

Solving Absolute Value Equations,
Inequalities, and Absolute Value Inequalities
Honors Algebra 2

1. Solve the following:

a. $9 = |x + 12|$

$$\begin{array}{r} x + 12 = 9 \quad \text{and} \quad x + 12 = -9 \\ -12 \quad -12 \qquad \qquad -12 \quad -12 \\ x = -3 \qquad \qquad x = -21 \end{array}$$

$x = -3, -21$

b. $|3x - 2| - 8 = 1$

* isolate abs value
+8 +8
 $3x - 2 = 9$
 $3x - 2 = -9$
 $3x = 11$ $3x = -7$
 $x = 11/3$ $x = -7/3$

$x = -7/3, 11/3$

2. Solve and graph the solution on a number line:

a. $-5(3x - 7) > 3(2x + 14)$

$$\begin{array}{r} -15x + 35 > 6x + 42 \\ +15x \qquad \qquad +15x \\ 35 > 21x + 42 \\ -42 \qquad \qquad -42 \\ -7 > 21x \\ \frac{-7}{21} > \frac{21x}{21} \\ -1/3 > x \end{array}$$

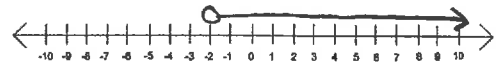
$x < -1/3$
 $(-\infty, -1/3)$



b. $-4x \leq \frac{5x+58}{6}$

$$\begin{array}{r} -24x < 5x + 58 \\ -5x \quad -5x \\ -29x < 58 \\ x > -2 \end{array}$$

$x > -2$
 $(-2, \infty)$



○ not included (\neq)
● included ($=$)

* divide or multiply by negative \rightarrow flip sign

3. Solve each inequality and graph the solution on a number line:

a. $8 < 2x - 4 < 16$
+4 +4 +4

$$\begin{array}{r} \frac{12}{2} < \frac{2x}{2} < \frac{20}{2} \\ 6 < x < 10 \end{array}$$

$6 < x < 10$
 $(6, 10)$



b. $4x + 3 < -6$ or $3x - 7 > 2$
 $3x - 7 > 2$

$$\begin{array}{r} 4x + 3 < -6 \\ -3 \quad -3 \\ 4x < -9 \\ x < -9/4 \end{array} \qquad \begin{array}{r} 3x - 7 > 2 \\ +7 \quad +7 \\ 3x > 9 \\ x > 3 \end{array}$$

$x < -9/4$ or $x > 3$
 $(-\infty, -9/4) \cup (3, \infty)$



★ Great OR
Less thAND

c. $|3x - 4| > 10$

$$3x - 4 > 10 \quad \text{or} \quad 3x - 4 < -10$$
$$\begin{array}{r} +4 \quad +4 \\ \hline 3x < -6 \end{array}$$

$$3x > 14$$

$$x > \frac{14}{3}$$

$$x < -2$$

$$x < -2 \text{ or } x > \frac{14}{3}$$
$$(-\infty, -2) \cup (\frac{14}{3}, \infty)$$



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d. $|-9x - 3| \leq 6$

$$-9x - 3 \leq 6 \quad \text{and} \quad -9x - 3 \geq -6$$
$$\begin{array}{r} +3 \quad +3 \\ \hline \end{array}$$

$$-9x \leq 9$$

$$x \geq -1$$

$$-9x \geq -3$$

$$x \leq \frac{1}{3}$$

$$-1 \leq x \leq \frac{1}{3}$$
$$[-1, \frac{1}{3}]$$

