Solving Absolute Value Equations Worksheet

Evaluate if \( x = -5 \)

1. \(|x|\)  
2. \(|4x|\)  
3. \(|-2x|\)  
4. \(|x + 6|\)  
5. \(|7x - 1|\)  
6. \(|-x|\)  
7. \(|2x + 5|\)  
8. \(|-2x + 5|\)  
9. \(5 - |x|\)  
10. \(5 - |-x|\)  
11. \(|x| + x\)  
12. \(|x - 7| - 8\)  
13. \(7 - |3x + 10|\)  
14. \(|x + 4| + |2x|\)

Solve each equation. Check Solutions.

15. \(|x + 11| = 42\)
16. \(|x - 5| = 11\)
17. \(3|x + 7| = 36\)
18. \(8|x - 3| = 88\)
19. \(\frac{1}{2} |x + 2| = 8\)
20. \(|x - \frac{7}{3}| = 6\)
21. \(\frac{1}{3} |6x + 5| = 7\)
22. \(|2x + 9| = 30\)
23. \(|4x - 3| = -27\)
24. \(|2x + 7| = 0\)
25. 
26. \(|2a + 7| = a - 4\)
27. \(|7 + 3a| = 11 - a\)

Use a calculator to evaluate each expression.

28. \(|7(-3) + 10|\)
29. \(|7(-3)| + 10\)
30. \(3|4x - 9| \text{ if } x = 2.8\)
31. \(3|4x - 9| \text{ if } x = 2.2\)
32. \(48|7k - 30| \text{ if } k = 14\)
33. \(4 - |5n - 8| \text{ if } n = 2\)
Solving Absolute Value Equations Worksheet Key

Evaluate if \( x = -5 \)

1. \(|x| \Rightarrow 5\)  
2. \(|4x| \Rightarrow 20\)  
3. \(|-2x| \Rightarrow 10\)  
4. \(|x + 6| \Rightarrow 1\)  
5. \(|7x - 1| \Rightarrow 36\)  
6. \(|-x| \Rightarrow 5\)  
7. \(|2x + 5| \Rightarrow 5\)  
8. \(|-2x + 5| \Rightarrow 15\)  
9. \(5 - |x| \Rightarrow 0\)  
10. \(5 - |-x| \Rightarrow 0\)  
11. \(|x| + x \Rightarrow 0\)  
12. \(|x - 7| - 8 \Rightarrow 4\)  
13. \(7 - |3x + 10| \Rightarrow 2\)  
14. \(|x + 4| + |2x| \Rightarrow 11\)

Solve each equation. Check Solutions.

15. \(|x + 11| = 42\)

If \(x + 11 \geq 0\) then \(x + 11 = 42\)

\(x = 31\)

Check – Is \(|31 + 11| = 42\)? YES

If \(x + 11 < 0\) then \(x + 11 = -42\)

\(x = -53\)

Check – Is \(|31 + (-53)| = 42\)? YES

The solution set is \(\{31, -53\}\)

16. \(|x - 5| = 11\)

If \(x - 5 \geq 0\) then \(x - 5 = 11\)

\(x = 16\)

Check – Is \(|16 - 5| = 11\)? YES

If \(x - 5 < 0\) then \(x - 5 = -11\)

\(x = -6\)

Check – Is \(|-6 - 5| = 11\)? YES

The solution set is \(\{16, -6\}\)

17. \(3|x + 7| = 36\)

Rewrite equation by dividing each side by 3.

\(|x + 7| = 12\)

If \(x + 7 \geq 0\) then \(x + 7 = 12\)

\(x = 5\)

Check – Is \(3|5 + 7| = 12\)? YES

If \(x + 7 < 0\) then \(x + 7 = -12\)

\(x = -19\)

Check – Is \(3|-19 + 7| = 12\)? YES

The solution set is \(\{5, -19\}\)
18. \(8|x - 3| = 88\)

Rewrite equation by dividing each side by 8.
\(|x - 3| = 11\)

If \(x - 3 \geq 0\) then \(x - 3 = 11\)
\(x = 14\)
Check – Is \(8|14 - 3| = 88\) YES

If \(x - 3 < 0\) then \(x - 3 = -11\)
\(x = -8\)
Check – Is \(8|-8 - 3| = 88\) YES

Solution set is \(\{14, -8\}\)

19. \(\left|\frac{1}{2} x + 2\right| = 8\)

