Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

① A fumtion, f, is defined as $f(x) = x^2 + 2x - 8$.
Find the interval i) $f(x) > 0$ and ii) $f(x) < 0$.
Demonstrate your knowledge using two different methods to conclude your solutions.

② Mary is selling her handmade bracelets at a craft fair this weekend. The fair is charging Mary $25 to rent a booth. Mary sells each bracelet for $4.50. Write an inequality that represents Mary's profit from selling her bracelets. How many bracelets does Mary need to sell in order to make a profit?

③ There is a rectangular hole that has an area of 2 feet squared. Mr. Butch, the shop teacher, has a machine designed to cut rectangular shaped pieces of wood, in such a way that the length is one less than three times the width. He has no other cutting tools and the machine can handle widths up to 10 feet. What is the range of widths he can use to cover the hole?

④ Paty is going to a trip; her mom gave her $360 dollars for her hotel and her meals. The hotel charges 150 dollars per day plus 5 dollars each meal. If Paty is staying 3 days in the hotel.
a) How many meals she can get with the money her mom gave her?
b) What is the biggest number of meals she can have if she doesn't want to spend all her money?
c) What is the smallest number of meals she can have to surplus the amount of money she has?

⑤ Kori needs to earn a "B" in Algebra. Her final exam is worth 4 test grades. In order to earn a "B", Kori must have an average that is between 80 and 89 inclusive. What range of scores can Kori receive on her final exam to earn a "B" if her current test scores are 92, 77, 75 and 88.

⑥ Sara earns $7.25 per hour working at the ball park. She also earns $5.50 per hour babysitting. If she works 20 hours at the ballpark this week, how many hours will she have to babysit to earn at least $200.00 this week?

⑦ Evaluate the following and graph the solution on a number line. Justify each step. $6(a-4)+2 \geq \frac{1}{2}(10a+16)-8a$

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

A function, f, is defined as $f(x) = x^2 + 2x - 8$.

Find the interval

i) $f(x) > 0$ and

ii) $f(x) < 0$. Demonstrate your ~~solutions~~ knowledge using two different methods.

$x^2 + 2x - 8 = 0$

$(x+4)(x-2) = 0$

$x = -4, \quad x = 2$

Method 1)

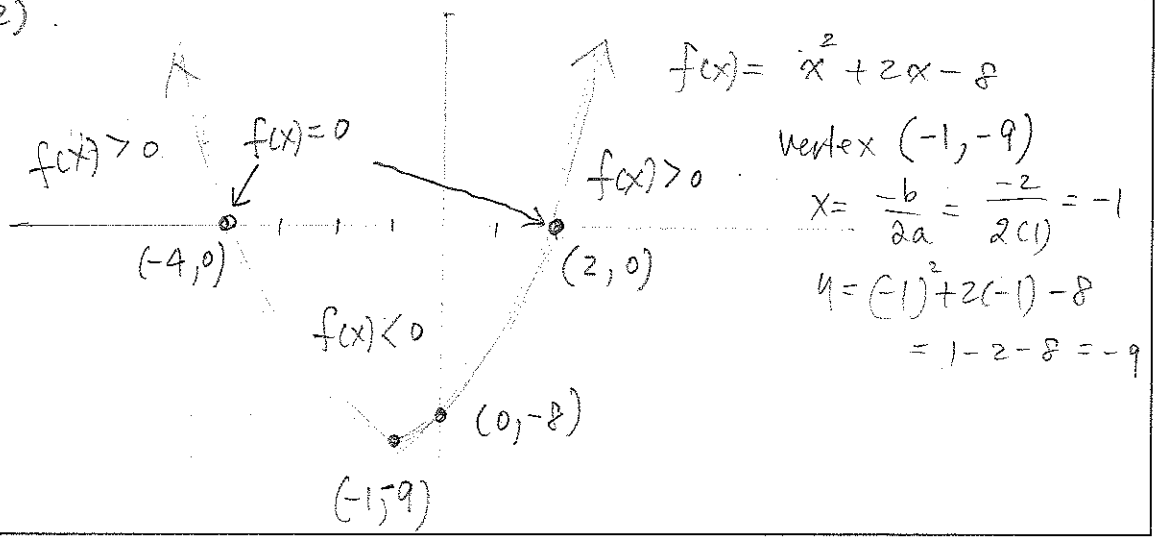
	$(-\infty, -4)$	-4	$(-4, 2)$	2	$(2, \infty)$
Test Value	-5	-4	0	2	3
Sign of $f(x)$	$(-5+4)$ $(-5-2)$ $= \oplus$	0	$(0+4)$ $(0-2)$ $= \ominus$	0	$(3+4)$ $(3-2)$ $= \oplus$

