4.6 - Absolute Value Inequalities

Vocabulary:

- absolute value

  ✱ the distance from zero

  ✱ always positive

1 EXAMPLE Solve and check $|a| - 3 = 5$.

$$+3 \quad +3$$

$$|-8| - 3 = 5$$

$$8 - 3 = 5$$

$$5 = 5 \checkmark$$

$$|a| = 8$$

$$a = 8 \qquad a = \bar{8}$$

$$\boxed{a = \pm 8}$$

Solve each equation. If there is no solution, write *no solution*.

1. $|b| = 2$

$b = \pm 2$

5. $7 = |s| + 4$

$ -4 -4$

$3 = |s|$

$s = \pm 3$

6. $-4 \cdot |x| = 16$

$$\frac{-4 \cdot |x|}{-4} = \frac{16}{4}$$

$|x| = -4$

NO solution

② **EXAMPLE** Solve $|3c - 6| = 9$.

change sign

Stays
same

$$3c - 6 = 9 \qquad \text{or} \qquad 3c - 6 = -9$$
$$+6 \quad +6 \qquad\qquad\qquad +6 \qquad +6$$

$$3c = 15 \qquad\qquad\qquad\qquad 3c = -3$$

$$c = 5 \qquad\qquad \text{or} \qquad\qquad c = -1$$

Solve each equation. If there is no solution, write *no solution*.

13. $|r - 8| = 5$

$r - 8 = 5$ or $r - 8 = -5$

$+8 \quad +8 \qquad\qquad +8 \qquad +8$

$r = 13$ or $r = 3$

15. $2 = |g + 1|$

$2 = g + 1$ or $-2 = g + 1$

$-1 \qquad -1 \qquad\qquad -1 \qquad -1$

$1 = g$ or $-3 = g$

3 **EXAMPLE** Solve $|y - 5| \leq 2$. Graph the solutions.

$\leq$ or $<$ $\rightarrow$ and

$\geq$ or $>$ $\rightarrow$ or

stay same

flip sign & change symbol

$y - 5 \leq 2$ and $y - 5 \geq -2$

$+5 \quad +5 \qquad\qquad +5 \quad +5$

$y \leq 7$ and $y \geq 3$

2 3 4 5 6 7 8
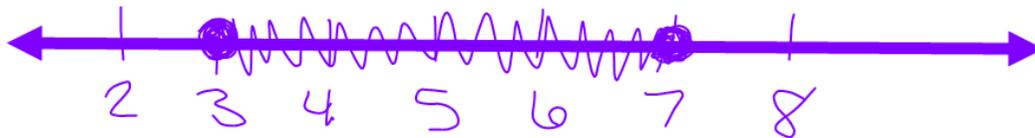
Solve each inequality. Graph your solution.

25. $|x + 3| < 5$

27. $|y - 2| \le 1$

$y - 2 \le 1$ 　　　　 $y - 2 \ge -1$
$+2 \quad +2$ 　　　　 $+2 \quad +2$

$y \le 3$ 　 and 　 $y \ge 1$

$X + 3 < 5$ 　　　 $X + 3 > -5$
$-3 \quad -3$ 　　　 $-3 \quad -3$

$X < 2$ and 　 $X > 8$

$\rightarrow$ 　　　　 $\leftarrow$

-10 -8 -6 -4 -2 0 2 4 6

0 1 2 3 4

4 **EXAMPLE** The ideal diameter of a piston for one type of car is 88.000 mm. The actual diameter can vary from the ideal diameter by at most 0.007 mm. Find the range of acceptable diameters for the piston.

$$88$$

$$-0.007 \qquad +0.007$$

88 mm
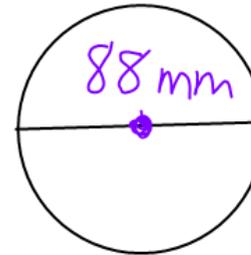
$$87.993\,mm \le d \le 88.007\,mm$$

35. Manufacturing The ideal diameter of a gear for a certain type of clock is
12.24 mm. An actual diameter can vary by 0.06 mm. Find the range of
acceptable diameters.

$$12.24$$

$$-0.06 \qquad\qquad +0.06$$

$$12.18 \leq d \leq 12.3 \text{ mm}$$

$$\text{mm}$$

12.24mm
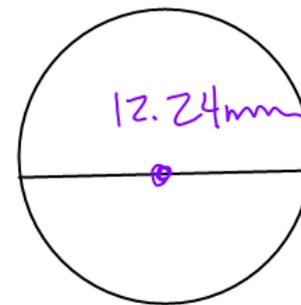
Homework: pg. 237 #8, 12, 16, 18, 26, 30, 34, 42, 44, 72, 90