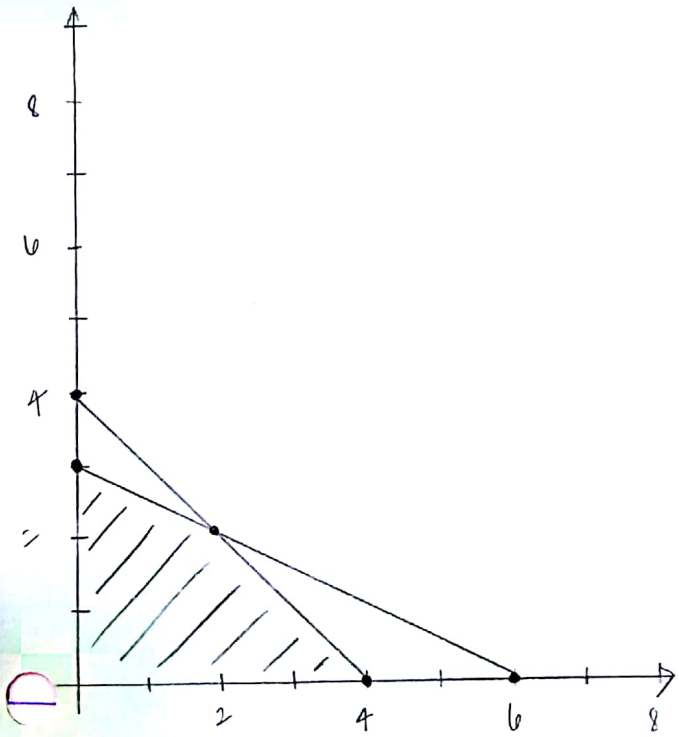
Lego Factory Linear Programming

The Lego factory manufactures only tables and chairs. The profit on one chair is $15 and on one table is $20. Each chair requires 1 large piece of stock and 2 small pieces of stock. Each table requires 2 large pieces of stock and 2 small pieces of stock. Suppose you only have 6 large and 8 small pieces of stock. How many chairs and tables should be built in order to maximize profit?

x = chair
y = table

$15x + 20y$ **MAX**

$x + 2y \leq 6$ (0, 3) (6, 0)
$2x + 2y \leq 8$ (0, 4) (4, 0)



$-x - 2y = -6$
$2x + 2y = 8$
$x = 2$

$2 + 2y = 6$
$2y = 4$
$y = 2$

(2, 2)

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

$15(0) + 20(3) = 60$
$15(2) + 20(2) = 70$
$15(4) + 20(0) = 60$

SHOULD MAKE 2 CHAIRS AND 2 TABLES.

Crops Linear Programming

You have 100 acres of land to grow lettuce and peas. You want to decide how many acres of each crop to plant to maximize profit.

Lettuce: Investment per acre is $120; Income per acre is $150 $ 30

Peas: Investment per acre is $200; Income per acre is $260 $ 60

Maximum amount you can invest is $15,000. How many acres of each crop should you plant to maximize profit?

X = lettuce
Y = peas

$30X + 60Y$ MAX

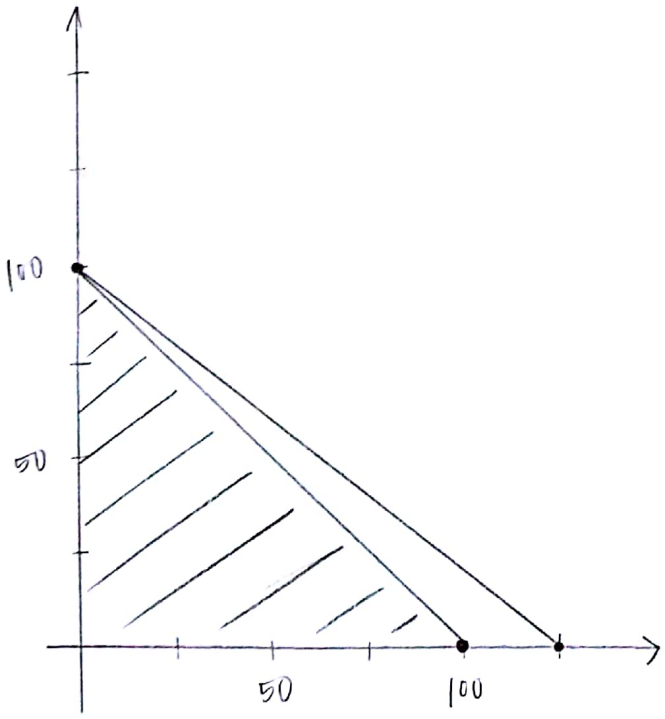
$X + Y \leq 100$ (0, 100) (100, 0)

