Study Guide and Intervention
Integers and Absolute Value

The absolute value of a number is the distance the number is from zero on a number line. Two vertical lines are used to represent absolute value. The symbol for absolute value of \(-5\) is \(|-5|\).

Example 1: Write an integer that represents 100 feet below sea level.
Because it represents below sea level, the integer is \(-100\).

Example 2: Evaluate \(|-2|\).

On the number line, the graph of \(-2\) is 2 units away from 0. So, \(|-2| = 2\).

Exercises
Write an integer for each situation.
1. \(+12\)
2. Owed \(\$24\)
3. \(+20\) pounds
4. \(-6\) miles

Evaluate each expression.
5. \(|-12| = 12\)
6. \(|-150| = 150\)
7. \(|-3| = 3\)
8. \(|15| = 15\)
9. \(|-10| = 10\)
10. \(|16| = 16\)
1. \textbf{Death Valley} is the lowest point in the United States, being \textbf{282 feet} below sea level. Write an integer to represent the altitude of Death Valley: \(-282\).

2. In the month of April, there were 9 inches more rainfall than normal. Write an integer to represent the amount of rainfall above normal in April: \(+9\).

3. \textbf{Archimedes} was a famous mathematician and physicist. He was born in \(287 \text{ B.C.}\). Write an integer to express the year of his birth: \(-287\).

4. \textbf{Temperature} is the measure of how hot or cold an object or environment is. In our world, temperature is measured in degrees Celsius or Fahrenheit. Write an integer to express the temperature: \(-23\).

5. \textbf{Stock Market} is the place where stocks are bought and sold. A certain stock gained 5 points in one day and lost 4 points the next day. Write integers to represent the stock's gain and loss for the two days: \(+5\) and \(-4\).

6. \textbf{Altitude} refers to the height of an object above or below a reference point. An airplane pilot changed his altitude by 100 meters. Describe what this could mean: This could mean the pilot is rising 100 meters which would be a positive. Or it could mean he is falling 100m, which would be negative.

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\textbf{Study Guide and Intervention}

\textbf{Comparing and Ordering Integers}

When two numbers are graphed on a number line, the number to the left is always less than \((<)\) the number to the right. The symbol \(<\) is used to show that \((<)\) the number to the left is less than the number to the right.

\textbf{Words}

- Less than: \(<\)
- Greater than: \(>\)
- Equal to: \(=\)

\textbf{Symbols}

\[\ldots\]

\textbf{Example 1}

Replace the \(\_\) with < or > to make \(-1\) \(\_\) a true sentence.

\textbf{Example 2}

Order the integers \(-2, -3, -4\) from least to greatest.

\textbf{Example 3}

Order the integers \(-2, -3, -4\) from greatest to least.

\textbf{Example 4}

Order the integers \(-2, -3, -4\) from greatest to least.

\textbf{Example 5}

Order the integers \(-2, -3, -4\) from least to greatest.

\[\ldots\]
Thalia is in the computer lab. Thalia will go left 2 spaces from the origin, then up one space.

Thalia’s next class is in the music room. The ordered pair is \((-6, -6)\).

Delsin is in Quadrant I, which is the upper right hand section.

5) Quadrant I

\((1, 4)\)

7 units up

\((-4, -3)\)

3 units right
Adding Integers

Find each sum using models (pictures) of algebra tiles.

1) $2 \times 1$

3) $-2 \times (+2)$

* same signs → add numbers, keep same sign

2) $-3 \times (-2)$

4) $3 \times 1$

$= \text{zero pair}$

Different → subtract numbers, take sign of bigger number

5) $-1 + 7$

6) $4 + (-6)$

7) $-2 + 5$

8) $8 + (-4)$
### Study Guide and Intervention

#### Adding Integers

**Add numbers, keep same sign**

- the sum of two positive integers is positive.
- the sum of two negative integers is negative.

For integers with different signs, subtract the absolute values. The sum is: subtract numbers, take sign of larger number.

**Subtract numbers, take sign of larger number**

- If the positive integer has the greater absolute value.
- If the negative integer has the greater absolute value.

To add integers, it is helpful to use counters or a number line.

#### Example 1

Find $4 + (-4)$.

- **Method 1** Use counters.
  - Combine a set of 4 positive counters and a set of 4 negative counters on a mat.

- **Method 2** Use a number line.
  - Start at 0.
  - Move 4 units right.
  - Then move 4 units left.

