Sec. 2.1 Introduction to Integers

Learning Objectives:
1. Represent real-life situations with integers.
2. Graph integers on a number line.
3. Compare integers.
4. Find the absolute value of a number.
5. Find the opposite of a number.
6. Read bar graphs containing integers.
7. Key Vocabulary: positive numbers, negative numbers, signed numbers, integers, is less than, is greater than, opposite, absolute value.

1. Represent real-life situations with integers

Example 1. Represent each quantity by an integer.

1. The record high temperature for the town is 113°F.

   Answer:________________________________

2. The number of televisions sold reflected a 35 percent loss from the previous year.

   Answer:________________________________

2. Graph integers on a number line

Example 2. Graph each integer in the list on the same number line.

-6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8

   Negative numbers

   Neither positive nor negative

   Positive numbers

Example 2. Graph each integer in the list on the same number line.

6, 4, 0, -2, -5,

3. Compare integers

Order Property for Integers: For any two real numbers a and b,

1. a is less than b if a is to the left of b on the number line.
2. a is greater than b if a is to the right of b on the number line.

Example 3. Insert <, >, or = in the space between the paired numbers to make each statement true.

1. 41____________14
2. −2.12____________2.12
Example 4. Determine whether each statement is true or false.

1. $3.002 > 3.202$
2. $\frac{14}{18} \neq \frac{7}{9}$
3. $\frac{6}{7} \geq \frac{11}{14}$

Answer:_________ Answer:_________ Answer:_________

4. Find the absolute value of a number

**Absolute value of a number**—is the distance from 0 on the number line.

**Note:** Absolute value of a number is never be negative number because it represents the distance.

Example 5. Find each absolute value.

1. $|6.2|$
2. $|-14|$
3. $\left|\frac{2}{9}\right|$
4. $|0|$

Answer:_________ Answer:_________ Answer:_________ Answer:_________

5. Find the opposite of a number

**Opposite or Additive Inverse**—Two numbers that are the same distance form 0 but lie on opposite side of 0 are called opposites or additive inverses of each other.

Example 6. Find the additive inverse or opposite.

1. 8
2. $-9$
3. 0

Answer:_________ Answer:_________ Answer:_________

6. Read bar graphs containing integers

Example 7. The bar graph shows the number of tickets sold each week by the garden club for their annual flower show.

1. During which week was the most number of tickets sold?

Answer:________________

2. During which week were 40 tickets sold?

Answer:________________
Learning Objectives:
1. Add integers.
2. Evaluate an algebraic expression by adding.
3. Solve problems by adding integers.

1. Add integers
   1. **Same sign**—is to add their absolute values. Use their common sign as the sign of the answer.
   2. **Different sign**—is to subtract their absolute values. Give the answer the same sign as the number with the larger absolute value.

**Example 1.** Add each of the following
1. \(-23 + (-17)\)
2. \(-74 + 27\)
3. \(-25 + (-4) + (-2) + (-6)\)

Answer:_________________________       Answer:_________________________

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2. Evaluate an algebraic expression by adding

**Example 2.** Evaluate \(x + y\) for \(x = -43\) and \(y = 38\).

Answer:_________________________

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3. Solve problems by adding integers

**Example 3.** Solve.
1. Find the sum of \(-52\), \(13\) and \(-82\).

Answer:__________________________

2. A local restaurant reported net incomes of \$1,397\), \(-\$2,042\) and \$809 for the past three months. What was its total net income for the three months?

Answer:__________________________
Sec. 2.3 Subtracting Integers

**Learning Objectives:**
1. Subtract integers.
2. Add and subtract integers.
3. Evaluate an algebraic expression by subtracting.
4. Solve problems by subtracting integers.
5. Key Vocabulary: additive inverse.

1. **Subtract integers**

   **Subtracting integers**—if \( a \) and \( b \) are real numbers, then \( a - b = a + (-b) \)

   **Example 1.** Subtract.
   1. \( 11 - (-15) \)
      Answer:_________________________
   2. \( -105 - 68 \)
      Answer:_________________________

2. **Add and subtract integers**

   **Example 2.** Simplify completely.
   1. \( -6 - (-8) + (-12) - 7 \)
      Answer:_________________________
   2. \( 5 + (-18) - (-21) - 2 \)
      Answer:_________________________

3. **Evaluate an algebraic expression by subtracting**

   **Example 3.** Evaluate \( 3y - z \) when \( y = 9 \), and \( z = -4 \).
   Answer:_________________________
4. Solve problems by subtracting integers

Example 4. Solve.

1. Amy has $545 in her checking account. She writes a check for $257, makes a deposit of $75, and then writes another check for $409. Find the balance in her account. (Write the amount as an integer.

Answer:_________________________

2. The temperature on a January morning in Worcester is – 5°F at 2 a.m. If the temperature drops 4° by 3 a.m., rise 6° by 4 a.m., and then drops 8° by 5 a.m., find the temperature after 5 a.m.

