

## Sec. 3.2 Solving Inequalities Using Addition or Subtraction

### Vocabulary

- equivalent inequalities: inequalities that have the same solution

### Addition Property of Inequalities

If  $a > b$ , then  $a + c > b + c$

If  $a < b$ , then  $a + c < b + c$

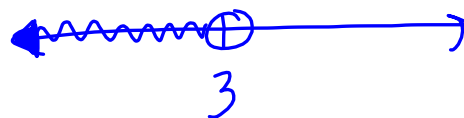
### Subtraction Property

If  $a > b$ , then  $a - c > b - c$

If  $a < b$ , then  $a - c < b - c$

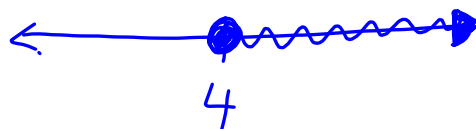
Problem 1: What are the solutions of  $x + 9 < 12$ ? Graph the solutions

$$\begin{array}{r} x + 9 < 12 \\ -9 \quad -9 \\ \hline x < 3 \end{array}$$



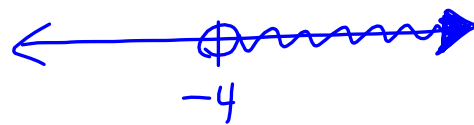
Problem 2: What are the solutions of  $7 \leq x + 3$ ? Graph the solutions.

$$\begin{array}{r} 7 \leq x + 3 \\ -3 \quad -3 \\ \hline 4 \leq x \end{array}$$



Problem 3: What are the solutions of  $x + 3 > -1$ ? Graph the solutions.

$$\begin{array}{r} x + 3 > -1 \\ -3 \quad -3 \\ \hline x > -4 \end{array}$$

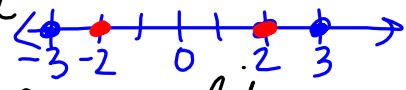


Problem 4: The hard drive on your computer has a capacity of 250 gigabytes (GB). You used 115 GB. You want to save some home videos to your hard drive. What are the possible sizes of the home video collection you can save?

$$\begin{array}{r} 115 + g \leq 250 \\ -115 \quad -115 \\ \hline g \leq 135 \end{array}$$

less than or equal to 135GB

# Sec. 3.3 Solving Inequalities Using Multiplication or Division

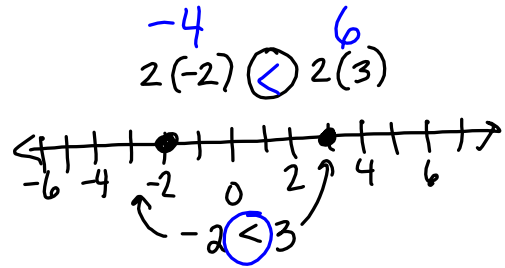


## Multiplication Property of Inequality

For  $c > 0$  (positive)

If  $a > b$ , then  $ac > bc$

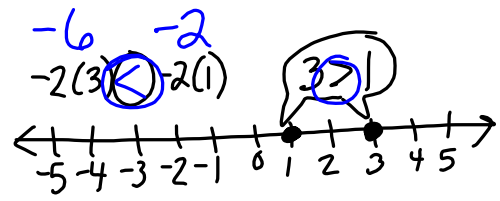
If  $a < b$ , then  $ac < bc$



For  $c < 0$  (negative)

If  $a > b$ , then  $ac < bc$

If  $a < b$ , then  $ac > bc$



## Division Property of Inequality

For  $c > 0$  (positive)

If  $a > b$ , then  $\frac{a}{c} > \frac{b}{c}$

If  $a < b$ , then  $\frac{a}{c} < \frac{b}{c}$

$$6 > 3, \frac{6}{3} > \frac{3}{3}$$

$$9 < 12, \frac{9}{3} < \frac{12}{3}$$

For  $c < 0$  (~~positive~~ negative)

If  $a > b$ , then  $\frac{a}{c} < \frac{b}{c}$

If  $a < b$ , then  $\frac{a}{c} > \frac{b}{c}$

$$6 > 3, \frac{6}{-3} < \frac{3}{-3}$$

$$9 < 12, \frac{9}{-3} > \frac{12}{-3}$$

RULE: When you multiply or divide

both sides of an inequality by a negative, change the inequality.

