Key

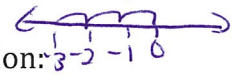
Algebra 1
Unit 3, Lesson 4 Notes
Equations Containing Absolute Value

Essential Question: How do I solve equations containing an absolute value?

Vocabulary:

Absolute Value: $|x|$ The distance a # is from zero on the # line.

ex: $|-3|=3$ bc -3 is 3 spaces away from 0



Extraneous Solution: An apparent solution that doesn't "check-out"

Review: Find the absolute value.

1) $|-2|$ → 2

2) $|4|$ → 4

3) $|4^2 - 3^3|$ → $|16-27|$ → $|-11|$ → 11

4) $|7 + (-3)^2|$ → $|7+9|$ → $|16|$ → 16

* What's the difference in simplifying the exponents in #3 & #4?

Solving an equation containing absolute value $|ax + b| = c$ where $c > 0$:

1. Isolate the absolute value on one side of the equation.
2. Write two equations: $ax+b=c$ or $ax+b=-c$.
3. Solve each equation.
4. Check each solution in the original equation.

Examples: Solve the equations. Check for extraneous solutions.

Set notation: $\{-2, 12\}$

1. $|x - 5| = 7$

$x - 5 = 7$ $\quad$ $x - 5 = -7$

$x = 12$ or $x = -2$

Check: $|12 - 5| = 7$ $\quad$ $|-2 - 5| = 7$

$7 = 7$ ✓ $\quad$ $|-7| = 7$

$7 = 7$ ✓

2. $|2x + 12| = 4x$

$2x + 12 = 4x$ $\quad$ $2x + 12 = -4x$

$12 = 2x$ $\quad$ $6x = -12$

$6 = x$ $\quad$ $x = -2$ ← extran. sol.

$x = 6$

Check: $|12 + 12| = 24$ $\quad$ $|2(-2) + 12| = 4(-2)$

$24 = 24$ ✓ $\quad$ $8 \neq -8$

3. $|x - 3| = 10$

$x - 3 = 10$ or $x - 3 = -10$

$x = 13$ or $x = -7$

Check: ✓ ✓

4. $|3x - 2| = 13$

$3x - 2 = 13$ $\quad$ $3x - 2 = -13$

$x = 5$ or $x = -\frac{11}{3}$

Check: ✓ ✓

* Watch your signs *

5. $|2x + 5| = 3x$

$2x + 5 = 3x$ $\quad$ $2x + 5 = -3x$

$x = 5$ $\quad$ $5 = -5x$

$x = -1$ → extraneous solution

Check: ✓ $\quad$ ✗

6. $|4x - 1| = 2x + 9$

$4x - 1 = 2x + 9$ $\quad$ $4x - 1 = -2x - 9$

$2x = 10$ $\quad$ $6x = -8$

$x = 5$ or $x = -\frac{4}{3}$

Check: ✓ $\quad$ $\left|-\frac{19}{3}\right| = \frac{19}{3}$ ✓

7. $|x + 3| = -2$

$x + 3 = -2$

* NO SOLUTION!

Why? (Discuss: ab. value is always positive)

8. $\frac{4|2x + 6|}{4} = \frac{48}{4}$

* Remember to isolate abs. value first!

$|2x + 6| = 12$

$2x + 6 = 12$ $\quad$ $2x + 6 = -12$

$x = 3$ or $x = -9$

Check: ✓ ✓

9. $|5x + 2| - 4 = 13$

$|5x + 2| = 17$

$5x + 2 = 17$ $\quad$ $5x + 2 = -17$

$x = 3$ or $x = -\frac{19}{5}$

Check: ✓ ✓

10. $|3x + 2| + 4 = 18$

$|3x + 2| = 14$

$3x + 2 = 14$ $\quad$ $3x + 2 = -14$

$x = 4$ or $x = -\frac{16}{3}$

Check: ✓ ✓