NOTE: THIS UNIT IS BEST DONE USING ERASABLE PENS!!!!

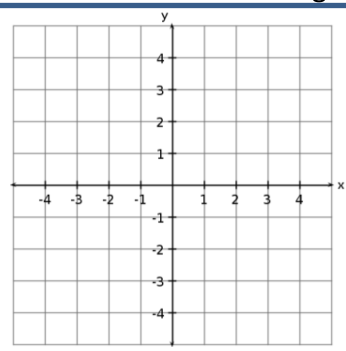
Concepts: #1

Online Video Lessons: https://goo.gl/Fr6YGU https://goo.gl/wr8ehd https://goo.gl/SyuU9G

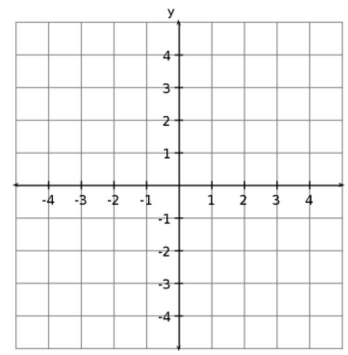
Q: What are inequalities?

Use your answer to describe what the following situations actually mean – draw a sketch!

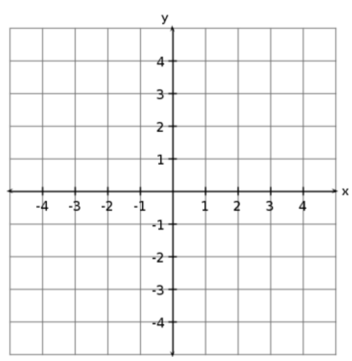
a) $y = 2x + 3$



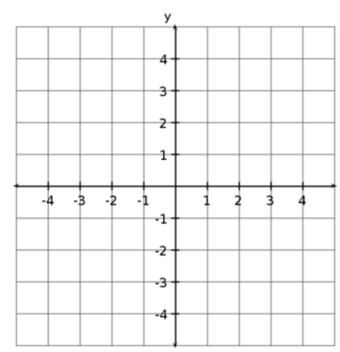
b) $Y > 2x + 3$



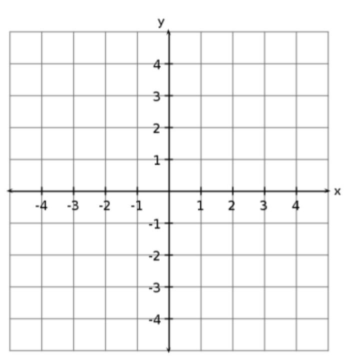
c) $Y < 2x + 3$



d) $Y \leq 2x + 3$



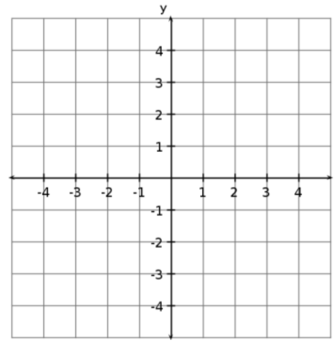
e) $Y \geq 2x + 3$



Q:

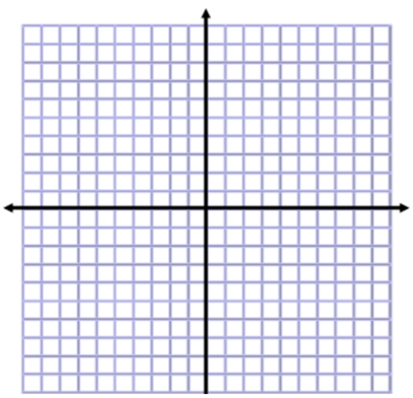
How would the above graphs look different if I changed the domain and range to Integers from the Real Numbers? Sketch the following with a domain of integers:

