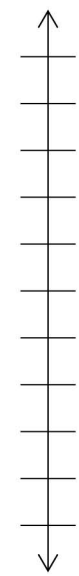
Name _____ Date_____

Absolute Value—Magnitude and Distance

Jessie and his family drove up to a picnic area on a mountain. In the morning, they followed a trail that led to the mountain summit, which was 2,000 feet above the picnic area. They then returned to the picnic area for lunch. After lunch, they hiked on a trail that led to the mountain overlook, which was 3,500 feet below the picnic area.

a. Locate and label the elevation of the mountain summit and mountain overlook on a vertical number line. The picnic area represents zero. Write a rational number to represent each location.



Picnic area: 0

Mountain summit: _____

Mountain overlook: _____

b. Use absolute value to represent the distance on the number line of each location from the picnic area.

Distance from the picnic area to the mountain summit: _____

Distance from the picnic area to the mountain overlook: _____

c. What is the distance between the elevations of the summit and overlook? Use absolute value and your number line from part (a) to explain your answer.

For each of the following two quantities in Problems 1–4, which has the greater magnitude? (Use absolute value to defend your answers.)

1. 33 dollars and -52 dollars

2. -14 feet and 23 feet

3. -24.6 pounds and -24.58 pounds

4. $-11\frac{1}{4}$ degrees and 11 degrees

For Problems 5–7, answer true or false. If false, explain why.

5. The absolute value of a negative number will always be a positive number.

6. The absolute value of any number will always be a positive number.

7. Positive numbers will always have a higher absolute value than negative numbers.

8. Write a word problem whose solution is $|20| = 20$.

9. Write a word problem whose solution is $|-70| = 70$.

10. Look at the bank account transactions listed below and determine which has the greatest impact on the account balance. Explain.
    a. A withdrawal of $\$60$.
    b. A deposit of $\$55$.
    c. A withdrawal of $\$58.50$.

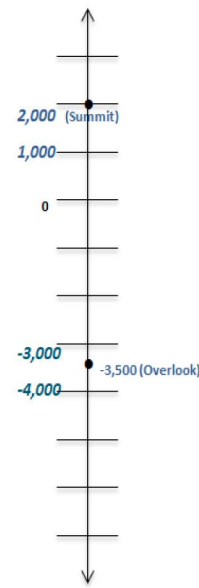
Jessie and his family drove up to a picnic area on a mountain. In the morning, they followed a trail that led to the mountain summit, which was $2,000$ feet above the picnic area. They then returned to the picnic area for lunch. After lunch, they hiked on a trail that led to the mountain overlook, which was $3,500$ feet below the picnic area.

a. Locate and label the elevation of the mountain summit and mountain overlook on a vertical number line. The picnic area represents zero. Write a rational number to represent each location.

Picnic Area: 0

Mountain Summit: $2,000$

Mountain Overlook: $-3,500$



b. Use absolute value to represent the distance on the number line of each location from the picnic area.

Distance from the picnic area to the mountain summit: $|2,000| = 2,000$

Distance from the picnic area to the mountain overlook: $|-3,500| = 3,500$

c. What is the distance between the elevations of the summit and overlook? Use absolute value and your number line from part (a) to explain your answer.

Summit to picnic area and picnic area to overlook: $2,000 + 3,500 = 5,500$ *feet*

There are $2,000$ *units from zero to* $2,000$ *on the number line.*

There are $3,500$ *units from zero to* $-3,500$ *on the number line.*

Altogether, that equals $5,500$ *units, which represents the distance on the number line between the two elevations. Therefore, the difference in elevations is* $5,500$ *feet.*

For each of the following two quantities in Problems 1–4, which has the greater magnitude? (Use absolute value to defend your answers.)

1. 33 dollars and -52 dollars

$|-52| = 52$ $\quad |33| = 33$ $\quad 52 > 33$, *so* -52 *dollars has the greater magnitude.*

2. -14 feet and 23 feet

$|-14| = 14$ $\quad |23| = 23$ $\quad 14 < 23$, *so* 23 *feet has the greater magnitude.*

3. -24.6 pounds and -24.58 pounds

$|-24.6| = 24.6$ $|-24.58| = 24.58$ $24.6 > 24.58$, *so* -24.6 *pounds has the greater magnitude.*

4. $-11\frac{1}{4}$ degrees and 11 degrees

$|-11\frac{1}{4}| = 11\frac{1}{4}$ $|-11| = 11$ $11\frac{1}{4} > 11$, *so* $-11\frac{1}{4}$ *degrees has the greater magnitude.*

For Problems 5–7, answer true or false. If false, explain why.

5. The absolute value of a negative number will always be a positive number.

True.

6. The absolute value of any number will always be a positive number.

False. Zero is the exception since the absolute value of zero is zero, and zero is not positive.

7. Positive numbers will always have a higher absolute value than negative numbers.

False. A number and its opposite have the same absolute value.

8. Write a word problem whose solution is $|20| = 20$.

Answers will vary. Kelli flew a kite 20 *feet above the ground. Determine the distance between the kite and the ground.*

9. Write a word problem whose solution is $|-70| = 70$.

Answers will vary. Paul dug a hole in his yard 70 *inches deep to prepare for an in-ground swimming pool. Determine the distance between the ground and the bottom of the hole that Paul dug.*

10. Look at the bank account transactions listed below and determine which has the greatest impact on the account balance. Explain.
    a. A withdrawal of $\$60$.
    b. A deposit of $\$55$.
    c. A withdrawal of $\$58.50$.

$|-60| = 60$ $|55| = 55$ $|-58.50| = 58.50$

$60 > 58.50 > 55$, *so a withdrawal of* $\$60$ *has the greatest impact on the account balance.*