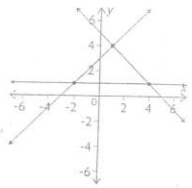
:tice

Foundations 11 Name ANSWER KEY

The graph of a system of linear inequalities is shown. The system represents the constraints of an algebraic model.



(6)

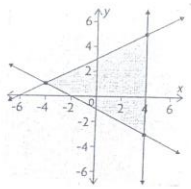
a) Determine the vertices of the feasible region.

b) What is the minimum solution for the system, if the objective function is $R = 2.5x + 3y$?

c) What is the maximum solution for the system and objective function?

(3)

Determine the vertices of the feasible region for the system of linear inequalities shown, where the objective function is $R = 2x - 2y$. What values do they represent?



The following model represents an optimization problem.
Determine the maximum solution.

(7)

(0,1)

Restrictions: $x \in W, y \in W$
Constraints: $y \leq 1, x \leq y + 2, x + 2y \leq 5$
Objective function: $T = y - 2x$

$-y \leq -x + 2$ $\quad 2y \leq -x + 5$

$y \geq x - 2$ $\quad y \leq -\frac{1}{2}x + \frac{5}{2}$

4. The following model represents an optimization problem.
Determine the maximum solution.

(7)

Restrictions: $x \in W, y \in W$ 6
Constraints: $x \geq 0, y \geq 0, 4x \geq y + 5, x + y \leq 4, y \leq 2$
Objective function: $A = x + 2y$

(2,2)

$4x \geq y + 5$ $\quad x + y \leq 4$

$-y \geq -4x + 5$ $\quad y \leq -x + 4$

$y \leq 4x - 5$

5. Yanni collects stamps and baseball cards. use graph paper (12)

- He has at most 100 stamps and at most 75 cards, but at least one of each.
- There were no more than 150 items, in total.
- Each stamp cost him 10¢, and each card cost him 50¢.

a) Create an algebraic model to represent the situation.

S → stamps $\quad S \in N$ $\quad S \leq 100$ $\quad S + C \leq 150$

C → cards $\quad C \in N$ $\quad C \leq 75$ $\quad C = 0.10S + 0.50C$

b) What is the minimum solution to this system, and what does it mean?

(100,1) $10.50

~~X~~ omit

~~X~~ Four teams are travelling to a badminton tournament in cars and minivans.

- Each team has no more than 2 coaches and 9 athletes.
- Each car can take 4 team members. Each minivan can take 6 team members.
- No more than 6 cars are available, but more than 3 minivans are available.

The school wants to know the combination of cars and minivans that will require the maximum number of vehicles.

~~X~~ Create and verify an algebraic model to represent this situation.

Linear Optimization

~~7~~ Use the optimization model to determine the combination of cars and minivans that will use the maximum number of vehicles.

omit

~~8~~ How many team members can travel in the maximum number of vehicles?

omit

LTIPLE CHOICE

The vertices of the feasible region for a system of linear inequalities are $(-1, 2)$, $(2, 4)$, $(-3, -5)$, and $(0, 0)$. The objective function for the system is $P = 3x - y$. What is the maximum solution? (1)

A. $(-1, 2)$ B. $(2, 4)$ C. $(-3, -5)$ D. $(0, 0)$

ITTEN RESPONSE

Adir makes wallets and belts from recycled tires. use graph paper (12)

- He can make no more than 4 wallets and at least 10 belts in a day.
- On an average day, he makes no more than 20 items.
- Each belt costs \$1.50 to make, and each wallet costs \$2.25.

a) Create an algebraic model to represent the situation, if w represents the number of wallets Adir can make and b represents the number of belts he can make.

w → wallets $w \in W$
b → belts $b \in W$
$w \leq 4$ $w + b \leq 20$ ~~C=150~~ $C = 2.25w + 1.50b$
$b \geq 10$

b) The vertices of the feasible region are (0, 10), (0, 20), (4, 10), and (4, 16). What is the minimum cost of production for the day? Explain your answer.