Y < 2x + 3

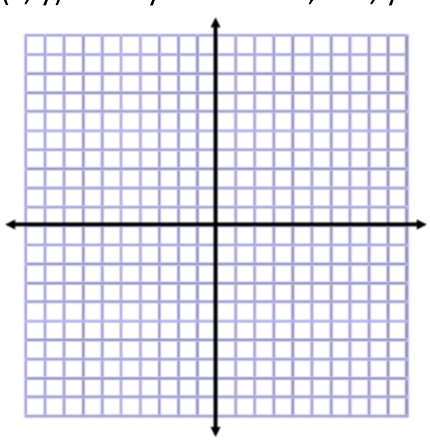


EXAMPLE #2: Sketch the solution region for the following:

a) {(x, y) l-3x + 4y $\leq$ 12, x$\in$ R, y$\in$R}



b) {(x, y) l x – 2y - 3 < 7 – 2x, x$\in$I, y$\in$I}



Visually determine which of the following points lie in the solution region of the above graphs

a) (-1, 0) b) (2, 4) c) (-3, -10)

EXAMPLE #3: Given the inequality $\{(x, y) | \ 3y > 2x + 1, x \in R, y \in R\}$ determine if (2, 5) falls within the feasible region.

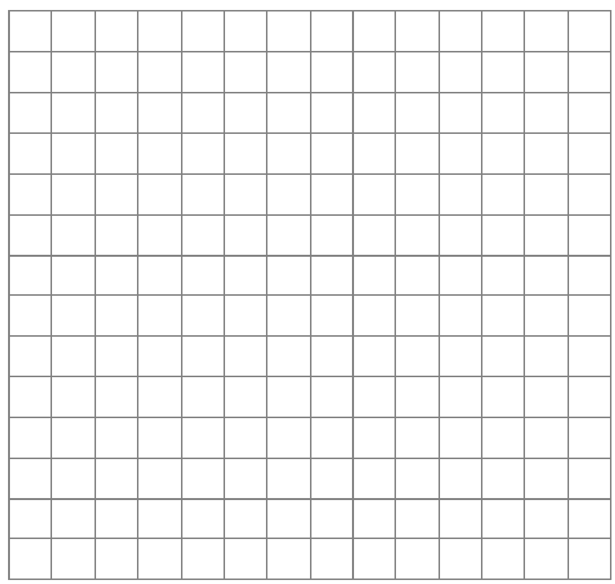
EXAMPLE #4: Given $\{(x, y) | \ 2x + 4y \leq 10, x \in R, y \in R\}$ determine if (1, 2) falls within the feasible region.

EXAMPLE #5: Kolton and Carolyn want to donate some money to a local food pantry. To raise funds, they are selling PI necklaces and earrings that they have made themselves. Necklaces cost $8 and earrings cost $5. What is the range of possible sales they could make in order to donate at least $100?

a) Assign your variables:

b) Establish your inequality:

c) Decide what type of restrictions will be on the domain and range and decide if your graph would include all Real Numbers, Integers or Whole Numbers.



d) Sketch a graph of this situation. Label and title each axis and write the scale, label the inequality and title the graph.

e) Find two points that satisfy this situation.

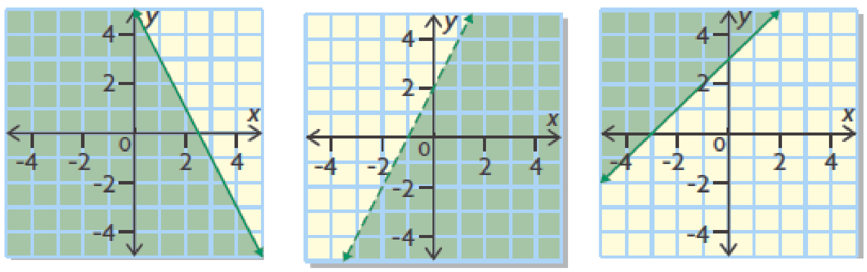
f) Algebraically verify both your points and explain what each point means within the context of this situation.

6.1 ASSIGNMENT

FA (FOUNDATIONAL ASSIGNMENT) – Must be done for the incentive!
P303 # 4, 5, 6abe, 7, 8, 9-12 & 14 PLUS THE FOLLOWING

1. For $y < 3x + 5$ which of the following points fall within the solution set?
$(-1,-3), (-1,2), (-4,3), (-2,-3), (3,1), (1,5), (0,5), (-1,3)$

