6.5 Solving Linear Inequalities by Using Multiplication and Division

Investigate

In the patterns below, each side of the inequality $12 > 6$ is multiplied or divided by the same non-zero number.

Multiplication Pattern	Division Pattern
$12 > 6$	$12 > 6$
$12(-3) \quad 6(-3)$ $-36 < -18$	$12 \div (-3) \quad 6 \div (-3)$ $-4 < -2$
$12(-2) \quad 6(-2)$ $-24 < -12$	$12 \div (-2) \quad 6 \div (-2)$ $-6 < -3$
$12(-1) \quad 6(-1)$ $-12 < -6$	$12 \div (-1) \quad 6 \div (-1)$ $-12 < -6$
$12(1) \quad 6(1)$ $12 > 6$	$12 \div (1) \quad 6 \div (1)$ $12 > 6$
$12(2) \quad 6(2)$ $24 > 12$	$12 \div (2) \quad 6 \div (2)$ $6 > 3$
$12(3) \quad 6(3)$ $36 > 18$	$12 \div (3) \quad 6 \div (3)$ $4 > 2$

Note

Multiplying or dividing by a negative number will result in a __false__ inequality.

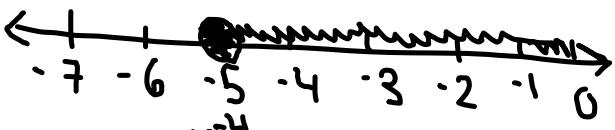
In this case the inequality sign must be __reversed__ to keep the truth of the inequality.

Example (1): Solve each inequality
Graph each solution.

a) $-5x \leq 25$

$\frac{}{-5} \quad \frac{}{-5}$

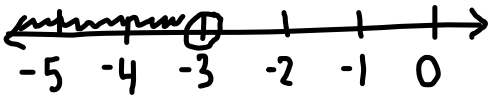
$x \geq -5$



b) $7a < -21$

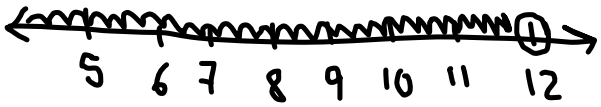
$\frac{}{7} \quad \frac{}{7}$

$a < -3$



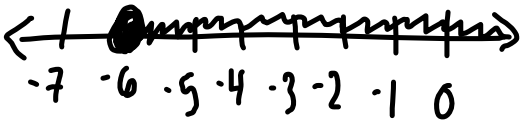
c) $\frac{y}{-4} > -3$ x-4

$y < 12$



d) $\frac{k}{3} \geq -2$ x3

$K \geq -6$



e) $-2.6x + 14.6 > -5.2 + 1.8x$

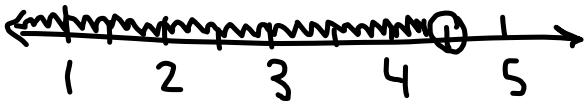
$-1.8x \quad -1.8x$

$-4.4x + 14.6 > -5.2$

$-14.6 \quad -14.6$

$\frac{-4.4x}{-4.4} > \frac{-19.8}{-4.4}$

$x < 4.5$



f) $5 - \frac{2}{3}x \geq \frac{1}{6}x + 4$ x6 x2 / 1x6 x2 / 1x6

$\frac{30}{6} - \frac{4}{6}x \geq \frac{1}{6}x + \frac{24}{6}$

$30 - 4x \geq 1x + 24$

$-1x \quad -1x$

$30 - 5x \geq 24$

$-30 \quad -30$

$\frac{-5x}{-5} \geq \frac{-6}{-5}$

$x \leq 1.2$

Example (3): A super-slide charges $1.25 to rent a mat and $0.75 per ride. Hank has $10.25. How many rides can Hank go on?

a) Choose a variable, then write an inequality to solve this problem.

r = # of rides

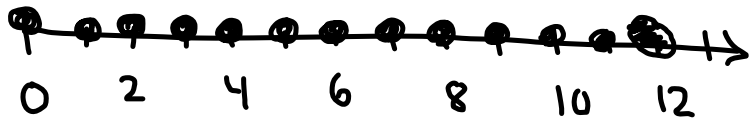
$$1.25 + 0.75r \leq 10.25$$

b) Solve the problem.

$$1.25 + 0.75r \leq 10.25$$
$$-1.25 \qquad -1.25$$
$$\frac{0.75r}{0.75} \leq \frac{9}{0.75}$$
$$\boxed{r \leq 12}$$

He can go on 12 or less rides.

c) Graph the solution.



Note: This data is discrete. You cannot go on part of a ride