

2.3 Applications of Linear Inequalities

In order to solve inequality word problems, you need to be able to translate the words into a mathematical sentence.

Example 1: Represent each of the following as an algebraic inequality. ($<$, $>$, \leq , \geq)

a.) x is at most 30

$$x \leq 30$$

b.) the sum of 5x and 2x is at least 14

$$5x + 2x \geq 14$$

c.) the product of x and y is less than or equal to 4

$$x \cdot y \leq 4 \text{ or } x(y) \leq 4 \text{ or } xy \leq 4$$

d.) 5 less than a number y is under 20

$$y - 5 < 20$$

** be careful to write the 5 after y*

Use the following as a "GUIDE" to solving inequality word problems.

- Read the entire problem carefully before attempting to solve.
- Go back and underline key words and numbers.
- Define a variable.
- Determine which inequality symbol to use: $<$, \leq , $>$, or \geq .
- Write and solve the inequality.
- Write your solution as a sentence.

** See separate sheets for all work! **

Example 2: Solve each application of inequalities.

a.) If 5 times a number is increased by 4, the result is at least 19. Find the least possible number that satisfies these conditions.

The least possible number to make this true is 3.

b.) The sum of twice a number and 5 is at most 15. What are the possible values for the number?

The most the number can be is 5.

c.) The cost of a gallon of orange juice is \$3.50. What is the maximum number of containers you can buy for \$15?

The maximum number of containers is 4.

d.) 3 times a number increased by 8 is no more than the number decreased by 4 . Find the number.

The number can be no more than -6 .

e.) $\frac{2}{3}$ of a number plus 5 is greater than 12 . Find the number.

$\frac{2}{3}$

The number is greater than 10.5 .

f.) The quotient of a number and 15 is no greater than 450 . What are the possible values for the number?

The number is no greater than 6750 .

g.) Keith and Michelle went out to dinner. The total cost of the meal, including the tip, came to $\$53.70$. If the combined tip came out to $\$9.60$, and each friend spent an equal amount, how much did each friend pay not including the tip?

Each friend paid at most $\$22.05$.

h.) Jason is saving up to buy a digital camera that costs $\$490$. So far, he saved $\$175$. He would like to buy the camera 3 weeks from now. What is the equation used to represent how much he must save every week to have enough money to purchase the camera? Inequality.

Jason must save at least $\$105$ for 3 weeks.

i.) Adrian works in New York City and makes $\$42$ per hour. She works in an office and must get her suit dry cleaned everyday for $\$75$. If she wants to make more than $\$260$ a day, at least how many hours must she work?

Total

She has to work at least 8 hours a day.

j.) Your brother has $\$2,000$ saved for a vacation. His airplane ticket is $\$637$. Write and solve an inequality to find out how much he can spend for everything else.

He can spend at most $\$1363$.

2.3 Apps of Inequalities.

a) $n = \text{a number}$
 \geq

$$5n + 4 \geq 19$$

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

$$\frac{5n}{5} \geq \frac{15}{5}$$

$$n \geq 3$$

Go back and fill the blank in for your Statement.

b) $n = \text{a number}$

$$2n + 5 \leq 15$$

$$\underline{-5} \quad \underline{-5}$$

$$\frac{2n}{2} \leq \frac{10}{2}$$

$$n \leq 5$$

c) $c = \text{\# of containers}$

$$\frac{3.50c}{3.50} \leq \frac{15}{3.50}$$

* max containers, so $c \leq 4.285714286$

can you have part
of a container? NO!

Do you round up or round down? Round down!

$$c \leq 4$$

d) $n = \text{a number}$

$$3n + 8 \leq n - 4$$

$$\underline{-8} \quad \underline{-8}$$

$$2n + 8 \leq -4$$

$$\underline{2} \quad \underline{2}$$

$$n \leq -6$$

e) $n = \text{a number}$

$$\frac{2}{3}n + 5 > 12$$

multiply by the
reciprocal

$$\left(\frac{3}{2}\right) \frac{2}{3}n > 7 \left(\frac{3}{2}\right)$$

$$n > \frac{21}{2} \quad \text{or} \quad n > 10.5$$

$$\frac{2}{3}n + 5 > 12$$

$$3 \left(\frac{2}{3}n + 5 \right) > 12(3)$$

$$2n + 15 > 36$$

$$\underline{-15} \quad \underline{-15}$$

$$\underline{2} \quad \underline{2}$$

$$n > 10.5$$

f) $n = \text{a number}$ $\frac{n}{15} < 450$

$$(15) \frac{n}{15} < 450 (15)$$

$$n < 6750$$

g) $d = \text{cost of dinner}$ $2d + 9.60 \leq 53.70$

$$-9.60 \quad -9.60$$

$$\frac{2d}{2} < \frac{44.10}{2}$$

$$d \leq 22.05$$

h) $a = \text{amount saved}$

$$3a + 175 \geq 490$$

$$\underline{-175} \quad \underline{-175}$$

$$\frac{3a}{3} \geq \frac{315}{3}$$

$$a \geq 105$$

$$+175 \geq 490$$

i) $h = \text{\# of hours}$ $42h - 75 > 260$

$$\underline{+75} \quad \underline{+75}$$

$$\frac{42h}{42} > \frac{335}{42}$$

$$h > 7.976190476$$

$$h > 8$$

Have to round
up to 8 b/c
7 is not enough.

j) a = amount for spending

$$x + 637 \leq 2000$$
$$\begin{array}{r} x + 637 \leq 2000 \\ \underline{-637} \quad \underline{-637} \end{array}$$

$$x \leq 1363$$