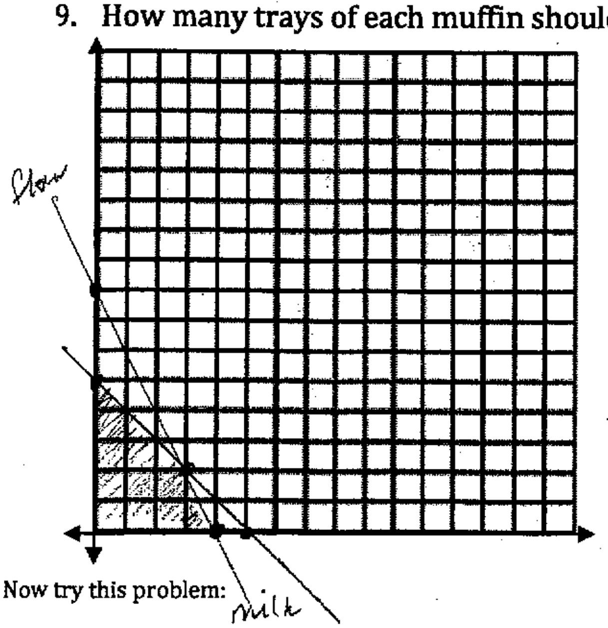
	Corn	bran	Total / Limits	inequality / constraints
# of (what is being produced?) Muffins	x	y		
Constraint #1 milk	4	2	16	$4x + 2y \le 16$
Constraint #2 flour	3	3	15	$3x + 3y \le 15$
Objective function Profit	3	2		$P = 3x + 2y$

Baking a tray of corn muffins takes 4 cups milk and 3 cups wheat flour. A tray of bran muffins takes 2 cups milk and 3 cups wheat flour. A baker has 16 cups of milk and 15 cups of flour. He makes $3 profit per tray of corn muffins and $2 profit per tray of bran muffins. How many trays of each type of muffin should the baker make to maximize profit?

1. Fill in the columns of what it being made.
2. The constraints are what the baker is limited by. What ingredients limit his baking?
3. What are the amounts of ingredients used in each type of muffin?
4. What is the profit on each type of muffin?
5. Write the inequalities to fit the information.
6. Graph the constraints. Then find the coordinates of each vertex.
7. Evaluate the objective function at each vertex.
8. At which vertex is the objective function maximized?
9. How many trays of each muffin should the baker make?

10. What is the max profit



Vertex points

(0,5) (3,2) (4,0)

Substitute vertex points in objective function to find maximum profit.

$P = 3(0) + 2(5) = 10$

$P = 3(3) + 2(2) = 13$

$P = 3(4) + 2(0) = 12$

The baker should make 3 trays of corn + 2 trays of bran for a $13 profit

Now try this problem:

A manufacturer is producing [redacted] skateboards. Each standard skateboard costs $~~4~~ 9 for parts and $15 for labor, and each longboard costs $6 for parts and $20 for labor. The manufacturer's budget is $810 for parts and $1800 for labor. If the income per unit is $150 for a standard skateboard and$175 for a longboard, how many of each type of skateboard should be manufactured to maximize income?

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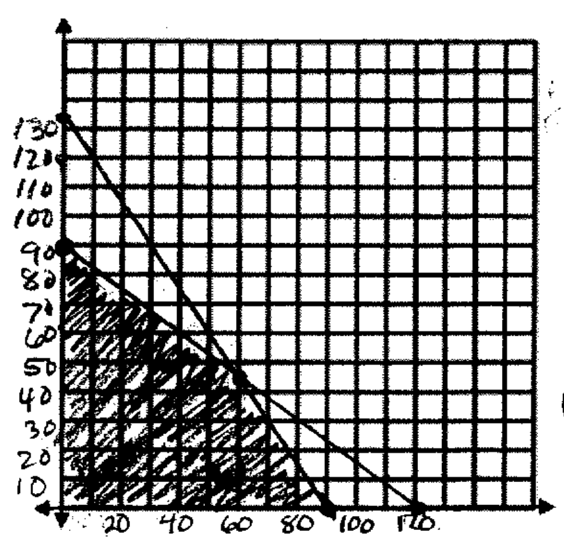
	Standard	Long	Total / Limits	inequality / constraints	
# of (what is being produced?) Skateboards	x	y			
limitation #1 Parts	9	6	810	$9x+6y\le 810$	1
limitation #2 Labor	15	20	1800	$15x+20y\le 1800$	2
objective function Profit	150	175		$P = 150x + 175y$	



Graph Inequalities/constraints

Easiest way to graph is to plug in $x=0$ to get y-intercept then plug in $y=0$ to get x-int.

1 $9(0)+6y = 810$

$\frac{6y}{6} = \frac{810}{6}$

$y = 135$ so $(0,135)$

$9x + 6(0) = 810$

$\frac{9x}{9} = \frac{810}{9}$

$x = 90$ so $(90,0)$

Inequality 2

$15(0)+20y = 1800$

$\frac{20y}{20} = \frac{1800}{20}$

$y = 90$ so $(0,90)$

$15x + 20(0) = 1800$

$\frac{15x}{15} = \frac{1800}{15}$ $x = 120$ so $(120,0)$

To Find Vertex where 2 constraints intersect you should use substitution or elimination to find exact point (the solution)

$$10(9x+6y=810) \Rightarrow \quad 90x+60y=8100$$
$$-3(15x+20y=1800) \quad + \; -45x-60y=-5400$$
$$45x = 2700$$
$$\frac{45x}{45} = \frac{2700}{45}$$
$$x = 60$$

substitute $x=60$ in either equation to get y.

$$9(60)+6y=810$$
$$540+6y=810$$
$$-540 \qquad -540$$
$$6y=270$$
$$\frac{6y}{6}=\frac{270}{6}$$
$$y=45$$

So vertex where constraints cross is point $(60,45)$

Vertex points are - plug these in $P=150x+175y$

$(0,0)$	$0+0$	$=0$
$(0,90)$	$0+175(90)$	$=15,750$
$(90,0)$	$150(90)+0$	$=13,500$
* $(60,45)$	$150(60)+175(45)$	$=16,875$ ← max profit

* So maximum profit of \$16,875 is achieved by making 60 standard boards and 45 long boards.