factor by grouping.**

$$2x^2 + 6x - xy - 3y$$

$$(2x^2 + 6x) + (-xy - 3y)$$

$$2x(x + 3) - y(x + 3)$$

$$(x + 3)(2x - y)$$

 Practice 1

Complete the practice problems on a separate sheet of paper.

Write the binomial factor that makes the statement true.

- 1)  $x(x - 2) + 3(x - 2) = (x + 3)(x - 2)$   
 2)  $3x(5x + 4) - 1(5x + 4) = (3x - 1)(5x + 4)$

Factor. Write as the product of two binomials.

- 3)  $2x(3x - 2) + 1(3x - 2)$   **$(2x + 1)(3x - 2)$**     4)  $11x(m + 2) + 7(m + 2)$   **$(m + 2)(11x + 7)$**   
 5)  $x(a - 6) + 2(6 - a)$   **$(x - 2)(a - 6)$**     6)  $3(5x - 1) - 8x(1 - 5x)$   **$(5x - 1)(8x + 3)$**

Factor by grouping.

- 7)  $24x^2 - 4xy + 30x - 5y$   **$(4x + 5)(6x - y)$**     8)  $10x^2 - 15x - 2x + 3$   **$(5x - 1)(2x - 3)$**   
 9)  $5x^2y + xy - 5x - 1$   **$(5x + 1)(xy - 1)$**     10)  $56xy - 16ry + 10r - 35x$   **$(8y - 5)(7x - 2r)$**

- 11) The following expression represents the area of a rectangle:  $3x^2 + 21xy + 5x + 35y$  square units. What are the side lengths? **The side lengths are  $(3x + 5)$  and  $(x + 7y)$  units.**  
 12) How is factoring related to the Distributive Property?

**Factoring is the inverse of the Distributive Property. When you distribute, you find the product of terms. Factoring takes the given product and looks for the factors.**

 Practice 1

 Worked solutions for these problems are located in the Digital Pack.

- 3) Q: If you write  $a$  times  $b$  and someone else writes  $b$  times  $a$ , are your expressions equal? What property demonstrates this?  
 A: *Yes, both expressions are equal because of the Commutative Property.*
- 5) Q: How should polynomial expressions be written?  
 A: *They should be written in standard form.*
- Q: If the signs of an expression are the inverse, what should you do to make the binomial expressions the same?  
 A: *Factor out  $-1$ .*
- 7) Q: What should your answer look like when you factor by grouping?  
 A: *It should look like two binomials being multiplied together.*
- 8) Q: What symbol should be between the two sets of parentheses before factoring?  
 A: *An addition sign.*
- 11) Q: How is the area formula related to the Distributive Property and factoring?  
 A: *Finding the sides when given the area is factoring. Finding the area when given the side lengths is distributing.*

## Mastery Check

### Show What You Know

- B)** Q: Why is it important to understand that both of these are the same answer?  
A: *It is important to understand this so you can accurately check your work.*
- C)** This error analysis shows that the middle term must be changed to adding a negative term. Your student should know that you cannot replace the subtraction symbols with addition symbols without maintaining the correct negative terms.

### Say What You Know

Your student should be able to restate the objectives of the lesson in their own words. If your student is unable to restate the lesson objectives, have them go back and reread the objectives and then explain them.

- Factor polynomials by grouping.

## Mastery Check

### Show What You Know

- A)** Why is it important that you know how to find the greatest common factor when factoring by grouping?  
**You cannot factor by grouping without first finding the GCF of the terms being paired together.**
- B)** If Michael wrote  $(x + 3)(x + 2)$  and Jordan wrote  $(x + 2)(x + 3)$ , are they both correct? Explain.  
**Both answers are correct because of the Commutative Property.**
- C)** Factor by grouping.  
Find and describe the error in the problem. Then rework the problem to find the correct answer.

$$12bc - 4bd - 15xc + 5xd$$

$$(12bc + 4bd) + (15xc + 5xd)$$

$$4b(3c + d) + 5x(3c + d)$$

$$(3c + d)(4b + 5x)$$

**The subtraction signs were changed to addition without rewriting the terms as negative.**

**Correct solution:**  
 $(12bc - 4bd) + (-15xc + 5xd)$   
 $4b(3c - d) + -5x(3c - d)$   
 $(3c - d)(4b - 5x)$

### Say What You Know

In your own words, talk about what you have learned using the objectives for this part of the lesson and your work on this page.

## Lesson Test

After achieving mastery for Parts A and B of this lesson, your student has the option to take the test. Before taking the test, ask your student these questions:

- Do you know all the new vocabulary words?
- Can you explain the objectives?
- Do you know how to check your work?
- Do you know how to use your Formula Sheet?
- Were you able to complete the practice questions without help?

### YES

If your student can answer “yes” to all of these questions, decide if your student is ready to take the Lesson Test.

### NOT YET

If your student cannot answer “yes” to all of these questions, consider having your student complete some of these options:

- Rework Practice 1.
- Complete Practice 2.
- Review the videos, Guided Notes, and Examples.

 Practice 2

Complete the practice problems on a separate sheet of paper.

Write the binomial factor that makes the statement true.

- 1)  $(x + 6)(7x - 8) = x(7x - 8) + 6(7x - 8)$   
 2)  $m(a + 5) + n(a + 5) = (a + 5)(m + n)$

Factor. Write as the product of two binomials.