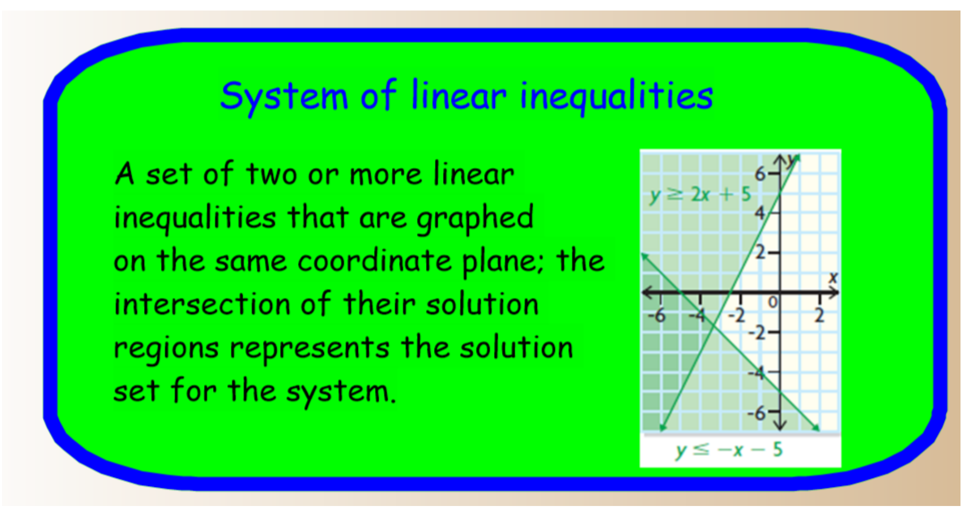
2 Determine the inequality for the following graphs



PreAP FDN 20 6.2 & 6.3 (Day 1) SOLVING SYSTEMS OF LINEAR INEQUALITIES

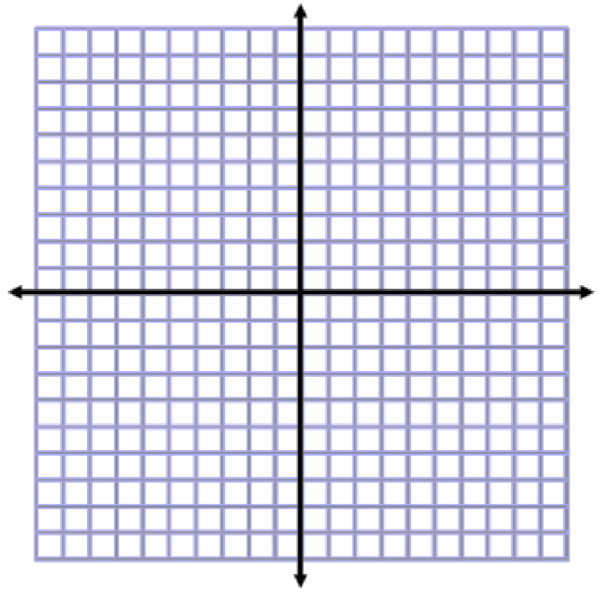
Online Video Lesson: **https://goo.gl/IUHCPn** **https://goo.gl/j6zgAc**

Concepts: #2



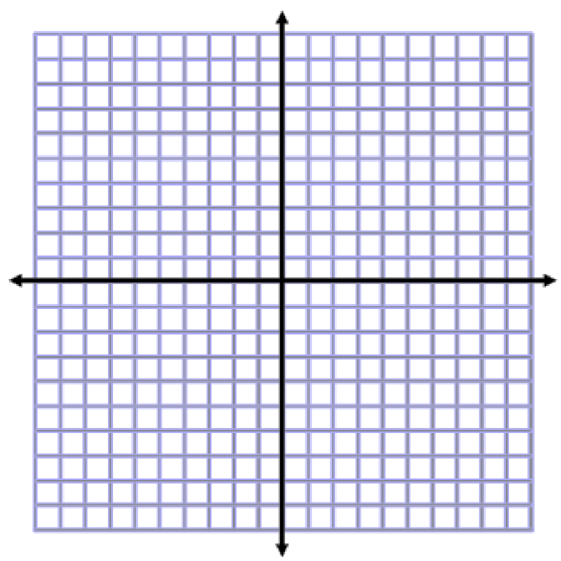
EXAMPLE #1:
Graph the system of linear inequalities.
Choose two possible solutions from the set.
Assume $x \in R$, $y \in R$.

$2x + 3y \leq 9$ and $y - 6x \geq 1$



EXAMPLE #2:
Graph the system of linear inequalities. Choose two possible solutions from the set. Assume $x \in I$, $y \in I$.