#### Exercises

**Add.**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $3 + (-2) = -1$</td>
<td>$2 + 1 = 3$</td>
</tr>
<tr>
<td>2. $10 + (-10) = 0$</td>
<td>$-5.22 + (-7) = -12.22$</td>
</tr>
</tbody>
</table>

**Evaluate each expression if $a = 8$, $b = -8$, and $c = 4$.**

<table>
<thead>
<tr>
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<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. $a + b + c = 8 + (-8) + 4 = 4$</td>
<td>$15: 10 + c = 15$</td>
</tr>
</tbody>
</table>

### Practice: Word Problems

#### Adding Integers

Write an addition expression to describe each situation. Then find each sum.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Expression</th>
<th>Calculation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. FOOTBALL. A team gains 20 yards. Then they lose 7 yards.</td>
<td>$20 + (-7)$</td>
<td>$20 - 7 = 13$</td>
<td>13 yards</td>
</tr>
<tr>
<td>2. MONEY. Roger owes his mom $3$. He borrows another $6 from her.</td>
<td>$-3 + 6$</td>
<td>$-3 + 6 = 3$</td>
<td>$3$ dollars owed</td>
</tr>
<tr>
<td>3. GOLF. Juanita's score was $22$ on the first 9 holes. Her score was $4$ on the second 9 holes.</td>
<td>$+5 + (-4)$</td>
<td>$5 - 4 = 1$</td>
<td>Juanita's score is $+1$ after 18 holes.</td>
</tr>
<tr>
<td>4. HOT AIR BALLOON. A balloon rises 490 feet into the air. Then it descends 130 feet. $1400 - 130$</td>
<td></td>
<td>$1270$ feet</td>
<td>The plane descends a total of $1700$ feet.</td>
</tr>
<tr>
<td>5. CYCLING. A cyclist travels downhill for 120 feet. Then she travels up a hill 50 feet.</td>
<td>$-1200 + 500$</td>
<td>$-1200 + 500 = -700$</td>
<td>$-700$ feet</td>
</tr>
</tbody>
</table>
Subtracting Integers

Find each difference using models (pictures) of algebra tiles. Remember: To subtract an integer, add its opposite.

1) $7 - 6$

2) $5 - (-3)$

3) $6 - (-3)$

4) $5 + 8$

5) $-6 - (-3)$

6) $-7 - 3$

7) $-5 - (-7)$

8) $-5 - 4$
-7 - 3

6. \(-1 + 3 = -10\)

7. \(-5 - (-7)\)

\(-5 + (7)\)
Study Guide and Intervention

Subtracting Integers

To subtract an integer, add its opposite.

"add the opposite" follow the addition rules

Example 1: Find 6 – 9.
6 – 9 = 6 + (−9)
= −3

Example 2: Find −10 − (−12).
−10 − (−12) = −10 + 12
= 2

Example 3: Evaluate a − b if a = −3 and b = 7.
a − b = −3 − 7
= −3 + (−7)
= −10

Example 4: Evaluate a − b − c if a = 2, b = 5, and c = 3.
a − b − c = 2 − 5 − 3
= −6

Exercises

1. 5 + (−8) → +2
2. 20 + (−10) → +26
3. −10 + 4 → −6
4. 0 + 13 → 13
5. −7 + (−5) → −12
6. 13 + 10 → 23
7. −20 − (−6) → −14
8. −8 − (−6) → −2
9. 55 − (−14) → 69
10. 55 − 50 → 5
11. 15 − (−5) → −10
12. 10 + (12) → 22

Evaluate each expression if m = −9, n = 10, and p = 5.
13. m − 6 → −15
14. 9 − n → 18
15. p − (−5) → 10
16. m − n → −14
17. m − n → −14
18. p − m → 2
19. (p) − (−2) → p + 2
20. (5) + (−2) → 3

Practice: Word Problems

Subtracting Integers

1. EXERCISE: A team gained 5 yards on their first play of the game. Then they had 6 yards. Find the total change in yards.

2. CANCELLING: Your checking account is overdrawn by $50. You write a check for $20. What is the balance in your account now?

   −50 + 20 → −30

   The balance in my account is −30.

3. TEMPERATURE: The average temperature in Calgary, Canada, is 22°C in July and −17°C in January. Find the range of the highest and lowest temperatures in Calgary.

4. ROLLER COASTER: A roller coaster begins at 90 feet above ground level. Then it descends 105 feet. Find the height of the coaster after the first descent.