$120X + 200Y \leq 15000$ (0, 100) (125, 0)

(0, 100) & (100, 0)

$30(0) + 60(100) = 6000$
$30(100) + 60(0) = 3000$

SHOULD PLANT 100 ACRES OF PEAS & 0 ACRES OF LETTUCE



Rawlings Linear Programming

Rawlings makes baseballs and softballs. For each baseball profits $2.00 and each softball profits $2.50. They are limited to 1500 hours of machine time and 2000 hours of manual labor time. The table below outlines the following times to make their product. How many baseball and softballs should they produce to maximize the profit?

	Baseballs	Softballs	
Machine Time	1.5	0.5	1500
Manual Time	1	2	2000

X = baseballs
Y = softballs

$2X + 2.5Y$ MAX

$1.5X + 0.5Y \leq 1500$ (0, 3000) (1000, 0)

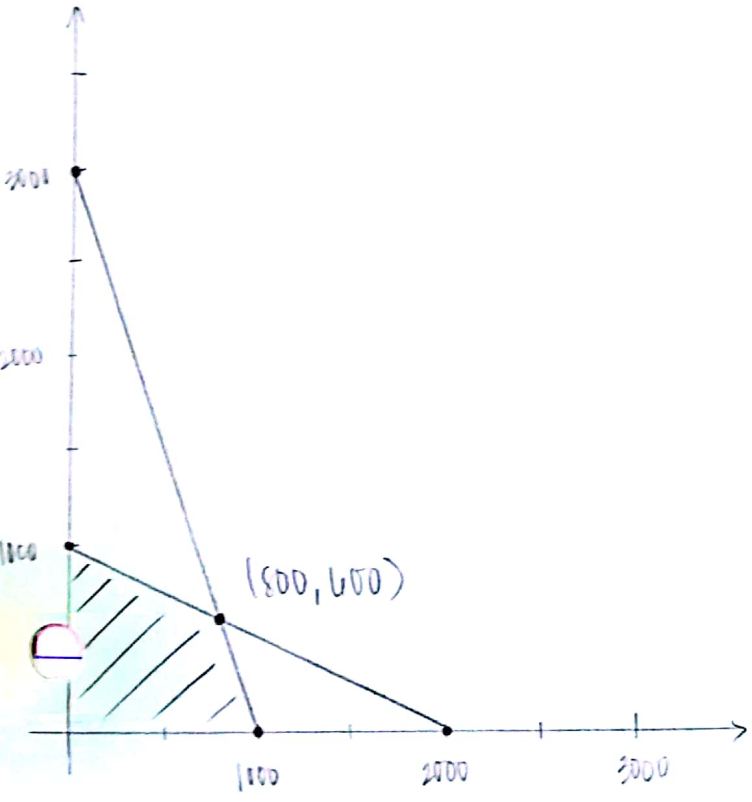
$X + 2Y \leq 2000$ (0, 1000) (2000, 0)

$-6X - 2Y = -6000$
$X + 2Y = 2000$
$-5X = -4000$
$X = 800$

$800 + 2Y = 2000$
$2Y = 1200$
$Y = 600$

(0, 1000), (800, 600), (1000, 0)

$2(0) + 2.5(1000) = 2500$
$2(800) + 2.5(600) = 3100$
$2(1000) + 2.5(0) = 2000$



SHOULD PRODUCE 800 BASEBALLS AND 600 SOFTBALLS

Computers Linear Programming

You are a manager of a store that sells home computers. You are getting ready to order next month's stock and are trying to decide how many of each of two models of monitors to order in order to obtain a maximum profit.

