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Solving Absolute Value Equations

🏠 60°F   🧳 x°F   Difference: 30°F

$$|x - 60| = 30$$

$$x - 60 = 30 \quad \text{or} \quad x - 60 = -30$$

$$+60 \quad +60 \qquad\qquad +60 \quad +60$$

$$x = 90°F \quad \text{or} \qquad\quad x = 30°F$$

(1) **What is the temperature at the vacation resort?**

(2) Solve the absolute value equation.

(3) Deduce the resulting rates.

(4) Analyze the absolute value equations.

(5) Solve the absolute value equations.

(+) with lots of tips, answer keys, and detailed answer explanations for all of the problems.

⚠️ The complete package, **including all problems, hints, answers, and detailed answer explanations** is available for all sofatutor.com subscribers.

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Worksheet: Solving Absolute Value Equations
Mathematics / Algebra 1 / Absolute Value / Solving Absolute Value Equations

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What is the temperature at the vacation resort?

Fill in the blanks.

Jasmine went on a surprise vacation.

What was the surprise? She didn't know the location - only that the temperature would be a guaranteed difference of $30°$F from the temperature at her home of $60°$F.

What a surprise. Although she expected a temperature of $90°$F, it was very cold.

$\boxed{x + 60 = 30}$ $\boxed{\text{two value}}$ $\boxed{30}$ $\boxed{\text{two value}}$ $\boxed{x - 60 = 30}$ $\boxed{60}$

$\boxed{\text{absolute value}}$ $\boxed{-30}$ $\boxed{90}$ $\boxed{x - 60 = -30}$ $\boxed{\text{absolute value}}$ $\boxed{-60}$

$\boxed{x + 60 = -30}$ $\boxed{|x - 30| = 60}$ $\boxed{|x - 60| = 30}$

Jasmine forgot about _____₁.

Let's solve this _____₂ equation:

_____₃

x is the unknown temperature, $60°$F is the temperature at home, and $30°$F is the guaranteed difference.

We can describe this situation with two equations:

1. _____₄

2. _____₅

Adding _____₆ to both sides of each equation:

$x = $_____₇ $°$F or $x = $_____₈ $°$F

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Hints for solving these problems

What is the temperature at the vacation resort?

Hint #1

Use a number line to model absolute value.

Hint #2

Check your work. The temperature difference from $60°$F has to be $30°$F.

Hint #3

If you get stuck, refer back to the definition of absolute value:

$$|x| = \begin{cases} x & \text{if } x > 0 \\ -x & \text{if } x < 0 \\ 0 & \text{if } x = 0 \end{cases}$$

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Answers and detailed answer explanations for these problems

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What is the temperature at the vacation resort?

Answer key: 1: absolute value // 2: absolute value // 3: $|x - 60| = 30$ // [4+5]¹: $x - 60 = 30$ **or** $x - 60 = -30$ // 6: 60 // [7+8]¹: 90 **or** 30

¹Each answer can only be used once. You can answer them in whatever order you want.

Poor Jasmine. She didn't know to bring warm clothes.

She assumed the temperature at her vacation spot would be $90°$ F. But what happened?

A $30°$ F temperature difference was advertised.

One possible solution: a temperature of $90°$ F because $90 - 30 = 60$.

Unfortunately, there was no guarantee of a higher temperature. The temperature could also be colder than the home temperature.

Let's solve the absolute value equation we set up earlier.

$$|x - 60| = 30$$

The definition of an absolute value equation is as follows:

$$|x| = \begin{cases} x & \text{if } x > 0 \\ -x & \text{if } x < 0 \\ 0 & \text{if } x = 0 \end{cases}$$

Splitting the equation above into two equations gives us:

- $x - 60 = 30$
- $x - 60 = -30$

Add 60 to both sides of both equations to get two solutions:

- $x = 90°$ F
- $x = 30°$ F

To figure out where she went wrong, Jasmine can spend her time inside the hotel solving absolute value equations.