Name _____ Date _____ Class _____

LESSON 3-4

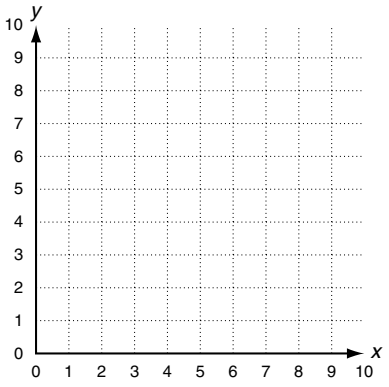
Practice B

Linear Programming

Maximize or minimize each objective function.

1. Maximize $P = 5x + 2y$

for the constraints $\begin{cases} y \geq 0 \\ x \geq 0 \\ y \leq -x + 10 \\ y \leq 2x + 1 \end{cases}$



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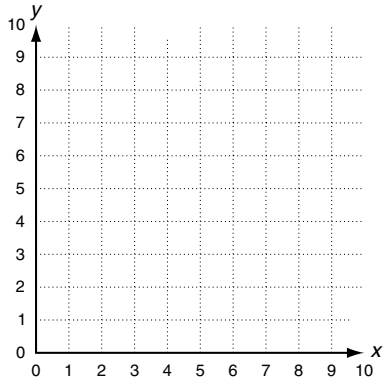
2. Minimize $P = 4x + 6y$

for the constraints $\begin{cases} 0 \leq x \leq 4 \\ y \geq 1 \\ y \geq -x + 4 \end{cases}$



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Solve.

3. A grocer buys cases of almonds and walnuts. Almonds are packaged 20 bags per case. The grocer pays $30 per case of almonds and makes a profit of $17 per case. Walnuts are packaged 24 bags per case. The grocer pays $26 per case of walnuts and makes a profit of $15 per case. He orders no more than 300 bags of almonds and walnuts together at a maximum cost of $400.

a. Write the constraints. Use x for the number of cases of almonds ordered and y for the number of cases of walnuts ordered.

b. Graph the constraints.

c. Write the objective function for the profit.

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d. How many cases of almonds and walnuts maximize the grocer's profit?

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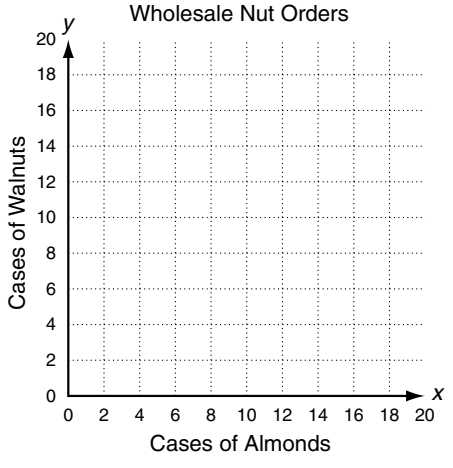


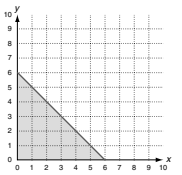
LESSON 3-4

Practice A

Linear Programming

Maximize or minimize each objective function.

1. Maximize $P = 2x + y$ for the constraints $\begin{cases} x \geq 0 \\ y \geq 0 \\ x + y \leq 6 \end{cases}$



a. Graph the constraints.

b. Write the vertices of the feasible region.

(0, 6), (6, 0), (0, 0)

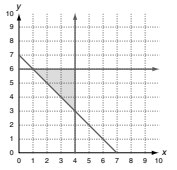
c. Use the table to evaluate P for the x- and y-values at each vertex.

x	y	$P = 2x + y$
0	0	0
0	6	6
6	0	12

d. Compare the values for P. Write the coordinate pair that gives the maximum value.

(6, 0)

2. Minimize $P = 4x + 3y$ for the constraints $\begin{cases} x \leq 4 \\ y \leq 6 \\ x + y \geq 7 \end{cases}$



(1, 6)

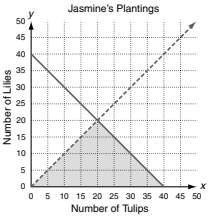
Solve.

3. Jasmine is planting a maximum of 40 bulbs of lilies and tulips in her backyard. She wants more tulips, x, than lilies, y.

a. Write a system of inequalities.

$$\begin{cases} x \geq 0 \\ y \geq 0 \\ x + y \leq 40 \\ y < x \end{cases}$$

b. Graph the system.



c. What is the maximum number of lily bulbs Jasmine could plant?

19

d. What is the minimum number of tulip bulbs Jasmine could plant?

1

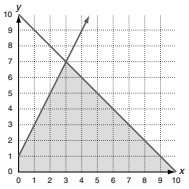
LESSON 3-4

Practice B

Linear Programming

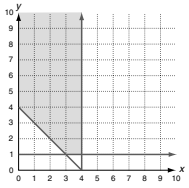
Maximize or minimize each objective function.