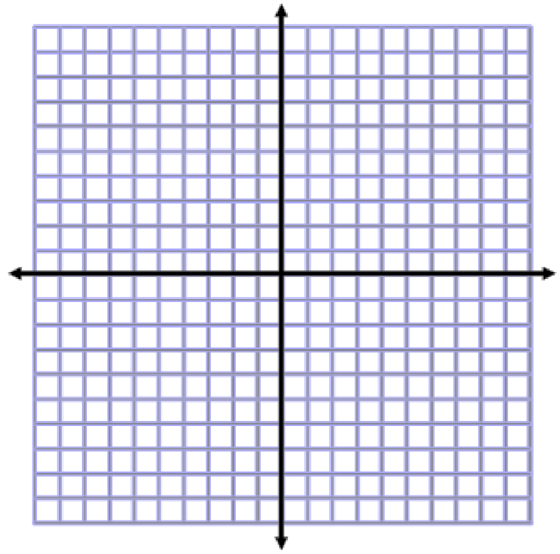
$-3x - 2y < 6$ and $y \leq 3$



EXAMPLE #3:

Graph the system of linear inequalities. Choose two possible solutions from the set. Assume $x \in W$, $y \in W$.

$y - x < 2$ and $x + y \geq 0$

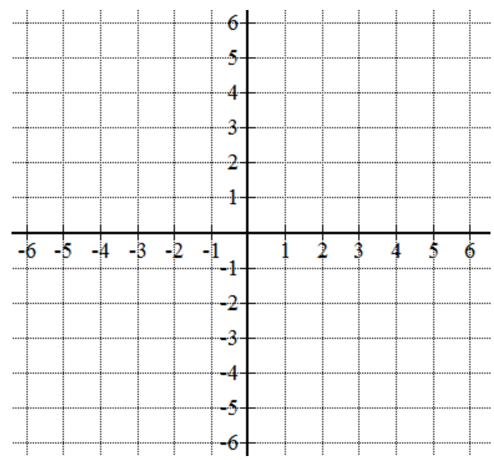


Does the intersection of the system have an open dot or a closed dot? Explain.

EXAMPLE #4:

Graph the system of linear inequalities. Choose two possible solutions from the set.
Assume $x \in R$, $y \in R$.

$2x + 10 > 3y$ and $3x - y - 4 \leq 0$ and $x \geq 0$



6.2 & 6.3 Day 1 ASSIGNMENTS (CONCEPT 2)

P307 #1, 2 & P317-318 # 1-5, 7, 11, 12

DELTA MATH ASSIGNMENT: F20 #1 Graphing Linear Inequalities in Two Variables

****All Delta Math Assignments Are Summative – Check the Delta Math Assignment or my Google Calendar for due dates!**

CONSTRAINT INEQUALITY: A limiting condition of the optimization problem being modelled, represented by a linear inequity.

Example 1:

Amir owns a health-food store. He is making a mixture of nuts and raisins to sell in bulk. His supplier charges $25/kg for nuts and $8/kg for raisins

Question: What quantities of nuts and raisins can Amir mix together if he wants to spend less than $200 to make the mixture? Find and verify two possible solutions.

Concepts: #3

Step 1: Define your variables and state the domain and range of each variable.

Step 2: Determine the number of constraint inequalities in the question and write them down.

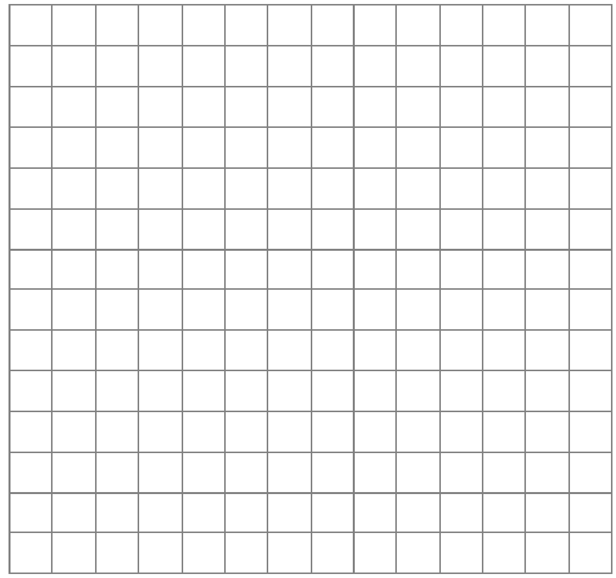
Step 3: Graph the inequalitie(s). Fully label your graph including labelling each axis (with a letter and a description), indicate the scale on each axis, give the graph a title and label each inequality.

