CCSS • 7.NS.1

Absolute Value

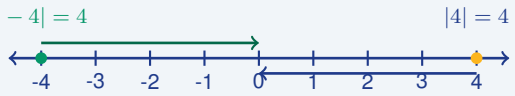
Name: _____	Date: _____	Score: _____ / 18

Here is a simple but powerful idea: **absolute value** measures how far a number is from zero on the number line—not which side of zero it is on. That is why $|-7|$ and $|7|$ both equal 7; each sits exactly 7 units from zero. Because distance is never negative, an absolute value is always zero or positive. One common trap to watch for: if there is a minus sign *outside* the absolute-value bars, find the absolute value first, then apply the sign. Mastering this concept now will pay off every time you work with integer operations, distance, and real-world contexts like temperature change.

Key Concepts & Quick Review

Definition: $|n|$ = distance from n to 0 on the number line $\Rightarrow$ $|n| \geq 0$ always.

Rule: $|n| = n$ if $n \geq 0$; $|n| = -n$ if $n < 0$ **Key fact:** $|-n| = |n|$ (opposites have the same absolute value)



Absolute value is distance from zero.

Examples

① Evaluate $-|-9|$.

Think It Through: Work from the inside out. First find the absolute value: $|-9| = 9$ because -9 is 9 units from zero. Then look at the negative sign outside the bars and apply it after the absolute value is finished. That gives $-(9) = -9$. A negative sign outside absolute value bars does not disappear.

Answer: -9

② Two hikers leave camp (position 0 on a trail). Hiker A walks $11\ mi$ east $(+11)$ and Hiker B walks $11\ mi$ west (-11). Use absolute value to compare the distances each hiker traveled. Then find $|+11| - |-11|$.

Think It Through: Absolute value tells distance from zero, so direction does not matter here. Hiker A traveled $|+11| = 11\ mi$ and Hiker B traveled $|-11| = 11\ mi$. That means they are the same distance from camp even though they walked in opposite directions. Subtracting the two distances gives $11 - 11 = 0$.

Answer: 0*; both hikers traveled equal distances*

Practice Problems

Evaluate each expression.

1. $|-8| =$ _____

2. $|15| =$ _____

3. $-|-7| =$ _____

4. $|-34| =$ _____

5. $-|12| =$ _____

6. $|0| =$ _____

7. $|-23| =$ _____

8. $-|-20| =$ _____

9. $|-45| =$ _____

10. $|7| - |-7| =$ _____

11. $|-13| + |-8| =$ _____

12. $|-6| \cdot |-4| =$ _____

13. $|-3|^2 =$ _____

14. $|8 - 15| =$ _____

15. $|-100| \div |-25| =$ _____

Study Tips

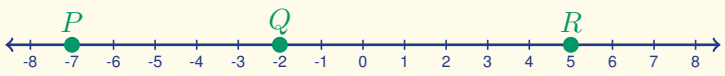
- Absolute value is **always** ≥ 0. It measures distance, and distance is never negative.
- A negative sign *outside* the bars is applied **after** taking the absolute value: $-|-5| = -(5) = -5$.
- Work from the inside out: simplify what is inside $|\cdot|$ first, then evaluate the absolute value, then apply any outside operations.

Word Problems

16. Two submarines depart from a dock at sea level (depth $= 0$). Submarine A dives to a depth of -340 feet and Submarine B dives to a depth of -180 feet. Use absolute value to determine which submarine is *closer* to the surface, and by exactly how many feet closer it is than the other submarine. _____

17. Alena's bank account balance was $\$0$ on Sunday. By Monday evening her balance had dropped to $-\$47$. By Tuesday evening it had dropped further to $-\$62$. Use absolute value to state her Tuesday balance as a positive amount owed. Then determine by how many dollars her balance changed between Monday evening and Tuesday evening, and express that change as an absolute value. _____

18. Three points P, Q, R are marked on the number line shown here. Find $|P|$, $|Q|$, and $|R|$. Then determine which point is *farthest* from zero, and compute $|P| + |R|$ (the total distance from zero of the two outer points).



_____

Answer Keys

1) 8
2) 15
3) -7
4) 34
5) -12
6) 0
7) 23
8) -20
9) 45
10) 0
11) 21
12) 24
13) 9
14) 7
15) 4
16) Sub B is closer; it is $160\,ft$ closer.
17) Owes \$62; $|-62-(-47)| = \$15$ change.
18) $P = -7$; $Q = -2$; $R = 5$; farthest from 0: P; $|P| + |R| = 12$

Step-by-Step Explanations

Strategy: For Absolute Value, treat absolute value as distance from zero; first make the value inside the bars nonnegative, then handle any operation outside the bars. A correct solution should make clear whether the bars changed the sign or only measured distance.

Practice 1: |-8|= **Answer:** 8
In the opening example, evaluate absolute-value bars as distance from zero before doing any remaining operation.

Practice 15: $|-100| \div |-25| =$ **Answer:** 4
For the end-of-set item, evaluate absolute-value bars as distance from zero before doing any remaining operation.

Word-problem notes:

16. Answer: Sub B is closer; it is $160\,ft$ closer.
Use absolute value to compare how far each submarine is below the surface. Submarine A is $|-340| = 340$ feet below, and Submarine B is $|-180| = 180$ feet below. Since 180 is smaller, Submarine B is closer to the surface. The difference is $340 - 180 = 160$ feet.

17. Answer: Owes \$62; $|-62-(-47)| = \$15$ change.
A balance of $-\$62$ means Alena owes $\$62$, so the positive amount owed is $\$62$. To find the change from Monday to Tuesday, subtract: $-62-(-47) = -62+47 = -15$. The negative sign shows the balance went down by 15 dollars. The size of the change is $|-15| = \$15$.

18. Answer: $P = -7$, so $|P| = 7$; $Q = -2$, so $|Q| = 2$; $R = 5$, so $|R| = 5$; P is farthest from 0; $|P| + |R| = 12$.
Read the points off the number line: P is at -7, Q is at -2, and R is at 5. Absolute value gives the distance from zero, so $|P| = 7$, $|Q| = 2$, and $|R| = 5$. The largest absolute value is 7, so P is farthest from zero. Adding the outer distances gives $|P| + |R| = 7 + 5 = 12$.

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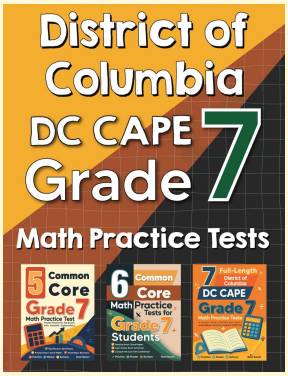

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