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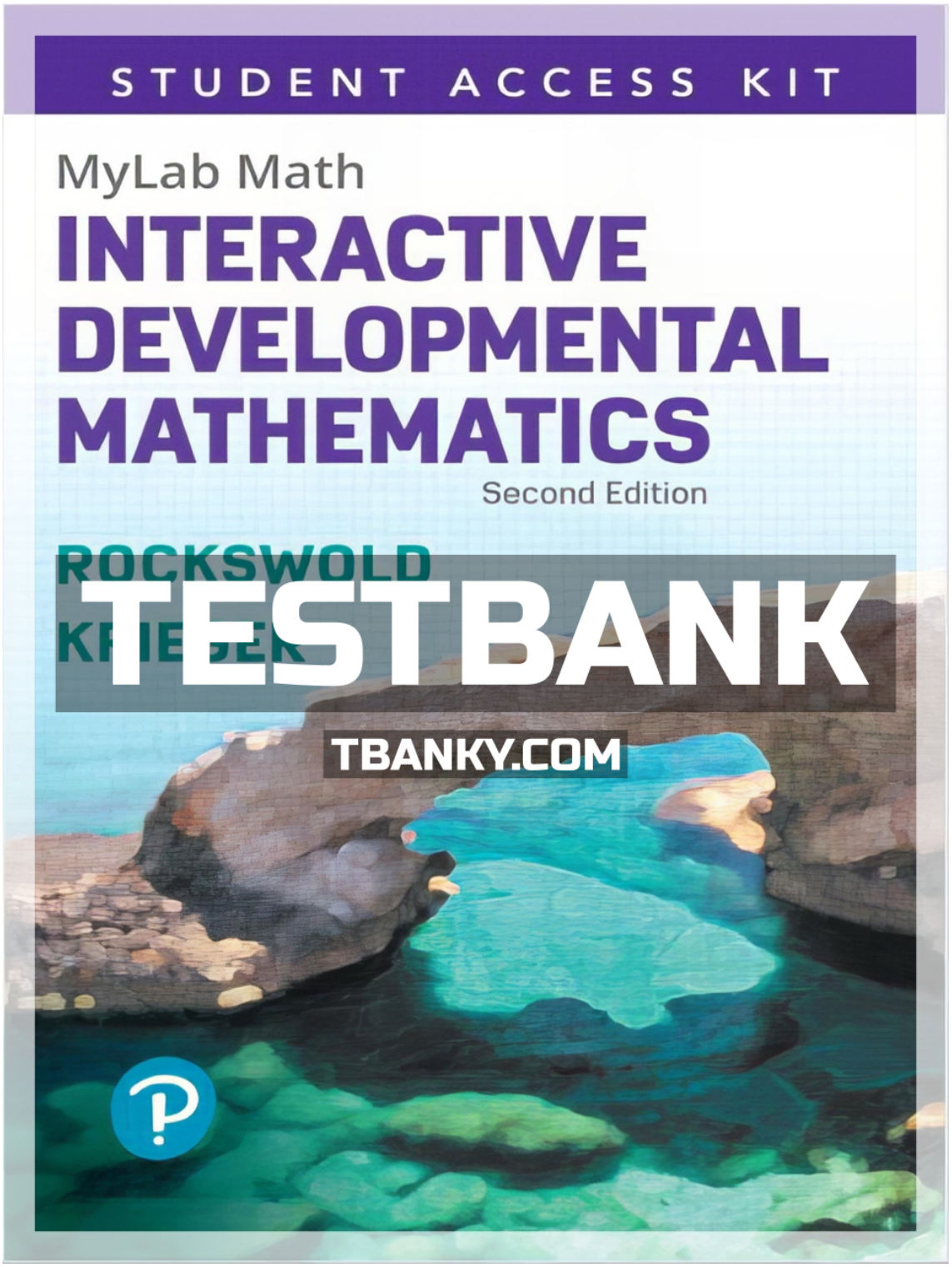

INSTRUCTOR'S RESOURCE MANUAL

INTERACTIVE DEVELOPMENTAL MATHEMATICS

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Mini-Lectures

Introduction to Whole Numbers

Objectives:

- Reviewing Natural Numbers and Whole Numbers
- Understanding Place Value
- Writing Whole Numbers in Word Form
- Writing Whole Numbers in Expanded Form
- Graphing Whole Numbers on the Number Line
- Reading Bar Graphs and Line Graphs
- Reading Spider Charts
- Reading Tables

Examples:

1. Identify the whole number(s).

   a) 9 b) $7\frac{2}{3}$ c) 0 d) 5.631

   e) –3 f) 2.1 g) 4 h) $\frac{9}{5}$

2. Identify the place value of the digit 2 in each number.

   a) 72,365 b) 126,301,840 c) 296,431,860,806

3. Write each number in word form.

   a) 5302 b) 3,643,112 c) 502,000,076,000

4. Write each number in standard form.

   a) two million, three hundred thousand, three

   b) thirty-eight billion, five hundred forty-one million, seventy four thousand, eight hundred two

   c) one hundred six trillion, four hundred two million

Teaching Notes:

- Some students who do not have English as their first language might need extra help learning the number period vocabulary such as ones, thousands, millions, billions, trillions, etc.
- Some students who do not have English as their first language are accustomed to using periods instead of commas as in the examples above.
- Many examples of tables are available on the Internet. Assign students to find examples and ask them to explain how to read the tables and write the numbers in words.

