Equations with absolute value

2.6

$|x| = 4$ ± 4 or -4 are solutions

$|2x-3| = 11$ There are 2 solutions

$2x-3 = 11$ or $2x-3 = -11$

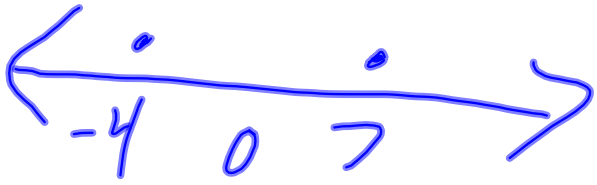
List 11 and -11 then solve both equations using algebra.

$2x - 3 = 11$ or $2x - 3 = -11$

$+3 \quad +3$ $\qquad$ $+3 \quad +3$

$2x = 14$ or $2x = -8$

$x = 7$ or $x = -4$



$$\left|\frac{x}{2}-1\right|=11$$

$$\frac{x}{2}-1=11$$

$$+1 \quad +1$$

$$2\cdot\frac{x}{2}=12\cdot 2$$

$x=24$

$x=-20$

$|2x| + 5 = 7$

$-5 \quad -5$

$|x| = 2$

Isolate the absolute value first and then set up both equations:

$|2x| = 2$

$2x = 2 \quad x = 1 \qquad 2x = -2 \quad x = -1$

Isolate the absolute value part of an equation:

$5|1-4x|-15=0$ Algebra

$+15$

$\frac{5}{5}|1-4x|=\frac{15}{5}$

$|1-4x|=3$

Write 2 equations

$1-4x=3$ or $1-4x=-3$

$-1 \quad -1$ $\quad -1 \quad -1$

$-4x=-4$

$\frac{-4x}{-4}=\frac{2}{-4}$

$x=-\frac{1}{2}$

$x=1$

Check your answers.

$$|2x+3| = |3x+2|$$

$2x+3 = 3x+2$

$-3 \quad -3$

$2x = 3x - 1$

$-3x \quad -3x$

$-x = -1$

$x = 1$

$2x+3 = -(3x+2)$

$2x+3 = -3x-2$

$+3x \quad -3 \quad +3x \quad -3$

$5x = -5$

$x = -1$

check it for extraneous solutions

(no solution)

$|2x+3| = |3x+2|$

Check it!

$x = 1$

$|2(1)+3| = 3(1)+2$

$5 = 5$

$x = 1$ ✓

$x = -1$

$|2(-1)+3| = |3(-1)+2|$

$|1| = |-1|$

✓

$$|x-3| = |5-x|$$

$x-3 = 5-x$

$+x \quad +3 \quad +3 \quad +x$

$2x = 8$

$x = 4$

$|4-3| = |5-4|$

$1 = 1$

$x-3 = -(5-x)$

$x-3 = -5+x$

$-x \quad +3 \quad +3 \quad -x$

$-3 = -5$

$0 = -2$

extraneous

$|2x+8| = |3x+7|$

$2x+8 = 3x+7$

$-3x \quad -8 \quad -3x \quad -8$

$\frac{-x}{-1} = \frac{-1}{-1}$

$x = 1$

check:

$|2(1)+8| = 3(1)+7$

$10 = 10$ works

$2x+8 = -3x-7$

$+3x \quad -8 \quad +3x \quad -8$

$\frac{5x}{5} = \frac{-15}{5}$

$x = -3$

$|2(-3)+8| = |3(-3)+7|$

$|2| = |2|$

works

$$\left|\frac{5x+3}{4}\right| = -8$$

$\emptyset$ or $\{\ \}$

$$|2x+4| = |3x-1|$$

$2x+4 = 3x-1$

$-3x \quad -4 \qquad -3x \quad -4$

$-x = -5$

$x = 5$

$2x+4 = -(3x-1)$

$2x+4 = -3x+1$

$+3x \quad -4 \qquad +3x \quad -4$

$5x = -3$

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