GRADE 7

ALIGNED TO THE CORE LESSON

FACTOR EXPRESSIONS

By DataWORKS Educational Research

Learning Objective

We will factor expressions.

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What are we going to do?

Activate Prior Knowledge

A common factor of two numbers is a factor both numbers share.

Find a common factor of the numbers below.

1. 9 and 6

   3

2. 4 and 10

   2

Rewrite both numbers using the common factor.

3. $9 = 3 \cdot 3$

   $6 = 3 \cdot 2$

4. $4 = 2 \cdot 2$

   $10 = 2 \cdot 5$

Make Connection

Students, you already know how to find a common factor of two numbers. Now, we will find common factors of terms when we factor expressions.

Factoring an expression is to rewrite an expression as the **product of expressions.**

- *One way to factor an expression is to find a common factor among terms.*
- *Factoring an expression produces[1] an equivalent[2] expression.*
- *If the only common factor among terms is 1, the expression cannot be factored.*

Factoring Expressions

$$9x + 6$$

3 is a common factor of $9x$ and 6.

$$3(3x + 2)$$

$9x + 6$ and $3(3x + 2)$ are **equivalent expressions.**

$$-4d + 10$$

-2 is a common factor of $-4d$ and 10.

$$-2(2d - 5)$$

$-4d + 10$ and $-2(2d - 5)$ are **equivalent expressions.**

CANNOT be Factored

$5a - 9$

$-2m + 7$

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Which expression shows $5b - 15$ factored? How do you know?

A $2b + 3b - 15$

B $5(b - 3)$

Explain why the expressions $-4d + 10$ and $-2(2d - 5)$ are equivalent expressions.

Explain why $-2m + 7$ CANNOT be factored.

In your own words, what is factoring an expression?

"Factoring an expression _____."

Vocabulary

[1] creates (synonym)
[2] equal value

Factoring an expression is to rewrite an expression as the **product of expressions**.

- *If the only **common factor** among terms is **1**, the expression **cannot** be factored.*

Factor expressions.

1. Determine[3] a factor the terms have in common.
   Hint: Use a factor that will make the variable term positive.
2. Rewrite **each term** as a product using the common factor.
3. Rewrite the **expression** as a product of expressions using the common factor.
4. Interpret[4] the factored expression. *"____ is equivalent to ___ times ___."*

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1. How did I/you determine a factor the terms have in common?
2. How did I/you rewrite each term?
3. How did I/you rewrite the expression?

1. $14a - 7$

Common Factor: 7

$7(2a) - 7(1)$
$7(2a - 1)$

"14a – 7 is equivalent to 7 times (2a – 1)"

2. $8y + 32$

Common Factor: 8

$8(y) + 8(4)$
$8(y + 4)$

"8y + 32 is equivalent to 8 times (y + 4)"

3. $-15b + 20$

Common Factor: -5

$-5(3b) + -5(-4)$
$-5[3b + (-4)]$
$-5(3b - 4)$

"-15b + 20 is equivalent to -5 times (3b – 4)"

4. $-12z - 18$

Common Factor: -6

$-6(2z) - (-6)(-3)$
$-6[2z - (-3)]$
$-6(2z + 3)$

"-12z – 18 is equivalent to -6 times (2z + 3)"

5. $3 - (4c + 6)$

Common Factor: 2

$3 - 2(2c) + 2(3)$
$3 - 2(2c + 3)$

"3 – (4c + 6) is equivalent to 3 minus 2 times (2c + 3)"

6. $7 + (10x - 20)$

Common Factor: 10

$7 + 10(x) - 10(2)$
$7 + 10(x - 2)$

"7 + (10x – 20) is equivalent to 7 plus 10 times (x – 2)"

Vocabulary

[3] figure out
[4] explain (synonym)

Factoring an expression is to rewrite an expression as the **product of expressions**.

- *If the only **common factor** among terms is **1**, the expression **cannot** be factored.*

Factor expressions.