Answers: 1) choices a, c, and g are whole numbers; 2a) thousands, b) ten-millions, c) hundred-billions; 3a) five thousand, three hundred two, b) three million, six hundred forty-three thousand, one hundred twelve, c) five hundred two billion, seventy-six thousand; 4a) 2,300,003, b) 38,541,074,802, c) 106,000,402,000,000

Adding and Subtracting Whole Numbers; Perimeter

Objectives:

- Adding Whole Numbers without Regrouping
- Adding Whole Numbers with Regrouping
- Using Properties of Addition
- Recognizing Words Associated with Addition
- Subtracting Whole Numbers without Regrouping
- Subtracting Whole Numbers with Regrouping
- Using Properties of Subtraction
- Recognizing Words Associated with Subtraction
- Solving Equations Involving Addition and Subtraction
- Solving Perimeter and Other Applications Involving Addition and Subtraction

Examples:

1. Add.

   a) $5+3$ b) $4+7$ c) $8+9$ d) $6+2$

   e) $3+3$ f) $6+4+3+7$ g) $8+8+0+5$

2. Add.

   a) $\begin{array}{r} 53 \\ +\ 12 \\ \hline \end{array}$ b) $\begin{array}{r} 1123 \\ +\ 345 \\ \hline \end{array}$ c) $\begin{array}{r} 40,001 \\ 32,442 \\ +\ 15,333 \\ \hline \end{array}$ d) $\begin{array}{r} 96 \\ +\ 47 \\ \hline \end{array}$ e) $\begin{array}{r} 5678 \\ +\ 3574 \\ \hline \end{array}$ f) $\begin{array}{r} 6505 \\ 173 \\ 7044 \\ +\ 168 \\ \hline \end{array}$

3. Solve each equation by finding the unknown value.

   a) $13-\square=8$ b) $\square-14=3$ c) $26+\square=54$

4. Subtract.

   a) $98-51$ b) $54-22$ c) $\begin{array}{r} 664 \\ -\ 51 \\ \hline \end{array}$ d) $\begin{array}{r} 51 \\ -\ 12 \\ \hline \end{array}$ e) $\begin{array}{r} 1123 \\ -\ 345 \\ \hline \end{array}$ f) $\begin{array}{r} 40,001 \\ -\ 15,333 \\ \hline \end{array}$

5. Find the perimeter of a triangle with sides of length 12 ft, 22 ft, and 25 ft.

Teaching Notes:

- Some students need to write the carry digit in order to get the correct answer for addition with carrying.
- Point out that the commutative property deals with the *order* of the addends, whereas the associative property deals with the *grouping* (order does not change) of the addends.
- Some students need to practice basic subtraction facts at home in order to master them.
- Some students have trouble using borrowing when zeros are involved.

Answers: 1a) 8, b) 11, c) 17, d) 8, e) 6, f) 20, g) 21; 2a) 65, b) 1468, c) 87,776, d) 143, e) 9252, f) 13,890; 5) 59 ft 3a) 4, b) 17, c) 28; 4a) 47, b) 32, c) 613, d) 39, e) 778, f) 24,668

Multiplying and Dividing Whole Numbers; Area

Objectives:

- Multiplying Whole Numbers
- Using Properties of Multiplication
- Multiplying Larger Whole Numbers
- Recognizing Words Associated with Multiplication
- Dividing Whole Numbers
- Using Properties of Division
- Performing Long Division
- Recognizing Words Associated with Division
- Solving Equations Involving Multiplication and Division
- Solving Area and Other Applications Involving Multiplication and Division

Examples:

1. Multiply.

   a) 3×2 b) 5×1 c) $11 \cdot 0$ d) $(3)(7)$ e) $42(153)$

2. Multiply.

   a) $\begin{array}{r} 51 \\ \times\ 2 \\ \hline \end{array}$ b) $\begin{array}{r} 1123 \\ \times\ \ 5 \\ \hline \end{array}$ c) $\begin{array}{r} 18 \\ \times\ 22 \\ \hline \end{array}$ d) $\begin{array}{r} 534 \\ \times\ 54 \\ \hline \end{array}$ e) $\begin{array}{r} 160 \\ \times\ 200 \\ \hline \end{array}$

