

Learning Objective: Students will be able to factor numerical and algebraic expressions.

# Warm Up

Find the value of each expression in lowest terms.

1.  $3 \div \frac{17}{4} \div \frac{18}{5}$

4.  $2 \div \left( \frac{12}{7} \div \frac{20}{3} \right)$

7.  $\frac{19}{7} \div \frac{1}{3} \div \frac{5}{3}$

2.  $\frac{1}{2} \div \frac{2}{7} \div 11$

5.  $\frac{4}{5} \div \left( \frac{7}{5} \div 10 \right)$

8.  $4 \div \frac{9}{2} \div \frac{17}{6}$

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# Warm Up Answers

Find the value of each expression in lowest terms.

$$1. 3 \div \frac{17}{4} \div \frac{18}{5}$$

$$= \frac{10}{51}$$

$$3 \cdot \frac{4}{17} = \frac{12}{17} \cdot \frac{5}{18} = \frac{10}{51}$$

$$4. 2 \div \left( \frac{12}{7} \div \frac{20}{3} \right)$$

$$= \frac{70}{9} = 7\frac{7}{9}$$

$$\left( \frac{10}{51} \right)$$

$$7. \frac{19}{7} \div \frac{1}{3} \div \frac{5}{3}$$

$$= \frac{171}{35} = 4\frac{31}{35}$$

$$2. \frac{1}{2} \div \frac{2}{7} \div 11$$

$$= \frac{7}{44}$$

$$5. \frac{4}{5} \div \left( \frac{7}{5} \div 10 \right)$$

$$= \frac{40}{7} = 5\frac{5}{7}$$

$$8. 4 \div \frac{9}{2} \div \frac{17}{6}$$

$$= \frac{16}{51}$$

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# Homework Answers

## 3.4 Record and Practice Journal

Use the Distributive Property and mental math to find the product.

1.  $4 \times 31$

**124**

2.  $7 \times 49$

**343**

3.  $16(38)$

**608**

Use the Distributive Property to simplify the expression.

4.  $8(5 + w)$

**$40 + 8w$**

5.  $11(9 + d)$

**$99 + 11d$**

6.  $15(p - 4 + 2)$

**$15p - 30$**

Simplify the expression.

7.  $2x - 4 + 3x$

**$5x - 4$**

8.  $4y - 1 - 3y + 2$

**$y + 1$**

9.  $x + 2(x - 4)$

**$3x - 8$**

10. A jazz band sells 31 large boxes of fruit and 74 small boxes of fruit for a fundraiser.

- a. Use the Distributive Property to write and simplify an expression for the profit.



Profit = Price - Cost

**$31(20 - x) + 74(10 - y)$**   
 **$1360 - 31x - 74y$**

- b. A large box of fruit costs \$9 and a small box of fruit costs \$4. What is the jazz band's profit?

**\$785**

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# Self-Evaluation Scale

Score	Description
4	I can teach other students how to factor numerical and algebraic expressions.
3	I can factor numerical and algebraic expressions.
2	I recognize, but still need help to factor numerical and algebraic expressions.
1	I do not know how to factor numerical and algebraic expressions.

## Key Idea

### Factoring an Expression

**Words** Writing a numerical expression or algebraic expression as a product of factors is called **factoring the expression**. You can use the Distributive Property to factor expressions.

**Numbers**  $3 \cdot 7 + 3 \cdot 2 = 3(7 + 2)$   
 $3 \cdot 7 - 3 \cdot 2 = 3(7 - 2)$

**Algebra**  $ab + ac = a(b + c)$   
 $ab - ac = a(b - c)$

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## 1 Factoring a Numerical Expression

Factor  $20 - 12$  using the GCF.

Find the GCF of 20 and 12 by listing their factors.

Factors of 20: ①, ②, ④, 5, 10, 20

Factors of 12: ①, ②, 3, ④, 6, 12

Circle the common factors.

The GCF of 20 and 12 is 4.

Write each term of the expression as a product of the GCF and the remaining factor. Then use the Distributive Property to factor the expression.

$$\begin{aligned} 20 - 12 &= 4(5) - 4(3) \\ &= 4(5 - 3) \end{aligned}$$

Rewrite using GCF.

Distributive Property

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2

## Identifying Equivalent Expressions

Which expression is not equivalent to  $16x + 24$ ?  $= 8(2x + 3)$

- (A)  $2(8x + 12)$    (B)  $4(4x + 6)$    (C)  $6(3x + 4)$    (D)  $(2x + 3)8$

Each choice is a product of two factors in which one is a whole number and the other is the sum of two terms. For an expression to be equivalent to  $16x + 24$ , its whole number factor must be a common factor of 16 and 24.

**Factors of 16:** ①, ②, ④, ⑧, 16

**Factors of 24:** ①, ②, 3, ④, 6, ⑧, 12, 24

Circle the common factors.

The common factors of 16 and 24 are 1, 2, 4, and 8. Because 6 is not a common factor of 16 and 24, Choice C cannot be equivalent to  $16x + 24$ .

**Check:**  $6(3x + 4) = 6(3x) + 6(4) = 18x + 24 \neq 16x + 24$  **X**

∴ So, the correct answer is (C).



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### 3 Factoring an Algebraic Expression

You receive a discount on each book you buy for your electronic reader. The original price of each book is  $x$  dollars. You buy 5 books for a total of  $(5x - 15)$  dollars. Factor the expression. What can you conclude about the discount?

Find the GCF of  $5x$  and  $15$  by writing their prime factorizations.

$$5x = 5 \cdot x$$

$$15 = 5 \cdot 3$$

Circle the common prime factor.

So, the GCF of  $5x$  and  $15$  is  $5$ . Use the GCF to factor the expression.

$$5x - 15 = 5(x) - 5(3)$$

Rewrite using GCF.

$$= 5(x - 3)$$

Distributive Property

The factor  $5$  represents the number of books purchased. The factor  $(x - 3)$  represents the price of each book. This factor is a difference of two terms, showing that the price  $x$  of each book is decreased by  $\$3$ .

••• So, the factored expression shows a  $\$3$  discount for every book you buy. The original expression shows a total savings of  $\$15$ .



$$22x + 11$$

$$11(2x + 1)$$

$$56x + 63$$

$$7(8x + 9)$$

$$64x + 24$$

$$8(8x + 3)$$

$$32x + 72$$

$$8(4x + 9)$$

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# Assignment

Complete problems 2, 6, 8, 10, 12, 14, 16, 18, & 19  
on page I4I in your Big Ideas Text Book.

# Assignment Answers

**2.**  $11(4 - 1)$

**4.**  $5(14 + 19)$

**6.**  $20(5 - 4)$

**8.**  $16(3 + 5)$

**10.**  $3(5x + 2)$

**12.**  $10(5x - 6)$

**14.**  $14(x - 7)$

**16.**  $8(3y + 11x)$

**18.** *Sample answer:*  $16 + 8x$ ,  
 $8(x + 2)$ ,  $4(2x + 4)$ ,  
 $2(4x + 8)$ ,  $(4x + 8)2$

**19.**  $(x + 4)$  ft

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# Homework

In your Big Ideas Record and Practice Journal  
page 73 & 74.