1. Determine a factor the terms have in common.
   Hint: Use a factor that will make the variable term positive.
2. Rewrite **each term** as a product using the common factor.
3. Rewrite the **expression** as a product of expressions using the common factor.
4. Interpret the factored expression. "____ *is equivalent to* ___ *times* ___."

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1. How did I/you determine a factor the terms have in common?
2. How did I/you rewrite each term?
3. How did I/you rewrite the expression?

7. $9k + 7$

Common Factor: 1

"9k + 7 cannot be factored because the only factor common among terms is 1."

8. $5w - 12$

Common Factor: 1

"5w – 12 cannot be factored because the only factor common among terms is 1."

9. $\frac{3}{4}k + 9$

Common Factor: $\frac{3}{4}$

$\frac{3}{4}(k) + \frac{3}{4}(12)$

$\frac{3}{4}(k + 12)$

"$\frac{3}{4}$k + 9 is equivalent to $\frac{3}{4}$ times (k + 12)"

10. $\frac{2}{3}h - 6$

Common Factor: $\frac{2}{3}$

$\frac{2}{3}(h) - \frac{2}{3}(9)$

$\frac{2}{3}(h - 9)$

"$\frac{2}{3}$h – 6 is equivalent to $\frac{2}{3}$ times (h – 9)"

Solving Math Problems

1. Determine what the question is asking.
2. Determine the math concept required.
3. Determine relevant information.
4. Solve the problem, then interpret the answer.
5. Check the reasonableness of your answer.

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1. How did I/you determine what the question is asking?
2. How did I/you determine the math concept required?
3. How did I/you determine the relevant information?
4. How did I/you solve and interpret the problem?
5. How did I/you check the reasonableness of the answer?

11. The perimeter[5] of an equilateral[6] triangle is $6p - 18$. What is the length of each side of the triangle?

$6p - 18$

$3(2p) - 3(6)$

Common Factor: 3 (sides)

$3(2p - 6)$

The length of each side of the triangle is $2p - 6$.

12. The perimeter of a square is $16q - 32$. What is the length of each side of the square?

$16q - 32$

$4(4q) - 4(8)$

Common Factor: 4 (sides)

$4(4q - 8)$

The length of each side of the square is $4q - 8$.

Vocabulary

[5] distance around
[6] all sides equal

Factoring an expression is to rewrite an expression as the **product of expressions**.

- *If the only **common factor** among terms is **1**, the expression **cannot** be factored.*

1 *Factoring expressions will help you solve equations.*

$$\frac{2}{3}h - \frac{5}{3} = 3$$

$$3 \bullet \frac{1}{3}(2h - 5) = 3 \bullet 3$$

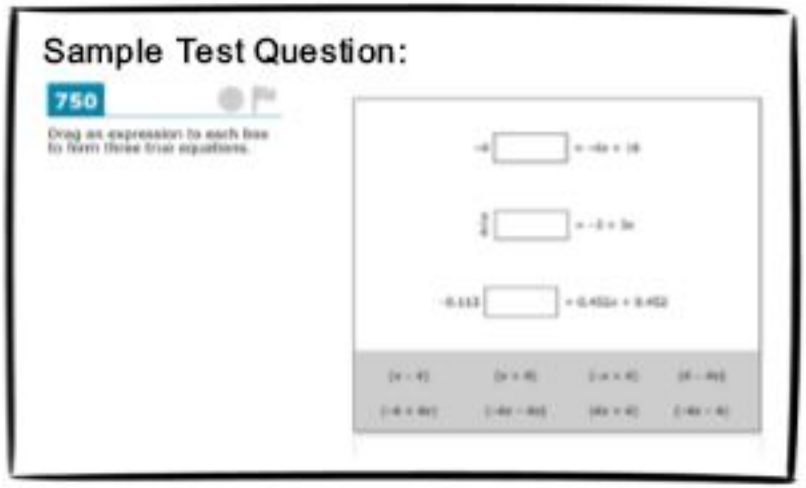
$$(2h - 5) = 9$$

$$+5 \quad +5$$

$$\frac{2h}{2} = \frac{14}{2}$$

$$h = 7$$

2 *Factoring expressions will help you do well on tests.*



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Does anyone else have another reason why it is relevant to factor expressions? (Pair-Share) Why is it relevant to factor expressions? You may give one of my reasons or one of your own. Which reason is more relevant to you? Why?