\$15

Stop here

6 Test Prep

not part of assignment

Complete the following to summarize the important ideas from this chapter.

Q: When you graph a linear inequality in two variables, how do you decide which points are in the solution set?

NEED HELP?
• See Lesson 6.1

A:
- First, determine the _____ by turning the inequality _____ into an ___ sign.
- To determine which half _____ is included in the solution set, use the inequality to test a _____ on either side of the _____.
- If the inequality type is $<$ or $>$, the boundary is/is not included. Use a _____ line for the boundary.
- If the inequality type is $\leq$ or $\geq$, the boundary is/is not included. Use a _____ line for the boundary with a continuous _____ set, and a stippled line with a _____ _____ set.

Q: How can you locate the points representing an optimal solution?

NEED HELP?
• See Lesson 6.5

A:
- In the _____ case, the optimal solutions will be at the _____ of the _____ region.
- In the _____ case, the optimal solutions may not be at the _____ of the _____ region. However, they will be near to the _____.

Q: What are the key steps in linear programming?

NEED HELP?
• See Lesson 6.6

A:
- Create an _____ model with a _____ statement, _____, constraints, and an _____ function.
- Create a _____ model of the system of _____; locate the _____ of the _____ region.
- Evaluate the _____ function at (or near) the _____.
- Choose the desired _____(s). Verify that each _____ satisfies the _____ for the problem.

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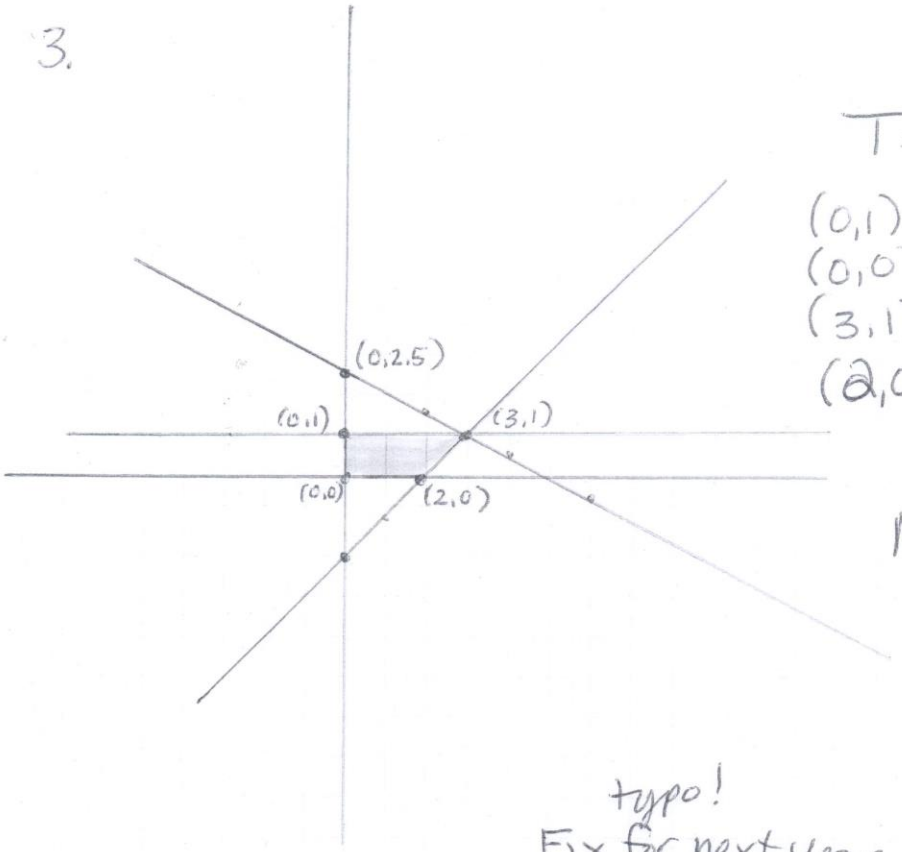
3.



