Integers and Absolute Value

- An integer is any positive or negative whole number from the set \{..., -\pi, -3, -2, -1, 0, 1, 2, 3, 4, ...\}
- Negative integers are integers _________ than zero.
- Positive integers are integers _________ than zero.
- ___________ is neither negative nor positive.

These numbers are **Integers**: 0, 3, -100, 432, \( \frac{10}{2} \), \( -\frac{6}{3} \), 987,654,321

These numbers are **not Integers**: 7.2, \( \frac{10}{4} \), \( -\frac{5}{8} \), -3.7

**Write Integers for Real-Life Situations**

- a gain of 5 yards on the first down.
- 6 feet below sea level
- a temperature of 10 degrees below zero.
- a $35 withdrawal

**You Try! Underline key words**

- a. Lost 6 points
- b. 3 stokes below par
- c. $5 deposit
- d. A loss of $30
- e. descend 20 meters
- f. 12 centimeters longer
- g. How far away is the plane from the submarine?
- h. 100 meters ascend and then 20 meters descend
Graph an Integer on a Number Line

Graph –4 on a number line. Then graph 3 on a number line. Which one is greater???

Compare Integers

Use the >, <, or = to make a true sentence.

-6 □ –4

a. 3 □ –5
b. –5 □ 0
c. 6 □ –1
d. –23 □ –29

Positive numbers are always _________________ than negative numbers.

Zero is always _____________ than a positive number, but _________________ than a negative number.

When comparing two negative numbers, imagine them on a number line. The negative number closer to the zero is always ______________.

Order Integers

SCIENECE The average surface temperatures of Jupiter, Mars, Earth, and the Moon are shown in the table. Order the temperatures from least to greatest (in ascending order).

<table>
<thead>
<tr>
<th>Name</th>
<th>Average Surface Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jupiter</td>
<td>–162</td>
</tr>
<tr>
<td>Moon</td>
<td>–10</td>
</tr>
<tr>
<td>Mars</td>
<td>–81</td>
</tr>
<tr>
<td>Earth</td>
<td>59</td>
</tr>
</tbody>
</table>

Absolute Value

- The ___________________________ of an integer is the ________________that number is from ________________ on a number line. (# of steps from zero)

- The absolute value of any number is ALWAYS _______________, or ____________________.

\[ |14| = |-14| = 14 \]
Evaluate and Graph the expression. \(|-4|\)

\[\begin{align*}
\text{a. } |6| &= \quad \text{b. } |4| + |-4| &= \\
\text{c. } |7| - |2| + |-1| &= \\
\text{d. } |-5| &= \\
\text{e. } |9| - |-5| &= \\
\text{f. } |-13| + |-7| &= 
\end{align*}\]

Record the absolute value for each integer.

\[\begin{align*}
1) \quad |{-8}| &= \quad 2) \quad |5| &= \\
3) \quad |15| &= \quad 4) \quad |-13| &= 
\end{align*}\]

Evaluate the problems below.

\[\begin{align*}
5) \quad |-22| + 9 &= \quad 6) \quad |10| - |-4| &= \\
7) \quad |7| \cdot 9 \cdot |0| &= \quad 8) \quad |-100| \div |5| &= 
\end{align*}\]

Compare, using <, >, or =

\[\begin{align*}
9) \quad 6 & \bigcirc |-14| \\
10) \quad |-17| & \bigcirc |17| 
\end{align*}\]

Order the following from GREATEST to LEAST (descending order).

\[\begin{align*}
11) \quad -32, -10, |16|, |-3|, |-30|, 25 & 
\end{align*}\]

**Additive Inverses**

Additive inverses are numbers that are the __________ distance from zero in ______________ directions on the number line. When additive inverses are combined through addition, the sum is ZERO.

Write the Additive Inverse of 3. _______ Graph 3 and its additive inverse on the number line.

