2-3 Solving Absolute-Value Equations PreAP Practice

Solve each equation. Check your solutions.

1. \(|x - 18| = 5\)
   \[x = 13 \text{ or } x = 23\]

2. \(9 = |x + 12|\)
   \[x = -21 \text{ or } x = -3\]

3. \(8 = |y + 5|\)
   \[y = -13 \text{ or } y = 3\]

4. \(-2|3a - 2| = 6\)
   \[\frac{-2|3a - 2|}{-2} \neq \frac{6}{-2}\]
   \[|3a - 2| = -3\]
   Not possible
   \[\text{Solution: } \emptyset\]

5. \(|4b + 1| + 8 = 0\)
   \[\left|\frac{4b + 1}{-6}\right| = -8\]
   \[\text{Solution: } \emptyset\]

6. \(|6x - 8| = 22\)
   \[|6x| = 30\]
   \[x = -5 \text{ or } x = 5\]

7. \[\frac{3|2x + 2| - 2x}{x + 1} = \frac{3x + 3}{3}\]
   \[\text{Solution: } x = -1\]

8. \[\frac{|2x - 6|}{4} + x = 4\]
   \[2x = -10 \text{ or } 2x = 10\]
   \[x = -5 \text{ or } x = 5\]

Check solutions:
- \(2(-5) = -10\)
- \(2(5) = 10\)
- \(10 - 6 = 4\)
- \(10 - 6 = 4\)
9. \[ |2w+3|+6=2 \]
\[ 2w+3 = -6 \]
\[ 2w = -9 \]
\[ w = -4.5 \]
\[ |2w+3| = 4 \] not possible
Solution: \( \emptyset \)

10. \[ |3n+2|+4=0 \]
\[ 3n+2 = -4 \]
\[ 3n = -6 \]
\[ n = -2 \]
\[ |3n+2| = 4 \] not possible
Solution: \( \emptyset \)

11a. \[ |c-2|=2c-10 \]
Negative
\[ c-2 = -(2c-10) \]
\[ c-2 = -2c+10 \]
\[ 3c = 12 \]
\[ c = 4 \]
Positive
\[ c-2 = 2c-10 \]
\[ c = 8 \]
Check
\[ |4-2|=2(4)-10 \]
\[ 2 = -6 \] no
\[ 2 = 2 \] yes
\[ |8-3|=2(8)-10 \]
\[ 6 = 6 \] yes
\[ |6|=16-10 \]
\[ 6 = 6 \] yes

11b. \[ |h-5|=3h-7 \]
Negative
\[ h-5 = -(3h-7) \]
\[ h-5 = -3h+7 \]
\[ 4h = 12 \]
\[ h = 3 \]
Positive
\[ h-5 = 3h-7 \]
\[ -2 = -2 \] yes
\[ 2 = 2 \] yes
\[ |4| = 3(1)-7 \]
\[ 4 = 4 \] yes

13. Leticia sets the thermostat in her apartment to 68 degrees. The actual temperature in her apartment can vary from this by 3.5 degrees. Write an absolute value equation that you can use to find the minimum and maximum temperatures.
\[ |t-68|=3.5 \]
Check
\[ |64.5-68|=3.5 \]
\[ 1.5 \] yes
\[ |71.5-68|=3.5 \]
\[ 3.5 \] yes
\[ \text{min: } 64.5^\circ \]
\[ \text{max: } 71.5^\circ \]

14. A quality control inspector at a bolt factory examines random bolts that come off the assembly line. Any bolt whose diameter differs by more than 0.04 mm from 6.5 mm is sent back. Write and solve an absolute value equation to find the maximum and minimum diameters of an acceptable bolt.
\[ |6.5-x|=0.04 \]
Check
\[ |6.5-6.46|=0.04 \]
\[ 0.04=0.04 \] yes
\[ |6.5-6.54|=0.04 \]
\[ 0.04=0.04 \] yes
\[ \text{min: } 6.46 \text{ mm} \]
\[ \text{max: } 6.54 \text{ mm} \]