$T = y - 2x$ max

$(0,1)$ $1-2(0)=1$

$(0,0)$ $0-2(0)=0$

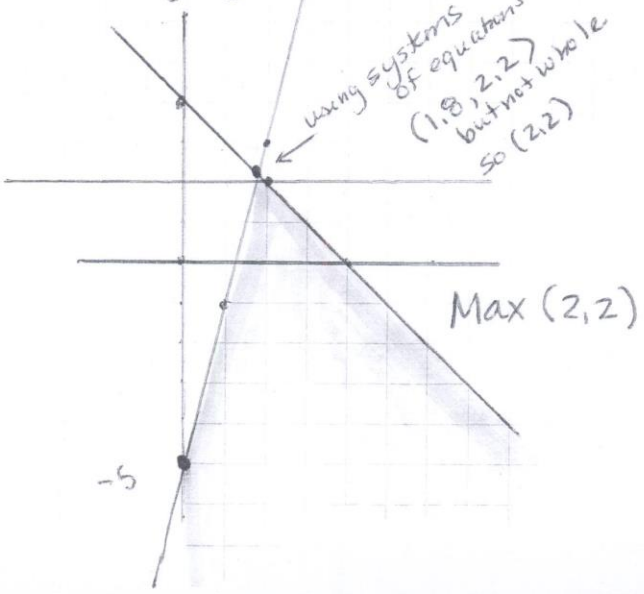
$(3,1)$ $1-2(3)=-5$

$(2,0)$ $0-2(2)=-4$

Max $(0,1)$

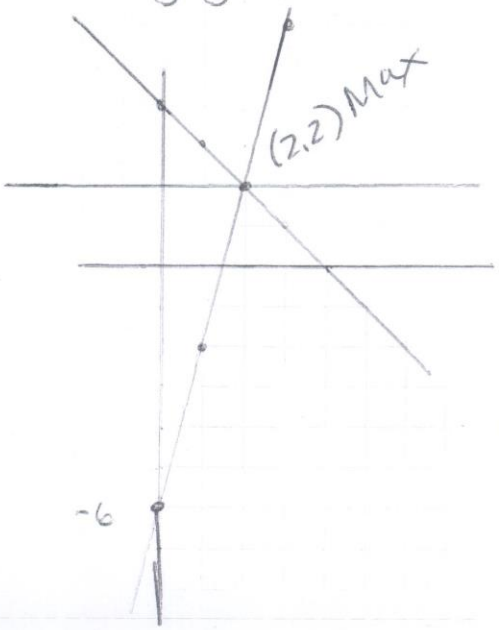
typo!
Fix for next year

4. using $y \leq 4x-5$

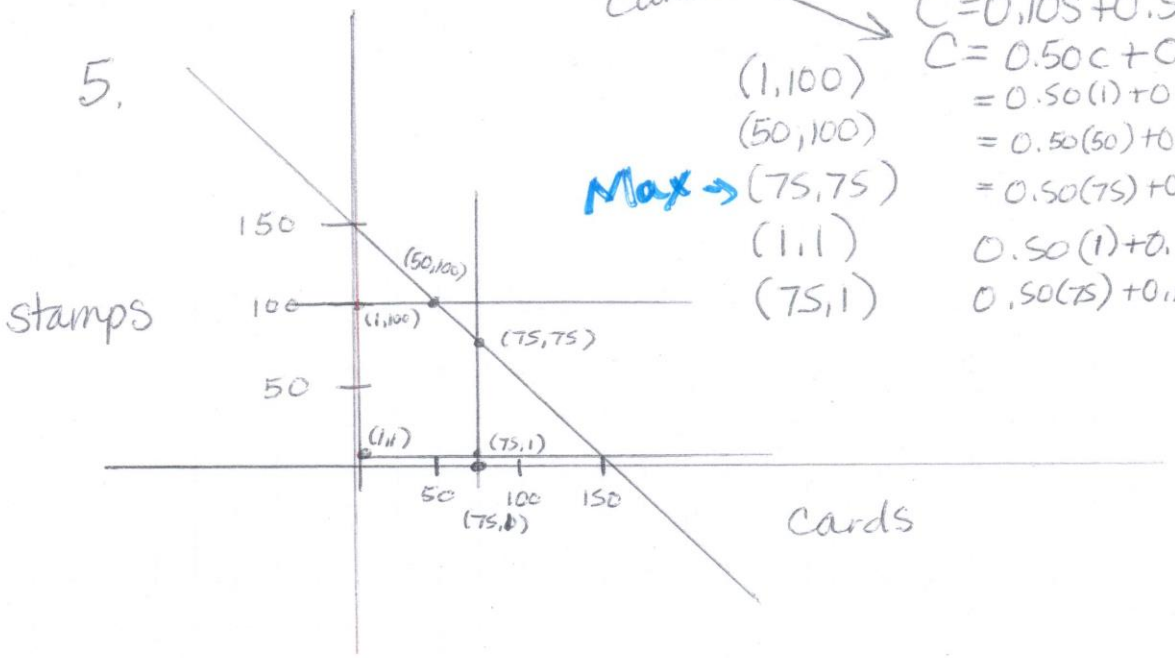


Max (2,2)

using $y \leq 4x-6$



5.



*careful

$C = 0.10s + 0.50c$

$C = 0.50c + 0.10s$

(1,100) $= 0.50(1) + 0.10(100)$

(50,100) $= 0.50(50) + 0.10(100)$

