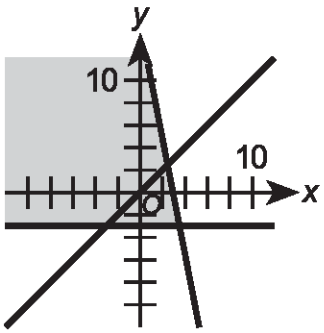
Name: Date:
Teacher: Class/Period:

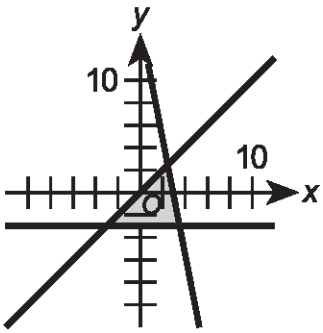
1) Which graph represents the solution set to this system of equations?

$$\begin{cases} y \le x \\ y \ge -3 \\ y \le 15 - 5x \end{cases}$$

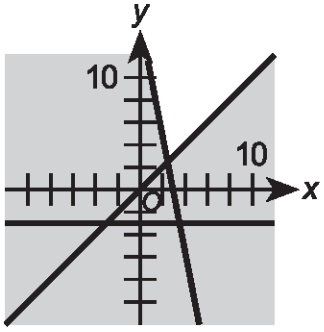
A.



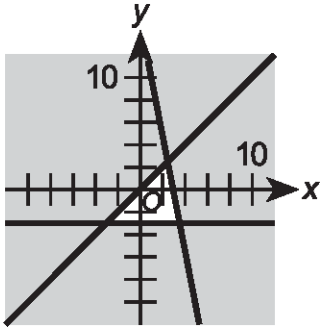
C.



B.



D.



2) Given:

$x + y \leq 6$

$x - y \leq 6$

$x \geq 0$

$y \geq 0$

Which point maximizes the objective function $P(x,y) = 3x + 4y$?

A. (0,0)

B. (0,6)

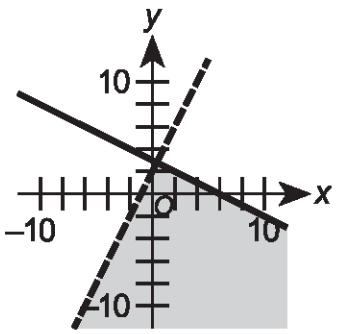
C. (4,0)

D. (8,1)

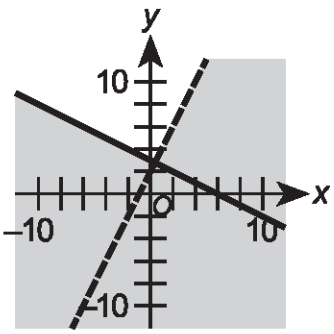
3) Which graph represents the solution set of this system of inequalities?

$$\begin{cases} x + 2y \leq 6 \\ 2x - y < -2 \end{cases}$$

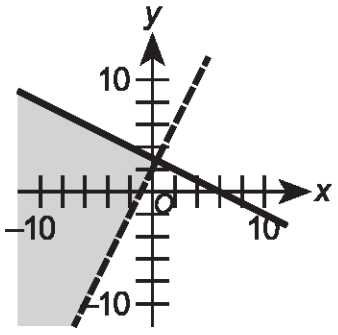
A.



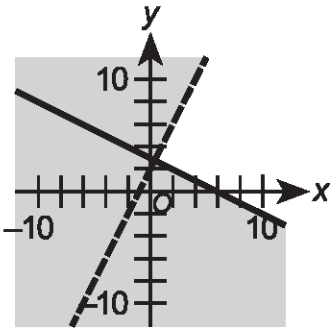
C.



B.



D.



4) Which system of inequalities represents a shaded triangle with vertices (2,6), (5,−1), and (−1,1) ?

A. $\begin{cases} 3x+7y \le 8 \\ 3x+y \ge -2 \\ 3x-5y \ge -8 \end{cases}$

C. $\begin{cases} 7x+3y \le 32 \\ x+3y \ge 2 \\ 5x-3y \ge -8 \end{cases}$

B. $\begin{cases} 3x+7y \le 8 \\ 3x+y \le -2 \\ 3x-5y \le -8 \end{cases}$

D. $\begin{cases} 7x+3y \le 32 \\ x+3y \le 2 \\ 5x-3y \le -8 \end{cases}$

5) The intersection of the boundary lines of this system of inequalities is $(\frac{5}{2},6)$.

$$\begin{cases} y \ge ax+4 \\ 5y \le -4x+40 \end{cases}$$

Which point is in the solution set of the system?