Conclusion:

$f(x) > 0, \longrightarrow (-\infty, -4) \cup (2, \infty)$ and

$f(x) < 0, \longrightarrow (-4, 2)$

Method 2)



Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

There is a rectangular hole that has an area of 2 feet. Mr. Butch in the shop class has a machine designed to cut wood in a way such that the length is one less than three times the width. He has no other cutting tools, and the machine can not take in widths larger than 10 ft. What is the range of widths he can use to cover the hole?

$(3w-1)w \geq 2$ $\quad w<10$

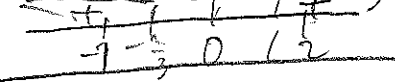
$3w^2-w-2 \geq 0$ $\quad w=[1,10]$

$(3w+2)(w-1) \geq 0$

$w \geq -\frac{2}{3}$ $\quad w \geq 1$ $\quad f(-1)=2$

$f(0)=-2$

$f(2)=8$



Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

Evaluate the following and graph the solution on a number line. Justify each step.:

$$6(a-4)+2 \geq \frac{1}{2}(10a+16)-8a$$

$6(a-4)+2 \geq \frac{1}{2}(10a+16)-8a$

Distributative

→ $6a-24+2 \geq 5a+8-8a$

Combine like terms

→ $6a-22 \geq -3a+8$

→ $6a-22+22 \geq -3a+8+22$

Simplify

→ $6a \geq -3a+30$

Combine like terms

→ $6a+3a \geq -3a+30+3a$

Simplify

→ $9a \geq 30$

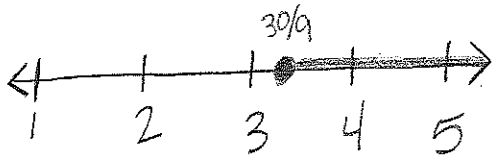
Divide

→ $\frac{9a}{9} \geq \frac{30}{9}$

Solve

→ $a \geq 30/9$

Graph on a number line →



Comments:

- lower level problem
- involves multiple steps
  - → distribute
  - → simplify
  - → find fraction on number line

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

Sara earns $7.25 per hour working at the ball park. She also earns $5.50 per hour babysitting. If she works 20 hours at the ball park this week, how many hours will she have to babysit to earn at least $200.00 this week?

Let x = the number of hours babysitting

$$7.25(20) + 5.50(x) \geq 200$$

$$145 + 5.5x \geq 200$$

$$5.5x \geq 55$$

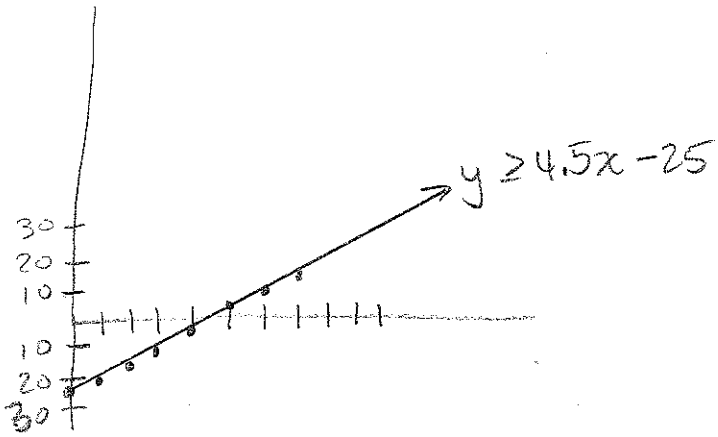
$$x \geq 10$$

Sara will need to babysit for 10 hours to earn at least $200 this week.

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

Mary is selling her handmade bracelets at a craft fair this weekend. The fair is charging Mary $25 to rent a booth. Mary sells each bracelet for $4.50. Write an inequality that represents Mary's profit from selling her bracelets. How many bracelets does Mary need to sell in order to make a profit?