Problem 1: What are the solutions of  $\frac{x}{2} < -3$ ? Graph the solutions

$$2 \cdot \frac{x}{2} < -3 \cdot 2$$

$$x < -6$$



Problem 2: What are the solutions of  $-\frac{2}{3}w \geq 2$ ? Graph the solutions.

$$\left(-\frac{3}{2}\right)\left(-\frac{2}{3}w\right) \geq 2\left(-\frac{3}{2}\right)$$

$$w \leq -3$$



Problem 3: A cheerleading squad earns \$5.50 per car washed. How many cars does the squad need to wash to earn at least \$77?  $x = \# \text{ cars washed}$

$$\frac{5.50x}{5.50} \geq \frac{77}{5.50} \quad \begin{array}{l} \text{at least} \\ 14 \text{ cars} \end{array}$$

$$x \geq 14$$

Problem 4: What are the solutions of  $-\frac{5a}{-5} \geq \frac{20}{-5}$ ? Graph the solutions.

$$a \leq -4$$



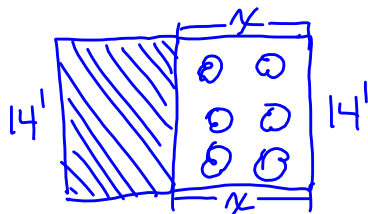
## Sec. 3.4 Solving Multi-Step Inequalities

RULE: MULTIPLY or DIVIDE BOTH sides by a NEGATIVE = FLIP the INEQUALITY SIGN

Problem 1: what are the solutions of

$$\begin{array}{r} 6 + 3t > 15 \\ -6 \quad -6 \\ \hline 3t > 9 \\ \frac{3t}{3} > \frac{9}{3} \\ t > 3 \end{array}$$

Problem 2: You want to fence in a rose bed that is adjacent to a deck. The length of your deck is 14 ft. You have at most 44 ft of fence. What are the possible widths of the rose bed?



$$\begin{array}{r} 2x + 14 \leq 44 \text{ less than} \\ -14 \quad -14 \text{ or equal} \\ \hline 2x \leq 30 \text{ to 15ft.} \\ \frac{2x}{2} \leq \frac{30}{2} \\ x \leq 15 \end{array}$$

Problem 3: Which is a solution of

$$2(t-1) + 3t < 2?$$

- A. 0  $0 < \frac{4}{5}$  T  $2(t-1) + 3t < 2$   
 B. 1  $1 < \frac{4}{5}$  F  $2t - 2 + 3t < 2$   
 C. 2  $2 < \frac{4}{5}$  F  $5t - 2 < 2$   
 D. 3  $3 < \frac{4}{5}$  F

$$\begin{array}{l} 2(0-1) + 3(0) < 2 \\ 2(-1) + 3(0) < 2 \\ -2 + 0 < 2 \\ -2 < 2 \text{ T.} \end{array}$$

$$\begin{array}{r} 5t - 2 < 2 \\ + 2 \quad + 2 \\ \hline 5t < 4 \\ \frac{5t}{5} < \frac{4}{5} \\ t < \frac{4}{5} \end{array}$$

Problem 4: What are the solutions of

$$\begin{array}{r}
 4m + 2 < 7m - 13? \\
 \underline{-4m \quad -4m} \\
 2 < 3m - 13 \\
 \underline{+13 \quad +13} \\
 15 < 3m \\
 \frac{15}{3} < \frac{3m}{3} \\
 5 < m
 \end{array}$$

Problem 5: Solve each inequality.

a.  $14 - 6m \leq 2(7 - 3m)$

$$\begin{array}{r}
 14 - 6m \leq 14 - 6m \leftarrow \\
 \underline{+6m \quad +6m} \\
 14 \leq 14
 \end{array}$$

$$14 \leq 14$$

True

$$0 \leq 0$$

all real numbers



b.  $4p + 3 > 9p + 6 - 5p$      $9p - 5p + 6$

$$\begin{array}{r}
 4p + 3 > 4p + 6 \\
 \underline{-3 \quad -3} \\
 4p > 4p + 3
 \end{array}$$

$$4p > 4p + 3$$

$$\underline{-4p \quad -4p}$$

$$0 > 3$$

$$\begin{array}{r}
 4p + 3 > 4p + 6 \\
 \underline{-4p \quad -4p} \\
 3 > 6
 \end{array}$$

$$3 > 6$$

False

no solution

