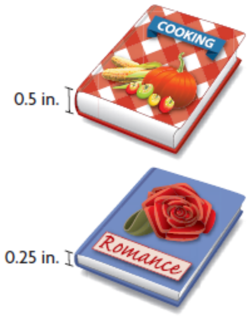
Hw ???

3. Meg is building a bookshelf to display her cookbooks and novels.
   - She has no more than 50 cookbooks and no more than 200 novels.
   - She wants to display at least 2 novels for every cookbook.
   - The cookbook spines are about half an inch wide, and the novel spines are about a quarter of an inch wide.

   Meg wants to know how long to make the bookshelf.

   The following model represents this situation.

   Let c represent the number of cookbooks.
   Let n represent the number of novels.
   Let W represent the width of the bookshelf.



   Restrictions:
   $c \in W$, $n \in W$

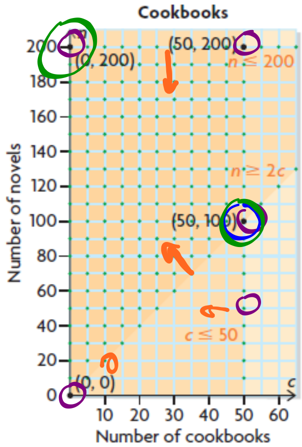
   Constraints:
   $c \geq 0$
   $n \geq 0$
   $c \leq 50$
   $n \leq 200$
   $n \geq 2c$

   Q1

   Graph

   Objective function:
   $W = 0.5c + 0.25n$

Collection of Novels and Cookbooks



   a) Which point in the feasible region represents the greatest number of books (both cookbooks and novels) that Meg could have? Explain how you know.
   b) Can she display the same number of cookbooks as novels? Explain.
   c) What point represents the most cookbooks and the fewest novels?
   d) What point represents the number of cookbooks that would require the longest shelf? How long would the shelf have to be?
   e) What point represents the number of cookbooks that would require the shortest shelf?

(50, 200)

ex: (50, 50) No

(50, 100)

(50, 200) → $W = 0.5(50) + 0.25(200)$
$W = 25 + 50$
$W = 75$ inches

(0, 200)
$W = 0.5(0) + 0.25(200)$
$= 50$ in.

(50, 100)
$W = 0.5(50) + 0.25(100)$
$= 25 + 25$
$= 50$ in

5. A football stadium has 50 000 seats.
- Two-fifths of the seats are in the lower deck. (20000)
- Three-fifths of the seats are in the upper deck. (30 000)
- At least 30 000 tickets are sold per game.
- A lower deck ticket costs \$120, and an upper deck ticket costs \$80.

Create a model that could be used to determine a combination of tickets for lower-deck and upper-deck seats that should be sold to maximize revenue.

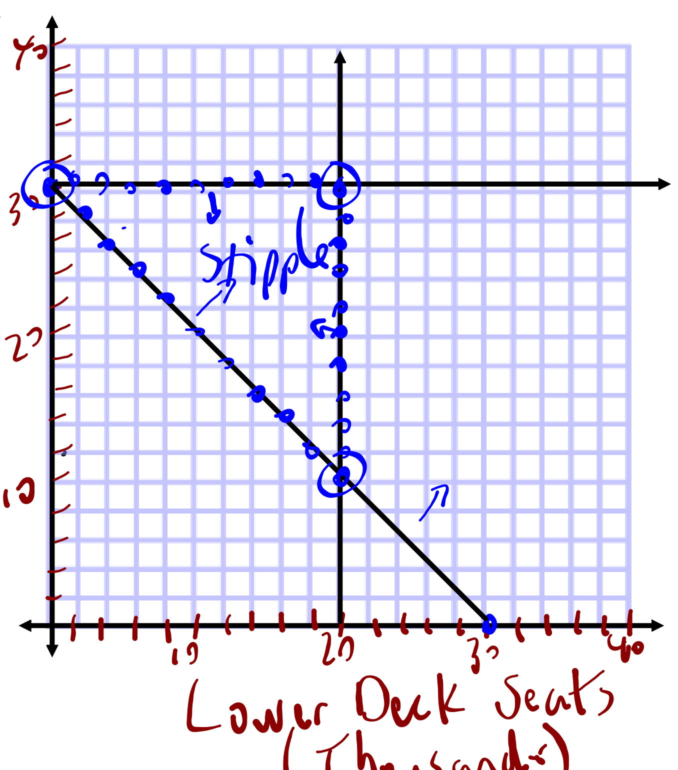
→ objective
$R = 120x + 80y$

x → # of lower deck seats sold
y → # of upper deck seats sold

$x \in W$
$y \in W$

$x \leq 20000$
$y \leq 30\,000$
$x + y \geq 30\,000$

$x + y = 30000$
x-int ⇒ (30 000, 0)
y-int ⇒ (0, 30 000)



