

Multiple Choice [10 Marks]

Circle the letter corresponding to the correct solution.

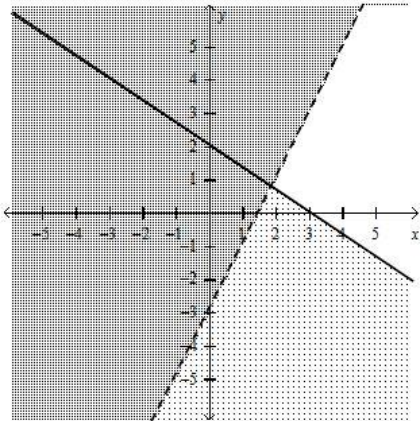
1. For which inequality is $(-50, -50)$ a possible solution?

- A) $y - 2x \geq 10$ B) $y \leq -9 + 2x$ C) $y > 9$ D) $y < x - 2$

2. What is the boundary line for the linear inequality $4x + 2y < 18$?

- A) $y = -4x + 36$ B) $y = -2x + 18$ C) $x = -2y + 18$ D) $y = -2x + 9$

3. What system of linear inequalities is shown here?



- A) $2x + 3y < 6$
 $y > 2x - 3$
- B) $2x + 3y \leq 6$
 $y > 2x - 3$
- C) $2x + 3y \leq 6$
 $y \geq 2x - 3$
- D) $2x + 3y < 6$
 $y \geq 2x - 3$

4. Which location best describes where would you find the optimal solutions to an objective function?

- A) within the feasible region B) along a boundary line
 C) outside the feasible region D) at or near the points of intersection

5. Describe the boundary lines for the following system of linear inequalities: $\{y - 3x < 12, x + y \geq 0, x \in \mathbb{R}, y \in \mathbb{R}\}$

- A) Solid line along $y = 3x + 12$; dashed line along $y = -x$ B) Solid line along $y = 3x + 12$; solid line along $y = -x$
 C) Dashed line along $y = 3x + 12$; solid line along $y = -x$ D) Dashed line along $y = 3x + 12$; dashed line along $y = -x$

6. A football stadium has 60 000 seats.

- 70% of the seats are in the lower deck.
- 30% of the seats are in the upper deck.
- At least 40 000 tickets are sold per game.
- A lower deck ticket costs \$100, and an upper deck ticket costs \$60.

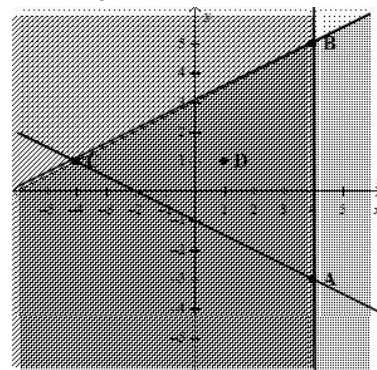
Let x represent the number of lower deck tickets. Let y represent the number of upper deck tickets.

How would you write the objective function for revenue, R ?

- A) $R = 100x + 60y$ B) $R = 30x + 70y$ C) $R = 60x + 100y$ D) $R = 70x + 30y$

7. Which point in the model below would result in the **maximum** value of the objective function $H = x - y$?

- A) $(4, -3)$
 B) $(4, 5)$
 C) $(-4, 1)$
 D) $(1, 1)$



Use the following to answer questions 8, 9 & 10

Noah volunteers to fold origami swans and frogs for a display in Mr. Hallihan's Math classroom.

- He has 8 squares of white paper for the swans and 12 squares of green paper for the frogs.
- It takes her 4 min to fold an origami swan and 3 min to fold an origami frog.
- There must be at least two frogs for every swan.

Let f represent the number of frogs. Let s represent the number of swans.

8. What are the restrictions on f and s ?

- A) $f \in \mathbb{R}, s \in \mathbb{R}$ B) $f \in \mathbb{W}, s \in \mathbb{W}$ C) $f \in \mathbb{I}, s \in \mathbb{I}$ D) No restrictions

9. Which of the following is a constraint for this situation?

- A) $2f \leq s$ B) $2f \geq s$ C) $f \leq 2s$ D) $f \geq 2s$

10. Which of the following is a constraint for this situation?

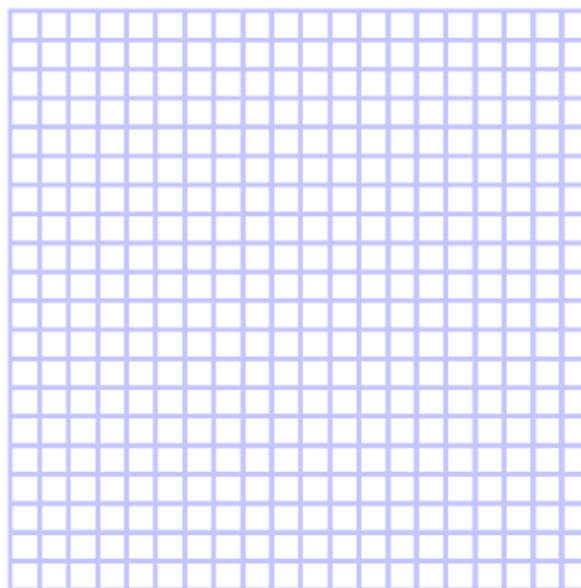
- A) $f \leq 8$ B) $f \geq 8$ C) $s \leq 8$ D) $s \geq 8$