Step 4: Identify two coordinates that satisfy your inequality(inequalities) and algebraically verify why each coordinate satisfies the inequalities. Write a sentence explaining what each coordinate represents in the context of the question.

Example 2:

Ben is buying snacks for his friends. He can spend up to $10.00. The choices are apples for $0.80 and muffins for $1.25. He needs to determine how much of each item to buy.

Step 1: Define your variables and state the domain and range of each variable.



Step 2: Determine the number of constraint inequalities in the question and write them down.

Step 3: Graph the inequalitie(s). Fully label your graph (instructions in last example)

Step 4: Identify two coordinates that satisfy your inequality(inequalities) and algebraically verify why each coordinate satisfies the inequalities. Write a sentence explaining what each coordinate represents in the context of the question.

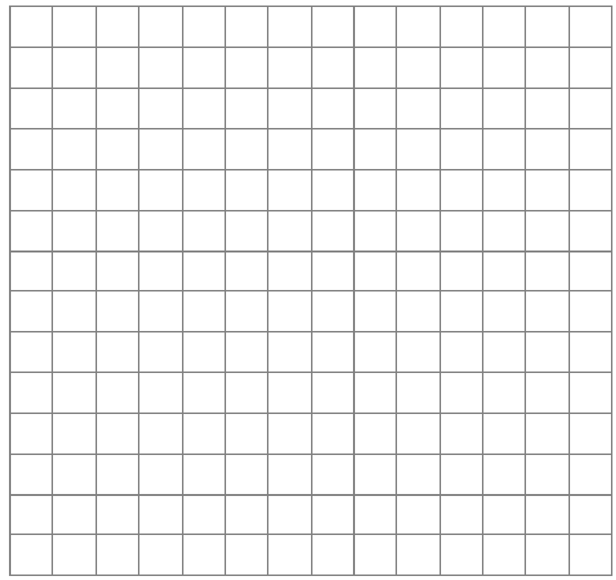
Example 3:

A parkade can fit at most 100 cars and trucks on its lot. A car covers 100 ft^2 and a truck covers 200 ft^2. The lot has 12,000 ft^2 of space.

a) Define the variables and state the domain and range of each.

b) Write the restrictions on the variables as inequalities.

c) Write the additional constraint inequalities that arise out of the given information



d) Graph the entire system of inequalities from step b and c within the domain and range in part a. Fully label the graph!

e) Determine two possible combinations of trucks and cars possible on the lot

f) What do you think the points of intersection on the graph mean?

6.3 Day 2 ASSIGNMENTS (CONCEPT 3)

P318 #6, 8, 9, 10

PLUS THE FOLLOWING (Done on Graph Paper)

NOTE: The questions below will be considered fully answered only by following all of the four steps in the examples in today's lesson.

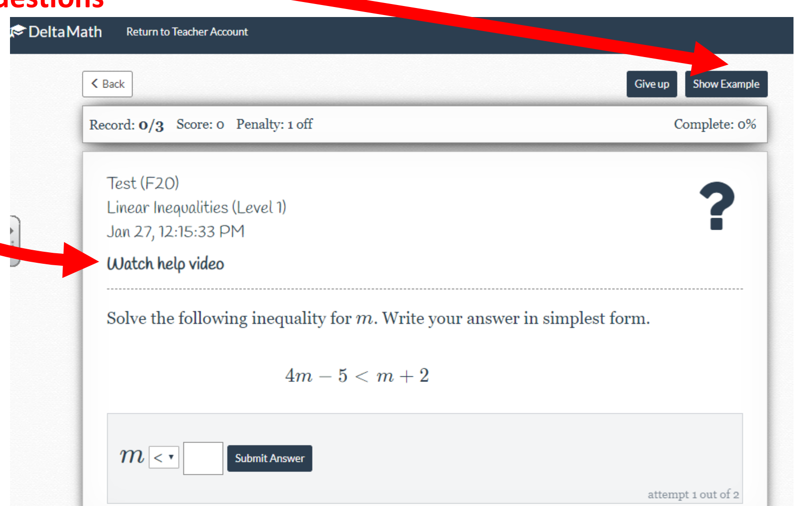
1. Your company makes Ipods and MP3 players. Each one must be processed by 2 machines. An Ipod takes 1 hour at the moulding station and 1 hour at the wiring station. An MP3 player it takes 2 hours at the moulding station and 1 hour at the wiring station. The moulding station is available for 16 hours and the wiring for 10 hours. What combinations of each music item can be made to meet the constraints?