Graph

$x \le 14$
$y \le 18$
$x + y \le 24$

6. Sung and Faith have weekend jobs at a marina, applying anti-fouling paint to the bottom of boats.

- Sung can work no more than 14 h per weekend.
- Faith is available no more than 18 h per weekend.
- The marina will hire both of them for 24 h or less per weekend.
- Sung paints one boat in 3 h, but Faith needs 4 h to paint one boat.

The marina wants to maximize the number of boats that are painted each weekend.

Max $= \frac{x}{3} + \frac{y}{4}$

a) Create a model to represent this situation.

b) Suppose that another employee, Frank, who can paint a boat in 2 h, replaced Faith for a weekend. How would your model change?

$x \to$ # of hrs Sung works $\quad x \in W$
$y \to$ # of hrs Faith works $\quad y \in W$

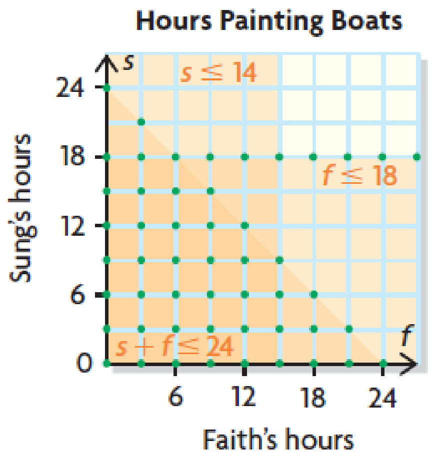
6. a) Let s represent the number of hours Sung works. Let f represent the number of hours Faith works. Let B represent the total number of boats painted.

$\{(f, s) \mid s \leq 14, s \in W, f \in W\}$

$\{(f, s) \mid f \leq 18, s \in W, f \in W\}$

$\{(f, s) \mid s + f \leq 24, s \in W, f \in W\}$

Objective function: $B = \frac{s}{3} + \frac{f}{4}$



b) The new objective function would be $B = \frac{s}{3} + \frac{f}{2}$.

EXAMPLE #1...

The vertices of the feasible region of a graph of a system of linear inequalities are (-4, -8); (5, 0) and (1, -6). Which point would result in the minimum value of the objective function C = 0.50x + 0.60y?

sub

vertex	objective $C = 0.50x + 0.60y$
Min $\boxed{(-4, -8)}$	$0.5(-4) + 0.6(-8) = -6.8$
$(5, 0)$	$0.5(5) + \cancel{0.6(0)} = 2.5$
$(1, -6)$	$0.5(1) + 0.6(-6) = -3.1$

EXAMPLE #2...

The following model represents an optimization problem. Determine the maximum solution.

Restrictions: $x \varepsilon R \text{ and } y \varepsilon R$

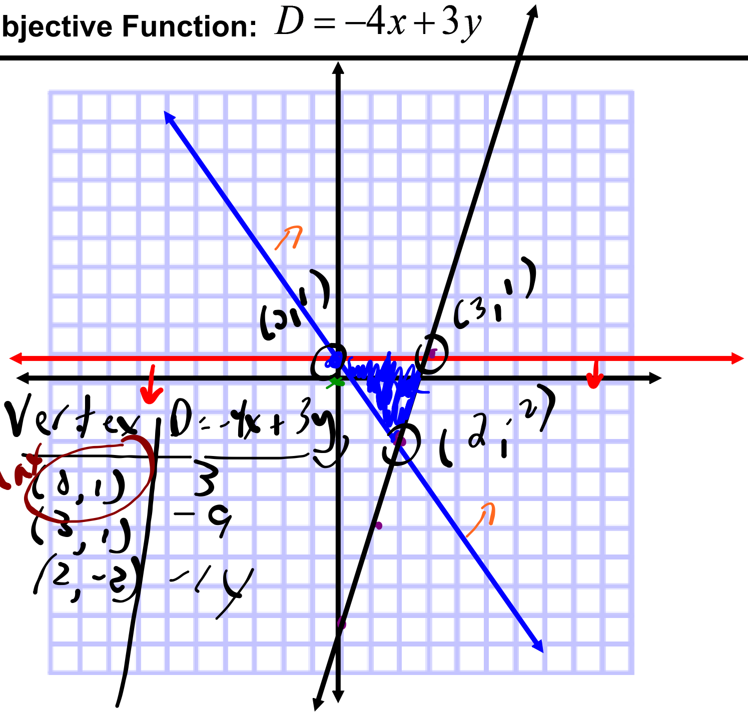
Constraints: $y \leq 1; 2y \geq -3x+2; y \geq 3x-8$