$y \geq 4.5x - 25$



must sell at least 6 bracelets to make a profit

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

Kori needs to earn a B in Algebra I. Her final exam is worth 4 test grades. In order to earn a B, Kori must have an average that is between 80 and 89 inclusive. What range of scores can Kori receive on her final exam to earn a B if her current test scores are 92, 77, 75 and 88.

Let x represent the score she must make on her final exam.

$$80 \leq \frac{92+77+75+88+4x}{8} \leq 88$$

$$640 \leq 332+4x \leq 704$$

$$308 \leq 4x \leq 372$$

$$77 \leq x \leq 93$$

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

Show work: (3, -4)

$-4x + 4y \leq 2$

$-4(3) + 4(-4) \leq 2$

$-12 + -16 \leq 2$

$-28 \leq 2$

yes, the ordered pair is a solution

(-3, -1)

$-4x + 4y \leq 2$

$-4(-3) + 4(-1) \leq 2$

$12 + (-4) \leq 2$

$8 \leq 2$

No, the ordered pair is not a solution

Determine if the ordered pairs (3, -4) and (-3, -1) are solutions of the following linear inequality in two variables.

$-4x + 4y \leq 2$

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

Paty is going to a trip; her mom gave her 360 dollars for the hotel and her meals. The hotel charges 150 dollar/day plus 5 dollar per each meal. If Paty is staying 2 days in the hotel

a) How many meals she can get with the money her mom gave her?

b) What is the biggest # of meals she can have if she doesn't want to spend all her money?

c) What is the smallest # of meals she can have to surpass the amount of money she has?

a) $(2 \cdot 150) + 5x = 360$

b) $(2 \cdot 150) + 5x < 360$

c) $(2 \cdot 150) + 5x > 360$

$x = 12$ $x < 12 = 11$ $x > 12$ 13

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

1. Solve and graph the inequality below:

$$-5x - 4 \leq \frac{\sqrt[3]{1728}}{2}$$

2) Solve & Graph on Number Line

$$\left|\frac{6x-5}{2}\right| > \frac{3}{4}$$

3. Solve the inequality and simplify.

$$|-1500x + 2500| \leq 0$$

4. Solve: $A \leq 2x - 1 \geq (-B)$

5. Solve by graphing: $y < 3x - 2$
$y \geq x^2 - 4$

6A. A rubber band is stretched into the shape of a circle whose maximum area is $15\pi mm^2$. Unstretched the rubber band forms a circle with an area of $8\pi mm^2$. What is the range of the radius for any circle formed by the rubber band. (No twisting the band is allowed).

B. Are there extraneous solutions to this problem? If so, what are they?

7. Solve the following and show where boundaries are positive or negative.

$$x^3 - 3x^2 + 2x \geq 0$$

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

(8th grade)

Solve and graph the inequality below:

$$-5x - 4 \leq \frac{\sqrt[3]{1728}}{2}$$

Solution

$$-5x - 4 \leq \frac{\sqrt[3]{1728}}{2}$$

$$-5x - 4 \leq \frac{12}{2} \quad \text{(simplify the radical)}$$

$$-5x - 4 \leq 6 \quad \text{(simplify the fraction)}$$

$$\begin{matrix}(+4) & & (+4)\end{matrix}$$

$$\frac{-5x}{-5} \leq \frac{10}{-5} \quad \text{(add 4 to both sides)}$$

$$x \geq -2 \quad \text{(divide by -5 and flip the sign)}$$

COMMENTS:

1. Provide justification. Enhances literacy and exhibits true understanding of the concepts. OR
2. Add more fractions OR
3. Graph the inequality in the coordinate plane
4. Create a compound inequality

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

Solve $\left|\frac{6x-5}{2}\right| > \frac{3}{4}$

$24 \cdot \left(\frac{6x-5}{2}\right) > \frac{3}{4} \cdot 24$

$12x - 10 > 3$

$+10 \quad +10$

$\frac{12x}{12} > \frac{13}{12}$

$x > 13/12$ $1\frac{1}{12}$

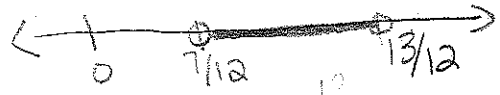
$24 \cdot \left(\frac{6x-5}{2}\right) < \left(\frac{-3}{4}\right) \cdot 4$

