UNITED ARAB EMIRATES
MINISTRY OF EDUCATION

YEAR OF
ZAYED

2018 - 2019

7

McGraw-Hill Education

Mathematics

Elite Stream

United Arab Emirates Edition

Interactive Student Guide

Mc Graw Hill Education

Answer Key

McGraw-Hill Education

Mathematics

Elite Stream

United Arab Emirates Edition

Interactive Student Guide

Mc Graw Hill Education

Brief Contents

Are You Ready?

Try these Quick Checks below.

Quick Review

Example 1

Find 11.9 − 2.15.

$$\begin{array}{r} {\scriptstyle 8\,10} \\ 11.\cancel{9}0 \\ -\ 2.15 \\ \hline 9.75 \end{array}$$

Annex a zero to align the decimal points.

Subtract.

$11.9 - 2.15 = 9.75$

Example 2

Write the number that represents point A on the number line.

The number line starts at 0 and increases by 1.

So, point *A* is at 4.

Quick Check

Decimals **Find each sum or difference.**

1. $\begin{array}{r} 5.8 \\ +\ 4.2 \\ \hline 10 \end{array}$

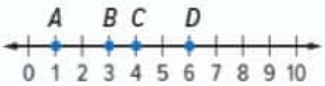
2. $\begin{array}{r} 9.4 \\ -\ 3.1 \\ \hline 6.3 \end{array}$

3. $\begin{array}{r} 5.7 \\ -\ 3.52 \\ \hline 2.18 \end{array}$

4. Rashid has AED 34.75. His sister gives him AED 13.75. How much money does Rashid have now? AED 48.50

Show your work.

Number Lines **Write the number that represents each point on the number line.**



5. *A* 1 **6.** *B* 3 **7.** *C* 4 **8.** *D* 6

How Did You Do?

Which problems did you answer correctly in the Quick Check? Shade those exercise numbers below.

(1) (2) (3) (4) (5) (6) (7) (8)

Lesson 6-1

A Plan for Problem Solving

Getting Started

Sample answers are given.

Scan Lesson 6-1 in your textbook. List two real-world scenarios which you could use the four-step plan to solve a problem.

- finding the total amount deposited into an account after 5 months if the same amount is deposited each month
- finding the total cost to spend the day at an amusement park

Quick Review

Circle the operation that you would use to answer each question.

- How many more? × (−)
- How many times as many? (÷) +

Real-World Link

Cell Phones The table shows the results of a survey about how teens use their cell phones. Fifty of the teens surveyed said they use their cell phones to play games *and* play music. How many play music only?

I Use My Cell Phone to...	Number of Teens
access social network sites	46
exchange videos	61
play games	92
play music	120
take pictures	177

1. Fill in the information that you know.

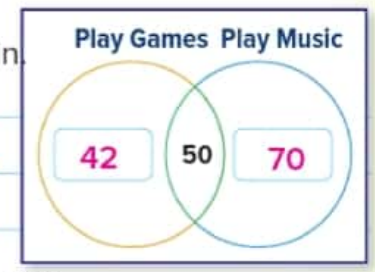
   92 teens use their cell phones to play games.

   120 teens use their cell phones to play music.

   50 teens use their cell phones to both play games and play music.

2. What operation(s) could you use to complete the diagram at the right? Explain.

   Subtraction; subtract the number of teens who play both music and games from the total number that play each.



3. Use the diagram to find the number of teens surveyed who use their cell phones to play music only. 70 teens

4. Does your answer make sense? Explain. Yes; sample answer: teens who play games: 42 + 50 or 92; teens who play music: 50 + 70 or 120

Questions

Notes

The Four-Step Plan

Identify the step in the four-step plan to which each statement or question belongs. Write U for *Understand*, P for *Plan*, S for *Solve*, or C for *Check*.

P Determine how the facts relate to each other.

U What facts do I know?

S Use my plan to solve the problem.

U What do I need to find out?

C Does my answer make sense?

P Choose one or more problem-solving strategies.

Solving Multi-Step Problems

Choose one of the multi-step problems in Lesson 6-1.

Describe your plan to solve the problem.

See students' work.

How many operations must be used? List them.

See students' work.

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

☐ I understand how to use the four-step plan.

Great! You're ready to move on!

☐ I still have questions about using the four-step plan.

Lesson 6-2

Words and Expressions

Getting Started

Sample answers are given.

Write the math and the real-world definitions of operation.

- math definition: an arithmetical action performed on numbers
- real-world definition: a medical procedure performed on a person

Quick Review

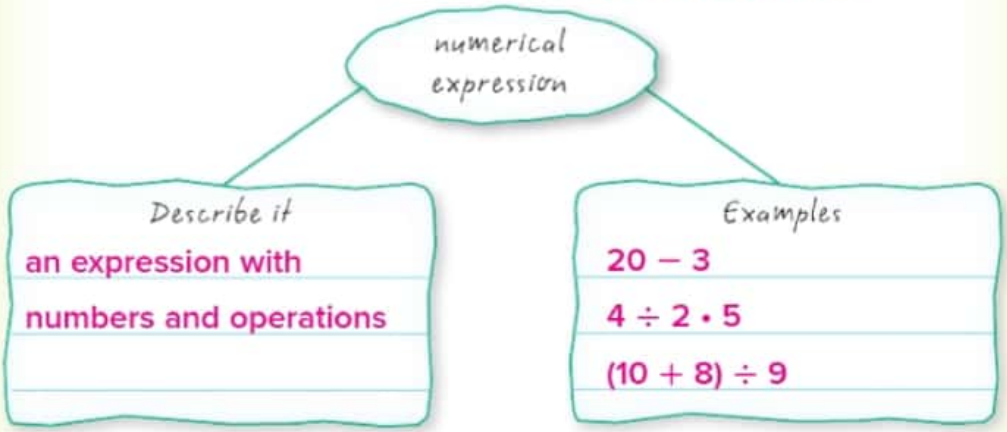
Name a mathematical operation and its inverse.

Sample answer: addition, subtraction

Vocabulary Start-Up

A **numerical expression** contains a combination of numbers and operations, such as addition, subtraction, multiplication, and division.

Complete the graphic organizer. Sample answers are given.



Real-World Link

Inventions Order the following steps for taking a digital picture from 1-5. Place a 1 by the step you would do first and a 5 by the step you would do last.

2 Point the camera at the person or object to be photographed.

1 Check the battery level.

5 Play back your picture to see if you want to keep it.

4 Take the picture.

3 Zoom in or out to focus.

Questions

Notes

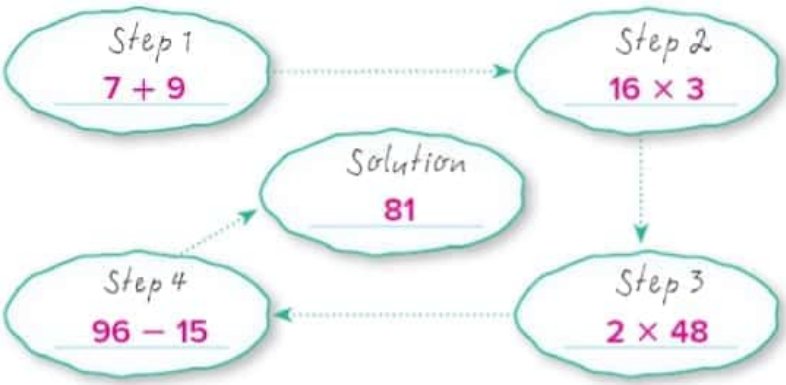
Translate Verbal Phrases into Expressions

Fill in each box with the correct symbol.

1. the difference of 18 and 13 → 18 − 13
2. the quotient of 81 and 9 → 81 ÷ 9
3. the cost of 4 pencils at AED 0.99 each → 4 × 0.99
4. total students if there are 7 boys and 11 girls → 7 + 11

Order of Operations

Complete each step to evaluate $2[(7 + 9) \times 3] - 15$.



Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

How confident are you about writing and evaluating numerical expressions? Shade the ring on the target.

FOLDABLES Time: Hang up your foldable!

Lesson 6-3

Variables and Expressions

Getting Started

Scan Lesson 6-3 in your textbook. List two headings you would use to make an outline of the lesson. Sample answers are given.

- Algebraic Expressions and Verbal Phrases
- Evaluating Expressions

Vocabulary

Check the box next to the term or phrase below that you already know.

- ☐ algebra
- ☐ algebraic expression
- ☐ defining a variable
- ☐ Substitution Property of Equality

Real-World Link

Online Games There are several different types of online games, including role playing games, real-time strategy games, and social games. Eiman likes to play a certain social game with his friends. The table below shows the number of points earned for different actions in the game.

Online Gaming	
Action	Points Earned
jumping over an obstacle	6
feeding an animal	3
recruiting a new player	20

1. How can you find the total number of points Eiman would earn if he jumps over five obstacles and recruits two new players?

   Find the sum of 5×6 and 2×20.

2. Refer to your answer for Exercise 1. How many points would he earn?

   70 points

3. Let a represent *any number of animals*. What expression could be used to find the total points earned for jumping over one obstacle and feeding any number of animals?

   $6 + 3a$

4. Suppose the letter p is used to represent the number of players Eiman recruits to play the game. What would the expression $20p + 3a$ represent?

   total number of points earned for recruiting p players and feeding a animals

Questions

Notes

Algebraic Expressions and Verbal Phrases

Complete the graphic organizer to describe the steps involved in writing algebraic expressions.

Words

Describe the situation using only the most important words.

Variable

Define a variable to represent the unknown quantity.

Expression

Translate the verbal model into an algebraic expression.

Substitution Property of Equality

Evaluate each expression if $a = 3$, $b = 7$, and $c = 5$.

1. $6c \div 15 =$ 2
2. $32 + 4a =$ 44
3. $27a - (16 - 3c) =$ 80
4. $\frac{bc}{a+2} =$ 7
5. $2b - 4a =$ 2

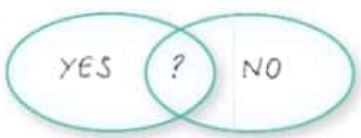
Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

Are you ready to move on? Shade the section that applies.



FOLDABLES Time to update your foldable!

Lesson 6-4

Properties of Numbers

Getting Started

Scan Lesson 6-4 in your textbook. Write the definitions of Associative Property of Addition and Associative Property of Multiplication in your own words. Sample answers are given.

- Addition: When adding, the way numbers are grouped does not affect their sum.
- Multiplication: When multiplying, the way numbers are grouped does not affect their product.

Vocabulary

Circle the vocabulary word defined below.

A statement that is true for any numbers.

property

counterexample

Real-World Link

Crafts Did you know that duct tape comes in dozens of colors and in patterns ranging from tie-dye to digital camouflage? The table shows the amount of duct tape that is needed to make a purse.

Purse Panels	Length of Strips (in.)	Number of Strips
front and back	12	28
sides		4
bottom	14	4

14

1. Complete the steps below to find the total number of duct tape strips needed to make a purse.

Method 1

$(28 + 14) + 4$

$42 + 4$

46

Method 2

$28 + (14 + 4)$

$28 + 18$

46

2. Based on what you learned from scanning the lesson, which property is illustrated in Exercise 1? Associative Property of Addition

3. Write an expression to find the total length of duct tape needed to make each of the following. Then find each length.

expression for side panels: 4×14 total length: 56 in.

expression for bottom panel: 14×4 total length: 56 in.

4. What do you notice about the expressions and solutions that you wrote in Exercise 3? Sample answer: The numbers are multiplied in different orders, and the products are the same.

Questions

Notes

Properties of Addition and Multiplication

Circle the word or number that describes each property. Then write an example for each. Sample answers are given.

Commutative (+ and ×)

order grouping

$4 + 5 = 5 + 4$

$4 \cdot 5 = 5 \cdot 4$

Associative (+ and ×)

order grouping

$(2 + 3) + 4 = 2 + (3 + 4)$

$(2 \cdot 3) \cdot 4 = 2 \cdot (3 \cdot 4)$

Identity (+)

0 1

$5 + 0 = 5$

Identity (×)

0 1

$7 \cdot 1 = 7$

Simplify Algebraic Expressions

Simplify each expression by filling in the boxes with a variable or number. Sample answers are given.

1. $(8 + x) + 2$

   x + 10

2. $k \times (4 \times 4)$

   k × 16

3. $3 \times (7 \times p)$

   21 × p

4. $9 + (b + 5)$

   14 + b

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

How confident are you about identifying and using properties? Check the box that applies.

FOLDABLES Time to update your foldable!

Mid-Chapter Check

Vocabulary Check

1. **Be Precise** Define *four-step plan*. List the steps in the plan. (Lesson 1)
four steps that can be used to solve any math problem; understand, plan, solve, check

Fill in the blank.

2. To evaluate an expression using the order of operations, first simplify inside grouping symbols . (Lesson 2)

Skills Check and Problem Solving

3. Fatema is saving for a tablet that costs AED 2185. She saves AED 92 each week. In how many weeks will she have enough money to buy the tablet? Use the four-step plan to solve. (Lesson 1) 24 weeks

Show your work

Evaluate. (Lesson 2)

4. $\frac{40-8}{5}+3=$ 4

5. $2(8+3)-4\times 5=$ 2

Translate each phrase into an algebraic expression. (Lesson 3)

6. five less than a number
$n-5$

7. twice as many students
$2s$

8. the number of tires on c cars
$4c$

9. **Standardized Test Practice** Which of the following is an example of the Commutative Property? (Lesson 4) C
   - (A) $18+(10+5)=(18+10)+5$
   - (B) $18+10+5=18+(10+5)$
   - (C) $(4\cdot 2)\cdot 10=(2\cdot 4)\cdot 10$
   - (D) $(4\cdot 2)\cdot 10=4\cdot(2\cdot 10)$

Lesson 6-5

Problem-Solving Strategies

Getting Started

Scan Lesson 6-5 in your textbook. List two headings you would use to make an outline of the lesson. Sample answers are given.

- Look for a Pattern
- Guess, Check, and Revise

Quick Review

What are the four steps in the problem-solving plan?

1. understand
2. plan
3. solve
4. check

Real-World Link

Movie Snacks Ayesha and her friends are at the concession counter at the movie theater. After buying a ticket, Ayesha has 10 dirhams left to buy snacks. The prices of the items she is considering are shown below.

1. Ayesha wants to buy a box of popcorn and two sodas. How much money will she have left? AED 1.25

2. How could you find all of the ways that she could receive the correct change? Make a table to show all of the possible combinations.

3. Complete the table to show all of the possible combinations for her change if she always receives a one dirham coin.

Dirham Coin	25-fils Coin	10-fils Coin	5-fils Coin
1	1	0	0
1	0	2	1
1	0	1	3
1	0	0	5

4. In how many different ways can Ayesha receive her change? 4 ways

Questions

Notes

Use Problem-Solving Strategies

Complete the table by writing a summary of each problem-solving strategy. Sample answers are given.