Model A: Your cost is $250; your profit over cost is $45
Model B: Your cost is $400; your profit over cost is $50

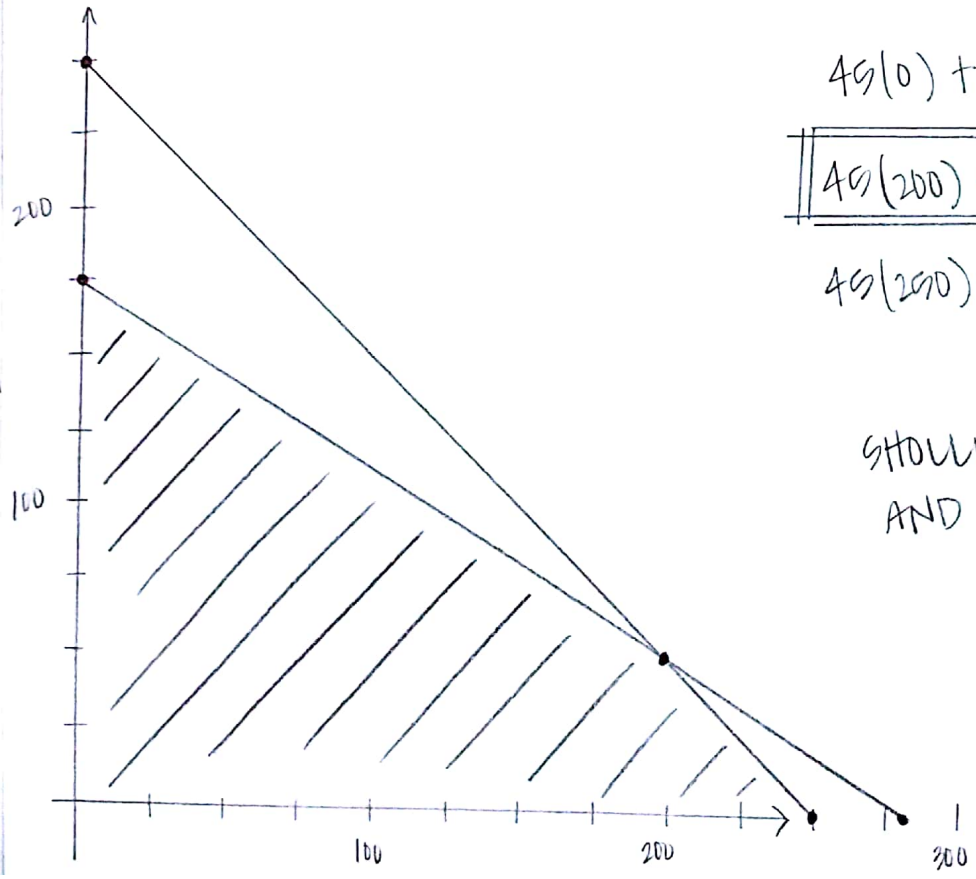
Your combined sales of Model A and B will not exceed 250 units. You do not want to order more than $70,000 worth of the two models. How many of each model should you order to maximize proft?

X = model A
Y = model B

$45X + 60Y$ MAX

$X + Y \leq 250$ (0, 250) (250, 0)

$250X + 400Y \leq 70{,}000$ (0, 175) (280, 0)



$-250X - 250Y = -62{,}500$
$250X + 400Y = 70{,}000$

$150Y = 7500$

$Y = 50$

$X + 50 = 250$

$X = 200$

(0, 175), (200, 50), (250, 0)

$45(0) + 60(175) = 10{,}500$

$45(200) + 60(50) = 12{,}000$

$45(250) + 60(0) = 11{,}250$

SHOULD ORDER 200 MODEL A AND 50 MODEL B

...t month's stock an...
...in a maximum profit.