$12x - 10 < -3$

$+10 \quad +10$

$\frac{12x}{12} < \frac{7}{12}$

$x < 7/12$



$7/12 > x > 13/12$

$(7/12, 13/12)$

* write out expanation for step to help students understand the process in their own words
* Make easier take out fraction
* make harder by adding negative signs or adding an inequality to other side

Group II #3

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

Solve the inequality and simplify.

$$|500x + 2500| \leq 0$$

$$-1500x = -2500$$

$$x = \frac{-2500}{-1500}$$

$$x = \frac{5}{3}$$

Comments

Test the students on knowing that absolute value can't be less than zero.

I could change this by changing 0 to a constant like 500 and test their knowledge on flipping sign when dividing by a negative

I could also require them to explain to me why there is only solution.

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

solve the following:

$A \leq 2x - 1 \geq (-B)$

solution:

$$A \leq 2x - 1 \geq (-B)$$
$$+1 \qquad +1 \qquad +1$$
$$\frac{A+1}{2} \leq \frac{2x}{2} \geq \frac{(-B)+1}{2}$$
$$\boxed{\frac{A+1}{2} \leq x \geq \frac{(-B)+1}{2}}$$

- students get caught up in the $\leq \geq$ signs. They want an $=$ sign.
- Add in values for A + B have them solve and then graph the solution.
- Create word problem to match the original equation.
- Suppose A and B are functions $f(x) = \ldots$ + $f(y) = \ldots$ now solve.

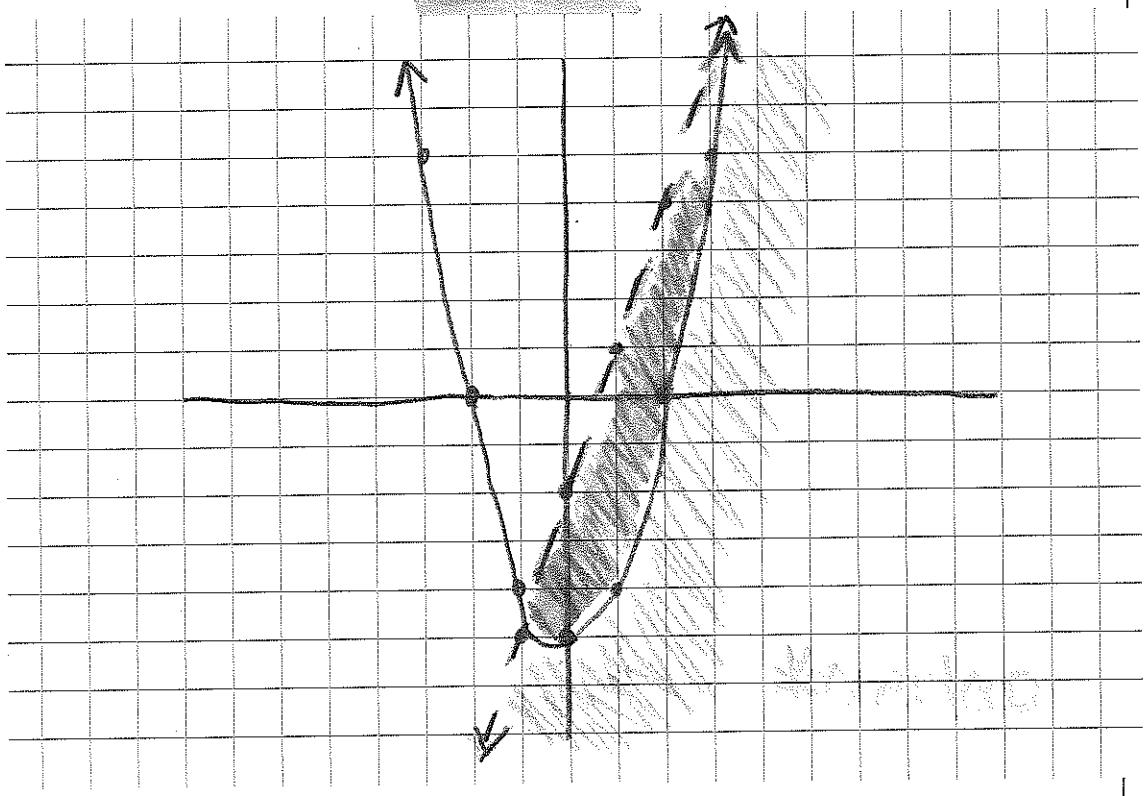
Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

Solve by graphing:

$y < 3x - 2$ *

$y \geq x^2 - 4$

Solution



Comments:

*I could give/test another way by giving them the graph and having them write the equations that make the graph true.