Strategy	Summary
guess, check, and revise	Make a reasonable guess and check it. Use the results to improve your guess until the solution is found.
look for a pattern	Analyze the first few numbers in a pattern to identify a rule. Then use the rule to extend the pattern and find a solution.
make a table	Use a table to organize information in an understandable way.
work backward	Begin with the end result and undo steps to find what happened earlier.

Select an appropriate strategy that could be used to solve each problem.

1. Abeer can run one lap in 65 seconds. Each additional lap takes her 2 seconds longer to run than the previous lap. How many minutes will it take her to run three kilometers, if 1 kilometer = 2.5 laps?

   Sample answer: look for a pattern

2. Saeed needs to be at school at 7:45 A.M. It takes him 25 minutes to walk to school, 25 minutes to eat, and 35 minutes to shower and get dressed. What time should he get up to be at school 5 minutes early?

   Sample answer: work backward

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

How well do you understand the different problem-solving strategies? Circle the image that applies.

Ordered Pairs and Relations

Getting Started

Scan Lesson 6-6 in your textbook. List two real-world scenarios in which you would use a coordinate syste Sample answers are given.

- to show the relationship between pizzas ordered and total cost
- to show the relationship between hours spent hiking and miles hiked

Vocabulary

Write the definition of *coordinate system* in your own words.

See students' work.

Vocabulary Start-Up

A set of ordered pairs such as {(1, 2), (2, 4), (3, 0), (4, 5)} is a **relation**. The **domain** of the relation is the set of *x*-coordinates. The **range** of the relation is the set of *y*-coordinates.

Label the sets below with the terms *domain*, *ordered pair*, *range*, and *relation*.

Relation

{(1, 2), (2, 4), (3, 0), (4, 5)}

Ordered Pair

{1, 2, 3, 4}

Domain

{0, 2, 4, 5}

Range

Real-World Link

Bungee Jumping The table describes the approximate heights and times of the jumps at four bungee jumping sites.

Height (ft)	Time of Fall (s)
170	3
452	5
630	6
764	7

1. Write the data as a relation with ordered pairs (meters, seconds).
   {(170, 3), (452, 5), (630, 6), (764,7)}

2. Write the domain and range of the relation.
   domain: {170, 452, 630, 764}
   range: {3, 5, 6, 7}

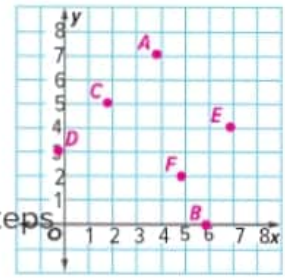
Questions

Notes

Ordered Pairs

Graph each ordered pair on the coordinate plane.

1. $A(4, 7)$
2. $B(6, 0)$
3. $C(2, 5)$
4. $D(0, 3)$
5. $E(7, 4)$
6. $F(5, 2)$



7. How would you explain to a friend the steps for graphing a point on the coordinate plane? See students' work.

Relations

Express each relation as a table. Then write the domain and range.

8. {(2, 2), (4, 1), (3, 0), (6, 6)}

domain: {2, 3, 4, 6}

range: {0, 1, 2, 6}

x	2	4	3	6
y	2	1	0	6

9. {(3, 4), (2, 1), (1, 2), (4, 5)}

domain: {1, 2, 3, 4}

range: {1, 2, 4, 5}

x	3	2	1	4
y	4	1	2	5

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

Are you ready to move on? Shade the section that applies.

Lesson 6-7

Words, Equations, Tables, and Graph

Getting Started

Scan Lesson 6-7 in your textbook. Predict two things you will le about multiple representations of equations. Sample answers are given.

- how to represent relations in different ways
- how to write an equation to represent a situation

Vocabulary

Write the definition of *equation* in your own words.

See students' work.

Real-World Link

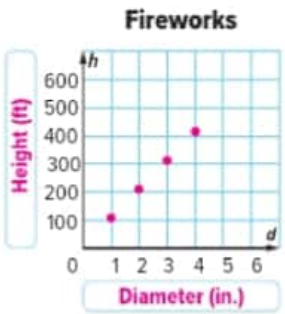
Fireworks Physics can be used to calculate the path of fireworks. In general, for every 1-inch increase in shell diameter, a firework's height increases by about 100 feet.

1. How does the height of a firework relate to the diameter of its shell?

   For every inch in shell diameter, the height increases by 100 feet.

2. Complete the table to show the approximate height of a firework with different sized shells. Then graph the data as ordered pairs (diameter, height).

Fireworks	
Diameter (in.)	Height (ft)
1	100
2	200
3	300
4	400



3. How could you find the approximate height of a firework with any sized shell? Multiply the diameter of the shell by 100.

4. Based on the rule you wrote in Exercise 3, what is the approximate height of a firework with a 6-inch shell?

   600 ft

   an 8-inch shell? 800 ft

Questions

Notes

Represent Relations

A store rents scooters for AED 27.50 per hour as shown in the table. In the graphic organizer, write this relationship using words and an equation.

Time (h)	1	2	3	4
Total Cost (AED)	27.50	55.00	82.50	110.00

Words

The cost to rent a scooter is AED 27.50 per hour.

Equation

Sample answer: Let c represent the total cost and h represent the time in hours; $c = 27.50h$.

Multiple Representations

The height y of a hot air balloon increases by 20 feet every minute after it lifts off the ground x. Use a table, a graph, and an equation to represent this situation.

Table

Time (min)	1	2	3	4	5
Height (ft)	20	40	60	80	100

Graph

Equation $y = 20x$

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

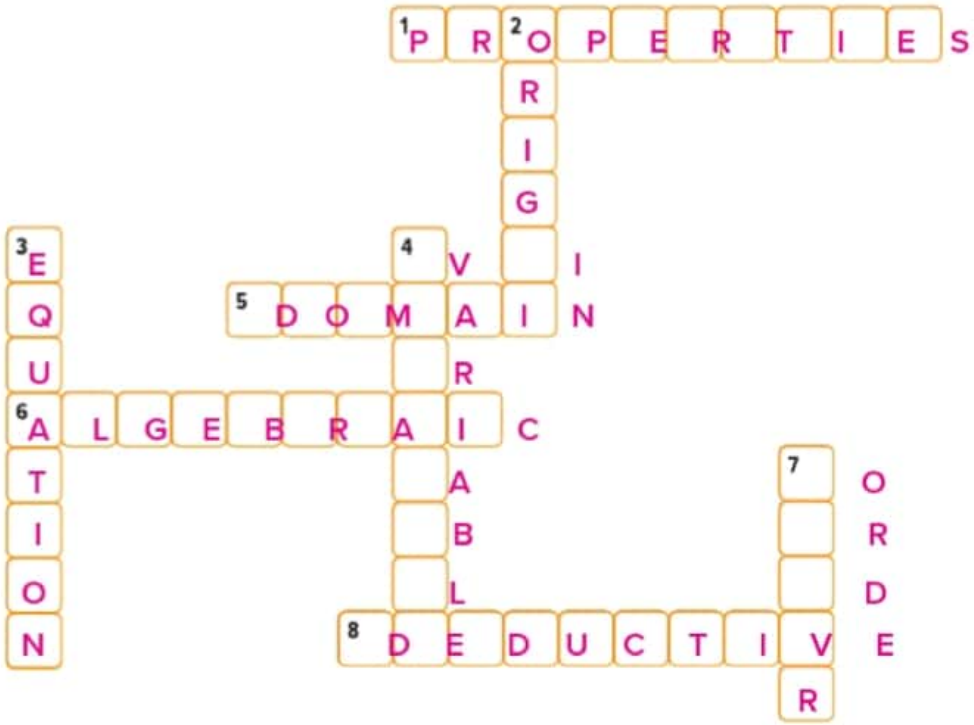
Rate Yourself!

How confident are you about using multiple representations of relations? Check the box that applies.

Chapter Review

Vocabulary Check

Complete the crossword puzzle using the vocabulary list at the beginning of the chapter.



Across

1. statements that are true for any numbers
5. the set of all *x*-values in a relation
6. a type of expression that contains at least one variable
8. the type of reasoning that uses facts, properties, or rules to reach a valid conclusion

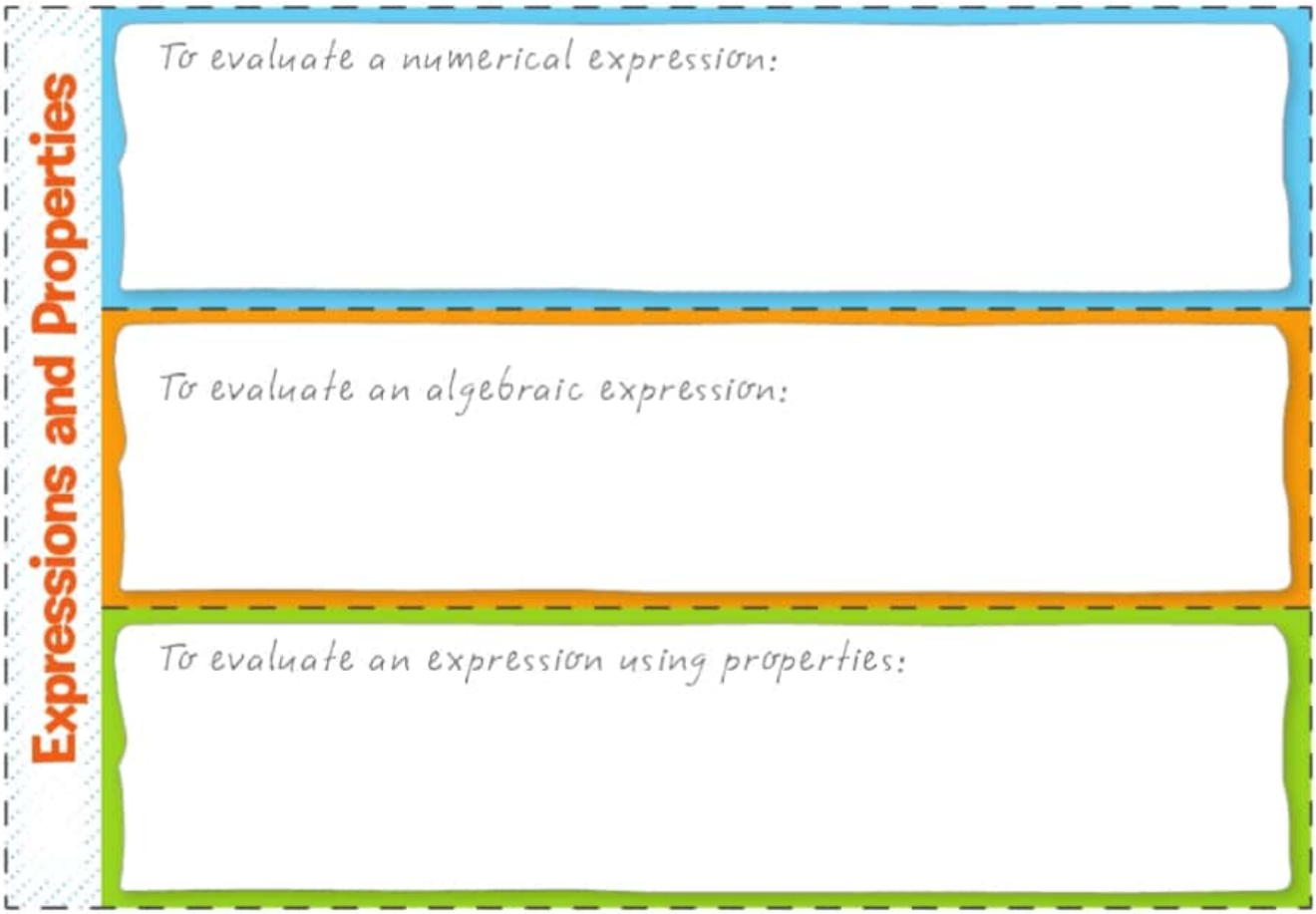
Down

2. the point at which the number lines on a coordinate plane intersect
3. a mathematical sentence stating that two quantities are equal
4. a letter or symbol used to represent an unknown
7. the rules to follow when evaluating an expression are called the ___? of operations

Use Your FOLDABLES

Use your Foldable to help review the chapter.

Tape here



Got it?

The problems below may or may not contain an error. If the problem is correct, write a "✓" by the answer. If the problem is not correct, write an "X" over the answer and correct the problem.

Evaluate each expression if $a = 6$, $b = 3$, and $c = 11$.

1. $2a + 4c$; 56 ✓

2. $\frac{10b}{a}$; ~~24~~

$\frac{10b}{a} = \frac{10(3)}{6}$

$= \frac{30}{6}$

$= \frac{5}{1}$ or 5

3. $2c + 3b$ ~~56~~

$2(11) + 3(3) = 22 + 9$

$= 31$

Problem Solving

1. A 500-liter tank is being filled with water. Eighty liters of water are in the tank after 4 minutes. How long will it take to fill the tank? (Lessons 1 and 5) 25 min

Show your work.

2. A cafeteria is charging AED 5 for a taco, AED 4 for a burrito, and AED 3.75 for a drink. Mohammed is generous, so he is buying lunch for all his friends. If he buys 3 tacos, 2 burritos, and 3 drinks, write and solve an expression to find the total cost. (Lesson 2) $5 \times 3 + 4 \times 2 + 3.75 \times 3$; AED 34.25

3. Admission to a high school football game is AED 8. At the game, snacks are sold for AED 3.50 each. Write an expression showing the cost of admission and a purchase of t snacks. Then find the total cost if 20 snacks are purchased. (Lesson 3) $8 + 3.50t$; AED 78

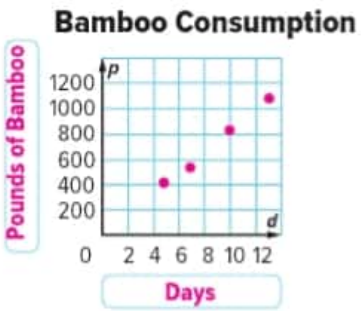
4. After school, Ayesha usually has a snack and works on her homework. Are the actions commutative? Explain. (Lesson 4) Sample answer: Yes; it does not matter in what order the actions are completed.

5. Pandas eat about 240 pounds of bamboo every three days. (Lessons 6 and 7)

   a. Write an equation that can be used to find the pounds of bamboo p a panda will eat in any number of days d. $p = 80d$

   b. Make a table of values to find the pounds of bamboo a panda will eat in 5, 7, 10, and 13 days. Then graph the ordered pairs (d, p).

Days (d)	$80d$	Pounds (p)
5	80(5)	400
7	80(7)	560
10	80(10)	800
13	80(13)	1040



Reflect

Answering the Essential Question

Use what you learned about algebraic expressions to complete the graphic organizer. Then answer the chapter's Essential Question below.

When do you use a variable?

