

Linear Programming

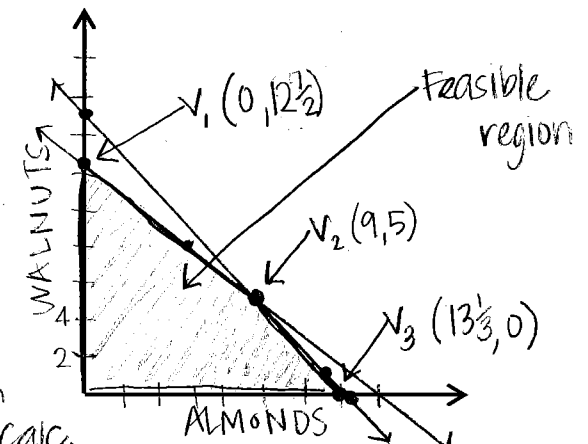
1. Almonds are packaged 20 bags per case and walnuts are packaged 24 bags per case. A grocer wants no more than 300 bags of almonds and walnuts together. He pays \$30 per case of almonds and \$26 per case of walnuts, and can spend \$400 maximum. He makes a profit of \$17 per case of almonds and \$15 per case of walnuts. How many cases of almonds and walnuts will maximize the grocer's profits?

$$20a + 24w \leq 300$$

$$30a + 26w \leq 400$$

$$w = \frac{-20a + 300}{24} = \frac{-5a + 75}{6}$$

$$w = \frac{-30a + 400}{26} = \frac{-15a + 200}{13}$$



$P(a, w) = 17a + 15w$ TABLE ON CALC. → graph on calc.

DO FIRST

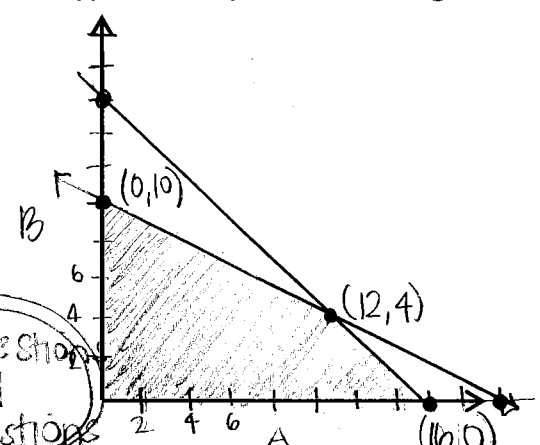
2. You are taking a test in which items of type A are worth 10 points and items of type B are worth 15 points. It takes 3 minutes for type A items and 6 minutes for type B items. The total test time is 60 minutes, and you are not allowed to answer more than 16 questions. Assuming all answers are correct, how many items of each type should you answer to get the best score?

$$A + B \leq 16$$

$$3A + 6B \leq 60$$

$$B = -A + 16$$

$$B = -\frac{1}{2}A + 10$$



(A, B)	3(A, B) = 10A + 15B	Score
(0, 10)	10(0) + 15(10)	150
(16, 0)	10(16) + 15(0)	160
(12, 4)	10(12) + 15(4)	180

12 A questions and 4 B questions

3. A college snack bar cooks and sells hamburgers and hot dogs during the lunch hour. To stay in business it must sell at least 10 hamburgers, but it cannot cook more than 40. It must also sell at least 30 hot dogs, but it cannot cook more than 70. It cannot cook more than 90 hamburgers and hot dogs altogether. If the profit on a hamburger is \$0.33 and \$0.21 on a hot dog, how much of each must they sell to make the maximum profit?

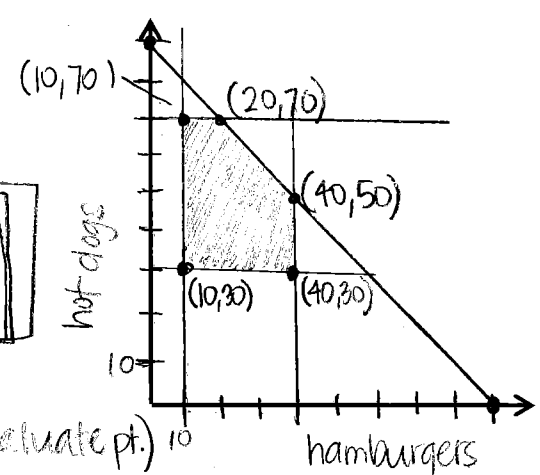
$$h + d \leq 90 \rightarrow d = -h + 90$$

$$10 \leq h \leq 40$$

$$30 \leq d \leq 70$$

(h, d)	.33h + .21d	profit
(10, 70)	.33(10) + .21(70)	18
(10, 30)	.33(10) + .21(30)	9.60
(40, 30)	.33(40) + .21(30)	19.50
(40, 50)	.33(40) + .21(50)	23.70
(20, 70)	.33(20) + .21(70)	21.30

