

3.4 Linear Programming Application Problems

1. Fly-High Airlines sells business class and tourist class seats for its charter flights. To charter a plane at least 5 business class tickets must be sold and at least 9 tourist class tickets must be sold. The plane does not hold more than 30 passengers. Fly-High makes \$40 profit for each business class ticket sold and \$45 profit for each tourist class ticket sold. In order for Fly-High Airlines to maximize its profits, how many tourist class seats should they sell?
[A] 30 [B] 25 [C] 23 [D] 21
2. The Plexus Dance Theatre Company will appear at the University of Georgia. According to school policy, no more than 2000 general admission tickets can be sold and no more than 4000 student tickets can be sold. It costs \$0.50 per ticket to advertise the dance company to the students and \$1 per ticket to advertise to the general public. The dance company has an advertising budget of \$3000 for this show. Find the maximum profit the company can make if it charges \$4 for a student ticket and \$7 for a general admission ticket. How many student tickets should they sell?
[A] 2000 [B] 1000 [C] 3750 [D] 4000
3. Funtime Airways flies from Palau to Nauru weekly if at least 12 first class tickets and at least 16 tourist class tickets are sold. The plane can not carry more than 50 passengers. Funtime Airways makes \$26 profit for each tourist class seat sold and \$24 profit for each first class seat sold. In order for Funtime Airways to maximize its profits, how many of each type of seat should they sell? What is the maximum profit?
4. Reynaldo Electronica manufactures radios and tape players. The manufacturing plant has the capacity to manufacture at most 600 radios and 500 tape players. It costs the company \$10 to make a radio and \$12 to make a tape player. The company can spend \$8400 to make these products. Reynaldo Electronica makes a profit of \$19 on each radio and \$12 on each tape player. To maximize profits, how many of each product should they manufacture?
5. Marcus is creating a low-fat pie crust recipe for his pie shop. Butter has six grams of saturated fat and one gram of polyunsaturated fat per tablespoon. Vegetable shortening has one gram of saturated fat and four grams of polyunsaturated fat per tablespoon. In the recipe, the butter and vegetable shortening will not be more than 25 tablespoons. The butter and vegetable shortening combine for at least 34 grams of saturated fat and at least 44 grams of polyunsaturated fat. Minimize the number of calories in the recipe if butter has 100 calories per tablespoon and vegetable shortening has 115 calories per tablespoon.

① B = Business Class
T = Tourist Class

$$B \geq 5 \quad B \geq 0 \quad P(B, T) = 40B + 45T$$

$$T \geq 9 \quad T \geq 0$$

$$B + T \leq 30$$

$$(0, 0) = \$0$$

$$(21, 9) = \$1245$$

$$(5, 25) = \$1325$$

25 tourist
tickets

② $G = \text{General}$ $S = \text{Student}$

$$G \geq 0$$

$$G \leq 2000$$

$$S \geq 0$$

$$S \leq 4000$$

$$.5S + 1G \leq 3000 \rightarrow G \leq 3000 - \frac{1}{2}S$$

$$P(G, S) = 4S + 7G$$

$$(2000, 0) = \$8000$$

$$(0, 0) = \$0$$

$$(0, 3000) = \$21,000$$

$$(2000, 2000) = \$22,000$$

↑
2000 Student tickets

③

F = First Class

T = Tourist Class

$$F \geq 12$$

$$T \geq 16$$

$$F \leq 38$$

$$T \leq 34$$

$$F + T \leq 50$$

$$P(F, T) = 24F + 26T$$

$$(16, 34) = 24(16) + 26(34) = \$1268$$

$$(12, 34) = 24(12) + 26(34) = \$1172$$

$$(12, 16) = 24(12) + 26(16) = \$704$$

$$\rightarrow (34, 16) = 24(34) + 26(16) = \$1280$$

Max. profit is \$1280 if they

sell 34 1st Class and 16 Tourist class tickets

④

$R = \text{Radio}$

$T = \text{Tape}$

$$R \geq 0$$

$$T \geq 0$$

$$R \leq 600$$

$$T \leq 500$$

$$10R + 12T \leq 8400 \rightarrow T \leq -\frac{5}{6}R + 700$$

$$P(R, T) = 19R + 12T$$

$$(0, 500) = 19(0) + 12(500) = \$6000$$

$$(240, 500) = 19(240) + 12(500) = \$10,560$$

$$(0, 0) = \$0$$

$$(600, 0) = 19(600) + 12(0) = \$11,400$$

$$\rightarrow (600, 200) = 19(600) + 12(200) = \$1380$$

Sell 600 Radios and 200 Tapes
for a profit of \$1380.

⑤ B = Butter

v = Veg. Shortening

	S. Fat	P.v. Fat
B	6	1
v	1	4
	<u>34</u>	<u>44</u>

$$6B + 1v = 34 \quad | \quad 1B + 4v = 44$$

$$B \geq 0 \quad v \geq 0 \quad B + S \leq 25$$

$$P(B, v) = 100B + 15v$$

$$(0, 0) = 0$$

$$(0, 11) = 1265$$

$$\rightarrow (4, 10) = 1550$$

$$(5.67, 0) = 567$$

The zeros
Do not count as
the crust is a
mixture