If \(\frac{1}{2} x + 2 \geq 0\) then \(\frac{1}{2} x + 2 = 8\)
\(\frac{1}{2} x = 6\) \(\Rightarrow x = 12\)
Check – Is \(\left|\frac{1}{2} (12) + 2\right| = 8\) YES

If \(\frac{1}{2} x + 2 < 0\) then \(\frac{1}{2} x + 2 = -8\)
\(\frac{1}{2} x = -10\) \(\Rightarrow x = -20\)
Check – Is \(\left|\frac{1}{2} (-20) + 2\right| = 8\) YES

Solution set is \(\{12, -20\}\)

20. \(|x - \frac{7}{3}| = 6\)

If \(x - \frac{7}{3} \geq 0\) then \(x - \frac{7}{3} = 6\)
\(x = \frac{25}{3}\)
Check – Is \(|\frac{25}{3} - \frac{7}{3}| = 6\) YES

If \(x - \frac{7}{3} < 0\) then \(x - \frac{7}{3} = -6\)
\(x = -\frac{11}{3}\)
Check – Is \(|-\frac{11}{3} - \frac{7}{3}| = 6\) YES

Solution set is \(\left\{\frac{25}{3}, -\frac{11}{3}\right\}\)

21. \(\frac{1}{3}|6x + 5| = 7\)

Rewrite the equation by multiplying each side by 3.
\(|6x + 5| = 21\)

If \(6x + 5 \geq 0\) then \(6x + 5 = 21\)
\(6x = 16\) \(\Rightarrow x = \frac{8}{3}\)
Check – Is \(\frac{1}{3}|6(\frac{8}{3}) + 5| = 7\) YES

If \(6x + 5 < 0\) then \(6x + 5 = -21\)
\(6x = -26\) \(\Rightarrow x = -\frac{13}{3}\)
Check – Is \(\frac{1}{3}|6(-\frac{13}{3}) + 5| = 7\) YES

Solution set is \(\left\{\frac{8}{3}, -\frac{13}{3}\right\}\)
22. \(|2x + 9| = 30\)

If \(2x + 9 \geq 0\) then \(2x + 9 = 30\)
\[
2x = 21 \Rightarrow x = \frac{21}{2}
\]

Check – Is \(|2\left(\frac{21}{2}\right) + 9| = 30\) YES

If \(2x + 9 < 0\) then \(2x + 9 = -30\)
\[
2x = -3 \Rightarrow x = \frac{-39}{2}
\]

Check – Is \(|2\left(-\frac{39}{2}\right) + 9| = 30\) YES

Solution set is \(\left\{\frac{21}{2}, \frac{-39}{2}\right\}\)

23. \(|4x - 3| = -27\)

Since the absolute value of a number cannot be negative, there is no solution

Solution set is \(\emptyset\)

24. \(|2x + 7| = 0\)

Since the absolute value is equal to zero, there can only be one solution

\[
2x + 7 = 0
\]
\[
2x = -7 \Rightarrow x = \frac{-7}{2}
\]

Check – Is \(|2\left(-\frac{7}{2}\right) + 7| = 0\) YES

Solution set is \(\left\{-\frac{7}{2}\right\}\)

25. \(-6|2x - 14| = -42\)

Rewrite equation by dividing both sides by negative 6
\[|2x - 14| = 7\]

If \(2x - 14 \geq 0\) then \(2x - 14 = 7\)
\[
2x = 21 \Rightarrow x = \frac{21}{2}
\]

Check – Is \(-6\left|2\left(\frac{21}{2}\right) - 14\right| = -42\) YES

Solution set is \(\left\{\frac{21}{2}, \frac{7}{2}\right\}\)

If \(2x - 14 < 0\) then \(2x - 14 = -7\)
\[
2x = 7 \Rightarrow x = \frac{7}{2}
\]

Check – Is \(-6\left|2\left(\frac{7}{2}\right) - 14\right| = -42\) YES

Solution set is \(\left\{\frac{21}{2}, \frac{7}{2}\right\}\)
26. \(|2a + 7| = a - 4\)

If \(2a + 7 \geq 0\) then \(2a + 7 = a - 4\)

\(a = -11\)

Does not check because \((a - 4)\) must be positive

If \(2a + 7 < 0\) then \(2a + 7 = -(a - 4)\)

\(3a = -3 \Rightarrow a = -1\)

Does not check because \((a - 4)\) must be positive

27. \(|7 + 3a| = 11 - a\)

If \(7 + 3a \geq 0\) then \(7 + 3a = 11 - a\)

\(4a = 4 \Rightarrow a = 1\)

Check – Is \(|7 + 3(1)| = 11 - (1)\) YES

If \(7 + 3a < 0\) then \(7 + 3a = -(11 - a)\)

\(2a = -18 \Rightarrow a = -9\)

Check – Is \(|7 + 3(-9)| = 11 - (-9)\) YES

Use a calculator to evaluate each expression.

