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

1. Solve the following:

a. $9 = |x + 12|$

$x+12 = 9$ and $x+12 = -9$

$-12 \quad -12$ $\qquad$ $-12 \quad -12$

$x = -3$ $\qquad$ $x = -21$

$x = -3, -21$

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

* isolate abs value

$+8 \quad +8$

$|3x - 2| = 9$

$3x - 2 = 9$ and $3x - 2 = -9$

$3x = 11$ $\qquad$ $3x = -7$

$x = 11/3$ $\qquad$ $x = -7/3$

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

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

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

$-15x + 35 > 6x + 42$

$+15x \qquad +15x$

$35 > 21x + 42$

$-42 \qquad -42$

$\frac{-7}{21} > \frac{21x}{21}$

$-1/3 > x$

$x < -1/3$

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

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

$-24x < 5x + 58$

$-5x \quad -5x$

$-29x < 58$

$x > -2$

$x > -2$

$(-2, \infty)$

o not
( ) included
(≠)

● included
[ ] (=)

*divide or multiply by negative → flip sign

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

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

$+4 \qquad +4 \qquad +4$

$\frac{12}{2} < \frac{2x}{2} < \frac{20}{2}$

$6 < x < 10$

$6 < x < 10$

$(6, 10)$

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

$4x + 3 < -6$

$-3 \quad -3$

$4x < -9$

$x < -9/4$

$3x - 7 > 2$

$+7 \quad +7$

$3x > 9$

$x > 3$

$x < -9/4$ or $x > 3$

$(-\infty, -9/4) \cup (3, \infty)$

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★ Great OR
Less than AND

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

$3x - 4 > 10$ or $3x - 4 < -10$
$+4 \quad +4$ $+4 \quad +4$
$3x > 14$ $3x < -6$
$x > 14/3$ $x < -2$

$x < -2$ or $x > 14/3$
$(-\infty, -2) \cup (14/3, \infty)$

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

$-9x - 3 \leq 6$ and $-9x - 3 \geq -6$
$+3 \quad +3$ $+3 \quad +3$
$-9x \leq 9$ $-9x \geq -3$
$x \geq -1$ $x \leq \frac{1}{3}$

$-1 \leq x \leq 1/3$
$[-1, 1/3]$