Understanding Positive and Negative Numbers

Positive and negative numbers: Applications and decisions

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QUICK REVIEW

Choose a reference value called zero. Above zero is positive and below zero is negative. A depth 7 m below sea level is -7 m; 4 m above is $+4$ m. On a number line $-7 < 0 < 4$. A negative sign indicates direction, not just a small size.

Worked example

Write the signed elevation of a point 12 m below sea level and compare it with 3 m above.

1. Below the zero reference is negative, so the first elevation is -12 m.
2. Above it is $+3$ m; the separation is $12 + 3 = 15$ m, with -12 left of 3.
Answer: -12 m and $+3$ m; $-12 < 3$.

Practice Problems

Show your thinking.

1. Trail A is at -5 m; B is at 8 m. Which is higher and by how much?

2. A freezer is 11 degrees below zero. Write its temperature and compare it with $-7°$C.

3. Design two signed changes of equal size for earning and losing 12 points.

4. A diver is 7 m below sea level. A dock is 2 m above. State both signed elevations and the vertical gap.

5. A debt of 20 dollars is shown as -20. A student calls it more money than a 5-dollar balance. Correct the comparison.

6. A cave is 16 m from sea level, below it. Recover its signed elevation.

7. A lake bottom is 9 m below sea level and a bridge 4 m above. State both signed elevations and their gap.

8. Design a pair of temperature readings equally far above and below zero, at distance 6 degrees.

Answer Key

1. B, by 13 m.
2. -11°C$< -7^\circ$C.
3. $+12$ and -12.
4. -7 m, $+2$ m; gap 9 m.
5. $-20 < 5$.
6. -16 m.
7. -9 m, $+4$ m; 13 m gap.
8. $+6^\circ$C and -6°C.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. $8 > -5$, so B is higher.
2. $8 - (-5) = 13$ m is the elevation gap.

Problem 2

1. Below zero gives -11°C.
2. $-7 - (-11) = 4$ degrees, so the freezer is 4 degrees colder.

Problem 3

1. Earning 12 is $+12$; losing 12 is -12.
2. $12 + (-12) = 0$, so the changes cancel.

Problem 4

1. The signed positions are -7 and $+2$.
2. $2 - (-7) = 9$ m between them.

Problem 5

1. -20 is below zero, whereas 5 is above zero.
2. The 5-dollar balance is $5 - (-20) = 25$ dollars higher.

Problem 6

1. Below the reference chooses the negative value -16.
2. $|-16| = 16$ m confirms its distance from sea level.

Problem 7

1. Below is -9 m; above is $+4$ m.
2. Gap $= 4 - (-9) = 13$ m.

Problem 8

1. Equal distance requires $|6| = |-6| = 6$ degrees.
2. Their midpoint is $(6 + (-6))/2 = 0$, so the readings balance around zero.

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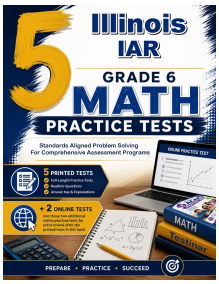

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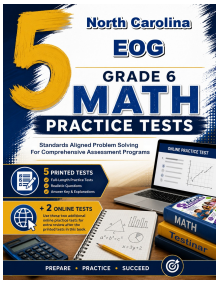

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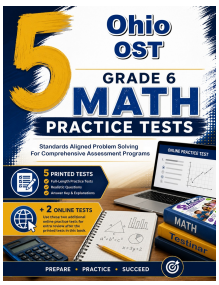

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