

A2T Notes on Linear Programming Word Problems

1. Using linear programming, find the values of  $x$  and  $y$  that:

a. maximize and find the maximum.

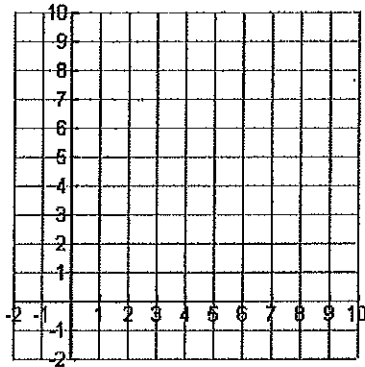
b. minimizes and find the minimum

$$x \geq 2$$

$$y \geq x$$

$$y \leq 8$$

$$F = 15x + 25y$$



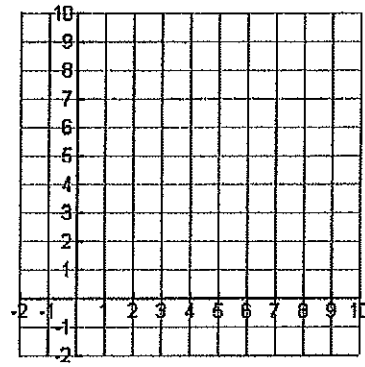
$$x \geq 1$$

$$y \geq 2$$

$$x + y \leq 10$$

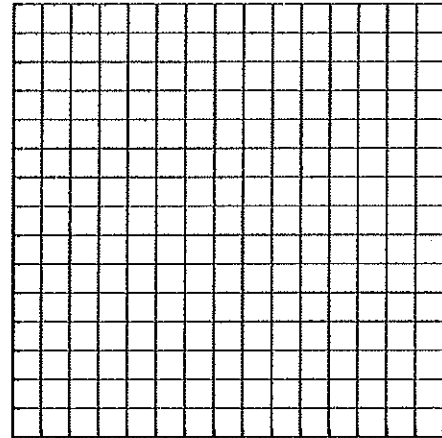
$$-x + y \leq 6$$

$$D = 6x + 5y$$

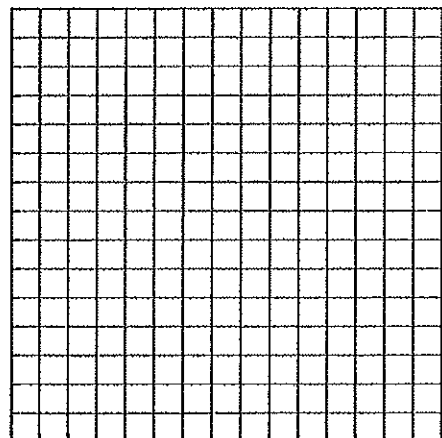


Use linear programming to solve each problem.

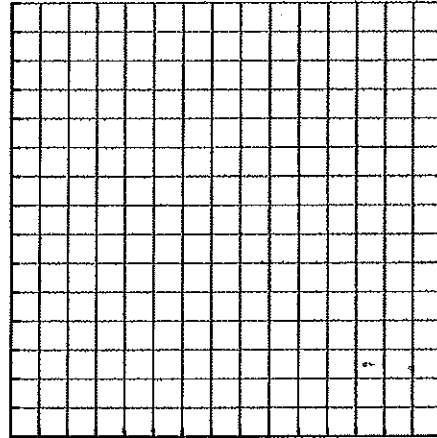
2. Alli is making bread to sell at a holiday fair. A loaf of oatmeal bread takes 2 cups of flour and 2 eggs. A loaf of banana bread takes 3 cups of flour and 1 egg. Alli has 12 cups of flour and 8 eggs. Alli will make \$1.50 profit for each loaf of oatmeal bread and \$2 profit for each loaf of banana bread. Use linear programming to find how many loaves of each type Alli should make to maximize profit.



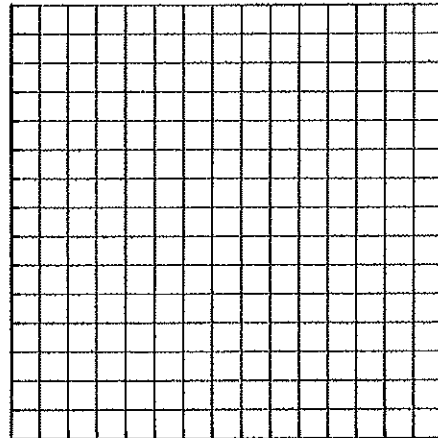
3. The manager of a travel agency is printing **brochures** and **fliers** to advertise special discounts on vacation spots during the summer months. Each brochure costs \$0.08 to print, and each flier costs \$0.04 to print. A brochure requires 3 pages, and a flier requires 2 pages. The manager does not want to use more than 600 pages, and she needs at least 50 brochures and 150 fliers. How many of each should she print to minimize the cost?