*I could give them the equations in another form & they have to solve for y then graph

*Give equations where there is no overlap and ask what that means

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

1.A. A rubber band is stretched into the shape of a circle whose maximum area is $15\pi mm^2$. Unstretched, the rubber band forms a circle with an area of $8\pi mm^2$. What is the range of the radius for any circle formed by the rubber band. (No twisting the rubber band is allowed). $A=\pi r^2$ (3pts)

$$8\pi \leq \pi r^2 \leq 15\pi$$
$$8 \leq r^2 \leq 15$$
$$+2\sqrt{2} \leq r \leq \sqrt{15}$$

B. Are there extraneous solutions to this problem? If so, what are they? (3pts)

Discussion:

Once they have the radius, they can find an arc length, circumference, etc. The scope of the problem is amazing.

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

Solve. $x^3 - 3x^2 + 2x \geq 0$

Show where your boundary's are positive or negative

Solution

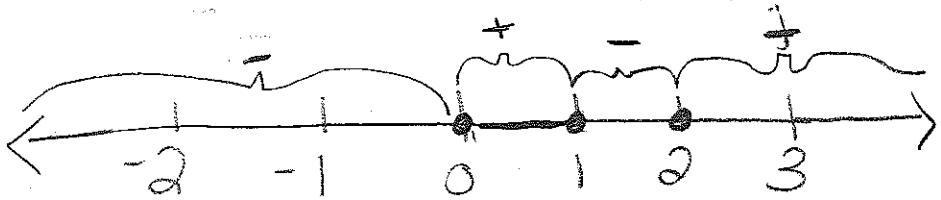
$x(x^2 - 3x + 2) \geq 0$

$x(x-2)(x-1) \geq 0$

$x=0 \quad x-2=0 \quad x-1=0$

$x=0 \quad x=2 \quad x=1$

Test Value	Outcome (+,-)
$(-\infty, 0] \rightarrow -1$	-6 (-)
$[0, 1] \rightarrow \frac{1}{2}$	$\frac{3}{8}$ (+)
$[1, 2] \rightarrow 1.5$	$-\frac{3}{8}$ (-)
$[2, \infty) \rightarrow 3$	6 (+)



$(-\infty, 0] \cup [0, 1] \cup [1, 2] \cup [2, \infty)$

Comments

* Change way to write solution.
* instead of x^3 I could do a standard x^2
* make the equation something that is not factorable so they would have to use quadradic formula

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

I. Solve each inequality and graph its solution.

1) $x + 5 < 10$ 2) $-3 \geq 12$ 3) $5x + 7 < 38$

4) $x - 8 \leq 21$ 5) $3x - 4 > 12$ 6) $12 - 2x \geq 6$

7) $-4x - 8 \leq 32$

II Solve each compound inequality, graph its solution. Express in set notation.

8.) $15 < 2x - 3 < 27$

9.) $2x < 2$ or $-3x - 5 < -20$

10.) $3x - 12 > 24$ or $x + 8 \leq 4$

III. YOU ARE THE OWNER OF A BIKE MANUFACTURER, YOU CREATE BICYCLES + TRICYCLES, BIKES SELL FOR $200 AND TRIKES FOR $150, IF YOU HAVE ENOUGH MATERIALS FOR AT MOST 20 VEHICLES AND YOU MUST MAKE AT LEAST SIX BIKES AND THREE TRIKES.

A) WHAT IS THE MOST AMOUNT OF MONEY YOU CAN MAKE,

B) WHAT IS THE LEAST AMOUNT OF MONEY YOU CAN MAKE.