3. Divide.

   a) $189 \div 9$ b) $324 \div 6$ c) $488 \div 61$

   d) $1290 \div 4$ e) $2272 \div 23$ f) $9360 \div 13$

4. Solve each equation by finding the unknown value.

   a) $56 \div \square = 8$ b) $15 \times \square = 90$ c) $24 \div \square = 6$

5. Find the area of a rectangular garden with length 16 meters and width 9 meters.

Teaching Notes:

- Some students need to practice basic multiplication and division facts at home in order to master them.
- Some students are not sure how to multiply by factors which have zeros.
- Some students are not sure how to align the products when the multiplier contains zero.
- Many students do not know that division by zero is "undefined" and that dividing zero by any non-zero number results in zero.
- Some students do not know how to check a division problem if there is a remainder and must be shown several examples.

Answers: 1a) 6, b) 5, c) 0, d) 21, e) 6426; 2a) 102, b) 5615, c) 396, d) 28,836, e) 32,000; 3a) 21, b) 54, c) 8, d) 322 R2, e) 98 R18, f) 720; 4a) 7, b) 6, c) 4; 5) 144 square meters

Exponents, Variables, and Algebraic Expressions

Objectives:

- Understanding Exponential Notation
- Squaring and Cubing Numerical Expressions
- Finding Powers of Ten
- Using Variables
- Recognizing Algebraic Expressions
- Evaluating Formulas
- Translating Words to Expressions and Formulas
- Solving Equations

Examples:

1. Use exponential notation to write each repeated multiplication.

   a) $7 \cdot 7 \cdot 7 \cdot 7$ b) $2 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5$

2. Evaluate the exponential expression.

   a) 5^3 b) $4 \cdot 10^6$

3. Evaluate the expression for the replacement value(s).

   a) $a + 5$ for $a = 16$ b) $40 - \frac{d}{5}$ for $d = 25$

   c) $2m + 3n$ for $m = 3$ and $n = 4$ d) $10x - 2y$ for $x = 3$ and $y = 1$

4. Find the perimeter of a square with a 3-inch side.

5. Find the area of a square with a 9-centimeter side.

6. Solve the equation.

   a) $6x = 42$ b) $81 = a^4$

Teaching Notes:

- Remind students of the importance of following the correct order of operations in exercise 3.
- Some students think $x^2 = x + x$.
- Many students make sign errors as they learn to evaluate variable expressions.

Answers: 1a) 7^4, b) $2^4 \cdot 5^2$; 2a) 125, b) 4,000,000; 3a) 21, b) 35, c) 18, d) 28; 4) 12 inches; 5) 81 square centimeters; 6a) 7, b) 3

Rounding and Estimating; Square Roots

Objectives:

- Rounding Whole Numbers
- Estimating and Approximating
- Solving Problems Using Estimation
- Estimating Data Graphically
- Finding Square Roots

Examples:

1. Round each number to the indicated place.
   a) 745 to the nearest ten
   b) 6372 to the nearest hundred
   c) $39,091$ to the nearest hundred
   d) $49,728$ to the nearest thousand
   e) 892,631 to the nearest ten thousand
   f) $17,506,830$ to the nearest million

2. Use front end rounding to round each number.
   a) Flood waters destroyed property worth $761,493,000. Round this number to the hundred millions.
   b) Richard lost $329,250 of his pension when the stock market crashed. Round this number to the hundred thousands.

3. Round each number to the nearest hundred to estimate the sum or difference. Then find the exact answer.
   a) $320+496$
   b) $4325+191-240$
   c) $7061+3956$
   d) $379-165$

4. Round each number to its highest place value to estimate the product or quotient. Then find the exact answer.
   a) $68\cdot 31,724$
   b) $814\div 37$

5. Compute each square root.
   a) $\sqrt{81}$
   b) $\sqrt{169}$

6. Approximate each square root to the nearest whole number.
   a) $\sqrt{74}$
   b) $\sqrt{255}$

Teaching Notes:

- Review the meaning of place values in Chapter 1, Section 1.
- Students should be familiar with the idea of rounding. Help them understand how this concept can be useful in the classroom and for many common applications.

Answers: 1a) 750, b) 6400, c) 39,100, d) 50,000, e) 890,000, f) 18,000,000; 2a) $800,000,000, b) $300,000; 3a) estimate 800, exact 816, b) estimate 4300, exact4276, c) estimate 11,100, exact 11,017, d) estimate 200, exact214; 4a) estimate 2,100,000, exact 2,157,232; a) estimate 20, exact 22; 5a) 9, b) 13; 6a) 9, b) 16

Order of Operations

Objectives:

- Applying the Order of Operations Agreement
- Evaluating Algebraic Expressions
- Translating Words to Symbols

Examples:

