Warm-up

Name:_____

1. Mrs. Jackson earned a $500 bonus for signing a one-year contract to work as a nurse. Her salary is $22 per hour. If her first week's check including the bonus is $1204, how many hours did Mrs. Jackson work?

Variables: $h = \#$ of hours

Equation: $500 + 22h = 1204$

$$500 + 22h = 1204$$
$$-500 \qquad\quad -500$$
$$\frac{22h}{22} = \frac{704}{22}$$
$$h = 32 \text{ hours}$$

2. Morgan subscribes to a website for processing her digital pictures. The subscription is $5.95 per month and 4 by 6 inch prints are $0.19. How many prints did Morgan purchase if the charge for January was $15.83?

Variables: $x = \#$ of prints

Equation: $5.95 + 0.19x = 15.83$

$$5.95 + 0.19x = 15.83$$
$$-5.95 \qquad\qquad -5.95$$
$$\frac{0.19x}{0.19} = \frac{9.88}{0.19}$$
$$x = 52 \text{ prints}$$

3. A rectangle is 12m longer than it is wide. Its perimeter is 68m. Find its length and width. (Hint: p = 2w + 2l).

Variables: $w = \text{width}$

Equation: $4w + 24 = 68$

add sides

w [rectangle: $w+12$ top, w left, w right, $w+12$ bottom] w

$$w + w + w + 12 + w + 12 = 68$$
$$4w + 24 = 68$$
$$\quad\; -24 \quad -24$$
$$\frac{4w}{4} = \frac{44}{4}$$
$$w = 11 \text{ m}$$

$$l = w + 12$$
$$l = 11 + 12$$
$$l = 23 \text{ m}$$

$x \xrightarrow{+2} \cdot \xrightarrow{+4}$

$10, 12, 14$

$x, x+2, x+4$

Consecutive Numbers Chart				
Type of Consecutive Numbers	Examples	Expressions for Terms		
		First	Second	Third
Consecutive Numbers	4, 5, 6 27, 28, 29	(x) + (x + 1) + (x + 2)		
Consecutive Even Numbers	8, 10, 12 62, 64, 66	x	x + 2	x + 4
Consecutive Odd Numbers	23, 25, 27 89, 91, 93	x	x + 2	x + 4

$x, x+1, x+2$

$1, 2, 3$

$1, 3, 5$

$x, x+2, x+4$

1. The sum of three consecutive numbers is 72. What is the smallest of these numbers?

$(x) + (x+1) + (x+2) = 72$

Variables: ___X___

Equation: $3x + 3 = 72$

2. Find three consecutive odd integers whose sum is 261

$x, (x+2), (x+4)$

$1, 3, 5$

$(x) + (x+2) + (x+4) = 261$

$3x + 6 = 261$

Variables: ___X___

Equation: $3x + 6 = 261$

$\boxed{85, 87, 89}$

$3x + 6 = 261$
$3x = 255$
$x = 85$

Solving Inequalities

An **inequality** is a statement that that compares two quantities. The quantities being compared use one of the following signs:

$A < B$	$A > B$	$A \leq B$	$A \geq B$	$A \neq B$
A Is less than B.	A Is greater than B.	A Is less than or equal to B.	A Is greater than or equal to B.	A Is not equal to B.

When reading an inequality, you always to want to <u>read from the variable</u>. Translate the following inequalities into words:

A. $x > 2$ X is greater than 2

B. $-3 > p$ P is less than -3

C. $y \leq 0$ y is less than or equal to 0

D. $-2 \leq z$ z is greater than or equal to -2

E. $x \neq 1$ x is not equal to 1

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When graphing an inequality on a number line, you must pay attention to the sign of the inequality.

Words	Example	Circle	Number Line
Greater Than	$x > 2$	Open	
Less Than	$p < 3$	Open	
Greater Than or Equal To	$z \geq 2$	Closed	
Less Than or Equal To	$y \leq 0$	Closed	
Not Equal To	$x \neq 1$	Open	

Handwritten annotations:

$-3 > p$
$\underline{}$ LEFT
$p < -3$

more ink (on Greater Than or Equal To row)

(circle) Less Than or Equal To LEFT

Solutions to Inequalities

A **solution** to an inequality is any number that makes the inequality true.

Handwritten number line marked −12 and −8

Value of x	$2x - 4 \geq -12$	Is the inequality true?
-2	$2(-2) - 4 \geq -12$ $-4 - 4 \geq -12$ $-8 \geq -12$	Yes!
-4	$2(-4) - 4 \geq -12$ $-8 - 4 \geq -12$ $-12 \geq -12$	Yes!
-6	$2(-6) - 4 \geq -12$ $-12 - 4 \geq -12$ $-16 \geq -12$	NO!

Handwritten work:

$2x - 4 \geq -12$
$ +4 \quad +4$
$\dfrac{2x}{2} \geq \dfrac{-8}{2}$
$x \geq -4$

Solving and Graphing Linear Inequalities

Solving linear inequalities is very similar to solving equations, but there is one minor difference. See if you can figure it out below:

Experiment

Take the inequality $6 > 2$. Is this true? **yes**

1. Add 3 to both sides. What is your new inequality?

$$\begin{array}{r} 6 > 2 \\ +3 \quad +3 \\ \hline 9 > 5 \end{array}$$ **yes**

2. Subtract 3 from both sides. What is your new inequality?

$$\begin{array}{r} 6 > 2 \\ -3 \quad -3 \\ \hline 3 > 1 \end{array}$$ **yes**

3. Multiply both sides by 3. What is your new inequality?

$$\begin{array}{r} 6 > 2 \\ \cdot 3 \quad \cdot 3 \\ \hline 18 > 6 \end{array}$$ **yes**

4. Divide both sides by 3. What is your new inequality?

$$\begin{array}{r} \frac{6}{3} > \frac{2}{3} \\ 2 > \frac{2}{3} \end{array}$$ **yes**

3. ⃝Multiply both sides by -3. What is your new inequality?

$$\begin{array}{r} 6 > 2 \\ \cdot -3 \quad \cdot -3 \\ \hline -18 \; \underset{<}{>} -6 \end{array}$$ **NO!**

4. ⃝Divide both sides by -3. What is your new inequality?

$$\begin{array}{r} \frac{6}{-3} > \frac{2}{-3} \\ -2 \; \underset{>}{<} \; \frac{2}{3} \end{array}$$ **NO!**

When you multiply or divide by a negative # FLIP THE SIGN !

Conclusion:

Practice: Solve each inequality and graph.

1. $x - 4 < -2$

Less LEFT

$$\begin{array}{r} +4 \quad +4 \\ \hline x < 2 \end{array}$$

2. $-3x > 12$

$-3(-5) > 12$
$15 > 12$ ✗ FLIP ✗

less = LEFT

$$\frac{-3x}{-3} > \frac{12}{-3}$$

$$x < -4$$

3. $7 \le \frac{1}{2}x$

4. $\frac{x}{4} - 1 > 9$

5. $-2(x + 1) \ge 6$ ✗ FLIP

$$\begin{array}{r} -2x - 2 \ge 6 \\ +2 \quad +2 \\ \hline -2x \ge 8 \\ \hline -2 \qquad -2 \\ x \le -4 \end{array}$$

6. $6x - 5 \le 7 + 2x$

$$\begin{array}{r} -2x \qquad -2x \\ \hline 4x - 5 \le 7 \\ +5 \quad +5 \\ \hline 4x \le 12 \\ x \le 3 \end{array}$$