C) REPRESENT THIS SITUATION WITH THREE INEQUALITIES.

d) USE A GRAPH TO SHOW ALL POSSIBLE COMBINATIONS OF BIKES + TRIKES.

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

YOU ARE THE OWNER OF BATON ROUGE BICYCLE MANUFACTURING (BRBM). YOU CREATE BICYCLES AND TRICYCLES. BICYCLES SELL FOR $200 A PIECE AND TRICYCLES SELL FOR $150. IF YOU HAVE ENOUGH MATERIALS TO MAKE AT MOST 20 VEHICLES, AND PAST EXPERIENCES DICTATE YOU MAKE AT LEAST ~~SIX~~ BIKES AND THREE TRIKES.

a) WHAT IS THE MOST AMOUNT OF MONEY YOU CAN MAKE.

b) WHAT IS THE LEAST AMOUNT OF MONEY YOU CAN MAKE.

c) MODEL THE SITUATION WITH THREE INEQUALITIES.

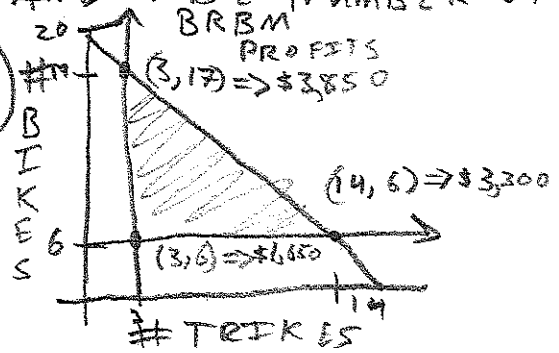
d) USE A GRAPH TO SHOW ALL POSSIBLE COMBINATIONS OF BIKES & TRIKES.

SOLUTION: (a) 17 BIKES & 3 TRIKES MAKES $3850

(b) BARE MINIMUM OF 6 BIKES & 3 TRIKES MAKE ONLY $1650 (c) LET B BE NUMBER OF BIKES AND T BE NUMBER OF TRIKES THEN:

$$\begin{cases} B+T \leq 20 \\ B \geq 6 \\ T \geq 3 \end{cases}$$

(d)



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DIRECTIONS: SOLVE + GRAPH.

PART. A. SIMPLE INEQUALITIES
(ADDITION OR MULT. PROPERTY)

1) $x + 5 < 10$

2) $-3x \geq 12$

PART. B. SIMPLE INEQUALITIES
(MULT. PROPERTIES)

1) $5x + 7 < 38$

2) $-4x - 8 \leq 32$

PART. C. COMPOUND INEQUALITIES

1) $15 < 2x - 3 < 27$

2) $2x < 2$ OR $-3x - 5 < -20$

PART. D APPLICATION
(WORD PROBLEM)

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

Solve the following

1. $x - 8 \leq 21$

2. $3x - 4 > 12$

3. $12 - 2x \geq 6$

1. $x - 8 \leq 21$
$+8 \quad +8$
$x \leq 29$

2. $3x - 4 > 12$
$+4 \quad +4$
$\frac{3x}{3} > \frac{16}{3}$
$x > 5.33$

3. $12 - 2x \geq 6$
$-12 \quad -12$
$\frac{-2x}{-2} \geq \frac{-6}{-2}$
$x \geq 3$

I took a simple approach as I taught 6th grade math. In 6th grade students touch on the use of inequalities ~~with~~ when comparing whole numbers, decimals, and fractions. In 6th grade students learn to solve one and two step equations, but not with inequalities.

Review the CCSS document for High School Algebra. Make up a 15-minute quiz for high-school students that would be useful in testing the material on **inequalities** that is outlined there. Write out the quiz and solutions below.

Solve the following compound inequality. Graph its solution, then write the solution in interval notation.

$3x - 12 > 24$ or $x + 8 \leq 4$

Solution: To solve this compound inequality @ solve both inequalities separately by using the properties of inequality.

$3x - 12 > 24$

$+12 \quad +12$

$\frac{3x}{3} > \frac{36}{3}$

$x > 12$

$x + 8 \leq 4$

$-8 \quad -8$

$x \leq -7$

After we solve for each, we graph both on the same line.

finally the interval notation is stated as

$(-\infty, -7] \cup (12, \infty)$