Max → (75,75) $= 0.50(75) + 0.10(75)$

(1,1) $0.50(1) + 0.10(1)$

(75,1) $0.50(75) + 0.10(1)$

7. $P = 3x - y$

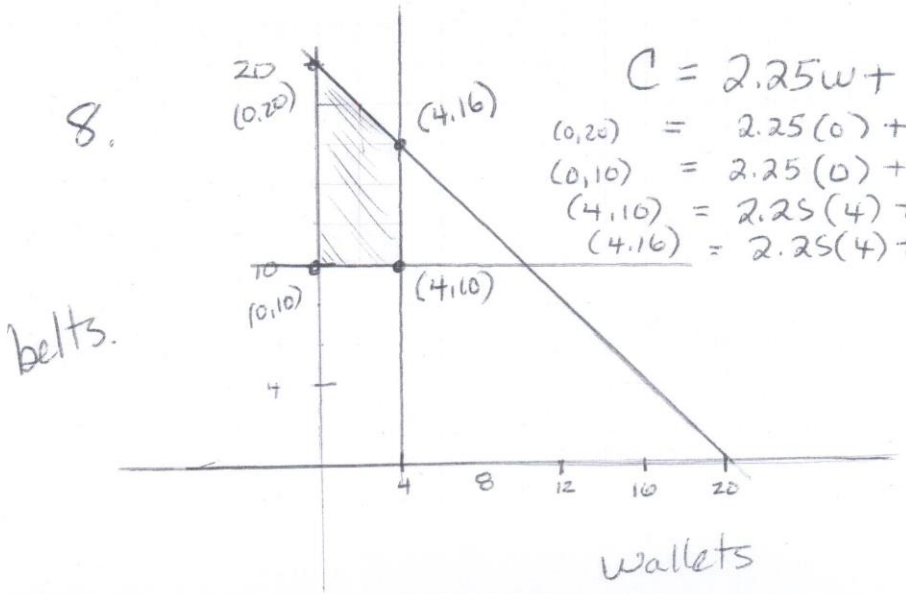
$(-1,2) \quad = 3(-1) - 2 = -5$

$(2,4) \quad = 3(2) - 4 = 2$ max

$(-3,-5) \quad = 3(-3) + 5 = -4$

$(0,0) \quad = 3(0) - 0 = 0$

8.



$C = 2.25w + 1.50b$

(0,20) $= 2.25(0) + 1.50(20) = 30$ ← min

(0,10) $= 2.25(0) + 1.50(10) = 15$

(4,10) $= 2.25(4) + 1.50(10)$

(4,16) $= 2.25(4) + 1.50(16)$