Objective Function: $D = -4x + 3y$

LS ≥ RS

0	3(0) − 8
≱	−8

↳ vertices
↳ graph



Vertex	D = −4x + 3y
Max (0,1)	3
(3,1)	−9
(2,−2)	−14

$\frac{2y}{2} = \frac{-3x}{2} + \frac{2}{2}$

$y = -\frac{3}{2}x + 1$

Test (0,0)

LS ≥ RS

2(0)	−3(0) + 2
0 ≱	2 No

ONE MORE...

Malia and Lainey are baking cupcakes and banana mini-loaves to sell at a school fundraiser...

- No more than 60 cupcakes and 35 mini-loaves can be made each day.
- Malia and Lainey can make no more than 80 baked goods, in total, each day.
- It costs \$0.50 to make a cupcake and \$0.75 to make a mini-loaf.

Determine the minimum cost to produce the baked goods.

$x \to$ # of cupcakes $x \in W$

$y \to$ # of loaves $y \in W$

$x \le 60$

$y \le 35$

$x + y \le 80$

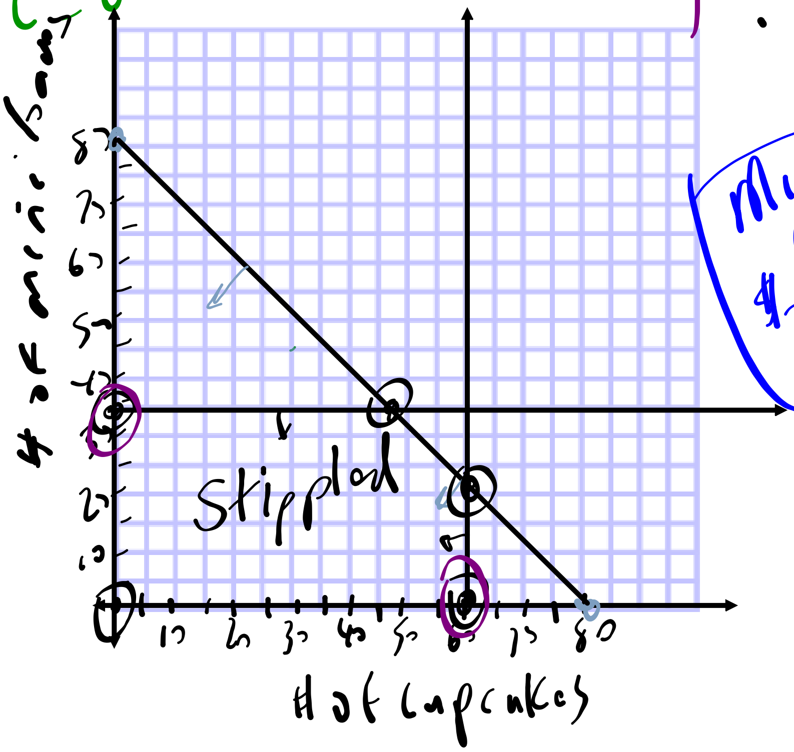
$x + y = 80$

$x$int $\to (80, 0)$

$y$int $\to (0, 80)$

$C = 0.50x + 0.75y$

Sub Min Vertex	Objective $0.5x + 0.75y$
(0, 35)	\$26.25
(60, 0)	\$30



Min cost \$26.25

HOMEWORK...

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