1. Evaluate the expression.

   a) $2+8\cdot 2$ b) $3+5(5-2)$ c) $4(2)(9-6)+4$

   d) $(3)^2+4(7)$ e) $22-20\div 10(3)^2+4$ f) $\dfrac{3-(10-7)}{2(15\div 5)}$

   g) $\sqrt{55-30}+5(4)$ h) $6-\sqrt{4+2^3-9\div 3}+2(5)$ i) $\dfrac{3(1+7^2)}{8\cdot 5+\sqrt{100}}$

2. Evaluate the expression for the given values of the variables.

   a) $x+y\cdot 3$, for $x=3$ and $y=1$ b) $3x^2-2y+5$, for $x=2$ and $y=4$

   c) $\dfrac{3(5-x)}{4+(25\div y)}$ for $x=2$ and $y=5$ d) $\sqrt{x^2+5y}-(x-y)$ for $x=7$ and $y=3$

3. Use symbols to write the expression and then evaluate it.

   a) Fifteen more than seven b) Four squared minus eleven

   c) Three cubed plus five d) Twelve divided by three increased by the square root of nine

Teaching Notes:

- Show students how you can arrive at different answers if the order of operations is not followed.
- Use memory devices such as PEMDAS or Please Excuse My Dear Aunt Sally for teaching the correct order of operations.
- Show students how a comma will affect the translation of a math phrase into math symbols.

Answers: 1a) 18, b) 18, c) 28, d) 37, e) 8, f) 0, g) 25, h) 13, i) 3; 2a) 6, b) 9, c) 1, d) 4; 3a) 7+15, 22, b) 4^2-11, 5, c) 3^3+5, 32, d) $12\,,\ 3+\sqrt{9}, 7$

More with Equations and Problem Solving

Objectives:

- Identifying Equations and Expressions
- Recognizing Like Terms
- Combining Like Terms
- Applying Arithmetic Properties
- Checking a Solution to an Equation
- Applying a Problem-Solving Strategy

Examples:

1. Simplify the expression.

   a) $4x+2x$ b) $3y+6y-5$ c) $9x+6(x-2)$

   d) $3(x-5)+4x$ e) $8xy-xy+x$ f) $6xy+3x+2xy-x$

   g) $7x^2+2-5x^2+7$ h) $5x^2+2y-3x$ i) $4+3(3xy+3+3xy)$

2. Simplify the expression on each side of the equals sign. Then check to see if 4 is a solution to both the given equation and the simplified equation.

   a) $x+2x=4(x-2)+4$ b) $2(2+x)+3=2x+3x-5$ c) $x^2+3x^2=8(x+4)$

3. The perimeter of a rectangle is 50 inches. Find the value of x if the length of the rectangle is $3x$ inches and the width is $2x$ inches.

4. If a number is tripled and then added to itself, the result is the number added to fifteen. Find the number.

5. Mary earned a score of 2500 on a video game. If this value is 500 more than double her previous high score, then find her previous high score.

Teaching Notes:

- Students often omit a variable with no coefficient (e.g., $3x+x+5x\neq 8x$) because the coefficient is understood to be 1.
- Remind students that when combining terms, the variable part remains the same.
- Encourage students to review the problem-solving strategy in the interactive course.

Answers: 1a) 6x, b) 9y-5, c) 15x-12, d) 7x-15, e) 7xy+x, f) 8xy+2x, g) $2x^2$+9, h) $5x^2$+2y-3x, i) 13+18xy; 2a) 3x = 4x-4,4 checks in both , b) 7+2x=5x-5, 4 checks in both, c) $4x^2$=8x+32, 4 checks in both; 3) 5; 4) 5; 5) 1000

Integers and the Number Line

Objectives:

- Introducing Signed Numbers
- Finding Opposites
- Working with Integers and Their Graphs
- Comparing Integers
- Finding Absolute Value
- Solving Applications Involving Integers

Examples:

1. Simplify the expression.

   a) $-(9)$ b) $-(-16)$ c) $-(-(-22))$

2. Graph the integers on a number line.

   0, 5, −1, and −4

3. Write < or > between each pair of numbers to make a true statement.

   a) 11 ____ 1 b) −2 ____ 0 c) −7 ____ −9

   d) −5 ____ 5 e) 9 ____ −8 f) 0 ____ −14

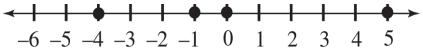
4. Find each absolute value.

   a) $|5|$ b) $|-1|$ c) $|0|$

   d) $-|300|$ e) $|-7421|$ f) $|-49|$

Teaching Notes:

- Some students have never worked with negative numbers and will benefit from graphing several examples.
- Remind students that the "smaller end of the inequality symbol" points to the "smaller number" (the number that is the lesser number).
- Absolute value will be a new concept for some students.