- 3)  $x(2x - 9) + 3(2x - 9)$      $(2x - 9)(x + 3)$     4)  $8x(5x - 7) - 7(5x - 7)$      $(8x - 7)(5x - 7)$   
 5)  $2x(y - 8) + 3(8 - y)$      $(2x - 3)(y - 8)$     6)  $5(9 - x) + x(x - 9)$      $(x - 9)(x - 5)$

- 7) The Distributive Property is often written using the following formal notation:

$$a(b + c) = ab + ac$$

$$a(b - c) = ab - ac$$

Use this to explain how factoring and distributing are inverses.

Factor by grouping.

- 8)  $15x^2 + 12x + 20xy + 16y$      $(3x + 4y)(5x + 4)$     9)  $4xy - 24y + 6 - x$      $(4y - 1)(x - 6)$   
 10)  $21x^2y - 9xy - 14x + 6$      $(7x - 3)(3xy - 2)$

- 11) The area of a rectangle is  $8xy - 2y - 15 + 60x$ . What are the side lengths of the rectangle?

**The side lengths of a rectangle are  $4x - 1$  and  $2y + 15$  units.**

- 12)  $21x^2 + 9x - 42x - 18$   
 $3(x - 2)(7x + 3)$

 Practice 2

 Worked solutions for these problems are located in the Digital Pack.

3–6)

Note: remember to write expressions in standard form.

- 7) Finding the greatest common factor among terms is the first step in factoring. When looking at the right side of the equations you can see that all terms are multiplied by a. If you rewrite the products as their factors you would get the left side of the equations. This shows that factoring and distributing are inverses.

- 12) Factoring completely will be addressed in a later lesson. If your student has  $(3x - 6)(7x + 3)$  as their final answer, have them look at each binomial and ask if they see any more common factors.

If needed, have your student go back to the Mastery Check and reapply what they have learned to say and show what they know.

 Lesson Test

Refer to the Part B Mastery Check instructor note to determine if your student is ready for the test.

## Targeted Review

 Worked solutions for these problems are located in the Digital Pack.

If your student is going to take the Lesson Test, it is recommended that they do so before beginning the Targeted Review.

9) Q: What does consecutive mean?

A: *Consecutive means in a row (e.g., 4, 5, 6).*

11) Distractor Rationale:

- A) This is the correct value if the subtraction symbol between the expressions is ignored.
- B) This would be the value if  $6x^2$  was divided by  $Qx^2$ .
- C) This results in a positive leading coefficient.

12) Distractor Rationale:

- A) This product is a trinomial where +16 is the constant.
- B) This product is a trinomial where +16 is the constant.
- D) This product is a binomial but has -64 as the constant.

## TARGETED REVIEW 21

### Targeted Review

In the Targeted Review, you will practice topics you have mastered in earlier lessons. Reviewing these concepts will help you be successful as you work through this unit.

Complete the problems on a separate sheet of paper.

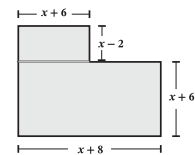
Find the product.

- 1)  $(6x + 1)(6x - 1)$   **$36x^2 - 1$**                       2)  $(6x - 1)(6x - 1)$   **$36x^2 - 12x + 1$**

- 3) The area of the Maxwell family's entire yard including their house is  $5x^2 + 6x + 30$ . The area of the house is  $x^2 + 2x + 13$ . What is the area of ONLY their yard? Write and simplify an expression to find the area of the shaded region.  **$4x^2 + 4x + 17$**



- 4) Find the total area of the composite figure. (Hint: Add the individual areas together.)  **$2x^2 + 18x + 36$  square units**



- 5) Suppose the value of  $x$  is 5 feet. What will the total area be for the previous problem?  **$176 \text{ ft}^2$**

Multiply using the exponent rules.

- 6)  $3x^4y^6 \cdot (3xy)^2$   **$27x^6y^8$**                       7)  $(5^8x^3y^{11})^{\frac{1}{2}}$   **$5^4x^{\frac{3}{2}}y^{\frac{11}{2}}$**

- 8) The length in feet of a rectangle is  $8y$ . The width is  $3xy$  feet. Find the area of the rectangle.  **$24xy^2 \text{ ft}^2$**
- 9) Write an equation and solve. The sum of three consecutive integers is 81. **The three consecutive numbers that add to 81 are 26, 27, 28.**
- 10) Amal's online business has a fixed expense of \$60 for access to the internet, plus it costs him \$0.50 per item he makes. Each item made earns Amal \$3.00. Write and solve a system of equations to determine when Amal will break even. **Amal needs to sell 24 items to break even.**

Multiple Choice

- D** 11) Determine the value of the unknown coefficient.
- $$(6x^2 - 4x - 5) - (Qx^2 - 7x + 11) = -2x^2 + 3x - 16$$
- A)  $Q = -8$
  - B)  $Q = -3$
  - C)  $Q = 4$
  - D)  $Q = 8$

- C** 12) Which set of binomial factors are equivalent to the given expression?  $121x^2 - 16$
- A)  $(11x - 4)^2$
  - B)  $(11x + 4)^2$
  - C)  **$(11x - 4)(11x + 4)$**
  - D)  $(11x + 8)(11x - 8)$

Problem	1	2	3	4	5	6	7	8	9	10	11	12
Lesson Origin	20	20	20	20	20	19	19	19	2	18	20	20