Write the additive inverse of each number. Graph each pair on the number line.

\[\begin{align*}
a. \quad -4 \\
b. \quad 8 \\
c. \quad -9 
\end{align*}\]
Practice (1.1)

Write an integer to represent the situation below:

1) sea level _______ 2) a withdraw of 42 dollars ________
3) 14 degrees below 0 _______ 4) an increase in height of 3 inches ________

Write the value represented by the point for each letter. Then find its additive inverse (a.i.).

\[
\begin{array}{cccccccccc}
& H & P & K & M \\
\bullet & -5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 \\
\end{array}
\]

5) K ______, a.i.: ______ 6) H _______, a.i: ______
7) M ______, a.i: ______ 8) P ________, a.i: ______

Evaluate

9) \(|29| = \) 10) \(|-15| = \)
11) \(|9| - |-2| = \) 12) \(|-50| + |-7| = \)

13) What is the sum of the absolute values of \(-14\) and \(10\)? __________________

14) \(|-30| - |-4| + |5| = \)

Compare using \(>\), \(<\), or \(=\)

15) \(-32 \bigcirc 14 \) 16) \(11 \bigcirc -4 \) 17) \(|-9| \bigcirc |9| \)

Order the following from least to greatest (ascending order).

18) \(-8, 10, 2, -13, -5, 3 \) __________________________

19) \(-22, -11, |11|, |0|, |14|, 22, -10 \) __________________________

Order the following from greatest to least (descending order).

20) \(-9, -19, 19, 99, -29, -99, 29 \) __________________________

??? Why is it better to have a positive bank account rather than a negative bank account?
2-1 Study Guide and Intervention
Integers and Absolute Value

The set of integers can be written {..., -3, -2, -1, 0, 1, 2, 3, ...} where ... means continues indefinitely. Two integers can be compared using an inequality, which is a mathematical sentence containing < or >.

**Example 1**
Use the integers graphed on the number line below for each question.

Replace each with < or > to make a true sentence.

a. -6  -2
   -2 is greater since it lies to the right of -6.
   So write -6 < -2.

b. 3  -4
   3 is greater since it lies to the right of -4.
   So write 3 > -4.

Numbers on opposite sides of zero and the same distance from zero have the same absolute value.

The symbol for absolute value is two vertical bars on either side of the number. |2| = 2 and |-2| = 2

**Example 2**
Evaluate each expression.

a. |-4|  
   |-4| = 4

b. |-3| + |6|
   |-3| + |6| = 3 + 6
   = 9
   Simplify.

**Exercises**

Replace each with <, >, or = to make a true sentence.

1. 4  -4
2. 8  12
3. -7  -5
4. 2  5
5. -1  1
6. 4  -3
7. 6  8
8. -2  12
9. 9  -1
10. -6  -6
11. 5  -3
12. -10  2

Evaluate each expression.

13. |-6|
14. |15|
15. |-12|
16. |21|
17. |4| - |2|
18. |-8| + |-3|
19. |-10| - |-6|
20. |12| + |-4|
Skills Practice

Integers and Absolute Value

Replace each \( \diamond \) with \(<\), \(>\), or \(=\) to make a true sentence.

1. \(1 \diamond 0\)  
2. \(-3 \diamond 0\)  
3. \(0 \diamond -1\)  
4. \(0 \diamond 9\)  
5. \(-7 \diamond -7\)  
6. \(2 \diamond -2\)  
7. \(-2 \diamond 8\)  
8. \(-4 \diamond 4\)  
9. \(5 \diamond 5\)  
10. \(0 \diamond -6\)  
11. \(4 \diamond 10\)  
12. \(6 \diamond -6\)  
13. \(3 \diamond 7\)  
14. \(-1 \diamond -2\)  
15. \(3 \diamond 4\)  
16. \(-3 \diamond -4\)

Order the integers in each set from least to greatest.