Open Response [40 Marks]

Show ALL your work in the space provided. Be sure to scale and label your graphs when necessary!

ONLY SHADE/STIPPLE (write the word 'stipple' if the area is too big) THE FEASIBLE REGION IN YOUR GRAPHS.

1. a) Graph the following system of linear inequalities: $\{(x, y) | 4x - 8 \leq 0, x \in I, y \in I\}$ [8]
 $\{(x, y) | 6x + 3y - 18 > 0, x \in I, y \in I\}$



b) Answer each of the following...

i) State a possible solution \rightarrow _____

ii) Is the intersection point a solution? (circle): YES / NO

[2]

2. The following algebraic model represents an optimization problem...

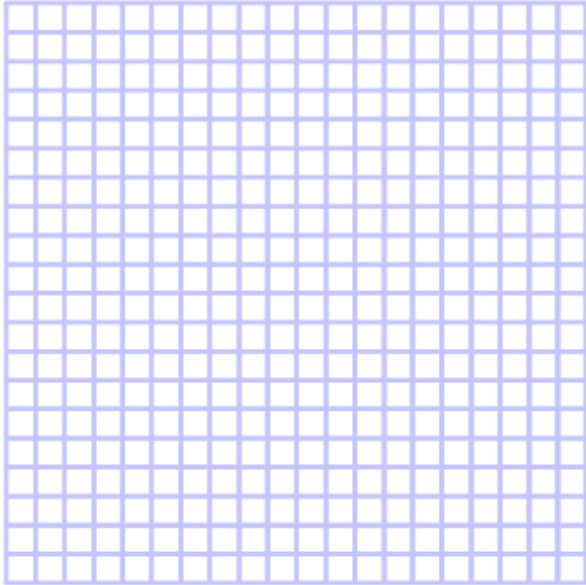
Restrictions: $x \in R; y \in R$

Constraints: $4x + 6y \geq -12$; $2y \geq x + 10$; $y \leq 4$

Objective Function: $M = 2x - 3y$

a) Create a graphical model to represent the problem.

[9]



b) What are **ALL** the vertices of the feasible region? [3]

c) Which point(s) would result in the **maximum** value of the objective function? What is the value? [2]

Point \rightarrow _____

Max Value \rightarrow _____

3. Anita Summoola has two summer jobs...one at Pita Pit and the other at Robin's Coffee.

- She works no more than a total of 50 h a week. Both jobs allow her to have flexible hours but in whole hours only.
- At the Pita Pit, Anita works no fewer than 25 hours and earns \$10.50/hr.
- At the Robin's Coffee, Anita works at most 20 hours and earns \$12.25/hr.

a) Define the variables and state any restrictions.

[2]

b) List the constraints and any other inequalities.

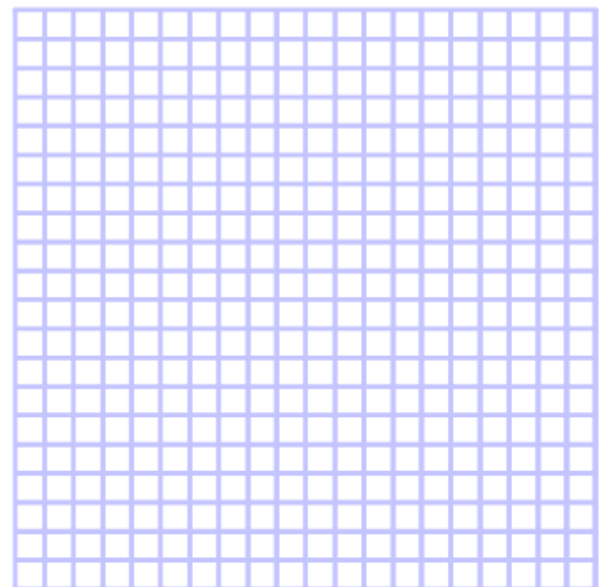
[3]

c) Create a graphical model to represent the problem.

[8]

d) State the objective function.

[1]



e) What combination of numbers of hours will allow Anita to maximize her earnings and what will be her earnings? [2]

(Show your work to justify your solution)

COMBINATION OF HOURS \rightarrow _____

MAX EARNINGS = \$ _____