Sample answer: A variable is a letter or symbol that represents a number or set of numbers. Variables are used to represent an unknown quantity. Suppose a real-world problem states that each pizza costs AED 7, but the problem does not state how many pizzas are ordered. Let p represent the number of pizzas ordered and $7p$ represent the cost of the pizzas.

Essential Question

How can you use numbers and symbols to represent mathematical ideas?

How do you know which operation symbol to use?

Sample answer: Four operation symbols are: + for addition; − for subtraction; ×, ·, or ( ) for multiplication, and ÷ for division. Read a real-world problem carefully to look for key words indicating which operation to use, such as *more than* or *increased by* for addition and *less than* or *decreased by* for subtraction. Then use the symbol for that operation.

Answer the Essential Question. HOW can you use numbers and symbols to represent mathematical ideas?

See students' work.

Chapter 7

Algebraic Expressions

Chapter Preview

Vocabulary

coefficient	factor	simplest form
constant	factored form	simplifying the expression
Distributive Property	like terms	term
equivalent expressions	linear expression	

Vocabulary Activity

Use the glossary to find the definitions of the terms below. Then draw a line to match each term with the correct definition.

1. equivalent expressions
2. term
3. coefficient
4. like terms
5. constant
6. simplest form
7. simplify the expression
8. linear expression

a. The numerical part of a term that contains a variable.

b. An algebraic expression that has no like terms and no parentheses.

c. Expressions that contain the same variables to the same power.

d. Expressions that have the same value.

e. A term without a variable.

f. An algebraic expression in which the variable is raised to the first power.

g. To use distribution to combine like terms.

h. The different parts of an algebraic expression that are separated by addition or subtraction signs.

Are You Ready?

Quick Review

Example 1

Find 7(−2).

$7(-2) = -14$ The factors have different signs. The product is negative.

Example 2

Write 8 − 12 as an addition expression. Then find the value of the expression.

$8 - 12 = 8 + (-12)$ To subtract 12, add −12.

$= -4$ Simplify.

Quick Check

Multiplying Integers **Find each product.**

1. $3(-3) =$ −9
2. $-4(2) =$ −8
3. $-7(-4) =$ 28
4. $-4 \cdot 5 =$ −20
5. $-11(-8) =$ 88
6. $9(-6) =$ −54

7. The price of a stock decreased AED 2 each day for 5 consecutive days. Write a multiplication expression for the total change in the value of the stock over the five-day period. Then find the total change. 5(−2); −AED 10

Show your work.

Subtracting Integers **Write each subtraction expression as an addition expression. Then find the value of the expression.**

8. $4 - 10$ 4 + (−10); −6
9. $-11 - 5$ −11 + (−5); −16

10. Student Council spent AED 178 on decorations and AED 110 on snacks for a school function. Write an addition expression for the amount remaining if Student Council initially had AED 593. Then find the amount remaining.

593 + (−178) + (−110); AED 305

How Did You Do?

Which problems did you answer correctly in the Quick Check? Shade those exercise numbers below.

1 2 3 4 5 6 7 8 9 10

Lesson 7-1

The Distributive Property

Getting Started

Scan Lesson 7-1 in your textbook. List two headings you would use to make an outline of the lesson. Sample answers are given.

- Numerical Expressions
- Algebraic Expressions

Vocabulary

Write the definition of *equivalent expressions* in your own words.

See students' work.

Real-World Link

Entertainment The table shows the cost of different activities at an aquarium. Jassim and his three cousins each paid for admission and went on the behind-the-scenes tour.

Activity	Cost per Person (AED)
Admission	25
Penguin Encounters	23
Behind-the-Scenes Tour	15

1. Complete the expression that represents the cost of four admissions and four behind-the-scenes tours.

   4 · 25 + 4 · 15

2. Complete the expression that represents four times the sum of the cost of one admission and one behind-the-scenes tour.

   4 (25 + 15)

3. Evaluate the expressions in Exercises 1 and 2. What do you notice?

   Sample answer: Both expressions have a value of AED 160.

4. Suppose Jassim and his three cousins also went to Penguin Encounters. Circle the expression that represents the total cost of their visit to the Newport Aquarium.

   4 · 25 · 15 · 23 (4 · 25 + 4 · 15 + 4 · 23)

5. Write another expression that has the same value as the expression you circled in Exercise 4.

   4(25 + 15 + 23)

Questions

Notes

Numerical Expressions

Complete each expression using the Distributive Property.

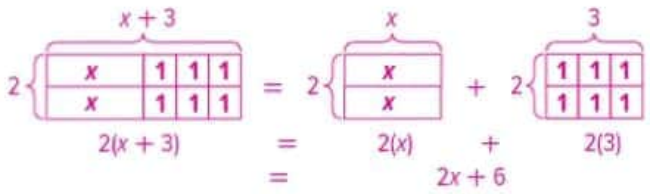
1. $5(3 + 4) = 5 \cdot 3 + 5$ **4**
2. $6(7 - 1) = 6$ **7** $- 6 \cdot 1$
3. $\frac{1}{2}(8 - 3) = \frac{1}{2} \cdot$ **8** $- \frac{1}{2} \cdot$ **3**
4. $(6 + 3)0.7 = 6$ **0.7** $+ 3$ **0.7**
5. Complete the sentence below to describe how to use the Distributive Property.

When using the Distributive Property, **multiply each term in the parentheses by the number outside the parentheses.**

Algebraic Expressions

Use a model to rewrite $2(x + 3)$ as an equivalent expression.

Show your work.



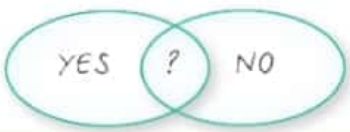
Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

Are you ready to move on? Shade the section that applies.



Lesson 7-2

Simplifying Algebraic Expressions

Getting Started

Scan Lesson 7-2 in your textbook. Predict two things you will learn about algebraic expressions. Sample answers are given.

- how to identify like terms in an algebraic expression
- how to simplify an algebraic expression

Vocabulary

Check the boxes of the vocabulary terms that you already know.

- ☐ algebraic expression
- ☐ coefficient
- ☐ constant
- ☐ like terms
- ☐ term

Vocabulary Start-Up

When addition or subtraction signs separate an algebraic expression into parts, each part is a **term**. In this chapter, we will work only with terms with an exponent of 1. In this case, **like terms** are terms that contain the same variables, such as $2n$ and $5n$ or $6xy$ and $4xy$.

Underline the variable(s) in each term. Then cross out the term in each line that is not like the other two terms.

$5x$	~~$4y$~~	$7x$
$3c$	$-2c$	~~$6d$~~
~~$2mn$~~	$3np$	$6np$
$5rs$	$-5rs$	~~$5st$~~

Real-World Link

Recycling Suppose one class collected k kilograms of recyclables and a second class collected six more kilograms of recyclables more than the first class.

1. Write an expression to represent the kilograms of recyclables collected by each class.

   first class: k second class: $k + 6$

2. Write an addition expression to represent the total pounds of recyclables collected by both classes.

   $k + (k + 6)$

Questions

Notes

Parts of Algebraic Expressions

1. Identify the parts of the algebraic expression below. Write *coefficient*, *constant*, or *term*.

$4x - 9y + x - 5y + 2$

term: $4x$ and x; $-9y$ and $-5y$ — coefficient: -9 and -5 — constant: 2

2. Identify two pairs of like terms. 4x and x; −9y and −5y

3. What is the coefficient of the third term? 1

Simplify Algebraic Expressions

Fill in the boxes to write each expression in simplest form.

4. $4x + 3x =$ 7 x

5. $10 + 4.5y + 6.5y =$ ~~10~~ 11 y

6. $15a + 6b - a - 2b =$ 14 a +8 b

7. $3t + 1 + 8t - 6 =$ 11 $t -$ 5

8. $2m - 4k + 3 - 8m + 2 =$ −6 m −4 $k +$ 5

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

How confident are you about simplifying algebraic expressions? Shade the ring on the target.

Lesson 7-3

Adding Linear Expressions

Getting Started

Scan Lesson 7-3 in your textbook. List two real-world scenarios in which you would add linear expressions. Sample answers are given.

- to represent the cost of a phone bill
- to find perimeter

Quick Review

Simplify $3(2c + 4d) - d$.

$6c + 11d$

Real-World Link

Engineering A *trebuchet* is a medieval catapult that was used to hurl large projectiles at castle walls. Sultan and Saleh are building their own trebuchets to see which one can launch objects farther. Each student is using the amounts of wood shown in the table.

Length of Wood (cm)	Number of Pieces
25	4
30	3
40	1

1. Complete the expressions below to represent the pieces of wood that each student needs.

Sultan:

1 40-centimeter piece +3 30-centimeter pieces 4+ 25-centimeter pieces

Saleh:

1 40-centimeter piece +3 30-centimeter pieces 4+ 25-centimeter pieces

2. Complete the expression below to represent the total number of pieces of wood that the students need.

2 40-centimeter pieces +6 30-centimeter pieces 8+ 25-centimeter pieces

3. Explain how you found the solution for Exercise 2.

Sample answer: Added the numbers of like pieces.

4. Sultan uses 2 rubber balls and Saleh uses 5 rubber balls to test their trebuchets. Then they each use x clay balls to test their trebuchets. The model below represent the total number of balls that they use. Write an expression in simplest form to represent the model.

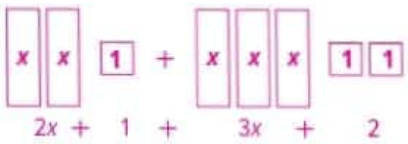
$2x + 7$

Questions

Notes

Add Linear Expressions

1. Draw a model to represent $(2x + 1) + (3x + 2)$.



2. Use the model in Exercise 1 to add $(2x + 1) + (3x + 2)$. $5x + 3$

3. How is adding linear expressions with algebra tiles similar to adding linear expressions by combining like terms?

   Sample answer: Grouping tiles with the same shapes represents adding the coefficients of like terms.

Find Perimeter

Let s represent the length of the first side of a triangle. The length of the second side of the triangle is three more than the first side. The length of the third side is four less than 1.5 times the first side.

4. Write an expression for the length of the second and third sides of the triangle.

   second side: $s + 3$

   third side: $1.5s - 4$

5. Write and simplify an expression to find the perimeter of the triangle.

   $s + (s + 3) + (1.5s - 4)$; $3.5s - 1$

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

How well do you understand adding linear expressions? Circle the image that applies.

FOLDABLES Time to update your foldable!

Mid-Chapter Check

Vocabulary Check

1. **Be Precise** Define *equivalent expressions*. Give an example of two equivalent expressions. (Lesson 1)

   Equivalent expressions are two expressions that have the same value;
   Sample answer: $2(x + 4)$ and $2x + 8$

2. Fill in the blank in the sentence below with the correct term. (Lesson 2)

   A coefficient is the numerical factor of a multiplication expression like $4x$.

Skills Check and Problem Solving

Simplify each expression. (Lessons 1 and 2)

3. $8(x + 3) =$ $8x + 24$ (Show your work.)

4. $4(x - 5) =$ $4x - 20$

5. $9y + 3 - y =$ $8y + 3$

6. $6.5(m + 2) - 2m =$ $4.5m + 13$

Add. Use models if needed. (Lesson 3)

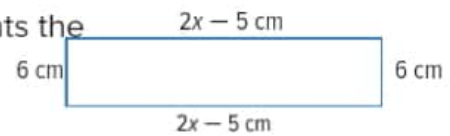
7. $(2x + 6) + (5x + 4) =$ $7x + 10$

8. $(-6x + 3) + (-2x + 7) =$ $8x + 10$

9. $(4x - 5) + (8x - 6) =$ $12x - 11$

10. $3(x + 4) + (2x + 6) =$ $5x + 18$

11. Write an expression in simplest form that represents the perimeter of the rectangle shown. Then find the perimeter if $x = 5$. (Lesson 3) $(4x + 2)$ cm; 22 cm



12. **Standardized Test Practice** Houriyya works at a bookstore and earns AED 29.50 per hour. She works 3 hours on Friday and 7 hours on Saturday. Which expression does *not* represent her wages for those days? (Lesson 1) D

   Ⓐ $29.5(3 + 7)$
   Ⓑ $10(29.5)$
   Ⓒ $29.5(3) + 29.5(7)$
   Ⓓ $29.5(3)(7)$

Lesson 7-4

Subtracting Linear Expressions

Getting Started

Scan Lesson 7-4 in your textbook. List two headings you would use to an outline of the lesson. Sample answers are given.

- Subtract Linear Expressions
- Solve Problems Involving Subtraction of Linear Expressions

Vocabulary

Define *linear expression* in your own words..

See students' work.

Real-World Link

Lacrosse Some of the statistics that are tracked in middle school lacrosse include goals and assists. The table shows the number of goals and assists that Fatheya and Fatema scored in the first two games of the season.

Player	Number of Goals		Number of Assists	
	Game 1	Game 2	Game 1	Game 2
Fatheya	g	3	2	1
Fatema	0	2	5	a

1. Write an expression to represent the total number of goals that each player scored in the first two games.

   Fatheya: $g + 3$ Fatema: 2

2. Write an expression to show how many more goals Fatheya scored than Fatema in the first two games. Then simplify the expression.

   $g + 3 - 2$; $g + 1$

3. Write an expression to represent the total number of assists that each player had in the first two games.

   Fatheya: 3 Fatema: $5 + a$

4. Write an expression to show how many more assists Fatema had than Fatheya in the first two games. $5 + a - 3$

5. Show the steps you would use to simplify the expression you wrote in Exercise 4. Justify each step.

   $5 + a - 3 = 5 + a + (-3)$ Definition of subtraction

   $= 5 + (-3) + a$ Commutative Property of Addition

   $= 2 + a$ Simplify.

Questions

Notes

Subtract Linear Expressions

For Exericses 1–3 circle the expression that is equivalent to the given expression.

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

   $5x + 2 - 3x + 1$ $\quad$ $5x + 2 - 3x - 1$

2. $(8c - 3) - (7c - 9)$

   $8c - 3 - 7c + 9$ $\quad$ $8c - 3 - 7c - 9$

3. $(4n + 5) - (2n + 6 - 5n)$

   $4n + 5 - 2n - 6 + 5n$ $\quad$ $4n + 5 - 2n - 6 - 5n$

4. What is one thing you need to remember about subtracting linear expressions?

   Sample answer: When subtracting linear expressions, subtract all the terms in the subtrahend.

Solve Problems with Linear Expressions

5. The expression $2k - 1$ represents the distance driven by Abdul's family on Day 1 of a 3-day family vacation. The expression $5k + 6$ represents the total number of kilometers driven on the vacation. Write and simplify a subtraction expression that represents the distance driven on Days 2 and 3. $(5k + 6) - (2k - 1)$; $(3k + 7)$ km

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

Are you ready to move on? Shade the section that applies.

FOLDABLES Time to update your foldable!

Lesson 7-5

Factoring Linear Expressions

Getting Started

Scan Lesson 7-5 in your textbook. Predict two things you will le about factoring linear expressions. Sample answers are given.

