

3.4 Multi-Step Inequalities (Variables on Both Sides)

* Solve just like you would solve a multi-step equation EXCEPT, FLIP the inequality sign when your last step is division or multiplication by a negative.

Got it? #1 on pg. 187

$$\textcircled{A} \quad -6a - 7 \leq 17$$

$$\quad +7 \quad +7$$

$$\quad -6$$

$$a \leq -4$$

$$\boxed{a \geq -4}$$

check:

$$-6a - 7 = 17$$

$$-6(-4) - 7 = 17$$

$$24 - 7 = 17$$

$$17 = 17$$

✓

$$\textcircled{B} \quad -4 < 5 - 3n$$

$$\quad -5 \quad -5$$

$$\quad -9 < -3n$$

$$\quad -3$$

$$3 < n$$

$$3 > n \text{ *FLIP}$$

$$\boxed{n < 3} \text{ *Rewrite}$$

check:

$$-4 = 5 - 3n$$

$$-4 = 5 - 3(3)$$

$$-4 = 5 - 9$$

$$-4 = -4$$

✓

$$\textcircled{C} \quad 50 > 0.8x + 30$$

$$\quad -30 \quad -30$$

$$20 > \frac{8}{10}x$$

$$\frac{5}{4} (20 > \frac{4}{5}x) \frac{5}{4}$$

$$\frac{5}{4} \cdot \frac{20}{1} > x$$

$$25 > x$$

$$\boxed{x < 25}$$

check:

$$50 = \frac{8}{10} \left(\frac{25}{1} \right) + 30$$

$$50 = \frac{8}{10} \cdot \frac{25}{1} + 30$$

$$50 = \frac{40}{2} + 30$$

$$50 = 20 + 30$$

$$50 = 50$$

✓

* Review Problem 2 on pg. 187

* Got it? #2

(2)
$$\begin{array}{|c} P=48 \\ \hline 18ft. \end{array}$$

$$\begin{aligned} P &= 2l + 2w \\ 48 &\geq 2l + 2w \\ 48 &\geq 2(18) + 2w \\ 48 &\geq 36 + 2w \\ -36 &\quad -36 \\ \hline 12 &\geq 2w \\ &\quad 2 \\ 6 &\geq w \\ w &\leq 6 \end{aligned}$$

* any width greater than 0ft & less than or equal to 6ft.

* Review Problem 3 on pg. 188

* Got it? #3

(3)
$$\begin{aligned} 15 &\leq 5 - 2(4m + 7) \\ 15 &\leq 5 - 8m + -14 \\ 15 &\leq -9 - 8m \\ +9 &\quad +9 \\ \hline 24 &\leq -8m \\ \hline -8 & \end{aligned}$$

check:

$$\begin{aligned} 15 &= 5 - 2(4(3) + 7) \\ 15 &= 5 - 2(-12 + 7) \\ 15 &= 5 - 2(-5) \\ 15 &= 5 + 10 \\ 15 &= 15 \end{aligned}$$

$$m \leq -3$$
 * FLIP & REWRITE

* Review Problem 4 on pg. 188

* Got it? #4

$$\begin{array}{l} \textcircled{1} \quad 3b + 12 > 27 - 2b \\ \textcircled{a} \quad + 2b \qquad \qquad + 2b \end{array}$$

$$5b + 12 > 27$$

$$-12 \quad -12$$

$$\underline{5b > 15}$$

$$\overset{5}{b} > 3$$

check°

$$3b + 12 = 27 - 2b$$

$$\underline{3(3)} + 12 = 27 - 2(3)$$

$$9 + 12 = 27 - 6$$

$$21 = 21$$

✓

- choices are
- Adding 1 to both sides
 - Subtracting 10 from both sides
 - Subtracting 8 from both sides

* Just like with equations, where you can have One Solution, No Solution or Infinitely Many Solutions, it is also true with Inequalities

* Review Problem 5 on pg. 189

* Got it? #5



$$(5a) \quad 9 + 5n \leq 5n - 1$$

$$+1 \qquad \qquad \qquad +1$$

$$10 + 5n \leq 5n$$

$$-5n \quad -5n$$

$$10 \leq 0$$

FALSE

No Solution

$$(5b) \quad 8 + 6x \geq 7x + 2 - x$$

$$8 + 6x \geq 6x + 2$$

$$-2 \qquad \qquad \qquad -2$$

$$6 + 6x \geq 6x$$

$$-6x \quad -6x$$

$$6 \geq 0$$

TRUE

Infinitely Many Solutions

OR

All Real #s

Chapter 3: Practice Writing Sentences from an Inequality

Keep

1. The speed limit is 25mph. Write an inequality for the legal speed limit and write a sentence describing the inequality.

$$x \leq 25$$

2. Find the length of the base of a triangle when one side is 2 cm shorter than the base and the other side is 3 cm longer than the base. The perimeter is greater than 19 cm. Solve the inequality. Then write a sentence describing the solution to the inequality.



$$x + (3+x) + (x-2) > 19$$

$$3x + 1 > 19$$

$$3x > 18$$

$$x > 6$$

The base of the triangle is longer than 6cm.