Answers: 1a) −9, b) 16, c) −22; 2) 

3a) >, b) <, c) >, d) <, e) >, f) >;

4a) 5, b) 1, c) 0, d) −300, e) 7421, f) 49

Adding Integers

Objectives:

- Adding Integers That Have Like Signs
- Adding Integers That Have Unlike Signs
- Recognizing the Addition Properties for Integers
- Adding Integers Using a Number Line
- Adding Integers Using Symbols
- Solving Applications Involving Addition of Integers

Examples:

1. Add by using the rule for addition of integers with the same sign.

   a) $5+5$ b) $-7+(-3)$ c) $-4+(-2)$ d) $11+5$

2. Add by using the rule for addition of integers with different signs.

   a) $5+(-3)$ b) $-5+3$ c) $2+(-3)$ d) $-2+3$

3. Add by using the rules for addition of integers.

   a) $12+(-11)$ b) $-3+8$ c) $-9+(-12)$ d) $8+(-8)$

   e) $3+(-7)$ f) $2+(-6)+3+(-5)$ g) $-12+5+(-9)+4$

4. Identify the property of addition represented by each example. The properties are: ***identity property of addition, inverse property of addition, commutative property of addition,*** and ***associative property of addition***.

   a) $(-3+2)+(-6)=-3+(2+(-6))$ b) $-29+0=-29$

   c) $16+(-11)=-11+16$ d) $-12+12=0$

5. Last night the temperature was -5 º F. The temperature dropped 12º F this afternoon. What is the new temperature?

Teaching Notes:

- Some students understand signed numbers better if they think of depositing and withdrawing money from a bank account.
- Some students need to see the problems done on a number line at first.
- Refer students to the rules for adding two or more numbers with the same sign and the rules for adding two or more numbers with different signs.

Answers: 1a) 10, b) −10, c) −6, d) 16; 2a) 2, b) −2, c) −1, d) 1; 3a) 1, b) 5, c) −21, d) 0, e) −4, f) −6, g) −12; 4a) associative property of addition, b) identity property of zero, c) commutative property of addition, d) inverse property of addition; 5) −17º F

Subtracting Integers

Objectives:

- Subtracting Integers
- Adding and Subtracting Integers
- Subtracting Integers Using a Number Line
- Subtracting Integers Using Symbols
- Solving Applications Involving Subtraction of Integers

Examples:

1. Rewrite each subtraction as addition of the opposite.

   a) $7-3=4$ b) $5-2=3$ c) $10-(-6)=16$

2. Subtract.

   a) $5-4$ b) $5-(-4)$ c) $-5-4$ d) $-5-(-4)$

   e) $7-11$ f) $12-(-3)$ g) $-32-20$ h) $-15-(-13)$

3. Perform the necessary operations.

   a) $6-2-4-12$ b) $5-11-4+8$ c) $-6-(-10)-(-4)$

   d) $-8-(-8)$ e) $4+8-6-3$ f) $-5-3+(-6)-2$

4. a) Find the difference in altitude between a mountain 5436 feet high and a gorge 213 feet below sea level.

   b) Find the difference in temperature in Conway, New Hampshire, between $-3\,^\circ$ F during the day and $-12\,^\circ$ F during the night.

Teaching Notes:

- Many students find subtracting signed numbers difficult at first.
- Some students like to see subtracting signed numbers on a number line.
- Most students prefer to think of subtraction as adding the opposite of a number.

Answers: 1a) $7+(-3)=4$, b) $5+(-2)=3$, c) $10+6=16$; 2a) 1, b) 9, c) -9, d) -1, e) -4, f) 15, g) -52, h) -2; 3a) -12, b) -2, c) 8, d) 0, e) 3, f) -16; 4a) 5649 ft, b) $9\,^\circ F$

Multiplying and Dividing Integers

Objectives:

- Multiplying Integers
- Recognizing the Multiplication Properties for Integers
- Multiplying More Than Two Integer Factors
- Dividing Integers
- Finding Square Roots of Integers
- Solving Applications Involving Multiplication and Division of Integers

Examples:

1. Multiply.

   a) $3\cdot 2$ b) $3\cdot(-2)$ c) $-3\cdot 2$ d) $-3\cdot(-2)$

   e) $-4(-5)$ f) $4(-12)$ g) $-8(9)$ h) $-7(-6)$

2. Multiply.

   a) $3\cdot(-2)\cdot(-6)$ b) $3\cdot(-2)\cdot(-3)\cdot(-2)$ c) $-2\cdot(-4)\cdot(-1)\cdot(-2)$

   d) $(-2)(-1)(3)(-4)$ e) $3(2)(-4)(-5)$ f) $(3)(-2)(1)(6)$

3. State the property of multiplication shown in each example.

   a) $-5\cdot(4\cdot(-2))=(-5\cdot 4)\cdot(-2)$ b) $-2(4+5)=-2(4)+-2(5)$

   c) $43(1)=43$ d) $0\cdot(-5)=0$ e) $3\cdot(-5)=-5\cdot 3$

4. Divide.

   a) $8\div 4$ b) $-8\div 4$ c) $8\div(-4)$ d) $-8\div(-4)$ e) $\frac{-16}{4}$

   f) $\frac{-25}{-5}$ g) $\frac{72}{-8}$ h) $\frac{-24}{-3}$ i) $\frac{-17}{-17}$ j) $\frac{18}{1}$

5. Simplify each expression, if possible.

   a) $\sqrt{49}$ b) $-\sqrt{144}$ c) $\sqrt{-36}$

Teaching Notes:

- Encourage students to study multiplication and division facts independently in order to master them.
- Some students mix up the rules for addition of integers with the rules for multiplication and division.
- Students must understand the difference between dividing 0 by a number and dividing a number by 0.