2. You are selling canoes and kayaks. Each canoe requires 2 hours on the shaping machine and 1 hour on the cutting machine. Each kayak requires 1 hour on the shaping machine and 1 hour on the cutting machine. The shaping machine is available for 16 hours each day and the cutting machine is available for 12 hours each day. What combination of each boat can be sold to satisfy the constraints?

3. Marnie has two part-time jobs. She earns minimum wage working at the information desk in a hospital and $4 above minimum wage helping with her mother's house-cleaning business. Marnie works in whole-hour increments only. She does not work more than 15 hours a week, since she often has a lot of homework. How many hours at each job must she work to make at least $160?

DELTA MATH ASSIGNMENT: F20 #2 Inequality Word Problems (Non-Optimization)

- **Remember that all Delta Math Assignments are Summative – Check the Delta Math Assignment or my Google Calendar for due dates!**
- **Remember that even once you have completed the Delta Math assignment, you can go back and do more questions for practice!**
- **Remember that you have access to a worked out example and for most questions you also have a Help Video to explain HOW to do the questions**



Online Video Lesson: https://goo.gl/Hn9IIm

Concepts: #4

EXAMPLE #1:

A florist is ordering bracken fern and baby's breath for bouquets and centerpieces. No more than 100 stems of baby's breath will be ordered. More than 100 stems of bracken fern will be ordered. The florist has space to store no more than 250 stems, in total. Is each of the following a combination she can order? Explain.

Baby's Breath	Bracken Fern
0	150
25	25
50	150
100	100
95.5	114.5
100	150
150	125

OPTIMIZATION PROBLEM:

A problem where a quantity must be maximized or minimized following a set of guidelines or conditions.

OBJECTIVE FUNCTION:

In an optimization problem, the equation that represents the relationship between the two variables in the system of linear inequalities and the quantity to be optimized

FEASIBLE REGION:

The solution region for a system of linear inequalities that is modelling an optimization problem.

OPTIMAL SOLUTION:

A point in the solution set that represents the maximum or minimum value of the objective function.

LINEAR PROGRAMMING:

A mathematical technique used to determine which solutions in the feasible region result in the optimal solutions of the objective function.

EXAMPLE #2:

Three teams are travelling to a basketball tournament in cars and minivans.

* Each team has no more than 2 coaches and 14 athletes
* Each car can take 4 team members, and each minivan can take 6 team members.
* No more than 4 minivans and 12 cars are available.

The school wants to know the combination of cars and minivans that will require the minimum and maximum number of vehicles. Create a model to represent this situation.

1. Variable Statement(s) and domain and range for each

2. Create the restriction and constraint inequalities

3. Graph the above Constraint Inequalities within the domain and range. Fully label your graph.

4. Create the Objective Function to be Maximized or Minimized.

THIS SPOT IS FOR PART 2 OF THE PROBLEM WHICH WE WILL DO TOMORROW:

EXAMPLE #3:

A refinery produces oil and gas.

- At least 2 L of gasoline is produced for each litre of heating oil
- The refinery can produce up to 9 million litres of heating oil and 6 million litres of gasoline each day.
- Gasoline is projected to sell for $1.10 per litre.
- Heating oil is projected to sell for $1.75 per litre.

The company needs to determine the daily combination of gas and heating oil that must be produced to maximize revenue. Create a model to represent this situation.