5. LAUREN: Lauren has $25 in her savings account. She withdraws $15. What is left in her savings account?

6. PENNIES: Wai and Kuri were digging in the sand at the beach. Wai dug a hole that was 15 inches deep. Kuri dug a hole that was 10 inches deep. The difference in the depths of their holes:

   −15 − (−9)

   −15 + (−9)

   −6

   The difference between Wai and Kuri's holes at the beach is 6 inches.
Study Guide and Intervention

Multiplying Integers

EXAMPLE 1
Multiply 5(-3).
5(-3) = -15
The product of two integers with different signs is negative.

EXAMPLE 2
Multiply 3(-7).
-3(-7) = 21
The product of two integers with different signs is positive.

EXAMPLE 3
Multiply 6(-9).
6(-9) = -54
The product of two integers with the same sign is positive.

EXAMPLE 4
Multiply (-2)(-2).
(-2)(-2) = 4
There are 4 integers of -2.
The product is positive.

EXAMPLE 5
Simplify -2(5).
-2(5) = -10
Associative Property of Multiplication. Simplify.

EXAMPLE 6
Simplify 3(2).
3(2) = 6
Associative Property of Multiplication. Simplify.

Exercise

Multiply.
1. -3(-6) = 36
2. -2(-7) = 14
3. -2(-6) = 12
4. -3(-2) = 6
5. -4(-3) = 12
6. -5(-2) = 10

ALGEBRA Simplify each expression.
7. -5(-7) = 35
8. 3(-2) = -6
9. 5(0) = 0
10. 7(-4) = -28
11. -6(-4) = 24
12. -7(-9) = 63

ALGEBRA Evaluate each expression if x = -3, y = -6, and c = 5.
13. -3x = 9
14. 10y = 60
15. -2c = -10
16. -3x - 2y = -24

Practice: Word Problems

Multiplying Integers

1. TEMPERATURE Suppose the temperature outside is dropping 5 degrees each hour. How much will the temperature drop in 8 hours?

2. DIVING A deep-sea diver descends below the surface of the water at a rate of 0.5 feet each minute. What is the depth of the diver after 10 minutes?

3. STOCK A manager must sell 50 stocks each hour for 8 hours. Find the total points the stock fell.

4. DROUGHT A drought can cause the level of the local water supply to drop by a few inches each week. Suppose the level of the water supply drops 2 inches each week. How far will it have dropped in 4 weeks?

5. MONEY Mrs. Rockwell lost money on an investment at a rate of 0.8% per day. How much did she lose after 2 weeks?

6. TIERED BALLS Josh purchased 8 cases of tennis balls. Each case came with 3 balls in each can. How many balls did Josh purchase?
Study Guide and Intervention
Dividing Integers

The quotient of two integers with different signs is negative.
The quotient of two integers with the same sign is positive.

EXAMPLE 1 Divide $-20 \div (-5)$.
$-20 \div (-5) = 4$ The integers have different signs.

EXAMPLE 2 Divide $30 \div (-6)$.
$30 \div (-6) = -5$ The integer is negative.

EVALUATE Evaluate each expression. If $a = -6$, $b = -4$, and $c = 2$.

11. $12 - c = 12 - (-4) = 16$
12. $60 + f = 60 + f$
13. $d = e$
14. $d = e$
15. $\frac{a}{c} = \frac{-6}{-4} = \frac{3}{2}$
16. $\frac{c}{a} = \frac{-4}{-6} = \frac{2}{3}$
17. $\left(\frac{a}{c}\right)^2 = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$
18. $\frac{c}{a} \cdot \left(\frac{a}{c}\right)^2 = \frac{-2}{3} \cdot \frac{9}{4} = -\frac{3}{2}$
19. $\frac{d}{c} \cdot \left(\frac{a}{c}\right)^2 = \frac{2}{3} \cdot \frac{3}{2} = 1$

Practice: Word Problems
Dividing Integers

1. STOCK MARKET During a 5-day week, the stock market decreased by 45 points. Find the average daily change in the market for the week.

2. MOTION Mr. Diaz decreased the speed of his car by 30 miles per hour over a period of 10 seconds. Find the average change in speed each second.

3. WEATHER Over the past seven days, Mrs. Cho found that the temperature outside had dropped a total of 36 degrees. Find the average drop in temperature each day.

4. BASKETBALL The basketball team lost their last 6 games. They lost by a total of 48 points. Find the average number of points by which each game was lost.

5. POPULATION The enrollment at Dorsey Middle School dropped by 60 students over a 5-year period. What is the average yearly drop in enrollment?

6. SUBMARINE A submarine descends at a rate of 60 feet each minute. How long will it take to descend to a depth of 600 feet below the surface?
24) $3 each week for 7 weeks
at the end of 7 weeks = ?

\[-3 \times 7\]

\[-21\]

The total amount change after 7 weeks is $-21$