3. Amanda and David do volunteer work at an animal shelter. ^{David} Drew worked 3 more hours than Amanda and together they worked more than 27 hours. Find the least number of hours EACH worked. Then write a sentence describing each solution.

$$(x) + (x+3) > 27$$

$$2x + 3 > 27$$

$$\begin{array}{r} -3 \quad -3 \\ 2x > 24 \\ x > 12 \end{array}$$

$$A > 12$$

$$D > 15$$

Amanda worked more than 12 hours & David worked more than 15 hours

Chapter 3: Practice Writing Sentences from an Inequality

1. The speed limit is 25mph. Write an inequality for the legal speed limit and write a sentence describing the inequality.
2. Find the length of the base of a triangle when one side is 2 cm shorter than the base and the other side is 3 cm longer than the base. The perimeter is greater than 19 cm. Solve the inequality. Then write a sentence describing the solution to the inequality.

3. Amanda and David do volunteer work at an animal shelter. ^{David} Drew worked 3 more hours than Amanda and together they worked more than 27 hours. Find the least number of hours EACH worked. Then write a sentence describing each solution.

13 problems

#36-44 EVENS

3.4 pg. 190 #15 & 16 #18-34 EOE #50

15) $250 \leq 5x$

$$50 \leq x$$

$x \geq 50$ mph

26) $6 - 3p \leq 4 - p$

$$+3p \quad +3p$$

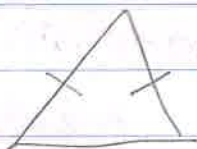
$$6 \leq 4 + 2p$$

$$-4 \quad -4$$

$$2 \leq 2p$$

$p \geq 1$

16)



$$12 \geq 5 + 5 + x$$

$$12 \geq 10 + x$$

$$2 \geq x$$

$x \leq 2$

but greater than zero

30) $-5r + 6 \leq -5(r + 2)$

$$-5r + 6 \leq -5r - 10$$

$$+5r \quad +5r$$

$$6 \leq -10$$

False

no solution

18) $-(7c - 18) - 2c > 0$

$$-7c + 18 - 2c > 0$$

$$18 - 9c > 0$$

$$-18 \quad -18$$

$$-9c > -18$$

$$-9$$

$$c > 2$$

$c < 2$

34) $6w - 4 \leq 2(3w + 6)$

$$6w - 4 \leq 6w + 12$$

$$6w \quad -6w$$

$$-4 \leq 12$$

TRUE

all real #s

22) $-4(d + 5) - 3d > 8$

$$-4d - 20 - 3d > 8$$

$$-20 - 7d > 8$$

$$-7d > 28$$

$$d > -4$$

$d < -4$

$$(38) \frac{4}{3}s - 3 < \frac{2}{3} + \frac{2}{3}s - \frac{1}{3}s$$

$$\frac{4}{3}s - 3 < \frac{2}{3} + \frac{2}{3}s$$

+3 +3

$$\frac{4}{3}s < 3\frac{2}{3} + \frac{2}{3}s$$

$$-\frac{2}{3}s \qquad -\frac{2}{3}s$$

$$\frac{2}{3}s < 3\frac{2}{3}$$

$$\frac{3}{2} \left(\frac{2}{3}s < \frac{11}{3} \right)$$

$$s < \frac{11}{2}$$

or

$$5\frac{1}{2}$$

$$(42) 4(3n - 1) \geq 2(n + 3)$$

$$12n - 4 \geq 2n + 6$$

+4 +4

$$12n \geq 2n + 10$$

$$-2n \quad -2n$$

$$10n \geq 10$$

$$\frac{10}{10}$$

$$n \geq 1$$

(44)

$$39.99 + .15x \leq 45$$

-39.99 -39.99

$$.15x \leq 5.01$$

$$x \leq 33.4$$

at most you can
send 33 text
messages

(50)

a) Always b/c
identity

b) Always b) - 3

$$c) 5m + 10 < 5m - 4$$

$$10 < -4$$

Never TRUE

$$\textcircled{36} \quad 3s+6 \leq -5(s+2)$$

$$3s+6 \leq -5s+(-10)$$

$$+10 \qquad +10$$

$$3s+6 \leq -5s$$

$$-3s \qquad -3s$$

$$6 \leq -8s$$

$$-8$$

$$-2 \leq s$$

$$-2 \geq s$$

$$s \leq -2$$

$$\textcircled{46} \quad -2(0.5-4t) \geq -3(4-3.5t)$$

$$-1+8t \geq -12+10.5t$$

$$+12$$

$$+12$$

$$11+8t \geq 10.5t$$

$$-8t \qquad -8t$$

$$11 \geq 2.5t$$

$$2.5$$

$$4.4 \geq t$$

$$t \leq 4.4$$

1/2 x 2

(45) $1500 + 125x \leq 2125$
 $125x \leq 625$
 $x \leq 5$

3 hours + 5($\frac{1}{2}$) = 5.5 hours

$3 + 2.5 = 5\frac{1}{2}$ hours