Answers: 1a) 6, b) −6, c) −6, d) 6, e) 20, f) −48, g) −72, h) 42; 2a) 36, b) −36, c) 16, d) −24, e) 120, f) −36; 3a) Associative Property, b) Distributive Property, c) Identity Property of Multiplication, d) Zero Property of Multiplication, e) Commutative Property; 4a) 2, b) −2, c) −2, d) 2, e) −4, f) 5, g) −9, h) 8, i) 1, j) 18; 5a) 7, b) −12, c) not an integer

Order of Operations; Averages

Objectives:

- Use the Order of Operations Agreement with Integers
- Evaluating Exponential Expressions
- Evaluating Algebraic Expressions with Integers
- Finding Averages

Examples:

1. Evaluate each expression.

a) $-2+8\cdot 2$

b) $3+5(2-5)$

c) $4(-2)(6-9)+4$

d) $-8(6\div 2)+4$

e) $-15\div 5-12$

f) $(-3)^2+4(-7)$

g) $(-1)^3+5(-4)$

h) $-12-20\div 10\cdot(-3)^2+4$

i) $\dfrac{-25\div 5-1}{3-(-3)}$

j) $\dfrac{-14-2(-3)}{12-14}$

k) $\dfrac{-3-(7-10)}{-2(15\div(-5))}$

l) $\dfrac{3(2+(-7))}{9^2-81}$

2. Evaluate each expression for $x=-5$, $y=4$, and $z=-3$.

a) $15-2xz$

b) $6y\div(|z|-x-2)$

c) $\dfrac{3yz}{x-1}$

3. Find the average of the list of Fahrenheit temperatures. $-11°, 7°, -8°, 16°, 12°, -4°$

Teaching Notes:

- Some students confuse the rules for addition of integers with the rules for multiplication/division of integers.
- Many students do not understand the difference between -2^2 and $(-2)^2$.
  Encourage students to review the order of operations agreement.

Answers: 1a) 14, b) −12, c) 28, d) −20, e) −15, f) −19, g) −21, h) −26, i) −1, j) 4, k) 0, l) undefined; 2a) −15, b) 4, c) 6; 3) 2°F

Solving Equations That Have Integer Solutions

Objectives:

- Checking a Solution
- Solving Equations Using Guess-and-Check
- Solving Equations Using Tables of Values
- Solving Equations That Have Integer Solutions Graphically

Examples:

1. Determine if the given value is a solution to the given equation.

   a) 1, $x-8=-7$ b) -3, $-3x+6=-3$ c) 6, $\dfrac{4-x}{2}=-1$

2. Solve each equation.

   a) $7c+6=62$ b) $3y-1=8$ c) $5-6m=-13$

   d) $-3d-21=0$ e) $-35=-6q+1$ f) $8x+4=4x-20$

   g) $\sqrt{x}=10$ h) $(-x)^3=-64$

3. Complete the table. Then solve the equation.

   a) $2x-1=1$

x	-2	-1	0	1	2
$2x-1$					

   b) $-3x+8=11$

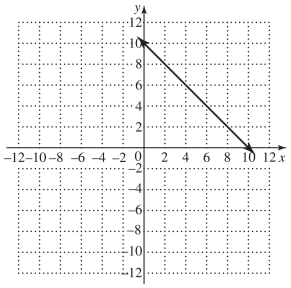
x	-2	-1	0	1	2
$-3x+8$					

   c) $\sqrt{x-2}=5$

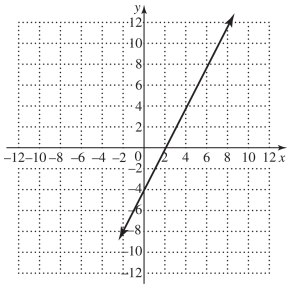
x	11	18	27	38	51
$\sqrt{x-2}$					

4. Solve the given equation visually.

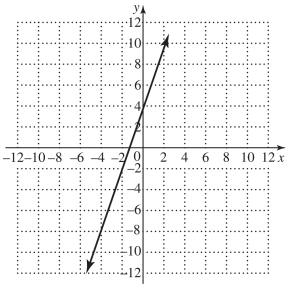
   a) $10-x=6$



   b) $2x-4=10$



   c) $3x+4=-8$



Teaching Notes:

- A table of values can be explained as an organized way to use a guess-and-check method for solving.
- To review the use of line graphs, see Sections 1.5 and 2.1.
- Solutions read from a graph should be checked.

