Math 1 **Linear Programming: Word Problems** Unit 2

Objective Function: _____

Steps to Solving a Linear Programming System of Inequalities

Step 1: Define your variables
Step 2: Organize your information
Step 3: Write the inequalities
Step 4: Set up the objective function (maximize or minimize)
Step 5: Take a breath and dance a little
Step 6: Graph inequalities
Step 7: Find the vertices
Step 8: Plug vertices back into objective function
Step 9: Answer the question

Example 1: Paul sells chocolate chip cookies and peanut butter cookies.

- Baking a batch of chocolate chip cookies takes 2.4 cups of flour and 2 eggs.
- Baking a batch of peanut butter cookies takes 1.6 cups of flour and 1 egg.
- Paul has 12.8 cups of flour and 10 eggs.
- He makes $4 profit per batch of chocolate chip cookies.
- He makes $2 profit per batch of peanut butter cookies.

How many batches of peanut butter cookies should Paul make to maximize his profit?

Step 1:

Step 2:

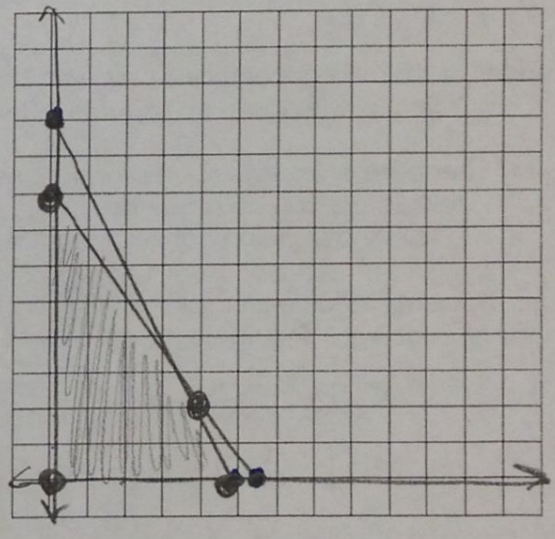
	Choc.	PB	
FLOUR	$2.4x +$	$1.6y$	≤ 12.8
EGGS	$2x +$	$1y$	≤ 10
profit	$4x +$	$2y$	$= P$

Step 3:

$P = 4x + 2y$

Step 4:

Step 6 and Step 7:



Step 8:

Intersection 1: $(0,0) \rightarrow 4(0) + 2(0) = 0$

Intersection 2: $(0,8) \rightarrow 4(0) + 2(8) = 16$

Intersection 3: $(4,2) \rightarrow 4(4) + 2(2) = 20$

Intersection 4: $(5,0) \rightarrow 4(5) + 2(0) = 20$

Step 9: 0 choc chip 4 8 peanut butter

Example 2: A company produces packs of pencils and pens.

- The company produces at least 100 packs of pens each day, but no more than 240.
- The company produces at least 70 packs of pencils each day, but no more than 170.
- A total of less than 300 packs of pens and pencils are produced each day.
- Each pack of pens makes a profit of $1.25.
- Each pack of pencils makes a profit of $0.75

What is the maximum profit the company can make each day?

x = pens y = pencils

$x \geq 100$ $x \leq 240$

$y \geq 70$ $y \leq 170$

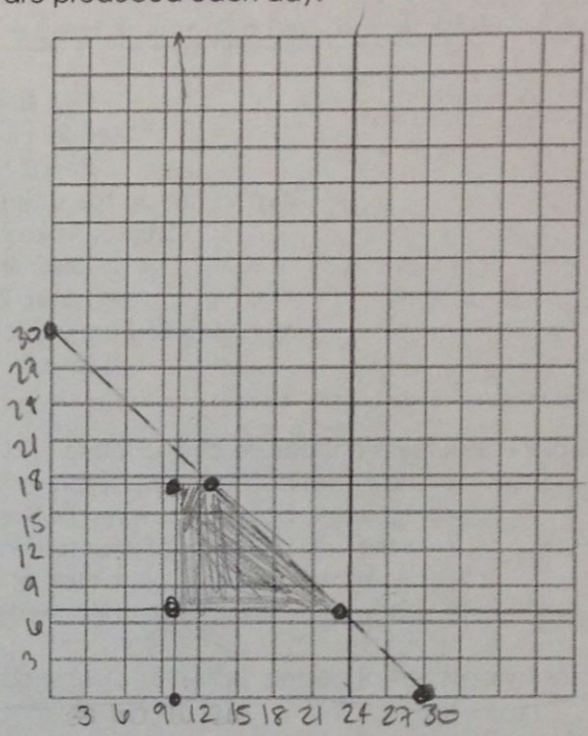
$x + y < 300$

$P = 1.25x + .75y$

V: (100, 70) (100, 170) → $252.50

(130, 170) (230, 70) → $340

$177.50 $290



Solution: $340 → but they can only do < 300 not ≤, so take one pencil away

$339.25

You Try! A calculator company produces a scientific calculator and a graphing calculator.

- Projections indicate an expected demand of at least 100 scientific and 80 graphing calculators each day.
- Because of limitations on production capacity, no more than 200 scientific and 170 graphing calculators can be made daily.
- To satisfy a shipping contract, a total of at least 200 calculators much be shipped each day.

If each scientific calculator sold results in a $2 loss, but each graphing calculator produces a $5 profit, how many of each type should be made daily to maximize net profits?

$x \geq 100$ $x \leq 200$

$y \geq 80$ $y \leq 170$

$x + y \geq 200$

$P = -2x + 5y$

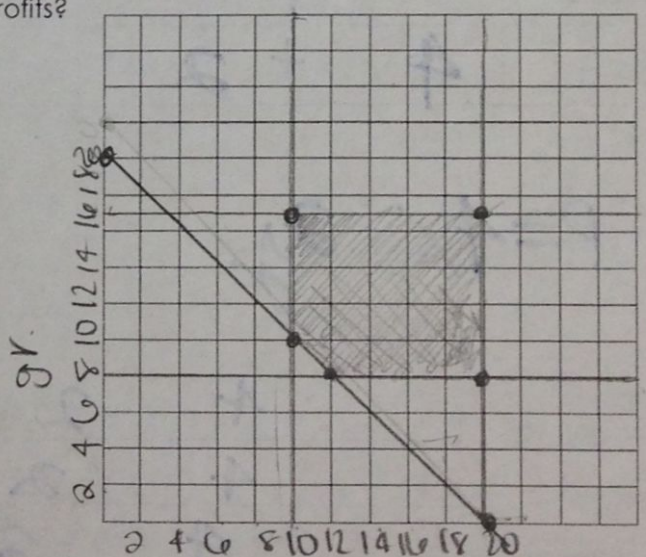
(100, 100) → $300

(100, 170) → $650

(200, 170) → $450

(200, 80) → $0

(120, 80) → $160



Solution: 100 scientific & 170 graphing