Answer:_________________________
Sec. 2.4 Multiplying and Dividing Integers

Learning Objectives:
1. Multiply integers.
2. Divide integers.
3. Evaluate an algebraic expression by multiplying or dividing.
4. Solve problems by multiplying or dividing integers.

1. Multiply integers
Sign Rules and Rules for Multiplication: For any real numbers $a$ and $b$,

1. $(-a)b = (a)(-b) = -a \cdot b$
2. $(-a)(-b) = a \cdot b$
3. $(a)(0) = (0)(a) = 0$

Example 1. Multiply.

1. $(-50)(0)(-5)(8)$

Answer:_________________________

2. $(-2)(3)(-1)(-4)(2)$

Answer:_________________________

2. Divide integers
Sign Rules and Rules for Division: For any real numbers $a$, $b$ and $c$,

1. $\frac{-a}{-b} = \frac{a}{b}$
2. $\frac{-a}{b} = \frac{a}{-b}$
3. $a \div b = \frac{a}{b}$
4. $\frac{a \div c}{b \div d} = \frac{a}{b} \div \frac{c}{d}$
5. $\frac{0}{a} = 0$
6. $\frac{a}{0} = undefined$

Example 2. Find each quotient.

1. $36 \div (-6)$

Answer:_________________________

2. $\frac{-17}{0}$

Answer:_________________________
3. **Evaluate an algebraic expression by multiplying or dividing**

**Example 3.** Evaluate: \[ \frac{-6x - 4y}{-2z + 3 - (-10)} \] when \( x = 5, y = -1 \) and \( z = 0 \)

Answer: ___________________________

4. **Solve problems by multiplying or dividing integers**

**Example 4.** Solve

1. Find the quotient of 63 and \(-9\)

Answer: ___________________________

2. Better Electric Co. marked $15 off the price of each microwave in stock. If there are 57 microwaves in stock, write the total reduction in price of all microwaves as an integer.

Answer: ___________________________
Sec. 2.5 Order of Operations

Learning Objectives:
1. Simplify expressions by using the order of operations.
2. Evaluate an algebraic expression.
3. Find the average of a list of numbers.

1. Simplify expressions by using the order of operations

Recall: Order of Operations:
1. Perform all operations within parentheses ( ), brackets [ ], or other grouping symbols such as fraction bars, starting with the innermost set.
2. Evaluate any expressions with exponents.
3. Multiply or divide in order from left to right.
4. Add or subtract in order from left to right.

Example 1. Simplify.

1. \(8^2 - 2(6) + 45 \div 5\)

Answer:_________________________

2. \(21 \div [7(-15 \div (-5))]\)

Answer:_________________________

3. \(\frac{20(-1) - (-5)(-2)}{3[-12 \div (-3 - 3)]}\)

Answer:_________________________
2. Evaluate an algebraic expression

Example 2. Evaluate each expression for $x = -3, y = 6$ and $z = -1$

1. $x^2 - y + z$

   Answer: ___________________

2. $\frac{8x}{2y}$

   Answer: ___________________

3. Find the average of a list of numbers

Example 3. Find the average of each list of numbers: $-20, -9, -1, 0, 4, 6, 6$

   Answer: ___________________
Sec. 2.6 Solving Equations: The Addition and Multiplication Properties

Learning Objectives:
1. Identify solutions of equations.
2. Use the addition or multiplications properties of equality to solve equations.
3. Key Vocabulary: equation, expression, multiplication, solution, addition and equivalent.

1. Identify solutions of equations
A solution of an equation—is a number that when substituted for a variable makes the equation a true statement.

Example 1. Decide whether the given number is a solution of the given equation.

1. Is 12 a solution of \( x + 3 = 15 \)?
   Answer:_________________________

2. Is 8 a solution of \( z – 15 = 23 \)?
   Answer:_________________________

2. Use the addition or multiplication properties of equality to solve equations
Definitions:
1. Linear Equation in One Variable—is an equation of the form________________________,
   where \( a, b \) and \( c \) are any real numbers and \( a \neq 0 \).

2. Addition Property of Equality: If___________________, then_____________________,
   where \( a, b \) and \( c \) are any real numbers.

3. Multiplication Property of Equality: If _______________ then _______________ where
   \( a, b \) and \( c \) are any real numbers.

4. Distributive Property:
   a)

   b) where \( a, b \) and \( c \) are any real numbers.

Steps to Simplify Equations:
1. Simplify each sides of equation as much as possible.
2. If an equation contains parentheses, use the distributive property to remove the parentheses.
3. Using the proper of equality to solve the resulted equation.
Example 2. Solve:

1. \( y - 6 = -2 \)
   Answer:_________________________

2. \( -32 = 8x \)
   Answer:_________________________

3. \( -\frac{x}{4} = 7 \)
   Answer:_________________________

4. \( -8x + 5 + 6x = -3x + 10 \)
   Answer:_________________________