1. Maximize $P = 5x + 2y$ for the constraints $\begin{cases} y \geq 0 \\ x \geq 0 \\ y \leq -x + 10 \\ y \leq 2x + 1 \end{cases}$



(10, 0)

2. Minimize $P = 4x + 6y$ for the constraints $\begin{cases} 0 \leq x \leq 4 \\ y \geq 1 \\ y \geq -x + 4 \end{cases}$



(3, 1)

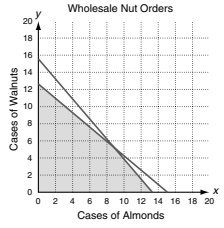
Solve.

3. A grocer buys cases of almonds and walnuts. Almonds are packaged 20 bags per case. The grocer pays \$30 per case of almonds and makes a profit of \$17 per case. Walnuts are packaged 24 bags per case. The grocer pays \$26 per case of walnuts and makes a profit of \$15 per case. He orders no more than 300 bags of almonds and walnuts together at a maximum cost of \$400.

a. Write the constraints. Use x for the number of cases of almonds ordered and y for the number of cases of walnuts ordered.

$$\begin{cases} x \geq 0 \\ y \geq 0 \\ 20x + 24y \leq 300 \\ 30x + 26y \leq 400 \end{cases}$$

b. Graph the constraints.



c. Write the objective function for the profit.

$P = 17x + 15y$

d. How many cases of almonds and walnuts maximize the grocer's profit?

9 cases of almonds, 5 cases of walnuts

LESSON 3-4

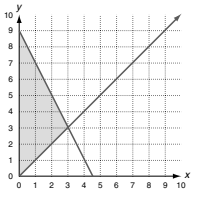
Practice C

Linear Programming

Solve.

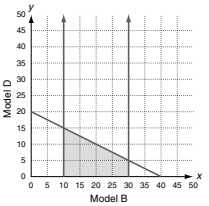
1. Maximize $P = 4.5x + 2.5y$ for the constraints $\begin{cases} y \geq 0 \\ x \geq 0 \\ y \geq x \\ y \leq -2x + 9 \end{cases}$

(0, 9)



2. Rita is production manager at a company that is manufacturing a new athletic training machine. There are 4 models. Models B and D are needed for the next shipment. Between 10 and 30 of model B are needed. Rita can use no more than 100 hours of production time and she wants to maximize the profit. Use the table to determine how many of each machine Rita should produce for the next shipment.

Athletic Trainer		
Model	**Production Time (h)**	**Profit per Item**
A	6.5	\$125
B	2.5	\$80
C	4.25	\$90
D	5.0	\$100



30 of Model B and 5 of Model D

3. A department store is planning to hire up to 24 temporary employees for a tent sale. Experienced workers will be paid \$20 per hour and inexperienced workers \$15 per hour. The company can pay up to \$400 per hour for the temporary employees. An experienced worker produces 1.5 times the profit that an inexperienced worker produces. How many of each type of worker should be hired?

20 experienced, 0 inexperienced

LESSON 3-4

Reteach

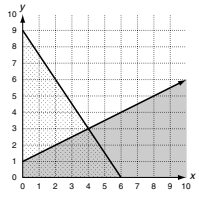
Linear Programming

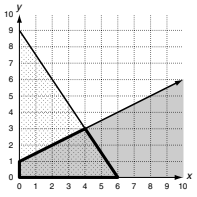
Linear programming is used to maximize or minimize a function based on conditions that have to be met. These conditions are called **constraints**. The constraints are a system of inequalities. The graph of their solution is the **feasible region**.

To graph the feasible region, graph the system of inequalities.

$$\begin{cases} x \geq 0 \\ y \geq 0 \\ y \leq 0.5x + 1 \\ y \leq -1.5x + 9 \end{cases}$$

When $x \geq 0$ and $y \geq 0$, the graph lies in the first quadrant, so the x- and y-values must be positive.





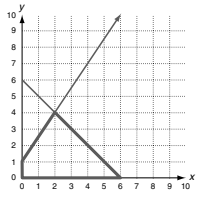
Check a point in the feasible region. Try $(2, 1)$.

$x \geq 0$	$y \geq 0$	$y \leq 0.5x + 1$	$y \leq -1.5x + 9$
$2 \geq 0$ ✓	$1 \geq 0$ ✓	$1 \stackrel{?}{\leq} 0.5(2) + 1$	$1 \stackrel{?}{\leq} -1.5(2) + 9$
		$1 \leq 2$ ✓	$1 \leq 6$ ✓

Since all of the inequalities are true, the constraints are satisfied.

Graph each feasible region.

1. $\begin{cases} x \geq 0 \\ y \geq 0 \\ y \leq 1.5x + 1 \\ y \leq -x + 6 \end{cases}$



2. $\begin{cases} x \geq 0 \\ y \geq 0 \\ y \geq 2x + 1 \\ y \leq -2x + 9 \end{cases}$