Answers: 1a) Yes, b) No, c) Yes; 2a) c = 8, b) y = 3, c) m = 3, d) d = ⁻7, e) q = 6, f) x =⁻6, g) x =100, h) x = 4; 3a) $-5,-3,-1,1,3$ $x=1$, b) $14,11,8,5,2$ $x=-1$ c) $3,4,5,6,7$ $x=27$; 4a) x = 4, b) x = 7, c) x = ⁻4

Simplifying Algebraic Expressions

Objectives:

- Reviewing Algebraic Expressions
- Combining Expressions That Have Like Terms
- Adding Expressions
- Finding the Opposite of an Expression
- Subtracting Expressions
- Multiplying Expressions
- Simplifying Expressions

Examples:

1. Simplify by combining like terms.

   a) $-4x+2x$ b) $3x-5x+4x$ c) $2x-5xy-3-2xy+2x$

2. Simplify the sum or difference.

   a) $(x+2)+(4-2x)$ b) $(x^2-x)+(2x^2+4x)$ c) $(4x^2+6x)+(4x^2+2)$

   d) $(3x+2)-(6-2x)$ e) $(5x^2+2x)-(-2x^2-6x)$ f) $(6x^2-8x)-(5x^2+9)$

3. Simplify the product.

   a) $12(5x)$ b) $-3(7a)$ c) $-2(x+3)$

   d) $-4(-2+x)$ e) $0(7a)$ f) $-1(-5-x)$

4. Simplify the expression.

   a) $2(x+2)-3(x-3)$ b) $7-4(2x+1)-5$ c) $8(x-1)-(8x-3)$

   d) $-3(-2x-1)+4(5x-1)$ e) $2(x^2+2x+1)+3(x^2-3)$

Teaching Notes:

- Remind students of the definitions for like terms and unlike terms.
- Remind students that when subtracting it is important to distribute the negative sign through all terms of the expression.

Answers: 1a) - 2x, b) 2x, c) - 7xy+4x 3; 2a) - x+6, b)$3x^2$+3x, c) $8x^2$+6x+2, d) 5x - 4, e) $7x^2$+8x, f) x^2 - 8x - 9; 3a) 60x, b) - 21a, c) - 2x - 6, d) 8 - 4x, e) 0, f) 5+x; 4a) - x+13, b) - 8x - 2, c) - 5, d) 26x - 1, e) $5x^2$+4x - 7

Translating Words to Expressions and Equations

Objectives:

- Translating Words to Expressions
- Translating Words to Equations

Examples:

1. Translate the phrase to an algebraic expression. Define each variable.
   a) Increase the score by 3

   b) The sum of the price and 8, times 4

   c) Five times his age increased by 6

   d) The quotient of the number of points and 10

2. Translate the sentence to an equation using x as the variable. Do not solve the equation.
   a) Multiplying a number by 8 gives a result of 88.

   b) The total of a number and 15 is 38.

   c) The sum of a number and 9 is the same as four times the number.

   d) Five is the same as the quotient of a number and 10.

   e) The perimeter of a rectangle with length $x+5$ and width x is 45.

Teaching Notes:

- Show students what it means to define a variable.
- Help students recognize words or phrases associated with arithmetic symbols.
- Point out the difference between an algebraic expression and an equation.

Answers: 1a) x+3, x is the score, b) (x+8)4, x is the price, c) 5x+6, x is the age, d) $\frac{x}{10}$*, x is the number of points;*

2a) 8x=88, b) x+15=38, c) x+9=4x, d) $5=\frac{x}{10}$*, e) 2(x+5)+2x = 45*

Properties of Equality

Objectives:

- Finding Solutions and Equivalent Equations
- Using the Addition Property of Equality
- Using the Multiplication Property of Equality

Examples:

1. Determine if the equations in the given pair are equivalent.

   a) $x+3=9$ and $x=6$ b) $2x+4=8$ and $x=4$ c) $4x-1=7$ and $x=2$

2. Use the addition property of equality to solve the equation. Check your solution.

   a) $x-4=12$ b) $x+4=12$ c) $m-6=-12$

   d) $m+6=-12$ e) $y+40=-55$ f) $n-13=-24$

3. Use the multiplication property of equality to solve the equation. Check your solution.

   a) $5x=20$ b) $2a=-16$ c) $-3x=12$

   d) $18=2y$ e) $\frac{x}{-3}=7$ f) $\frac{x}{4}=-8$

4. Solve the equation.

   a) $-12x=-48$ b) $2x-15=x+95$

5. Rachel has already earned 630 points in her biology class. Solve the equation $p+630=880$, to determine the number of additional points Rachel needs to earn a passing grade.