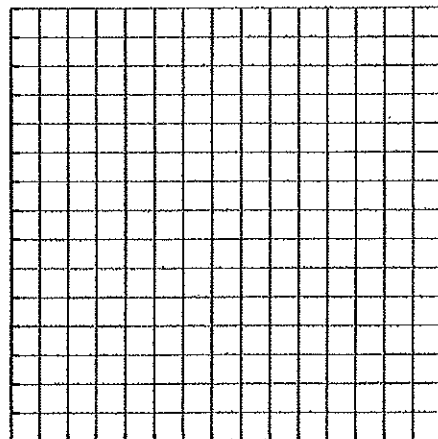
4. A recycling plant processes used plastic into food and drink containers. The plant processes up to 1200 tons of plastic per week. At least 300 tons must be processed for food containers, while at least 450 tons must be processed for drink containers. The profit is \$17.50 per ton for processing food containers and \$20 per ton for processing drink containers. What is the profit if the plant maximizes processing?



5. Huntington is in charge of decorating the school gym for graduation. He will need to buy gold and blue rolls of crepe paper. Blue crepe paper costs \$5 per roll and gold crepe paper costs \$3 per roll. He will need at least 12 rolls of crepe paper. He wants no more than 6 rolls of blue and no more than 7 rolls of gold. How many rolls of each color should he buy to minimize the cost? What is the minimum cost? Use linear programming.



6. You are designing a concert hall that will seat no more than 1200 people. You want at least 400 seats that will cost \$15 per ticket X. You want no more than 700 seats that will cost \$25 per ticket Y. How many of each type of seat should you include to maximize the income from ticket sales? What is the maximum income?

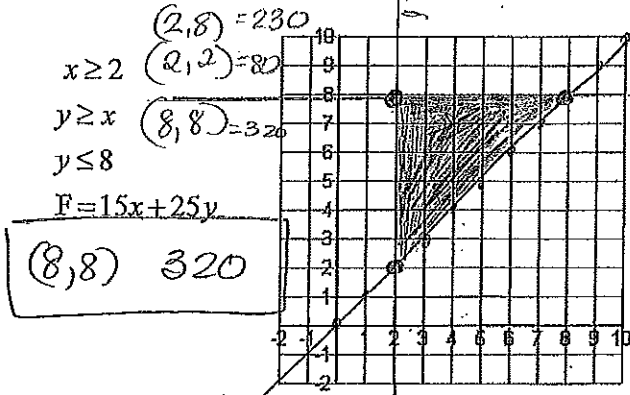


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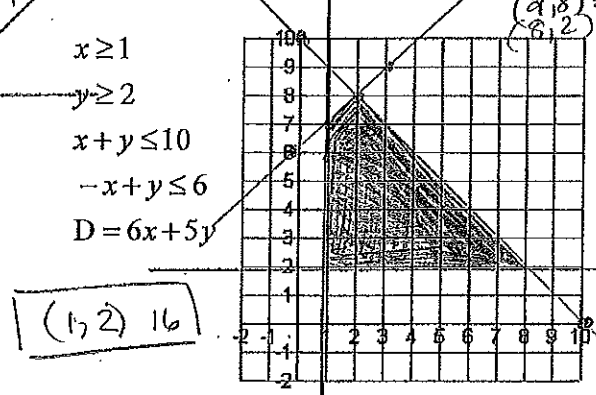
Key

1. Using linear programming, find the values of  $x$  and  $y$  that:

a. maximize and find the maximum.



b. minimize and find the minimum



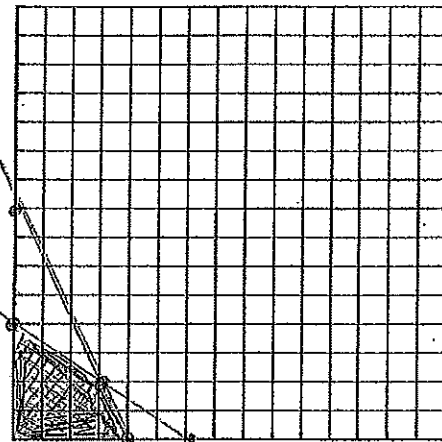
$(1, 2) = 6 + 10 = 16$   
 $(1, 7) = 6 + 35 = 41$   
 $(8, 8) = 48 + 20 = 68$   
 $(6, 2) = 36 + 10 = 46$

Use linear programming to solve each problem.