17. \(\{4, -5, 0\}\)  
18. \(\{8, -2, 1\}\)  
19. \(\{-6, -3, 0\}\)  
20. \(\{-5, 5, 3, -1\}\)  
21. \(\{0, -3, 7, -2\}\)  
22. \(\{9, -11, 1, 0\}\)  
23. \(\{12, -4, 3, -1\}\)  
24. \(\{-8, 15, 1, -10\}\)  
25. \(\{-12, -17, -20, 2\}\)

Evaluate each expression.

26. \(|1|\)  
27. \(|-10|\)  
28. \(|-8|\)  
29. \(|10|\)  
30. \(|4| + |-4|\)  
31. \(|9| - |-5|\)  
32. \(0 + |-1|\)  
33. \(|-6| + |-5|\)  
34. \(|-8| - |-8|\)  
35. \(|12| + |-3|\)  
36. \(|-15| - |6|\)  
37. \(|-13| + |-7|\)

Evaluate each expression if \(a = -3\), \(b = 0\), and \(c = 1\).

38. \(|a| - b\)  
39. \(|c| + 2\)  
40. \(9 - |a|\)  
41. \(|25| - b\)  
42. \(10 - |b|\)  
43. \(|-8| + |a|\)
2-1 Practice

Integers and Absolute Value

Replace each \( > \) with \(<\), \(>\), or \(=\) to make a true sentence.

1. \(0 \overset{>}{\vphantom{=}} -5\)  
2. \(10 \overset{>}{\vphantom{=}} -10\)  
3. \(-8 \overset{>}{\vphantom{=}} 3\)  
4. \(11 \overset{=}{\vphantom{>}} 11\)

5. \(-18 \overset{>}{\vphantom{=}} -18\)  
6. \(-18 \overset{<}{\vphantom{=}} 18\)  
7. \(18 \overset{>}{\vphantom{=}} -18\)  
8. \(18 \overset{=}{\vphantom{>}} 18\)

9. \(-120 \overset{>}{\vphantom{=}} -95\)  
10. \(35 \overset{=}{\vphantom{>}} -12\)  
11. \(-35 \overset{<}{\vphantom{=}} 12\)  
12. \(41 \overset{<}{\vphantom{=}} 17\)

Order the integers in each set from least to greatest.

13. \((-14, -6, -22, 0)\)  
14. \((-3, 19, 0, -5)\)  
15. \((-7, 20, -21, 7)\)

16. \((15, -1, 4, -3)\)  
17. \((0, -1, 2, -3, 4)\)  
18. \((55, 0, -60, 12)\)

19. \((-48, -30, -49, -8, 3, -4)\)  
20. \((-27, -9, 3, 0, -2, 29)\)

Evaluate each expression.

21. \(|-7|\)  
22. \(|14|\)  
23. \(|-11|\)

24. \(|-9| - |6|\)  
25. \(|-18| - |-8|\)  
26. \(|-12| + |1|\)

27. \(|8 - 4|\)  
28. \(|23| - |18|\)  
29. \(|-16| + |-22|\)

Evaluate each expression if \(a = -3\), \(b = 0\), and \(c = 1\).

30. \(|a| - |c|\)  
31. \(|a| + |c|\)  
32. \(|ab| + c\)

33. \(5 - |ac|\)  
34. \(c + |-5|\)  
35. \(c + |5|\)

36. WEATHER At 6:15 a.m. the temperature was \(-8^\circ F\). At 12:15 p.m. the temperature was \(-12^\circ F\). At 6:16 p.m. the temperature was \(-10^\circ F\). Order the temperatures from least to greatest.
Integers in Order

Connect the dots in each exercise in the order of the integers shown, from least to greatest. The least integer in each exercise is indicated by the arrow.

1. 0
   -5 •
   -8 •
   -12 •

2. 32
   67
   64
   81

3. 42
   72
   53

4. 4
   1
   -9
   -27
   -32
   -39
   -61
   -70

© Glencoe/McGraw-Hill