5. Variable Statement(s) and domain and range for each

6. Create the restriction and constraint inequalities

7. Graph the above Constraint Inequalities within the domain and range. Fully label your graph.

8. Create the Objective Function to be Maximized or Minimized.

THIS SPOT IS FOR PART 2 OF THE PROBLEM WHICH WE WILL DO TOMORROW:

6.4 Day 1 ASSIGNMENTS (CONCEPT 4)

FA P330 1-9

Note: Please do each question so that each question gets an entire side of a page of graph paper. Tomorrow, we will do part 2 of each question which will need at least 15 lines on each page. on one side of a page.

PreAP FDN 20 6.4 Day 2 & 6.5 Day 1 OPTIMIZATION

Online Video Lesson: **https://goo.gl/6W7Cus**

WHAT IS OPTIMIZATION?

Optimization is real life is a method of making the best of anything. In mathematics it is a mathematical technique for finding a maximum or minimum value of a function of several variables subject to a set of constraints. We can also describe it as is the selection of a best element (with regard to some criterion) from some set of available alternatives. Often this is used to find the minimum cost to produce an item or the maximum profit that can be obtained. The method we use to find the maximum or minimum is called Linear Programming.

Concepts: #4

FIRST – We will go back and finish OPTIMIZING OUR EXAMPLES FROM YESTERDAY.

This will involve the following final steps to each example:

1. Make a list of all thee ordered pairs of all vertices from the feasible region
2. One at a time substitute all ordered pairs from the vertices into the optimal equation to find the value of the optimal equation at each vertex
3. The largest answer from the above step is your MAXIMUM and the smallest answer is your MINIMUM.
4. Write a sentence to describe which specific point produces the desired maximum or minimum

NOTE: Your homework tonight will involve adding all these steps to the questions you did for homework yesterday!

ADDITIONAL EXAMPLE #1:

A toy company manufactures two types of toy vehicles: racing cars and sport-utility vehicles.

- Because the supply of materials is limited, no more than 40 racing cars and 60 sport utility vehicles can be made each day.
- However, the company can make 70 or more vehicles, in total, each day
- It costs $8 to make a racing car and $12 to make a sport-utility vehicle.

There are many possible combinations of racing cars and sport utility vehicles that could be made. The company wants to know what combinations will result in the minimum and maximum costs, and what those costs will be.

a) Create your variable statements and the domain and range for each.

b) State your **CONSTRAINTS INEQUALITIES** (some will be from restrictions on the variable and at least one "main" inequality" that will relate all the variables at once)

c) Create your **OBJECTIVE FUNCTION.** This is an equation (not an inequality) and it talks about how to maximize/minimize something (like profit etc)

d) Graph your constraints and label your graph.

e) Once you are SURE the graph is correct, Use a highlighter to outline the **FEASIBLE REGION.**

f) Find the minimum cost and when it occurs. Find the maximum cost and when it occurs. Show work and write concluding sentences. (*Hint: Begin by finding the ordered pairs that make up the corners of the feasible region and test those points in your Objective Function)*

6.4 Day 2 ASSIGNMENTS (CONCEPT 4)

GO BACK TO P330 1-7 **Please finish each question by optimizing each answer. Follow the steps from today for each of questions 1-7.**

PLUS P334 #1-3 **Please show ALL steps as we did on the example on page 15 of your notes**

 6.6 OPTIMIZATION & LINEAR PROGRAMMING

Online Video Lesson: **https://goo.gl/9qll1X**

Concepts: #4

Today we practice putting it "all together". The following box contains all the steps you will need to use for each question!

1. READ THE QUESTION CAREFULLY. Try and picture what is going on!
2. Define the variables and state the domain and range for each.
3. Write a system of linear inequalities (constraint inequalities) to model the situation. Remember that this often includes restriction inequalities as well as inequalities that relate all the variables.
4. Sketch the inequalities.
   - Be sure that you check to be sure if your lines should be solid or dashed
   - Shade each region appropriately. If your domain and range is not all real numbers, you will need to indicate that your answer "should be points or dots rather than the whole region"
5. Label your graph: Label the axis (with a letter and a description), indicate the scale on each axis, give the graph a title and label each inequality.
6. Decide if the boundaries are part of the solution.
7. Find and state the vertices of the feasible reason that are part of the solution.
8. Find and state the optimal equation (This will be an equation that requires finding a maximum or minimum – often a PROFIT equation or a COST equation)
9. Substitute all ordered pairs from the vertices into the optimal equation to find the possible maximum/minimum. The largest answer you find is your MAXIMUM and the smallest answer is your MINIMUM.
10. WRITE A FINAL SENTENCE! This will include the value of the maximum or minimum and the coordinates at which it was found.