40 hamburgers & 50 hot dogs



→ (each group evaluate pt.)

GRAPH ONLY (?) → Maximize Monday

4. A company manufactures motorcycles and bicycles. To stay in business it must produce at least 10 motorcycles each month, but it does not have the facilities to produce more than 60 motorcycles. It also does not have facilities to produce more than 120 bicycles. The total production of motorcycles and bicycles cannot exceed 160. The profit on a motorcycle is \$134 and on a bicycle is \$20. Find the number of each that should be manufactured to maximize profit.

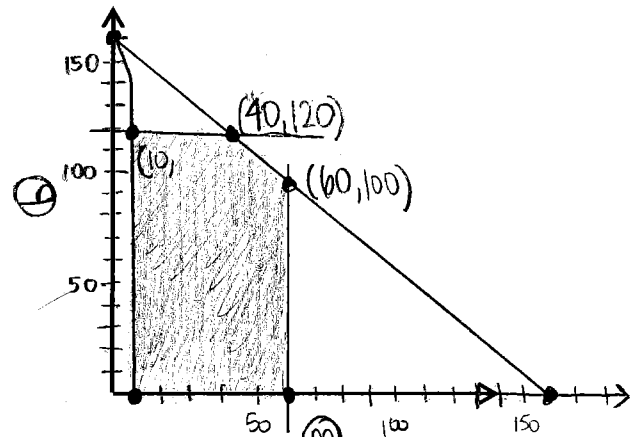
$$10 \leq m \leq 60$$

$$b \leq 120$$

$$m + b \leq 160$$

$$P(m,b) = 134m + 20b$$

(m,b)	$134m + 20b$	profit
(10,0)		
(60,0)		
(10,120)		
(40,120)		
(60,100)		



5. A woman is planning to invest up to \$40,000 in corporate or municipal bonds of both. The least she is allowed to invest in corporate bonds is \$6,000 and she does not want to invest more than \$22,000 in corporate bonds. She also does not want to invest more than \$30,000 in municipal bonds. The interest on corporate bonds is 8% and on municipal bonds is 7.5%. How much should she invest in each type of bond to maximize her income?

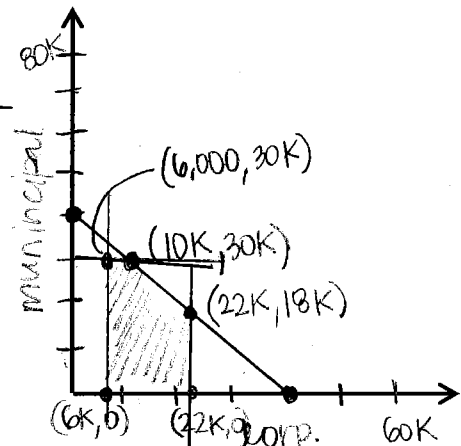
$$C + m \leq 40,000$$

$$6,000 \leq C \leq 22,000$$

$$m \leq 30,000$$

$$B(C,m) = .08C + .075m$$

(C,m)	$.08C + .075m$	B
(6K,0)		
(22K,0)		
(6K,30K)		
(10K,30K)		
(22K,18K)		



6. A farmer raises two crops, A and B. It takes one day to trim an acre of crop A and two days to trim an acre of crop B, and there are 240 days per year available for trimming. It takes 0.3 days to pick an acre of crop A and 0.1 day to pick an acre of crop B, and there are 30 days available for picking per year. Find the number of acres of each fruit that should be planted to maximize profit, assuming that the profit is \$140 per acre for crop A and \$235 per acre for crop B.

$$A + 2B \leq 240$$

$$0.3A + 0.1B \leq 30$$

$$P(A,B) = 140A + 235B$$