Factoring an expression is to rewrite an expression as the **product of expressions**.

- *If the only **common factor** among terms is **1**, the expression **cannot** be factored.*

Skill Closure

Factor expressions.

1. Determine a factor both terms have in common.
   Hint: Use a factor that will make the variable term positive.
2. Rewrite **each term** as a product using the common factor.
3. Rewrite the **expression** as a product of expressions using the common factor.
4. Interpret the factored expression. *"____ is equivalent to ___ times ___."*

1. $3f - 18$
   Common Factor: 3
   $3(f) - 3(6)$
   $3(f - 6)$
   "3f – 18 is equivalent to 3 times (f – 6)"

2. $-9d - 24$
   Common Factor: -3
   $-3(3d) - (-3)(-8)$
   $-3[3d - (-8)]$
   $-3(3d + 8)$
   "-9d – 24 is equivalent to -3 times (3d + 8)"

Access Common Core

Which expressions below are **NOT** factored? Explain your answer.

$3x + 9$ $\quad 3(x + 3)$ $\quad 2a + 6$ $\quad a + a + 6$ $\quad 2(4x)$

The expressions are **NOT** factored because they have common factors that both terms have in common.

Word Bank

factoring
equivalent
expression
determine

Summary Closure

What did you learn today about factoring expressions? (Pair-Share)
Use words from the word bank.

Factoring an expression is to rewrite an expression as the **product of expressions**.

- *If the only **common factor** among terms is **1**, the expression **cannot** be factored.*

Factor expressions.

1. Determine a factor the terms have in common.
   Hint: Use a factor that will make the variable term positive.
2. Rewrite **each term** as a product using the common factor.
3. Rewrite the **expression** as a product of expressions using the common factor.
4. Interpret the factored expression. *"____ is equivalent to ___ times ___."*

1. $15v - 5$

Common Factor: 5

$5(3v) - 5(1)$
$5(3v - 1)$

"15v – 5 is equivalent to 5 times (3v – 1)"

2. $-27b + 18$

Common Factor: -9

$-9(3b) + (-9)(-2)$
$-9[3b + (-2)]$
$-9(3b - 2)$

"-27b + 18 is equivalent to -9 times (3b – 2)"

3. $9 - (10x + 25)$

Common Factor: 5

$9 - 5(2x) + 5(5)$
$9 - 5(2x + 5)$

"9 – (10x + 25) is equivalent to 9 minus 5 times (2x + 5)"

4. $-3j - 8$

Common Factor: 1

"3j – 8 cannot be factored because the only factor common among terms is 1."

5. $\frac{2}{5}f + 8$

Common Factor: $\frac{2}{5}$

$\frac{2}{5}(f) + \frac{2}{5}(20)$
$\frac{2}{5}(f + 20)$

"$\frac{2}{5}$ f + 8 is equivalent to $\frac{2}{5}$ times (f + 20)"

Solving Math Problems

1. Determine what the question is asking.
2. Determine the math concept required.
3. Determine relevant information.
4. Solve the problem, then interpret the answer.
5. Check the reasonableness of your answer.

6. The perimeter of a regular[1] pentagon is $25p - 35$. What is the length of each side of the pentagon?

$25p - 35$

Common Factor: 5 (sides)

$5(5p) - 5(7)$

$5(5p - 7)$

The length of each side of the pentagon is $5p - 7$.