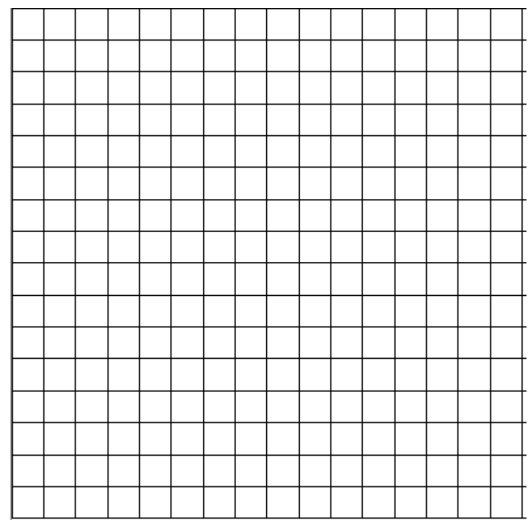
EXAMPLE #1:

Suppose that a certain diet requires you to have at least 24 units of vitamin D and 36 units of calcium each day. You decide to eat Munchies and Crunchies to supply your daily requirements of vitamin D and calcium.

Munchies contain 3 units of vitamin D and 6 units of calcium per serving.
Crunchies contain 4 units of vitamin D and 4 units of calcium per serving.
Munchies cost \$0.50 per serving and Crunchies cost \$0.65 per serving.

How many servings of Munchies and how many servings of Crunchies should you eat each day to supply your needs for vitamin D and calcium yet minimize your cost?

What is the minimum daily cost? Use the steps from the previous page to answer the question!

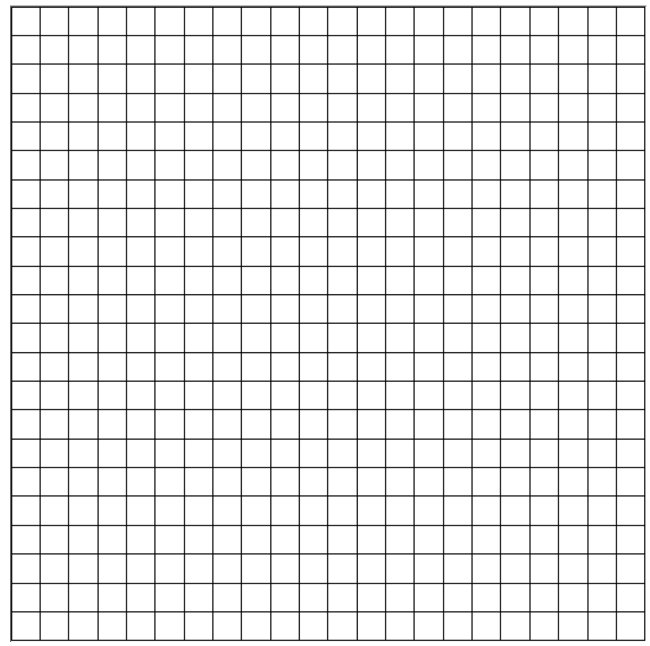


EXAMPLE #3:

L&G Construction is competing for a contract to build a fence.

- The fence will be no longer than 50 yd and will consist of narrow boards that are 6 in. wide and wide boards that are 8 in. wide.
- There must be no fewer than 100 wide boards and no more than 80 narrow boards.
- The narrow boards cost $3.56 each, and the wide boards cost $4.36 each.

Determine the maximum and minimum costs for the lumber to build the fence.



EXAMPLE #2:

It takes a woodworker 4 hours of cutting and 4 hours of finishing to build a rocking horse. To build a Kindergarten set it takes 3 hours of cutting and 2 hours of finishing. During the week the woodworker has a maximum of 24 hours available for cutting and 20 hours available for finishing. The woodworker makes a profit of \$150 on a rocking horse and \$100 on a kindergarten set. How many of each should the woodworker construct in order to maximize profit? What is the resulting maximum profit.

6.6 ASSIGNMENTS (CONCEPT 4)

FA: P341 #1, 2, 4, 5, 8, 9, 11, 12, 13, 14, 15, 16, 17