Teaching Notes:

- These addition and multiplication properties will be used a great deal in a student's math career. Insist that they have a good understanding of these concepts.
- Construct balance scale diagrams for a visual interpretation of solving equations.
- Consider showing students an example of how dividing by 3 is the same as multiplying by $\frac{1}{3}$.

Answers: 1a) equivalent, b) not equivalent, c) equivalent; 2a) x=16, b) x=8, c) m= - 6 , d) m= - 18 , e) y= - 95 , f) n= - 11 ; 2a) x = 4, b) a = ⁻8, c) x = ⁻4, d) y = 9, e) x = - 21 , f) x = - 32 ; 3a) x = 4, b) x = 110; 5. p = 250 points

Answers to Chapter Tests

ANSWERS TO CHAPTER TESTS

Chapter 1, Test Form A

1. Thousands
2. $6000+500+80+2$
3. $67,600$
4. 4360
5. 8409
6. $247,418$
7. 755 r18
8. 5^6
9. 128
10. 16
11. 13
12. 15
13. 3
14. 27
15. 6
16. 8
17. a^3
18. $9x+3$
19. $3y+11$
20. 6 t-shirts; \$2

Chapter 1, Test Form B

1. Ten-thousands
2. $7000+800+10+3$
3. $13,000$
4. 2062
5. $18,504$
6. $113,828$
7. 1348 r18
8. 4^5
9. 500
10. 26
11. 9
12. 12
13. 2
14. 0
15. 15
16. 7
17. $11x^4$
18. $16a+4$
19. $4y+17$
20. \$1863

Chapter 1, Test Form C

1. Hundreds
2. $70,000+8000+100+5$
3. $24,000$
4. 6393
5. 9420
6. $214,515$
7. 998 r12
8. 2^7
9. 324
10. 8
11. 12
12. 25
13. 3
14. 20
15. 16
16. 9
17. $11s^2$
18. $6a+8$
19. $7y+16$
20. $M=7h$

Chapter 1, Test Form D

1. (b)
2. (c)
3. (a)
4. (d)
5. (a)
6. (c)
7. (b)
8. (b)
9. (d)
10. (c)
11. (c)
12. (a)
13. (d)
14. (b)
15. (a)
16. (b)
17. (d)
18. (c)
19. (a)
20. (c)

Chapter 2, Test Form A

1. –7
2. >
3. =
4. –8
5. –29
6. –52
7. 9
8. –5
9. –120
10. –144
11. –8
12. 8
13. 6
14. 13
15. –11
16. Yes
17. –5
18. 16
19.

x	–2	–1	0	1	2
$-5+2x$	–9	–7	–5	–3	–1

; –2
20. –26 feet

Chapter 2, Test Form B

1. –4
2. <
3. >
4. 9
5. 27
6. 88
7. –9
8. 6
9. 168
10. 121
11. –9
12. –1
13. 33
14. 10
15. –3
16. No
17. –13
18. 36
19.

x	–2	–1	0	1	2
$-3-2x$	1	–1	–3	–5	–7

; 2
20. 7807 feet above sea level

Chapter 2, Test Form C

1. 13
2. <
3. =
4. 12
5. 17
6. −60
7. −12
8. −4
9. 120
10. −100
11. −7
12. 14
13. −4
14. 18
15. 3
16. No
17. −6
18. 25
19.

x	−2	−1	0	1	2
$11-2x$	15	13	11	9	7

; 1
20. $8800

Chapter 2, Test Form D

1. (c)
2. (a)
3. (c)
4. (d)
5. (b)
6. (d)
7. (a)
8. (a)
9. (b)
10. (d)
11. (b)
12. (a)
13. (c)
14. (c)
15. (d)
16. (b)
17. (a)
18. (d)
19. (b)
20. (a)

Chapter 3, Test Form A

1. $x-5$
2. $-4t-4$
3. $-12x$
4. $-10x+10$
5. $4z+15$
6. $x+6=2x$
7. $4(x+2)=-12$
8. 40
9. -14
10. -12
11. -75
12. Not linear
13. Linear; $a=5$, $b=-9$
14. 20
15. 2
16. -6
17. 7
18.

x	-2	-1	0	1	2
$-2x+3$	7	5	3	1	-1

; -1

19. -16
20. Length: 12 inches;
width: 9 inches

Chapter 3, Test Form B

1. $-x-3$
2. $-2a-14$
3. $-21x$
4. $-7x+16$
5. $3t+18$
6. $x+4=3x$
7. $5(x+3)=-10$
8. 52
9. -12
10. -7
11. -81
12. Linear; $a=4$, $b=-10$
13. Not linear
14. 1
15. 3
16. -13
17. -2
18.

x	-2	-1	0	1	2
$-3x+4$	10	7	4	1	-2

; 1

19. 3
20. \$228