- how to find the GCF of two or more monomials
- how to use the GCF to factor a linear expression

Vocabulary

Circle the vocabulary word d efined below.

A number, a variable, or a product of a number and one or more variables.

factor monomial

Real-World Link

Marching Band Band directors create geometrical formations that are eye-catching and exciting, but still stay with the rhythm and feel of the music. A band director is using a rectangular field that has an area of $(60x + 150)$ square meters. The director is separating the field into three equal-sized sections for the brass, woodwind, and percussion sections of the band.

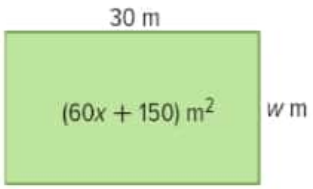
1. Describe how you could find the area of the percussion section.

   Sample answer: Find $(60x + 150) \div 3$.

2. Find the area of the percussion section. Explain your reasoning.

   $(20x + 50)$ m^2; Sample answer: 3 times some number equals $60x + 150$. Since $3 \times (20x + 50) = 60x + 150$, then the area of the percussion section is $(20x + 50)$ m^2.

3. Suppose the field is 30 meters long, as shown below. Fill in the boxes to write a sentence that represents the area of the field.



30 × w = 60x + 150

4. What is the width of the field? (2x + 5) m

Questions

Notes

Find the GCF of Monomials

1. Cross out the linear expressions that do not belong.

$4x + 8$ ~~$8r - 2$~~ $4m + 4n$

~~$20r - 18s$~~ $12v - 16$ ~~$24e + 30$~~

2. What do all the remaining expressions in Exercise 1 have in common?

Sample answer: They each have a GCF of 4.

Factor Linear Expressions

3. Complete the graphic organizer to factor $15x + 10$.

Step 1 Write the prime factorization of $15x$ and 10. → $15x = 3 \cdot 5 \cdot x$, $10 = 2 \cdot 5$

Step 2 Identify the common factors. → $15x = 3 \cdot 5 \cdot x$, $10 = 2 \cdot 5$

Step 3 Write each term as the product of the GCF and its remaining factors. → $15x + 10 = 5(3x) + 5(2)$

Step 3 Apply the Distributive Property. → $5(3x) + 5(2) = 5(3x + 2)$

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

How confident are you about factoring algebraic expressions? Check the box that applies.

FOLDABLES Time to update your foldable!

Chapter Review

Vocabulary Check

Reconstruct the vocabulary word and definition from the letters under the grid. The letters for each column are scrambled directly under that column.

	S	I	M	P	L	E	S	T		F	O	R	M	:				
W	H	E	N		A	N		A	L	G	E	B	R	A	I	C		
	E	X	P	R	E	S	S	I	O	N		H	A	S				
N	O		L	I	K	E		T	E	R	M	S		O	R			
			P	A	R	E	N	T	H	E	S	E	S	.				
N	E	E	L	A	A	E	N	A	E	E	E	B	A	A	I	C		
W	H	I	M	I	E	E	S	I	H	F	M	E	M	O	R			
	O	X	N	P	K	E	S	T	L	G	O	H	R	S				
	S		P	R	L	N		T	O	N	S	R	S					
			P		R	S		T		R		S						

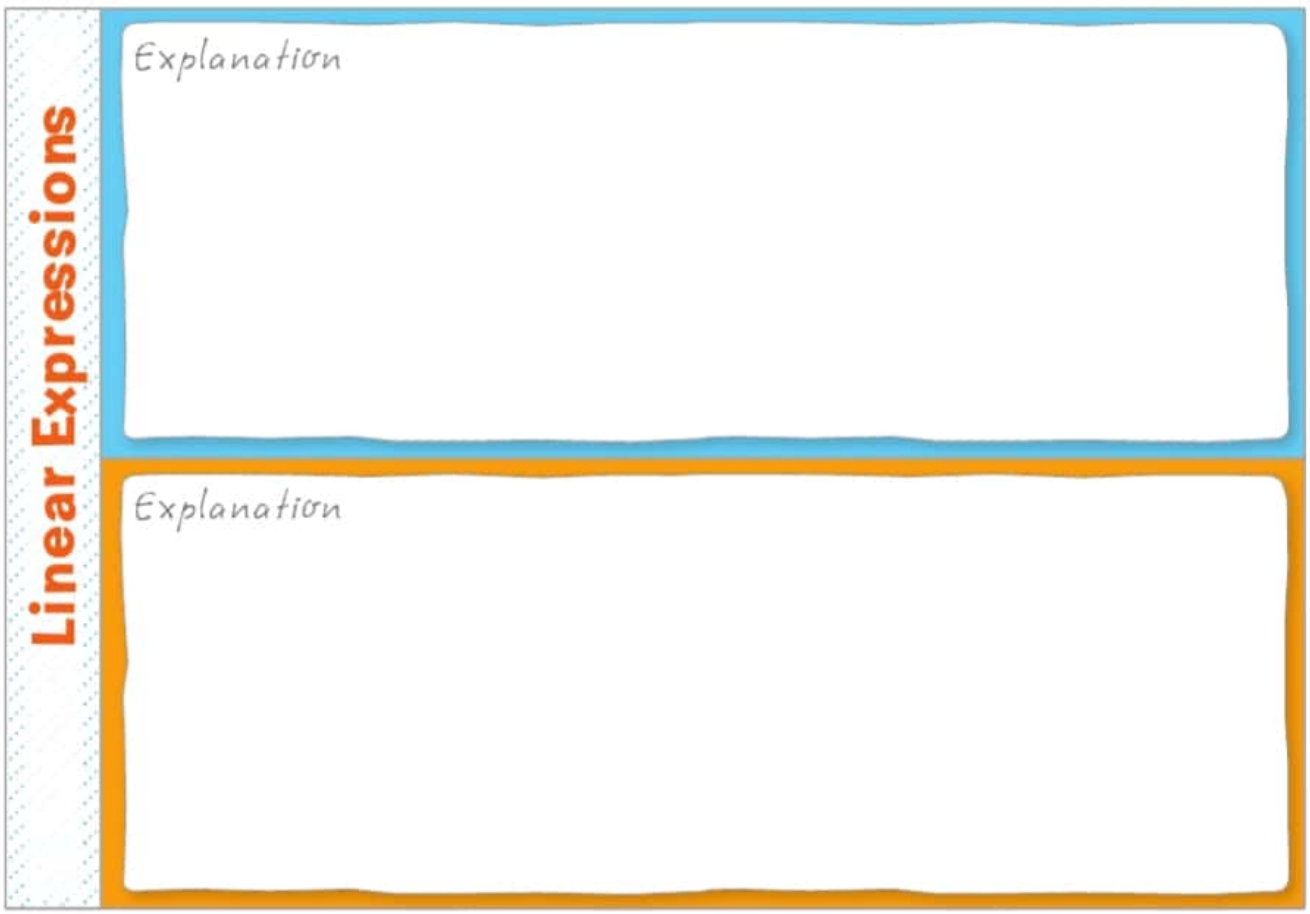
L	I	N	E	A	R		E	X	P	R	E	S	S	I	O	N	:	
	A	L	G	E	B	R	A	I	C		E	X	P	R	E	S	S	I
I	N		W	H	I	C	H		T	H	E		V	A	R	I	A	B
I	S		R	A	I	S	E	D		T	O		T	H	E		F	I
								P	O	W	E	R	.					
I	A	L	E	A	B	C	A	D	C	H	E		R	P	A	E	I	A
I	I	N	G	A	I	R	E	I	O	R		E	X	S		H	E	N
L	N		R	E	I	S	E	P	P		T	E	S		T	I	O	
	S		W	H	R		H	X		T	W	E		V	R	R		
											O							

Key Concept Check

Use Your FOLDABLES

Use your Foldable to help review the chapter.

Tape here



The first one is done for you.

Got it?

Draw a line to match equivalent expressions.

1. $3(2x + 4)$
2. $(x + 2) + (5x + 2)$
3. $4(2x + 5) - (2x + 3)$
4. $3x - (9x - 4) + 5$
5. $-8x - (-2x + 9)$

a. $6x + 4$

b. $-6x + 9$

c. $6x + 12$

d. $-6x - 9$

e. $6x + 17$

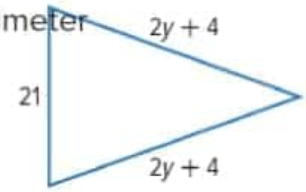
Problem Solving

1. A music appreciation class is taking a field trip to the symphony. The cost of admission and transportation for each of the 15 students is AED 20. Lunch will cost each person AED 8. Use mental math to find the total amount they will spend. Justify your answer by using the Distributive Property. (Lesson 1)

   AED 420; $15(20 + 8) = 15 \cdot 20 + 15 \cdot 8$

Show your work.

2. Write an expression in simplest form for the perimeter of the triangle. (Lesson 2)



   $(4y + 29)$ units

3. Alia purchased a new computer. She made an initial payment of AED 70 and will make monthly payments of AED 45 for x months. Write an expression to show the total amount Alia will pay for the computer. (Lesson 2)

   $(70 + 45x)$ dirhams

4. A rectangle has side lengths $(2x - 5)$ meters and $(2x + 6)$ meters. Write and simplify an expression to represent the perimeter of the rectangle. (Lesson 3)

   $(8x + 2)$ meters

5. The cost for shipping a package that weighs x kilograms is shown in the table. How much more does Mega Shipping charge than Delivery World? (Lesson 4)

Company	Cost (AED)
Mega Shipping	$3x + 3.50$
Delivery World	$2x + 2.99$

   $(x + 0.51)$ dirhams

6. Four friends visited the zoo to see the new shark exhibit. The group paid for admission to the zoo and AED 8 for parking. The total cost of the visit can be represented by the expression $(4x + 8)$ dirhams. What was the cost of the visit for each person? (Lesson 5)

   $(x + 2)$ dirhams

Reflect

Answering the Essential Question

Use what you learned about algebraic expressions to complete the graphic organizer. Explain why algebraic rules are useful. Then provide examples to illustrate your explanation.

Words

Sample answer: Without algebraic rules, people might get different answers when simplifying and evaluating algebraic expressions.

Essential Question

WHY are algebraic rules useful?

Examples

Sample answer: The Distributive Property States that $3(a + b)$ equals $3a + 3b$, not $3a + b$. The expression $4x + (2 + 7x)$ simplifies to $11x + 2$, not $13x$.

Answer the Essential Question. Why are algebraic rules useful?

See students' work.

Chapter 8

Equations and Inequalities

Chapter Preview

Vocabulary

empty set	identity	solution
equivalent equations	null set	two-step equation
inverse operations		

Vocabulary Activity

Complete the graphic organizer below. Sample answers are given.

Equations and Inequalities

Equation	Inequality
Describe It: A mathematical sentence stating that two quantities are equal.	Describe It: A mathematical sentence stating that two quantities are not equal.
List Some Examples: $6 + 4 = 10$; $\frac{1}{2}x = 5$; $3d + 9 = 33$; $2(y + 4) = 8$; $7y + 8 = 4y + 10$; $3(d + 2) = 12$	List Some Examples: $6 + 4 \neq 11$; $x + 5 > 12$; $x + 5 \geq 12$; $7c < 40$; $7c \leq 40$; $4(x - 3) > 6$

Are You Ready?

Quick Review

Example 1

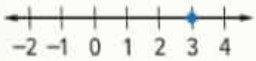
Solve $x + 5 = 8$. Graph your solution on a number line.

$x + 5 = 8$

$-5 = -5$ Subtract.

$x = 3$ Simplify.

To graph 3, draw a dot at 3 on the number line.



Example 2

Use the Distributive Property to write $5(11 + 2)$ as an equivalent expression. Then simplify the expression.

$5(11 + 2) = 5 \cdot 11 + 5 \cdot 2$ Multiply.

$= 55 + 10$ Add.

$= 65$

Quick Check

One-Step Equations Solve each equation. Graph your solution on a number line.

1. $5n = 10$ 2

2. $\frac{d}{3} = -2$ −6

Show your work.

Distributive Property Use the Distributive Property to write each expression as an equivalent expression. Then simplify the expression.

3. $5(6 - 2)$

$5 \cdot 6 - 5 \cdot 2$; 20

4. $4(n + 8)$

$4 \cdot n + 4 \cdot 8$; $4n + 32$

How Did You Do?

Which problems did you answer correctly in the Quick Check? Shade those exercise numbers below.

(1) (2) (3) (4)

Lesson 8-1

Solving Equations with Rational Coefficient

Getting Started

Sample answers are given.

Scan Lesson 8-1 in your textbook. List two real-world scenarios in which you would solve equations with rational coefficients.

- to solve real-world problems involving money
- to solve real-world problems involving a partial amount, such as three fourths of a yard of fabric

Vocabulary

Circle the vocabulary word defined below.

A letter or symbol used to represent an unknown value.

constant (variable)

Vocabulary Start-Up

An **equation** such as $12 - 3 = 9$ or $3 + 2x = 21$, is a mathematical sentence that shows two expressions are equal. If an equation contains a variable, the value for the variable that makes the equation true is called a **solution**. For example, 9 is the solution of $3 + 2x = 21$ because $3 + 2(9) = 21$.

For each equation, underline the variable. Then circle the correct solution.

Equation	Possible Solutions		
$x + 0.5 = 17$	$x = 12$	(x = 16.5)	$x = 17.5$
$t - 10 = -20$	(t = −10)	$t = 10$	$t = -30$
$3n = 9.6$	(n = 3.2)	$n = 3.6$	$n = 28.2$
$\frac{d}{4} = 8$	$d = 2$	$d = \frac{1}{2}$	(d = 32)

Real-World Link

Social Networks More pre-teens and teens are participating in social networking than ever before. Three fourths of teens surveyed said they belong to a social network, compared to 40% of adults surveyed.

1. Suppose 750 teens surveyed said they belong to a social network. Let t represent the total number of teens surveyed and write an equation that models this situation. $\frac{3}{4}t = 750$

2. Suppose 500 adults surveyed said they belong to a social network. Let a represent the total number of adults surveyed. Write an equation that models this situation. $0.4a = 500$

Questions

Notes

Solve Equations by Dividing

1. Cross out the equation that does not belong.

$0.25t = 5$ $\quad -2 = -0.1x$ $\quad$ ~~$2.5 = 0.125s$~~

2. What is true about the remaining equations?

The solution of each equation is 20.

Solve Equations by Multiplying

Complete the graphic organizer to solve $\frac{3}{4}c = 18$.

Step 1 Write the equation.	$\frac{3}{4}c = 18$
Step 2 Use the Multiplication Property of Equality.	$\left(\frac{4}{3}\right) \cdot \frac{3}{4}c = \left(\frac{4}{3}\right) \cdot 18$
Step 3 Write 18 as $\frac{18}{1}$. Divide by common factors.	$\left(\frac{4}{3}\right) \cdot \frac{3}{4}c = \left(\frac{4}{3}\right) \cdot \frac{18}{1}$
Step 4 Simplify.	$c = 24$

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

☐ I understand how to solve equations with rational coefficients.