28. \(|7(-3) + 10| \Rightarrow 11\)

29. \(|7(-3)| + 10 \Rightarrow 31\)

30. \(3|4x - 9|\) if \(x = 2.8 \Rightarrow 6.6\)

31. \(3|4x - 9|\) if \(x = 2.2 \Rightarrow 0.6\)

32. \(48|7k - 30|\) if \(k = 14 \Rightarrow 3264\)

33. \(4 - |5n - 8|\) if \(n = 2 \Rightarrow 2\)
<table>
<thead>
<tr>
<th></th>
<th>On questions 1 thru 14, did the student evaluate the questions correctly?</th>
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<tbody>
<tr>
<td>a</td>
<td>All 14 (70 points)</td>
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<tr>
<td>b</td>
<td>13 out of 14 (65 points)</td>
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<tr>
<td>c</td>
<td>12 out of 14 (60 points)</td>
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<td>d</td>
<td>11 out of 14 (55 points)</td>
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<td>e</td>
<td>10 out of 14 (50 points)</td>
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<td>9 out of 14 (45 points)</td>
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<td>8 out of 14 (40 points)</td>
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<td>7 out of 14 (35 points)</td>
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<td>6 out of 14 (30 points)</td>
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<td>j</td>
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<td>k</td>
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<td>1 out of 14 (5 points)</td>
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<tr>
<td>2</td>
<td>On question 15, did the student solve the equation correctly and check solution?</td>
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<td>a. Both (10 points)</td>
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<td>b. Solved correctly but did not check solution (5 points)</td>
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<td>3</td>
<td>On question 16, did the student solve the equation correctly and check solution?</td>
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<td>a. Both (10 points)</td>
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<td>b. Solved correctly but did not check solution (5 points)</td>
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<td>4</td>
<td>On question 17, did the student solve the equation correctly and check solution?</td>
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<td>b. Solved correctly but did not check solution (5 points)</td>
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<td>5</td>
<td>On question 18, did the student solve the equation correctly and check solution?</td>
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<td>a. Both (10 points)</td>
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<td>6</td>
<td>On question 19, did the student solve the equation correctly and check solution?</td>
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<td>a. Both (10 points)</td>
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<td>b. Solved correctly but did not check solution (5 points)</td>
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<td>7</td>
<td>On question 20, did the student solve the equation correctly and check solution?</td>
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<td>a. Both (10 points)</td>
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<td>8</td>
<td>On question 21, did the student solve the equation correctly and check solution?</td>
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<td>9</td>
<td>On question 22, did the student solve the equation correctly and check solution?</td>
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<tr>
<td></td>
<td>a. Both (10 points)</td>
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<td></td>
<td>b. Solved correctly but did not check solution (5 points)</td>
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</tbody>
</table>
10. On question 23, did the student solve the equation correctly and check solution?
   a. Both (10 points)
   b. Solved correctly but did not check solution (5 points)

11. On question 24, did the student solve the equation correctly and check solution?
   a. Both (10 points)
   b. Solved correctly but did not check solution (5 points)

12. On question 25, did the student solve the equation correctly and check solution?
   a. Both (10 points)
   b. Solved correctly but did not check solution (5 points)

13. On question 26, did the student solve the equation correctly and check solution?
   a. Both (10 points)
   b. Solved correctly but did not check solution (5 points)

14. On question 27, did the student solve the equation correctly and check solution?
   a. Both (10 points)
   b. Solved correctly but did not check solution (5 points)

15. On questions 28 thru 33, did the student evaluate each problem correctly using a calculator?
   a. All six (30 points)
   b. 5 out of 6 (25 points)
   c. 4 out of 6 (20 points)
   d. 3 out of 6 (15 points)
   e. 2 out of 6 (10 points)
   f. 1 out of 6 (5 points)

Total Number of Points _________

A  252 points and above
B  224 points and above
C  196 points and above
D  168 points and above
F  167 points and below

NOTE: The sole purpose of this checklist is to aide the teacher in identifying students that need remediation. Students who meet the “C” criteria are ready for the next level of learning. The teacher, when assigning grades to the handout, may also use a percentage to assign grades.