Candy Factory Linear Programming

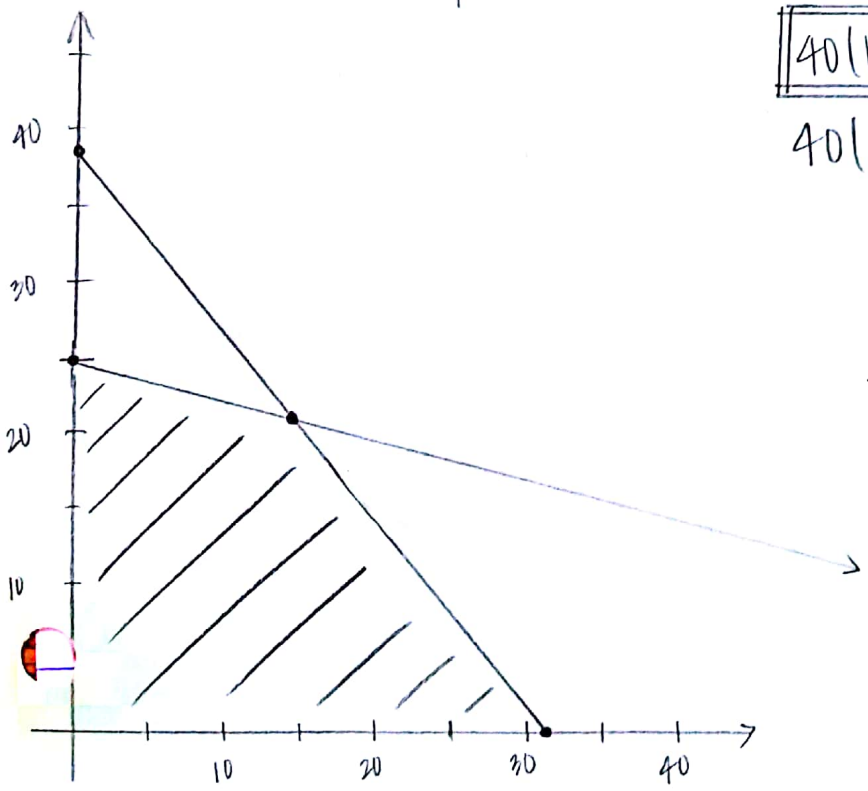
Your candy factory is making chocolate – covered peanuts and chocolate – covered pretzels. For each case of peanuts, you make a $40 profit. For each case of pretzels, you make a $55 profit. The table below shows the number of machine hours and man – hours needed to produce one case of each type of candy. It also shows the maximum number of hours available. How many cases of each should you produce to maximize profit?

Production Hours	Peanuts	Pretzels	Maximum Hours
Machine Hours	2	6	150
Man Hours	5	4	155

X = PEANUTS
Y = PRETZELS

$40X + 55Y$ MAX

$2X + 6Y \leq 150$ (0, 25) (75, 0)
$5X + 4Y \leq 155$ (0, 38.75) (31, 0)



$-10X - 30Y = -150$
$10X + 8Y = 310$

$-22Y = -440$
$Y = 20$

$2X + 6(20) = 150$
$2X + 120 = 150$
$2X = 30$
$X = 15$

(0, 25), (15, 20), (31, 0)

$40(0) + 55(25) = 1375$
$40(15) + 55(20) = 1700$
$40(31) + 55(0) = 1240$

SHOULD PRODUCE 15 CASES OF PEANUTS AND 20 CASES OF PRETZELS

Cabinets Linear Programming

You company produces cabinets using two different processes. The number of assembly hours requires for each process are listed below. You can use up to 3000 hours of machine time, up to 3600 hours of skilled labor, and up to 3600 hours of unskilled labor. The profit from Process A is $50 per cabinet and the profit from Process B is $70 per cabinet. How many cabinets should you make with each process to obtain the maximum profit? (Hint: draw your graph big ... some of it can be hard to see otherwise!)

	Assembly Hours	
	Process A	Process B
Unskilled Labor	3	1
Machine Time	1	2
Skilled Labor	2	2

X = PROCESS A
Y = PROCESS B

50X + 70Y MAX

$3X + Y \leq 3600$ (0, 3600) (1200, 0)
$X + 2Y \leq 3000$ (0, 1500) (3000, 0)
$2X + 2Y \leq 3600$ (0, 1800) (1500, 0)

on paper

$-2X - 4Y = -6000$
$2X + 2Y = 3600$
$-2Y = -2400$
$Y = 1200$

$X + 2(1200) = 3000$
$X + 2400 = 3000$
$X = 600$

$-6X - 2Y = -7200$
$2X + 2Y = 3600$
$-4X = -3600$
$X = 900$

$3(900) + Y = 3600$
$2700 + Y = 3600$
$Y = 900$

(0, 1500), (600, 1200), (900, 900), (1200, 0)

$50(0) + 70(1500) = 105,000$
$50(600) + 70(1200) = 114,000$
$50(900) + 70(900) = 108,000$
$50(1200) + 70(0) = 60,000$

SHOULD MAKE 600 USING PROCESS A AND 1200 USING PROCESS B

rs requires for
f skilled labor,