Great! You're ready to move on!

☐ I still have questions about solving equations with rational coefficients.

Lesson 8-2

Solving Two-Step Equations

Getting Started

Scan Lesson 8-2 in your textbook. List two headings you would use to make an outline of the lesson. Sample answers are given.

- Solve Two-Step Equations
- Solve Real-World Problems

Quick Review

Solve each equation.

$4x = 12$ $x = 3$

$x + 15 = -2$ $x = -17$

$\frac{x}{3} = 5$ $x = 15$

$x - 8 = 6$ $x = 14$

Real-World Link

Scouting Scouting boys in a middle school troop must purchase scout shoes for AED 35, plus white ankle socks for AED 3 per pair. The total amount spent is AED 53. The equation $35 + 3x = 53$, where x is the number of pairs of socks, represents the total cost. You can use the *work backward* strategy to solve for x.

Start with the total cost. AED 53

Subtract the cost of the shoes. AED 35

AED 18

Since each pair of socks costs AED 3, divide by three. AED 3 = 6

The scouts must buy 6 pairs of ankle socks.

You can check your work by substituting your solution into the equation.

$35 + 3(6) \stackrel{?}{=} 53$

$35 + 18 \stackrel{?}{=} 53$

$53 = 53$

1. How many pairs of socks are purchased if the total cost is AED 44?

   3 pairs

2. The equation $15x + 90 = 135$ represents the total cost of x caps and the scout uniform. How many sets of caps were purchased?

   3 sets

Questions

Notes

Solve Two-Step Equations

Evaluate the given solution for each equation. Mark an X through any incorrect solutions. Then find the correct solution.

1. $-3t + 8 = -4$ ⋯→ $t = 4$
2. $21 - \frac{y}{4} = 12$ ⋯→ ~~$y = 16$~~ $y = 36$
3. $7d - 15 = -71$ ⋯→ ~~$d = -12$~~ $d = -8$
4. $\frac{5s}{2} = -15$ ⋯→ $s = -6$

Solve Real-World Problems

5. Ali wants to spend AED 24 at an online music store. He buys one complete CD for AED 6 and several single songs for AED 2 each. Solve $24 = 2s + 6$ to find the number of single songs he can buy.

   9 songs

6. Abdulaziz went to the theater with several friends. Student tickets cost AED 8.50 each, and together they spent AED 25 on snacks. The total amount paid was AED 59. Solve $8.5x + 25 = 59$ to find the number of people that went to the theater.

   4 people

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

How confident are you about solving two-step equations? Shade the ring on the target.

FOLDABLES Time to update your Foldable!

Lesson 8-3

Writing Equations

Getting Started

Scan Lesson 8-3 in your textbook. Predict two things you will le about writing equations. Sample answers are given.

- how to translate a sentence into an equation
- how to write and solve two-step equations

Quick Review

Translate each sentence into an equation.

Three times a number is twelve. $3x = 12$

Twice a number is ten. $2x = 10$

Real-World Link

Tablet Computers Accessories for tablet computers, such as docking stations, power adapters, and connection kits, help users get the most out of their tablets. Lamya bought a case and a power adapter for her tablet. She paid AED 10 more for the case than the power adapter.

1. Which item cost more? the case

   How much more? AED 10

2. Suppose c represents the cost of the case. How much did the power adapter cost? $c - 10$

3. What expression could be used to represent the cost of the case and the power adapter? $c + c - 10$ or $2c - 10$

4. Suppose Lamya spent a total of AED 90 on both items. What equation could be used to represent the situation? $2c - 10 = 90$

5. Use the equation from Exercise 4 to find the cost of each item.

   case: AED 50

   power adapter: AED 40

Questions

Notes

Write Two-Step Equations

Place the indicator words under the correct operation in the table.

twice, quotient, less, into, product, increased by, times, more than, total, difference, decreased by, sum, less than

Addition	Subtraction	Multiplication	Division
increased by	decreased by	product	quotient
sum	less than	times	into
total	difference	twice	
more than	less		

Two-Step Verbal Problems

Answer each question using the information below.

Together, Obaid and Adnan spent AED 64 at the bookstore. Adnan spent AED 15 less than Obaid.

1. Who spent less money? Adnan
2. How much less? AED 15
3. Write an expression to represent the amount of money Obaid spent, in terms of m. m
4. Write an expression to represent the amount of money Adnan spent, in terms of m. $m - 15$
5. Write an equation to represent the amount of money they spent altogether. $m + m - 15 = 64$ or $2m - 15 = 64$
6. How much did each person spend at the bookstore?
   Obaid spent AED 39.50 and Adnan spent AED 24.50.

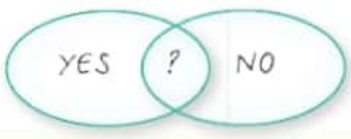
Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

Are you ready to move on? Shade the section that applies.



Lesson 8-4

More Two-Step Equations

Getting Started

Scan Lesson 8-4 in your textbook. List two headings you would use to make an outline of the lesson. Sample answers are given.

- Solve Two-Step Equations
- Use the Distributive Property

Vocabulary

Write the definition of *two-step equation* in your own words.

See students' work.

Real-World Link

Bowling Bowling alleys typically charge for the number of games played and the rental of bowling shoes. Khalid and two friends went bowling. Their total cost for games played and shoe rental was AED 48. Each person spent AED 2 to rent bowling shoes and paid the same amount of money for the games played.

1. Complete the bar diagram that represents the situation.

2. Use the bar diagram to complete the equation. $3x = 48$ $(x + 2) = 48$

3. From the diagram, you can see that Khalid spent one third of the total cost. So, Khalid spent AED x + AED $\frac{2}{3}$ or $\frac{\text{AED } 48}{3}$ AED 16.

4. Suppose Khalid and three friends went bowling. If each person rented bowling shoes for AED 2 and their total cost was AED 56, write an equation that could represent this situation.

$4(x + 2) = 56$

5. How could you use the equation you wrote in Exercise 4 to find the amount of money Khalid spent?

Find one fourth of AED 56.

Questions

Notes

Solve Two-Step Equations

Complete the graphic organizer to solve $5(x - 2) = 22$.

Step 1 Write the equation.	$5(x - 2) = 22$
Step 2 Use the Division Property of Equality.	$\frac{5(x-2)}{5} = \frac{22}{5}$
Step 3 Simplify.	$x - 2 = 4.4$
Step 4 Use the Addition Property of Equality.	$x - 2 = 4.4$ $+2 = +2$
Step 5 Simplify.	$x = 6.4$

Use the Distributive Property

1. Manal is making 5 costumes for the school play. Of the AED 60 she spent on material and supplies, she spent AED 3 per costume for buttons and zippers. Circle the equation that represents this situation.

   $5x + 3 = 60$ $\quad$ $5(x + 3) = 60$

2. In Exercise 1, how did you decide which equation to circle?

   Sample answer: The price for buttons and zippers also needs to be multiplied by 5.

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

Are you ready to move on? Shade the section that applies.

FOLDABLES Time to update your Foldable!

Mid-Chapter Check

Vocabulary Check

1. **Be Precise** Define *two-step equation*. Give an example of a two-step equation. Then solve your equation. (Lesson 2)

A two-step equation is an equation that contains two operations; Sample answer: $2x + 4 = 12$; $x = 4$

2. Describe how to solve the equation $\frac{2}{3}x = 6$. (Lesson 1)

Sample answer: Multiply each side of the equation by the reciprocal of $\frac{2}{3}$, $\frac{3}{2}$. Then divide by common factors and simplify.

Skills Check and Problem Solving

Solve each equation. Check your solution. (Lessons 1, 2, and 4)

3. $\frac{3}{4}x = -6$ -8

4. $\frac{5}{6}c + 7 = 17$ 12

5. $16 + 5w = 31$ 3

Show your work.

6. $28 = 4g - 4$ 8

7. $9(a - 4) = 27$ 7

8. $-5(3 + b) = 20$ -7

9. Abdulrahman is renting a car from an agency that charges AED 20 per day plus AED 0.15 per kilometer. He has a budget of AED 80 per day. Write and solve an equation to find the maximum number of kilometers he can drive each day. (Lesson 3)

$80 = 20 + 0.15k$; 400 km

10. **Standardized Test Practice** Ali signed up to receive internet service for AED 13 per month plus a AED 30 start-up fee. Which equation represents the number of months that he can receive internet service for AED 134? (Lesson 3)

D

Ⓐ $134 + 30 = 13m$

Ⓑ $30 - 13m = 134$

Ⓒ $13 + 30m = 134$

Ⓓ $30 + 13m = 134$

Lesson 8-5

Solving Equations with Variables on Each Si

Getting Started

Sample answers are given.

Scan Lesson 8-5 in your textbook. List two real-world scenarios which you would solve equations with variables on each side.

- comparing cell phone plans
- determining when the costs of two daily charges will be equal

Vocabulary

Write the definition of *Addition Property of Equality* in your own words.

See students' work.

Real-World Link

Camping Many campsites offer rentals for equipment, like kayaks and bicycles. The table shows the rental fees for a certain campground.

Item	Deposit (AED)	Cost per Day (AED)
Bicycle	3.00	5.50
Kayak	6.00	5.00

1. What expressions could be used to find the total cost of renting each item for any number of days d?

   bicycle: $5.5d + 3$ kayak: $5d + 6$

2. Use a table to find the number of days that you would need to rent each item for the costs to be the same. The first one is done for you.

Days	Bicycle Cost (AED)	Kayak Cost (AED)
1	8.50	11.00
2	14.00	16.00
3	19.50	21.00
4	25.00	26.00
5	30.50	31.00
6	36.00	36.00
7	41.50	41.00

3. When does it cost less to rent a bicycle? 5 days or less

4. When does it cost less to rent a kayak? 7 days or more

5. When does it cost the same? on day 6

Lesson 8-6

Inequalities

Getting Started

Sample answers are given.

Write the math and the real-world definitions of inequality.

- math definition: A mathematical sentence that compares quantities that are not equal.
- real-world definition: The condition of being unequal.

Quick Review

What is the meaning of each symbol?

> is greater than

< is less than

Real-World Link

Water Parks Wisconsin Dells, Wisconsin, is known as the Water Park Capital of the World. The town has 20 water parks with more than 200 waterslides and 60 million liters of water. The table shows the admission rates for one of the parks.

Type of Ticket	Price (AED)
Child 120 centimeters tall and under	25
Adult Over 120 centimeters tall	35

1. What is the height requirement to purchase an adult ticket?
   over 120 cm tall

2. What is the maximum height of a person that can purchase a child ticket?
   120 cm

3. Abdulkarim's family is going to the park. Circle the type of ticket Abdulkarim's father needs to buy for each family member.

Father	180 centimeters tall	child	(adult)
Mother	160 centimeters tall	child	(adult)
Abdulkarim	105 centimeters tall	(child)	adult
Omar	120 centimeters tall	(child)	adult
Moza	145 centimeters tall	child	(adult)

4. What type of ticket did he buy for Omar? Explain.
   Child; sample answer: Since Omar is exactly 120 centimeters tall, he can have a child ticket.

5. How tall are you? Would you need to buy an adult ticket? Explain.
   See students' work.

Questions

Notes

Write Inequalities

Write $<$, $>$, $\leq$, or $\geq$ to represent each phrase. The first one has been done for you.

Inequalities	
Phrase	Symbol
is greater than	$>$
is no more than	$\leq$
is at least	$\geq$
is fewer than	$<$
exceeds	$>$
is no less than	$\geq$
is at most	$\leq$

Graph Inequalities

For each inequality, write *closed* or *open* to indicate which type of circle you would use to graph the inequality on a number line. Then indicate whether the arrow would point *right* or *left*.

1. $x \geq -5$ closed; right
2. $x < 12$ open; left
3. $-8 > x$ open; left
4. $x \leq 4$ closed; left
5. $x < -6$ open; left
6. $3 \leq x$ closed; right

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

How well do you understand writing and graphing inequalities? Circle the image that applies.

Lesson 8-7

Solving Inequalities

Getting Started

Scan Lesson 8-7 in your textbook. List two headings you would use to make an outline of the lesson. Sample answers are given.

- Addition and Subtraction Properties
- Multiplication and Division Properties

Vocabulary

Write the definition of *inequality* in your own words.

See students' work.

Real-World Link

Pets Did you know that 39% of American households own at least one dog? The amount of food that you feed a dog should be based on the dog's weight. Eissa has a Labrador retriever that weighs 30 kilograms and should eat no more than 220 grams of dog food each day.

1. Which inequality symbol would you use to represent the phrase *no more than*? ≤

2. Suppose Eissa feeds his dog twice each day. If a represents the amount of feed he gives the dog at each feeding, what is the meaning of the inequality below?

$$2a \leq 220$$

Sample answer: The total amount of food must be no more than 220 grams.

3. Rewrite the inequality by replacing the ≤ sign with =. $2a = 220$

How would you solve this equation? Divide both sides of the equation by 2.

So, $a =$ 110

4. Replace the equals sign with the less than or equal to symbol.

$a \leq$ 110

What is the meaning of this new inequality?

Sample answer: Eissa must feed his dog 110 grams of food or less at each feeding so that he doesn't overfeed his dog.

Questions

Notes

Addition and Subtraction Properties

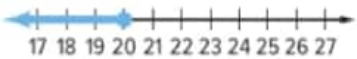
Complete the graphic organizer by writing the steps to solve the inequality.

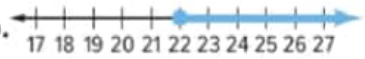
Write the inequality.	$-12 \leq y - 9$
Addition Property of Inequality	$-12 + 9 \leq y - 9 + 9$
Simplify	$-3 \leq y$ or $y \geq -3$
Check by substituting 4 for y	$-12 \leq y - 9$ $-12 \stackrel{?}{\leq} 4 - 9$ $-12 \leq -5$ ✓

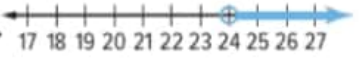
Multiplication and Division Properties

Solve each inequality. Then draw a line to match the solution to its corresponding number line.

1. $\frac{z}{6} > 4$
2. $-3n \geq -60$
3. $-2g \leq -44$

a. 

b. 

c. 

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

Are you ready to move on? Shade the section that applies.

FOLDABLES Time: Have you updated your Foldable?

Lesson 8-8

Solving Multi-Step Equations and Inequalitie

Getting Started

Scan Lesson 8-8 in your textbook. Write the definitions of *identity* and *null set*. Sample answers are given.

- *identity*: an equation that is true for every value of the variable
- *null set*: a set with no elements, shown by the symbol { } or Ø

Quick Review

Describe the steps for solving the equation $3x + 4 = 16$.

Step 1 Subtract 4 from each side.

Step 2 Divide each side by 3.