Vocabulary

[1] all sides and angles equal

Periodic Review 1

1. $6w - 15$	$3(2w - 5)$	2. $-30b + 15$	$-15(2b - 1)$
3. $\frac{1}{3}c + 7$	$\frac{1}{3}(c + 21)$	4. $-7h - 20$	Cannot be factored.
5. $9 - (8g + 14)$	$9 - 2(4g + 7)$	6. $-6b - 36$	$-6(b + 6)$

Access Common Core

Determine each factor that will make the expressions equivalent.

1. A $18d - 45 = \underline{3}(6d - 15)$
   B $6f + 42 = \underline{2}(3f + 21)$
   C $12g - 14 = \underline{2}(6g - 7)$
   D $9h + 36 = \underline{9}(h + 4)$

2. A $21j + 49 = \underline{7}(3j + 7)$
   B $15k + 3 = \underline{3}(5k + 1)$
   C $56m - 28 = \underline{14}(4m - 2)$
   D $8n - 4 = \underline{4}(2n - 1)$

3. A $25p - 45 = \underline{5}(5p - 9)$
   B $16q + 4 = \underline{2}(8q + 2)$
   C $35r + 56 = \underline{7}(5r + 8)$
   D $30u - 10 = \underline{10}(3u - 1)$

Periodic Review 2

1. $9t - 5$ Cannot be factored.

2. $-12p + 18$ $-6(2p - 3)$

3. $5 - (21g + 35)$ $5 - 7(3g + 5)$

4. $11p + 33$ $11(p + 3)$

Access Common Core

1. Choose Yes or No to indicate whether each expression is equivalent to $\mathbf{20h + 12}$.

A	$2(10h + 12)$	○ Yes	● No
B	$4(5h + 3)$	● Yes	○ No
C	$20(h + 12)$	○ Yes	● No
D	$2(10h + 6)$	● Yes	○ No

2. Choose Yes or No to indicate whether each expression is equivalent to $\mathbf{-18p + 36}$.

A	$-3(6p + 12)$	○ Yes	● No
B	$6(-3p + 6)$	● Yes	○ No
C	$-18(p - 2)$	● Yes	○ No
D	$-9(3p - 36)$	○ Yes	● No

3. Choose Yes or No to indicate whether each expression is equivalent to $\mathbf{45d - 15}$.

A	$3(15d - 5)$	● Yes	○ No
B	$45(d - 15)$	○ Yes	● No
C	$15(3d)$	○ Yes	● No
D	$5(9d - 3)$	● Yes	○ No

1. The perimeter of a square is $28d + 36$. What is the length of each side of the square?

The length of each side of the square is $7d + 9$.

2. The perimeter of a regular hexagon is $18b - 42$. What is the length of each side of the hexagon?

The length of each side of the hexagon is $3b - 7$.

Access Common Core

Describe and correct each error made in factoring expressions below.

1. A $-5x - 20$

$-5(x - 4)$

$-5(x + 4)$

-5 was factored from the first term, but +5 was factored from the second term.

B $-7y + 28$

$-7(y + 4)$

$-7(y - 4)$

-7 was factored from the first term, but +7 was factored from the second term.

C $-9z - 6$

$-3(3z - 2)$

$-3(3z + 2)$

-3 was factored from the first term, but +3 was factored from the second term.

2. A $15a - 20$

$15(a - 20)$

$5(3a - 4)$

15 is not a common factor among terms.

B $14b + 16$

$14(b + 16)$

$2(7b + 8)$

14 is not a common factor among terms.

C $18c - 6$

$18(c - 6)$

$6(3c - 1)$

18 is not a common factor among terms.

3. A $18k - 9$

$9(2k)$

$9(2k - 1)$

The 1 was left off after factoring the second term.

B $24m + 6$

$6(4m)$

$6(4m + 1)$

The 1 was left off after factoring the second term.

C $12n - 3$

$3(4n)$

$3(4n - 1)$

The 1 was left off after factoring the second term.