2. Alli is making bread to sell at a holiday fair. A loaf of oatmeal bread takes 2 cups of flour and 2 eggs. A loaf of banana bread takes 3 cups of flour and 1 egg. Alli has 12 cups of flour and 8 eggs. Alli will make \$1.50 profit for each loaf of oatmeal bread and \$2 profit for each loaf of banana bread. Use linear programming to find how many loaves of each type Alli should make to maximize profit.

	x Oatmeal	y Banana	Total
Flour	2 cups	3 cups	$\leq 12$
Eggs	2	1	$\leq 8$
Profit	$1.50x$	$+ 2.00y$	

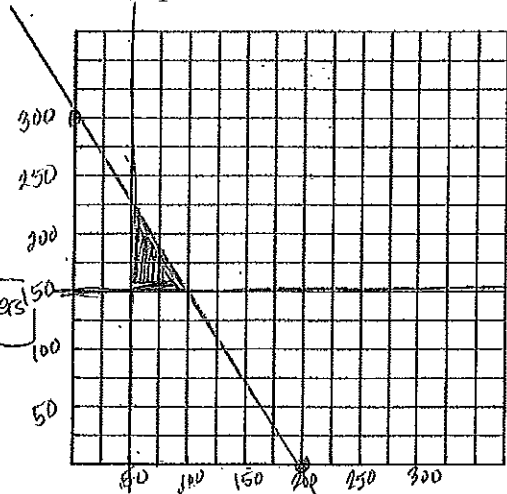
$\begin{cases} 2x + 3y \leq 12 \\ 2x + y \leq 8 \end{cases}$   
 $3 \text{ oatmeal}, 2 \text{ bb}$   
 $(3, 2)$   
 $(4, 0)$   
 $(0, 4)$   
 $1.50(3) + 2(2) = 4.50 + 4 = 8.50$



3. The manager of a travel agency is printing brochures and fliers to advertise special discounts on vacation spots during the summer months. Each brochure costs \$0.08 to print, and each flier costs \$0.04 to print. A brochure requires 3 pages, and a flier requires 2 pages. The manager does not want to use more than 600 pages, and she needs at least 50 brochures and 150 fliers. How many of each should she print to minimize the cost?

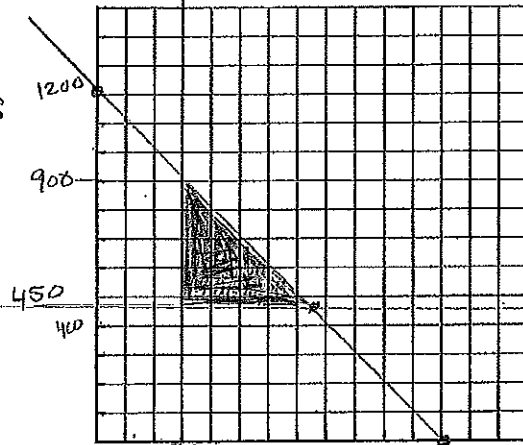
	x Brochure	y Flier	Total
Cost	$.08x$	$+ .04y$	
Pages	$3x$	$+ 2y$	$\leq 600$
	$x \geq 50$	$y \geq 150$	

$(50, 150) = 10$   
 $(100, 150) = 14$   
 $(50, 225) = 13$   
 $50 \text{ brochures} \& 150 \text{ fliers}$



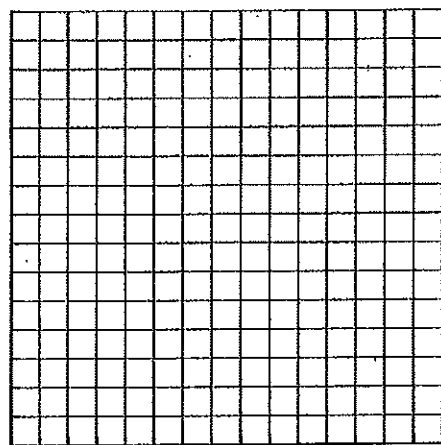
4. A recycling plant processes used plastic into food and drink containers. The plant processes up to 1200 tons of plastic per week. At least 300 tons must be processed for food containers, while at least 450 tons must be processed for drink containers. The profit is \$17.50 per ton for processing food containers and \$20 per ton for processing drink containers. What is the profit if the plant maximizes processing?

	Food	Drink	Total
	$x$	$y$	$\leq 1200$ tons
	$x \geq 300$ tons	$y \geq 450$ tons	
Profit	$17.50x + 20y$		
	$(300, 450) = 14,250$		
	$(300, 900) = 23,250$		<b>\$23,250</b>
	$(750, 450) = 22,125$		



5. Huntington is in charge of decorating the school gym for graduation. He will need to buy gold and blue rolls of crepe paper. Blue crepe paper costs \$5 per roll and gold crepe paper costs \$3 per roll. He will need at least 12 rolls of crepe paper. He wants no more than 6 rolls of blue and no more than 7 rolls of gold. How many rolls of each color should he buy to minimize the cost? What is the minimum cost? Use linear programming.

Omit



6. You are designing a concert hall that will seat no more than 1200 people. You want at least 400 seats that will cost \$15 per ticket X. You want no more than 700 seats that will cost \$25 per ticket Y. How many of each type of seat should you include to maximize the income from ticket sales? What is the maximum income?

	Ticket X	Ticket Y
$(400, 700) = 23500$	$x$	$y \leq 1200$
$(500, 700) = 25000$	$15x + 25y$	
$(100, 0)$	$x \geq 400$	$y \leq 700$
$(1200, 0)$		

500 ticket X  
and 700 ticket Y  
\$ 25,000