Step 3 Simplify.

Real-World Link

Field Trip Mr. Faris's class of 20 students is going on a field trip to the science center. Admission is AED 8 per student and there is an additional cost of m dirhams per student to watch the 3-D movie. The total cost for all of the students is AED 270.

1. Fill in the information that you know.

cost of admission per student	AED 8
cost of movie per student	m
number of students	20
total cost for all students	AED 270

2. What expression can be used to represent the total cost per student?

   $8 + m$

3. What expression can be used to represent the total cost of admission and a movie for all of the students?

   $20(8 + m)$

4. Use the Distributive Property to rewrite the expression from Exercise 3 as an equivalent expression.

   $20(8 + m) = 160 + 20m$

5. Using the expression for Exercise 4, write and solve an equation to find the cost of each ticket for the 3-D movie.

   $160 + 20m = 270$; AED 5.50

Questions

Notes

Solve Multi-Step Equations

Write an equation that has a solution that is an identity. Then write an equation that has a solution that is the empty set.

identity: Sample answer: $2(x - 4) + 5 = 2x - 3$

null or empty set: Sample answer: $-3x + 6(x - 1) = 3(x - 1)$

Solve Multi-Step Inequalities

Complete the steps in the table to solve $-4(x + 12) > -(3x + 16)$.

Solve Multi-Step Inequalities		
Step 1	Write the equation.	$-4(x + 12) > -(3x + 16)$
Step 2	Use the Distributive Property on both sides of the equation.	$-4x + (-48) > -3x + (-16)$
Step 3	Add 3x to both sides of the equation.	$-x + (-48) > -16$
Step 4	Add 48 to both sides of the equation.	$-x > 32$
Step 5	Multiply both sides of the equation by -1. Reverse the inequality symbol.	$x < -32$

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

☐ I understand how to solve multi-step equations and inequalities.

Great! You're ready to move on!

☐ I still have questions about solving multi-step equations and inequalities.

FOLDABLES Time to update your Foldable!

Chapter Review

Vocabulary Check

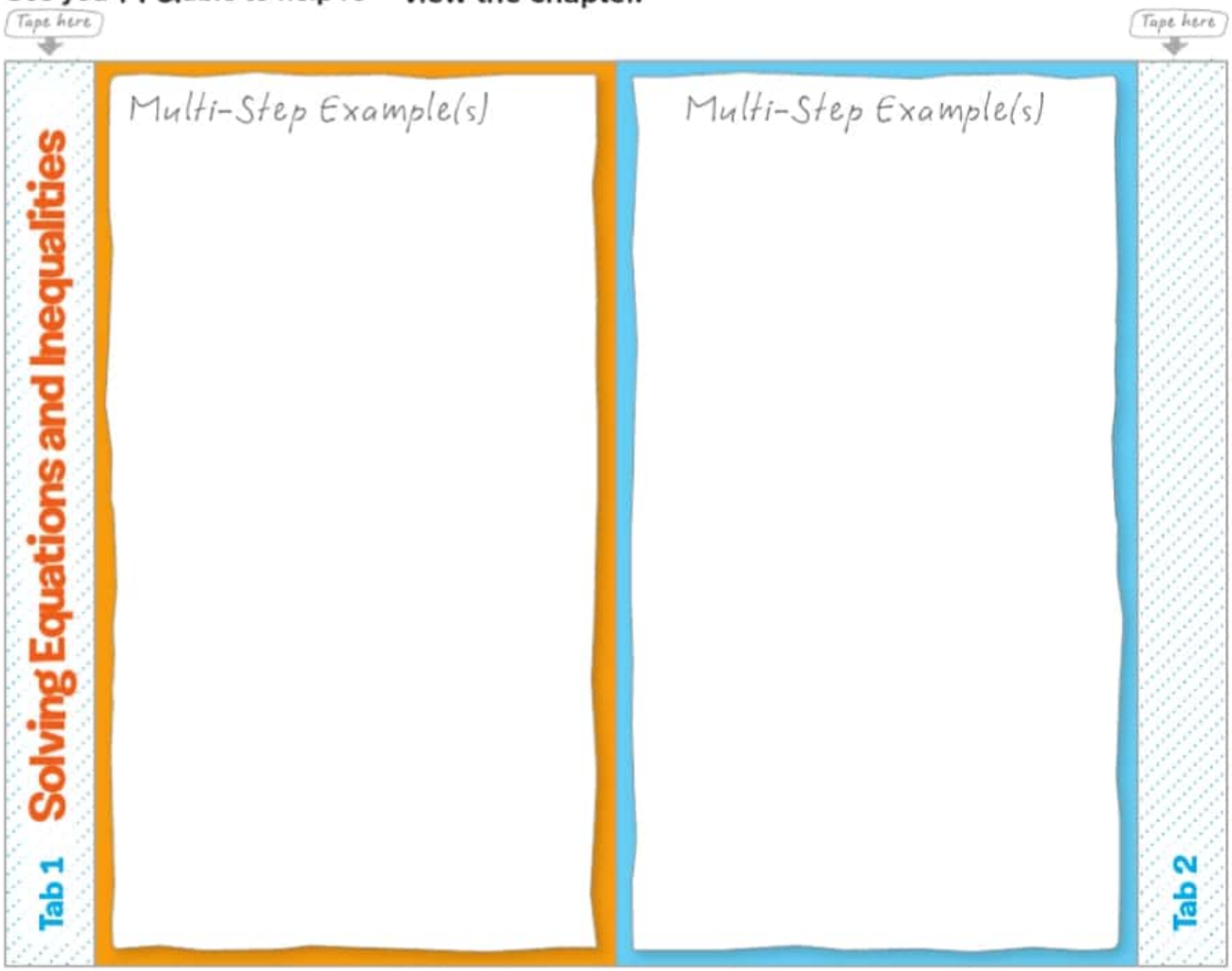
Fill in the blank with the correct vocabulary term. Then circle the word that completes the sentence in the word search.

1. The null or empty set is shown by the symbol Ø.
2. A(n) inequality is a mathematical sentence that contains a less than or greater than symbol.
3. The inequality symbol must be reversed when you multiply or divide both sides by a negative number.
4. The inequality symbol remains the same when you multiply or divide both sides by a positive number.
5. In the equation $\frac{1}{4}x^3 + 4 = 12\frac{3}{4}$, $\frac{1}{4}$ is a rational coefficient.
6. A value for the variable that makes an equation true is called a(n) solution.
7. An equation that contains two steps is called a(n) two-step equation.
8. A(n) equation is a mathematical sentence that contains an equals sign.
9. A(n) identity is an equation that is true for every value of the variable.

Q	C	J	P	X	L	G	P	Y	F	S	A	F	W	F	W	T	I	Q	A	M	I	Q	P	W
E	V	I	T	A	G	E	N	X	T	C	K	O	S	A	K	E	O	G	R	X	K	O	D	F
J	F	G	E	O	H	J	F	N	Q	I	T	X	H	N	Z	S	A	O	C	O	S	K	H	F
X	X	H	B	G	S	U	A	F	F	I	L	V	A	T	U	Y	E	V	G	I	E	P	U	B
D	D	S	W	W	N	H	Z	K	M	G	C	A	N	Y	L	T	A	P	T	F	P	F	V	C
N	Q	G	O	B	V	E	R	H	F	E	M	E	U	D	B	P	P	I	B	I	D	G	R	H
I	C	G	O	L	U	N	Z	B	Y	X	A	Q	P	Q	D	M	V	O	N	O	M	U	D	W
N	O	I	T	A	U	Q	E	P	E	T	S	O	W	T	E	E	L	O	A	N	M	H	W	D
L	U	D	S	A	G	T	K	S	G	A	O	L	M	K	G	N	I	A	W		C	S	V	V	F
O	B	E	A	K	Z	I	I	U	K	Q	A	K	L	M	Z	T	I	U	Z		I	W	D	E	J
A	R	N	U	H	V	V	W	O	O		F	FG	L	U	A	I	O	G	R		Z	Y	O	A	R
R	W	T	J	V	R	Y	N	P	N		H	UE	K	U	N	C	L	A	N	O	I	T	A	R	
F	L	I	B	N	S	N	L	MW		G	DC	Q	E	G	N	V	K	H		F	L	T	A	C	
V	V	T	P	F	D	I	G	S	V	F	I	E	W	I	R	Z	V	U	P		N	I	E	A	V
G	E	Y	E	J	W	J	F	D	Z	W	I	C	H	H	B	G	H	L	V	R	W	J	E	P	

Use Your FOLDABLES

Use your Foldable to help review the chapter.



Got it?

Number the steps in the order needed to solve each equation. Then solve the equation.

Sample answers are given for steps.

1. $3(x + 6) = -18$

2 Subtract 18 from each side.

3 Divide each side by 3.

1 Multiply x and 6 by 3.

$x = -12$

2. $4x - 7 = 6x - 5$

3 Divide each side by 2.

1 Subtract $4x$ from each side.

2 Add 5 to each side.

$x = 6$

3. $\frac{1}{3}(x - 12) = \frac{2}{3}x - 6$

4 Multiply each side by 3.

1 Multiply x and 12 by $\frac{1}{3}$.

3 Add 6 to each side.

2 Subtract $\frac{1}{3}x$ from each side.

$x = 6$

Problem Solving

1. An online music company advertises the rates shown in the table. Lamis has AED 30 to pay the membership fee and download songs. (Lessons 1 and 2)

Type of Fee	Cost (AED)
Membership	8.75
Song Download	0.85

   a. Solve the equation $0.85s + 8.75 = 30$ to find the number of songs that she can download. 25 songs

Show your work.

   b. If the membership fee increases to AED 11.30, how many songs could she download? 22 songs

2. The Trans-Pacific Express project is a telecommunications cable under the Pacific Ocean connecting the United States to eastern Asia. The length of the cable is about 18,000 kilometers, and it cost about $500 million in US dollars. Write and solve an equation to find the cost per kilometer. (Lesson 3)

   500,000,000 = 18,000c; about $27,780 per kilometer

3. Laila and Maysa are each saving money for a cruise. Laila has already saved AED 500 and plans to deposit AED 40 each month. Maysa is starting with AED 200 in her account and will deposit AED 60 each month. Write and solve an equation to find how many months it will take for them to have the same amount of money in their accounts. (Lesson 5)

   $500 + 40m = 200 + 60m$; 15 months

4. Mt. Waialeale in Hawaii receives an average rainfall of at least 990 centimeters per year. Write an inequality to describe the amount of rainfall. (Lesson 6) $r \geq 990$

5. Faleh earns AED 2,350 per month plus AED 45 for each sale he makes. Write and solve an inequality to find how many sales he needs to make each month in order to earn at least AED 3,000. (Lesson 7) $2350 + 45s \geq 3000$; 15 sales

6. Nabila is planning to run a marathon. To prepare for the race, she will follow the schedule below. She plans on running 11 hours per week. How many hours will she run each day? (Lesson 8)

Running Schedule	
Day	Length of Time
Monday	x hours
Tuesday	2 hours more than Monday
Thursday	same as Monday
Saturday	3 times as much as Monday

   Monday: $1\frac{1}{2}$ h; Tuesday: $3\frac{1}{2}$ h; Thursday: $1\frac{1}{2}$ h; Saturday: $4\frac{1}{2}$ h

Reflect

Answering the Essential Question

Use what you learned about equations and inequalities to complete the graphic organizer.

When do you use an equals sign?

Sample answer: Use an equals sign to indicate that one expression is equal to another expression. Apply the properties of equality to solve an equation.

Essential Question

HOW are equations and inequalities used to describe and solve multi-step problems?

When do you use an inequality symbol?

Sample answer: Use an inequality symbol when one expression is greater than, greater than or equal to, less than, or less than or equal to another expression. Apply the properties of inequality to solve an inequality.

Answer the Essential Question HOW are equations and inequalities used to describe and solve multi-step problems?

See students' work.

Chapter 9

Linear Functions

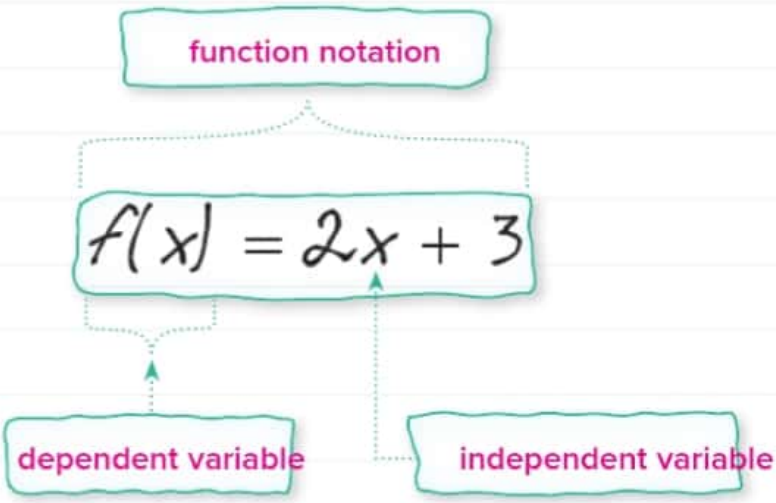
Chapter Preview

Vocabulary

constant of variation	dependent variable	slope-intercept form
constant rate of change	independent variable	substitution
direct variation	linear equation	system of equations
function	linear relationship	vertical line test
function notation	rate of change	*x*-intercept
function rule	slope	*y*-intercept
function table		

Vocabulary Activity

Use the glossary to find the definition of *function notation*. Then label the figure with the terms *function notation*, *dependent variable*, and *independent variable*.



How is the symbol $f(x)$ read?

f of *x*

Are You Ready?

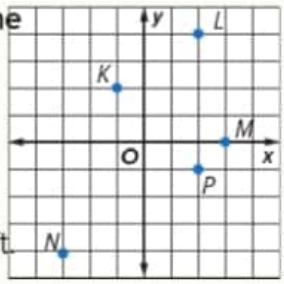
Try these Quick Checks below. Check

Quick Review

Review

Example 1

Use the coordinate plane to name the point for (−1, 2).



Step 1 Start at the origin, (0, 0).

Step 2 Move 1 unit left.

Step 3 Move 2 units up.

So, point *K* is at (−1, 2).

Example 2

Write 150 kilometers in 2 hours as a unit rate.

Write the rate that compares the number of kilometers to the number of hours.

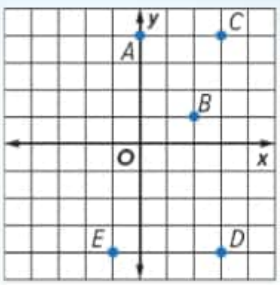
$$\frac{150 \text{ kilometers}}{2 \text{ hours}} = \frac{75 \text{ kilometers}}{1 \text{ hour}}$$

(÷2 over the left fraction; ÷2 under the right fraction)

So, the unit rate is 75 kilometers per hour.

