Understanding Positive and Negative Numbers

Positive and negative numbers: Models and calculations

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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. Write 8 degrees below $0°$C as a signed temperature.

2. Write a deposit of 25 dollars and a withdrawal of 9 dollars with signs.

3. Order the elevations $-4, 0, 6$ m from lowest to highest.

4. A submarine is 15 m below sea level. What signed number represents sea level and the submarine?

5. Which is warmer, $-2°$C or $-9°$C? State the difference.

6. Give signed numbers for 3 floors above ground and 2 floors below ground.

7. Write a signed number for a gain of 17 points, and the signed change that cancels it.

8. Compare floor -3 with ground floor 0. How far below ground is it?

Answer Key

1. $-8°$C.
2. $+25$ and -9 dollars.
3. $-4 < 0 < 6$.
4. 0 m and -15 m.
5. $-2°$C, by 7 degrees.
6. $+3$ and -2.
7. $+17$ and -17.
8. $-3 < 0$; 3 floors below.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Below 0 means a negative value, -8.
2. The distance back to 0 is $0 - (-8) = 8$ degrees.

Problem 2

1. A deposit increases the balance: $+25$.
2. A withdrawal decreases it: -9; together the change is $25 - 9 = 16$ dollars.

Problem 3

1. -4 lies 4 units below 0.
2. 6 lies 6 units above 0; the gap is $6 - (-4) = 10$ m.

Problem 4

1. Sea level is the reference 0.
2. The submarine is 15 m in the negative direction, so -15 m; $|-15| = 15$.

Problem 5

1. -2 is to the right of -9, so it is warmer.
2. $-2 - (-9) = 7$ degrees separates them.

Problem 6

1. Ground is floor 0; above is $+3$.
2. Below is -2, and the distance between floors is $3 - (-2) = 5$.

Problem 7

1. A gain is positive: $+17$ points.
2. The cancelling change is -17, since $17 + (-17) = 0$.

Problem 8

1. The signed position is -3, so it is below zero.
2. Distance to ground $= 0 - (-3) = 3$ floors.

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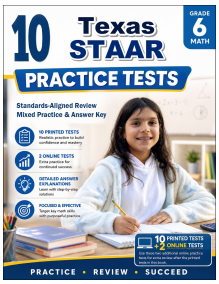

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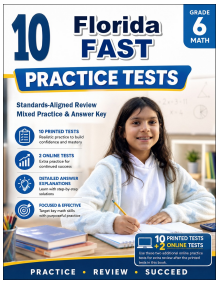

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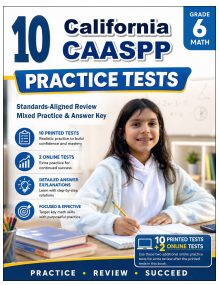

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