Quick Check

Coordinate Plane **Use the coordinate plane to name the point for each ordered pair.**



1. (3, −4) D
2. (0, 4) A
3. (−1, −4) E

Unit Rate **Write each rate as a unit rate.**

4. 180 liters in 10 minutes 18 liters per minute

Show your work.

5. 455 kilometers in 7 hours 65 kilometers per hour

How Did You Do?

Which problems did you answer correctly in the Quick Check? Shade those exercise numbers below.

1 2 3 4 5

Lesson 9-1

Functions

Getting Started

Scan Lesson 9-1 in your textbook. List two headings you would use to make an outline of the lesson. Sample answers are given.

- Relations and Functions
- Function Notation

Vocabulary

Circle the vocabulary word defined below.

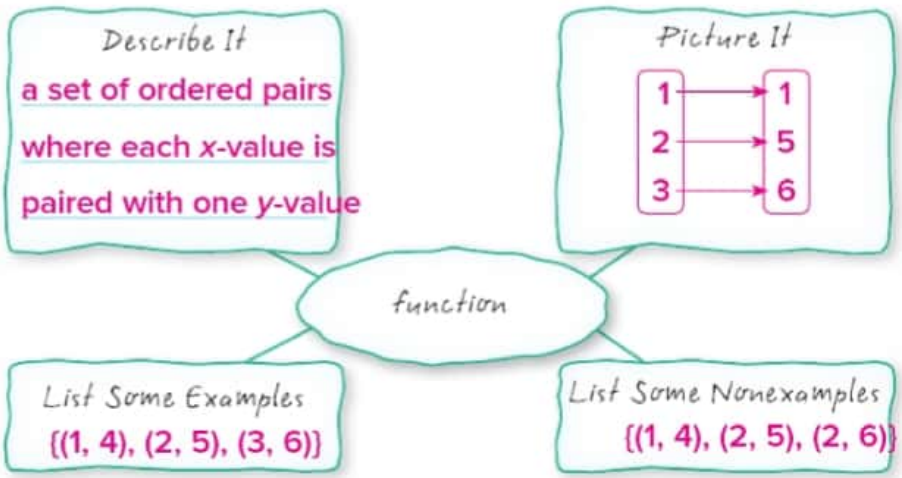
The set of all *x*-coordinates from a set of ordered pairs.

domain range

Vocabulary Start-Up

A set of ordered pairs such as {(2, 3), (3, 5), (4, 1), (5, 6)} is a relation. A relation is a function when each domain value is paired with exactly one range value.

Complete the graphic organizer below. Sample answers are given.



Real-World Link

Meerkats Meerkats have sharp claws to forage for food and dig underground burrows. A typical meerkat burrows has an average of 15 entrance and exit holes.

1. For each ordered pair in the relation below, the *x*-coordinate represents the number of burrows and the *y*-coordinate represents the number of entrance and exit holes. Complete the relation if each burrow has 15 exit and entrance holes.

   {(1, 15), (2, 30), (3, 45), (4, 60)}

2. Write a rule that represents the relation in Exercise 1. $y = 15x$

Questions

Notes

Relations and Functions

1. Complete the graphic organizer on relations and functions.

Relations and Functions

Sample answers are given.

A relation written as a set of ordered pairs is a function when each domain value is paired with exactly one range value.

A relation given as a graph in a coordinate plane is a function when a vertical line passes through no more than one point on the graph.

Describe Relationships

Najat spent AED 1.99 for each app she downloaded.

2. Write a function to find the cost of n number of downloaded apps.

Sample answer: $c(n) = 1.99n$

3. Write and evaluate an equation in function notation to find the cost of 5 apps.

function: $c(5) = 1.99(5)$ value: AED 9.95

4. Explain how to find a function value for a given function.

Substitute a given number for the variable in the function.

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

Are you ready to move on? Shade the section that applies.

Lesson 9-2

Representing Linear Functions

Getting Started

Scan Lesson 9-2 in your textbook. Predict two things you will le about representing linear functio Sample answers are given.

- how to solve linear functions with two variables
- how to graph linear functions

Vocabulary

Write the definitions of *x-intercept* and *y-intercept* in your own words.

See students' work.

Real-World Link

Racing The Daytona 500 was first run in 1959 and the average speed of the winner was about 225 kilometers per hour. The record for the fastest average speed is 338.5 kilometers per hour, which is almost 6 kilometers per minute.

1. Complete the table to find the distance traveled at the record speed after 5, 10, 15, and 20 minutes.

Total Distance Traveled		
Time (minutes)	$6x$	Distance (kilometers)
5	6(5)	30
10	6(10)	60
15	6(15)	90
20	6(20)	120

2. Graph the ordered pairs (time, distance). Then connect the points.

3. Do the data represent a function? Explain. Yes; sample answer: Each domain value is paired with exactly one range value.

4. Write an equation representing the relationship between distance y and time x. $y = 6x$

Questions

Notes

Solve Linear Functions

Complete each table. Then write the ordered pairs under the table.

1. $y = 3x + 1$

x	$3x + 1$	y
-2	$3(-2) + 1$	-5
0	$3(0) + 1$	1
1	$3(1) + 1$	4
2	$3(2) + 1$	7

$(-2, -5), (0, 1), (1, 4), (2, 7)$

2. $y = -x + 2$

x	$-x + 2$	y
-1	$-(-1) + 2$	3
0	$-(0) + 2$	2
2	$-(2) + 2$	0
3	$-(3) + 2$	-1

$(-1, 3), (0, 2), (2, 0), (3, -1)$

Graph Linear Functions

Complete the graphic organizer that compares the two methods of graphing a linear function.

	One Way:	Another Way:
Step 1	Find the x-intercept by finding x when $y = 0$.	Rewrite the equation by solving for y.
Step 2	Find the y-intercept by finding y when $x = 0$.	Choose 4 values for x and find the corresponding value for y.
Step 3	Graph the intercepts and connect them with a line.	Graph the coordinates and connect them with a line.

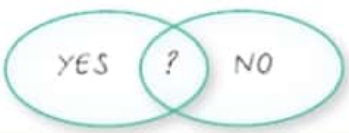
Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

Are you ready to move on? Shade the section that applies.



Lesson 9-3

Constant Rate of Change and Slop

Getting Started

Scan Lesson 9-3 in your textbook. Write the definitions of rate of change and linear relationship. Sample answers are given.

- rate of change how one quantity changes in relation to another quantity
- linear relationship a relationship that has a straight-line graph

Quick Review

Simplify $\frac{20-12}{15-13}$

4

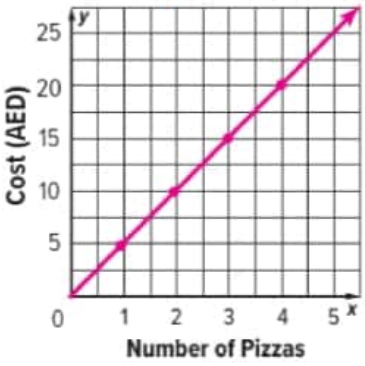
Vocabulary Start-Up

In a linear relationship, the rate of change is the same, or constant.

Complete the graphic organizer below. Sample answers are given.

constant rate of change

Number of Pizzas	Cost (AED)
1	AED 5
2	AED 10
3	AED 15
4	AED 20



Describe It

The cost, or constant rate of change, is AED 5 per pizza.

Real-World Link

Exercise Routines Treadmills, elliptical trainers, and free weights are among the most popular pieces of exercise equipment. The incline of a treadmill can determine the number of calories burned. Circle the correct statement.

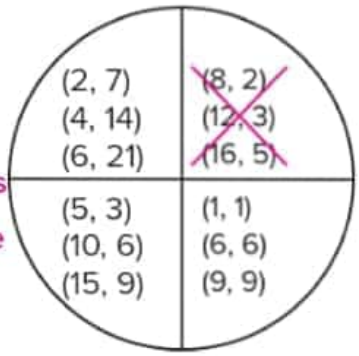
The steeper the incline of the treadmill, the fewer calories burned.	The steeper the incline of the treadmill, the more calories burned.

Questions

Notes

Constant Rate of Change

1. Cross out the set of coordinates in the circle that do not belong. Then describe what the remaining sets have in common.



Sample answer: The remaining sets of coordinates have a constant rate of change.

Slope

2. Complete the table on how to find slope. Sample answers are given.

Using a Graph	Using Coordinates of Points
Find the vertical change, or rise, compared to the horizontal change, or run.	Find the ratio of the difference of the y-values to the difference of the x-values.

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

How confident are you about constant rate of chang e? Shade the ring on the target.

FOLDABLES Time to update your foldable!

Lesson 9-4

Direct Variation

Getting Started

Scan Lesson 9-4 in your textbook. List two heading your would u to make an outline of the lesson. Sample answers are given.

- Direct Variation
- Proportional Linear Relationships

Vocabulary

Circle the type of relatio nship in which the ratio of two quantities is constant.

proportional

nonproportion al

Real-World Link

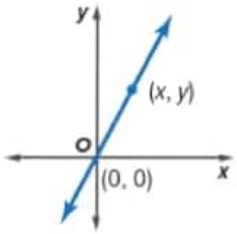
Video Games According to a recent survey, about 56% of households own a current video game system. Games for these systems can get expensive, so many stores offer sales on pre-owned video games. The prices for pre-owned games at a local store are shown in the table below.

Number of Games	Total Cost (AED)
2	16.50
4	33.00
6	49.50
8	66.00

Recall that when the ratio of two variable quantities is constant, a proportional relationship exists. This relationship is called a *direct variation*. The constant ratio is called the *constant of variation* or *constant of proportionality*.

1. Complete the steps below to derive the equation for a direct variation.

$\frac{y_2 - y_1}{x_2 - x_1} = m$ Slope formula



$\frac{y - 0}{x - 0} = m$ $(x_1, y_1) = (0, 0)$, $(x_2, y_2) = (x, y)$

$\frac{y}{x} = m$ Simplify.

$y = mx$ Multiplication Property of Equality

2. Use the table to find the rate of change. Then write an equation in $y = mx$ form to represent the situation.

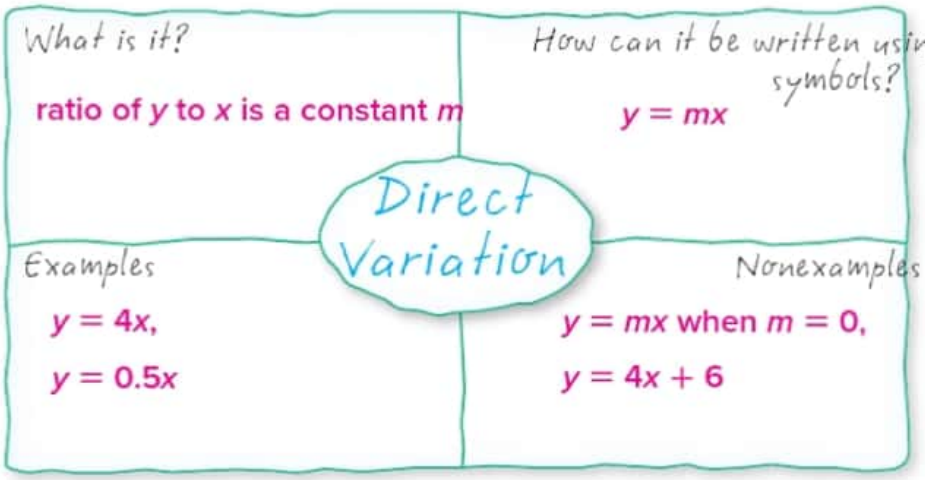
AED 8.25 per game; $y = 8.25x$

Questions

Notes

Direct Variation

Complete the graphic organizer. Sample answers are given.



Compare Direct Variations

The distance that Car A travels varies directly with the number of hours, as shown in the table at the right. Car B's distance traveled can be represented by the equation $y = 50x$. Which car travels faster? Explain.

Time (h), x	Distance (km), y
2	110
4	220
6	330
8	440

Car A; Sample answer: The unit rate for this car is 55 kilometers per hour, which is faster than Car B's unit rate of 50 kilometers per hour.

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

How well do you understand direct variation? Circle the image that applies.

FOLDABLES Time to update your Foldable!

Mid-Chapter Check

Vocabulary Check

1. **Be Precise** Define *function*. Give an example of a function. (Lesson 1)

A relation in which each element of the domain is paired with exactly one element in the range; Sample answer: {(−2, 3), (−1, 4), (0, 5), (1, 6)}

2. Explain why the equation $y = 2x - 4$ is not a direct variation. (Lesson 4)

Sample answer: The ratio of x to y is not constant.

Skills Check and Problem Solving

Determine whether each relation is a function. Explain. (Lesson 1)

3. {(0, 5), (1, 2), (1, −3), (2, 4)}

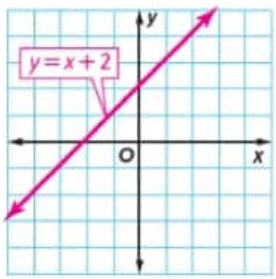
No, 1 is paired with 2 and −3.

4. {(−6, 3), (−3, 4), (0, 4), (3, 5)}

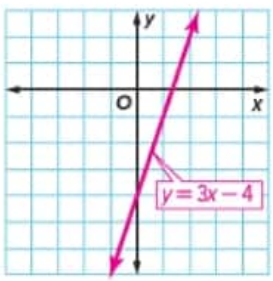
Yes, each x-value is paired with only one y-value.

Graph each function. (Lesson 2)

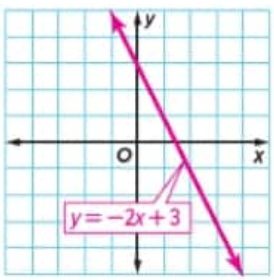
5. $y = x + 2$



6. $y = 3x - 4$

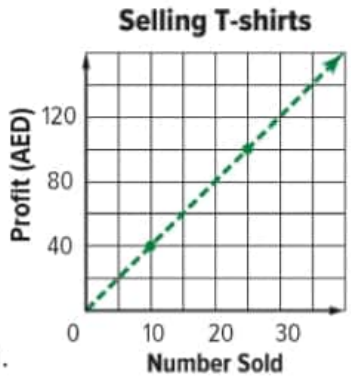


7. $y = -2x + 3$



8. Find the constant rate of change for the linear function shown at the right and interpret its meaning. (Lesson 3)

AED 4/shirt; the profit is AED 4 per T-shirt.



9. What is the slope of the line that passes through the points $R(11, 6)$ and $S(9, -1)$? (Lesson 3) $\frac{7}{2}$

10. **Standardized Test Practice** The total profit for a school fundraiser varies directly with the number of potted plants sold. The school earns AED 57.60 if 12 plants are sold. Which equation could be used to find the profit per plant sold? (Lesson 3)

Ⓐ $y = 57.6x$ Ⓑ $y = 12x$ Ⓒ $y = 4.8x$ Ⓓ $y = x$

21ST CENTURY CAREER in Music

Mastering the Music

Use the information in the tables to solve each problem.

1. Is the set of ordered pairs (number of songs, cost) in each table a function? Explain.
Yes; each domain value is paired with one range value.

2. Identify the independent and dependent variables for Dynamic Mastering. Then write a function to represent the total cost of any number of songs.
dependent: total cost c; independent: number of songs s; $c(s) = 60s$

3. Is there a proportional linear relationship between number of songs and cost at Dynamic Mastering? Explain.
Yes; the ratio $\frac{\text{total cost}}{\text{number of songs}}$ is a constant, $\frac{60}{1}$.

4. Write a direct variation equation to represent the number of songs x and cost y at Dynamic Mastering. How much does it cost to master 11 songs?
$y = 60x$; AED 660

5. Find the slope of the line represented in the Mastering Mix table. What does the slope represent?
75; As the number of songs increases by 1, the cost increases by AED 75.

6. Is the linear relationship represented in the Engineering Hits table a direct variation? Explain.
No; the ratio $\frac{\text{total cost}}{\text{number of songs}}$ is different for every pair of values.

Engineering Hits	
Number of Songs	Cost (AED)
1	100
2	160
3	210
4	250

Dynamic Mastering	
Number of Songs	Cost (AED)
2	120
4	240
6	360
8	480

Mastering Mix	
Number of Songs	Cost (AED)
1	125
3	275
5	425
7	575

Career Project

It's time to update your career portfolio! Find the name of the mastering engineer on one of your CDs. Use the Internet or another source to write a short biography of this engineer. Include a list of other artists whose songs he or she has mastered.

Do you think you would enjoy a career as a mastering engineer? Why or why not?

Lesson 9-5

Slope-Intercept Form

Getting Started

Scan Lesson 9-5 in your textbook. Predict two things you will le about the slope-intercept for Sample answers are given.

- how to find the slope and *y*-intercept using an equation
- how to graph an equation using the slope and *y*-intercept

Vocabulary

Write the definition of *linear relationship* in your own words.

See students' work.

Real-World Link

Camp A week-long science camp costs AED 800. Najla's parents paid an initial AED 400 deposit, and will pay the rest in monthly payments of AED 100, as shown in the table. In a nonproportional linear relationship, the graph passes through the point $(0, b)$, which is the *y*-intercept.

Number of Months	Total Amount Paid (AED)
0	400
1	500
2	600
3	700

1. Complete the steps to derive the equation for a nonproportional linear relationship by using the slope formula.

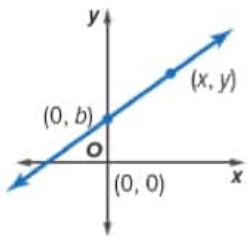
$\frac{y_2 - y_1}{x_2 - x_1} = m$ Slope formula

$\frac{y - b}{x - 0} = m$ $(x_1, y_1) = (0, b)$, $(x_2, y_2) = (x, y)$

$\frac{y - b}{x} = m$ Simplify

$y - b = m \cdot x$ Multiplication Property of Equality

$y = mx + b$ Addition Property of Equality



slope, *y*-intercept

$y = mx + b$

2. Is the relationship between number of months and total amount paid proportional? Explain.

No; the graph does not go through (0, 0).

Questions

Notes

Slope-Intercept Form

Complete the graphic organizer.

Equation	Slope	y-intercept
$y = 3x + 4$	3	4
$y = x - 1$	1	−1
$y = -5x + 2$	−5	2
$y = \frac{2}{3}x$	$\frac{2}{3}$	0

Graph Equations

Draw lines to correctly show the steps for graphing an equation using the slope-intercept form.

Step1	a. Draw a line through the two points.
Step2	b. Find the slope and *y*-intercept.
Step3	c. Use the slope to locate a second point on the line.
Step 4	d. Graph the *y*-intercept point.

Summary

Slope-Intercept Form

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

How confident are you about slope-intercept form? Shade the ring on the target.

Lesson 9-6

Solve Systems of Equations by Graphin

Getting Started

Scan Lesson 9-6 in your textbook. Write the math and the real-world definitions of system. Sample answers are given.

- math definition: two or more equations with the same set of variable(s)
- real-world definition: an interdependent group of items forming a unified whole

Quick Review

Explain how to graph two points on the line $y = 3x + 2$.

Graph (0, 2). Graph a point 3 units up and 1 unit right from (0, 2).

Real-World Link

Lizards Two of the most common lizards that people keep as pets are the chameleon and the green iguana. The chameleon feeds mostly on insects, while the green iguana is an herbivore, or feeds only on plants. It costs about AED 8 per month to buy food for a pet lizard at a local pet store. An online store charges an initial fee of AED 10, and then AED 6 per month for lizard food.

1. Write an equation to represent the total cost y of buying lizard food at a local pet store for any number of months x. $y = 8x$

2. Write an equation to represent the total cost y of buying lizard food online for any number of months x. $y = 6x + 10$

3. Write an expression to find the cost to buy lizard food at the local pet store and online for 3, 4, 5, 6, and 7 months. Then find each cost.

Months	Cost at Pet Store (AED)	Cost Online (AED)
3	8(3); 24	6(3) + 10; 28
4	8(4); 32	6(4) + 10; 34
5	8(5); 40	6(5) + 10; 40
6	8(6); 48	6(6) + 10; 46
7	8(7); 56	6(7) + 10; 52

4. At what month are the costs the same?

5 months

Questions

Notes

Solve Systems of Equations by Graphing

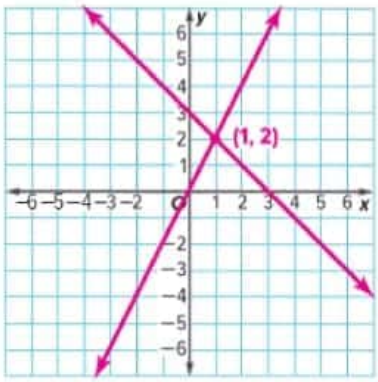
1. Fill in the blanks to explain how to solve a system of linear equations by graphing. Then solve the following system by graphing.

$$y = 2x$$
$$y = -x + 3$$

Step 1 Graph each line on the same coordinate plane.

Step 2 Find the coordinates of the point where the lines intersect.

Step 3 To check, replace the point coordinates into both equations.



Number of Solutions

Match each system description with its number of solutions.

2. different slope — **b.** exactly one
3. same slope, different *y*-intercepts — **c.** no solution
4. same slope, same *y*-intercept — **a.** infinitely many

5. Write an example of a system of two linear equations with no solutions.

Sample answer: $y = 4x + 1$, $y = 4x - 1$

Summary

Write 2–3 sentences to summarize the lesson.

See students' work.

Rate Yourself!

How confident are you about solving systems of equations by graphing? Check the box that applies.

Lesson 9-7

Solve Systems of Equations Algebraicall

Getting Started

Scan Lesson 9-7 in your textbook. List two headings you would u to make an outline of the lesso Sample answers are given.

- Solve a System of Equations Algebraically
- Interpret Solutions

Quick Review

For each equation, find the value of y if $x = 3$.

$y = 2x + 1$ 7

$x + y = 4$ 1

Real-World Link

Volleyball Noura scored a total of 12 points in two volleyball games. In the second game, she scored 2 times as many points as the first game.

1. Let x represent the number of points that Noura scored in the first game. Let y represent the number of points that she scored in the second game. Then write an equation to represent the total number of points that she scored in the two games. $x + y = 12$

2. Circle the expression that represents the number of points y that Noura scored in the second game.

   (2x) 2y 12x

3. Use the equation from Exercise 1 and the expression from Exercise 2 to write a new equation using only x to represent the total number of points scored in the two games. $x + 2x = 12$

4. How many points did Noura score in each game?

   Game 1: 4 points

   Game 2: 8 points

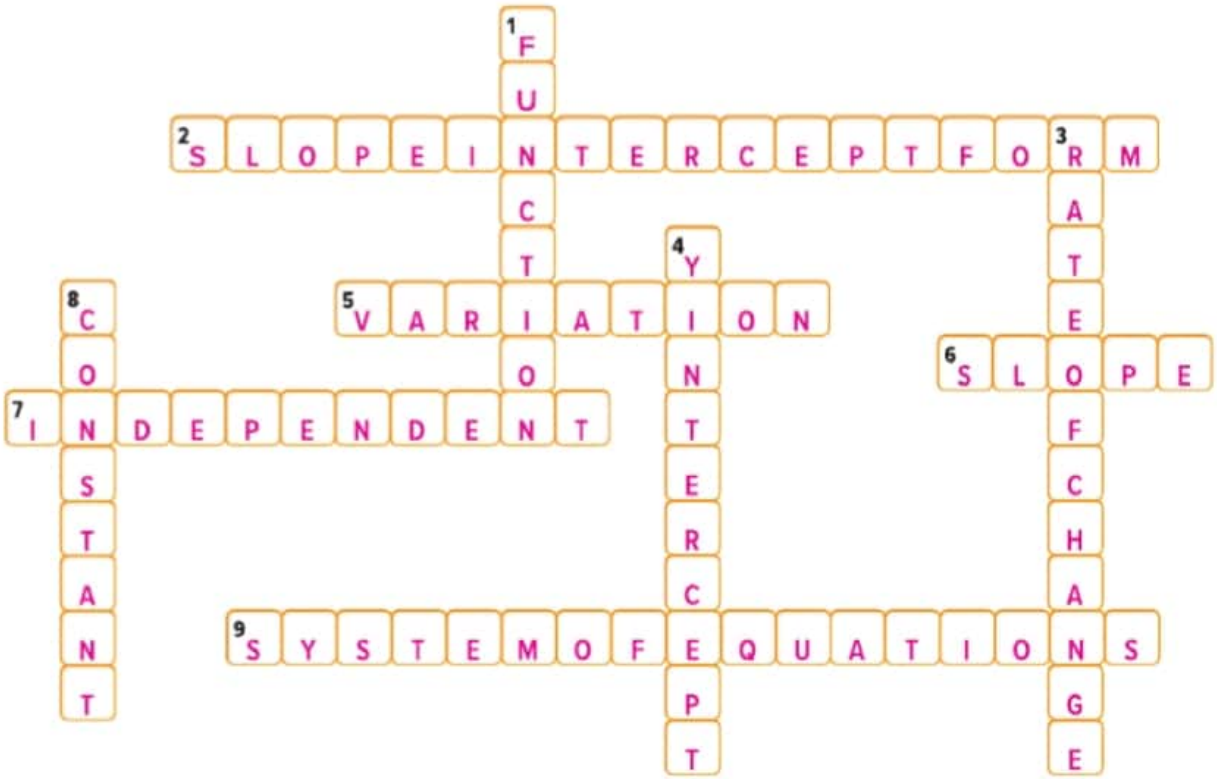
5. Does your answer make sense? Explain your reasoning.

   Sample answer: Yes; the total number of points scored is 4 + 8 or 12. She scored 4 points in the first game and 8 points, or twice as many, in the second game.

Chapter Review

Vocabulary Check

Complete the crossword puzzle using the vocabulary list at the beginning of the chapter.



Across

2. an equation written in the form $y = mx + b$
5. In a direct variation equation, the m is the constant of _____.
6. the ratio of the vertical change to the horizontal change of a line
7. In a linear equation, the _____ variable is a variable for the input.
9. a set of equations with the same variables

Down

1. a relation in which each value of the domain is paired with exactly one value in the range
3. a description of how one quantity changes in relation to another quantity
4. what the variable b represents in the equation $y = mx + b$
8. The rate of change is _____ when the rate of change between any two data points is the same.

Problem Solving

1. Ali ran 17 kilometers at an average speed of 5 kilometers per hour. (Lesson 9-1)

   a. Use function notation to write an equation that gives the total distance he ran as a function of the total time. $f(x) = 5x$

   b. Use the function to find the total time he ran. 3.4 h

Show your work.

2. Fahd and his friends are renting m movies and buying b boxes of popcorn. Find two solutions of $5m + 1.25b = 20$. Explain each solution. (Lesson 9-2)

   Sample answer: (1, 12) means they can get 1 movie and 12 boxes of popcorn. (2, 8) means they can get 2 movies and 8 boxes of popcorn.

3. The amount of water used in an area varies directly with the population. About 18 million people in Florida use 2.4 trillion liters of water a year. (Lesson 9-4)

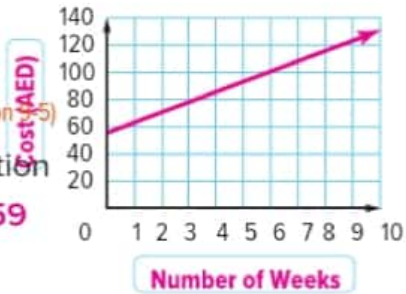
   a. Write a direct variation equation relating the population x and the amount of water used y. $y = 133{,}333.\overline{3}x$

   b. Estimate the amount of water that will be needed for 24 million people.

   about 3.2 trillion liters

4. A gym charges a AED 59 registration fee plus AED 7.70 per week that a person attends. The total cost y for any number of weeks x can be given by the equation $y = 7.7x + 59$. (Lesson 3-5)

   a. State the slope and y-intercept. Then graph the equation using the slope and y-intercept. slope: 7.7, y-intercept: 59

   b. Describe what the slope and y-intercept represent.

   The slope represents the weekly cost of using the club and the y-intercept represents the registration fee of the club.

5. Aya spent AED 8 for 1 magazine and 2 puzzle books. At the same store, Adel spent AED 23 for 4 magazines and 4 puzzle books. (Lesson 9-7)

   a. Write a system of equations to represent this situation.

   $8 = x + 2y$ and $23 = 4x + 4y$

   b. Solve the system of equations algebraically. Explain what the solution means. (3.5, 2.25); Each magazine costs AED 3.50 and each puzzle book costs AED 2.25.

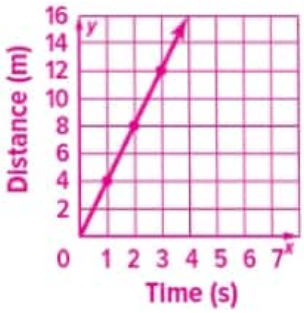
Reflect

Answering the Essential Question

Use what you learned about linear functions to complete the graphic organizer. List three ways in which functions are used to model proportional relationships. Then give an example of each. Sample answers are given.

Essential Question

HOW are linear functions used to model proportional relationships?

You can use an equation written in function notation.	You can use a graph. The graph of a linear proportional relationship will be a straight line through the origin.	You can use a table. A function table shows the input (domain), function, and output (range) of a function.
Examples:	Examples:	Examples:
$f(x) = 4x$		

Input	$f(x) = 4x$	Output
0	$f(x) = 4(0)$	0
1	$f(x) = 4(1)$	4
2	$f(x) = 4(2)$	8
3	$f(x) = 4(3)$	12

Answer the Essential Question HOW are linear functions used to model proportional relationships?

See students' work.