A. (−2,7)

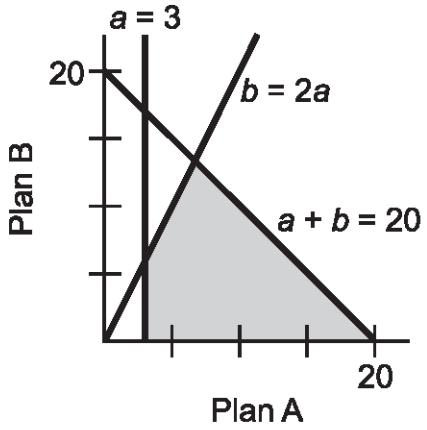
B. (−1,9)

C. (3,4)

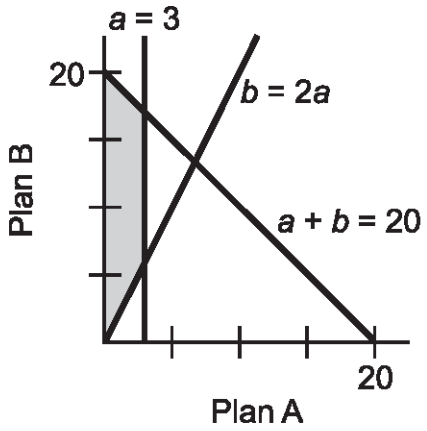
D. (6,8)

6) Hyun has at most $20,000 to invest. She wants to invest at least $3,000 in Plan A and the rest in Plan B. Her Plan B investment must be at least twice as large as her Plan A investment. Which graph, with axes in terms of thousands of dollars, represents all possibilities for her two investments?

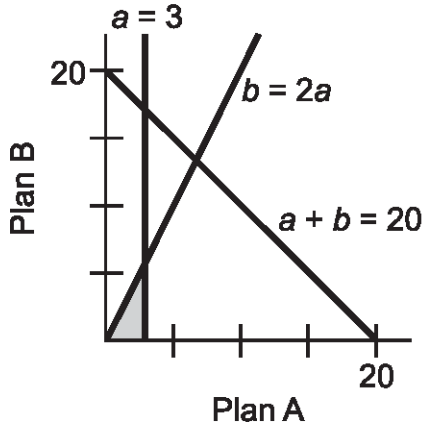
A.



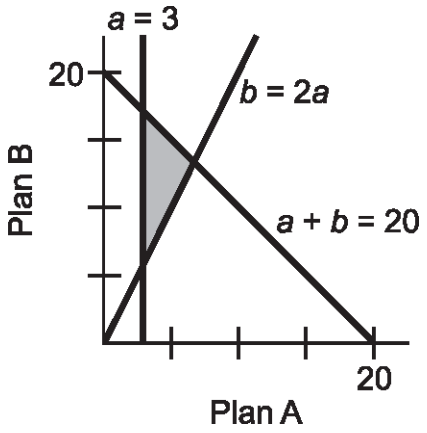
B.



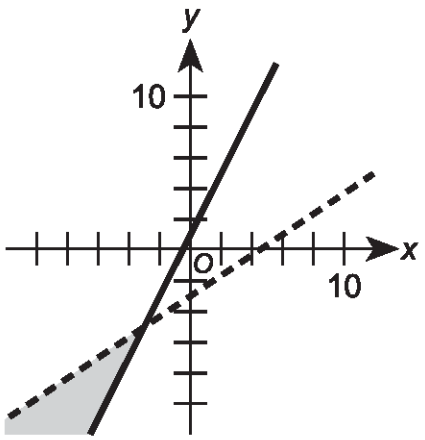
C.



D.



7) Which system of inequalities describes this graph?



A. $y > 2x + 1$ and $y \leq \frac{2}{3}x - 3$

B. $y < 2x + 1$ and $y \leq \frac{2}{3}x - 3$

C. $y \geq 2x + 1$ and $y < \frac{2}{3}x - 3$

D. $y \leq 2x + 1$ and $y > \frac{2}{3}x - 3$

8) Hunter's Transport Company has 7 dump trucks, 5 cement trucks, and 9 drivers. Dump trucks haul 6 tons, while cement trucks haul 10 tons. The company has a contract to transport 360 tons of gravel and cement per day to a road construction site. The dump trucks can make 8 trips a day, while the cement trucks can make 6 trips a day. A dump truck costs $30 per day, and a cement truck costs $42 per day. If all 9 drivers work on this job, using how many trucks of each type will minimize the cost?

A. 4 dump and 5 cement trucks

B. 5 dump and 4 cement trucks

C. 6 dump and 3 cement trucks

D. 7 dump and 2 cement trucks

9) The Gala Events Center has a rectangular parking lot measuring 30 m by 50 m. Only 80% of the lot is usable space. Each parked car requires 6 m^2 of space and each bus requires 30 m^2. The attendant can handle no more that 100 vehicles. It costs $5 to park a car and $15 to park a bus. What is the maximum income for a full lot?

A. $ 500

B. $ 750

C. $1,000

D. $1,500

10) Country Crafts makes round tables and rectangular tables. Each round table requires 2 hours on Machine X and 3 hours on Machine Y. A rectangular table requires 4 hours on Machine X and 1 hour on Machine Y. Machine X has a limit of 20 hours a day, and Machine Y has a limit of 15 hours a day. The profit for a round table is $24, and the profit for a rectangular table is $30. To maximize the profit, how many tables of each kind should Country Crafts make daily?

A. 3 round and 4 rectangular

B. 4 round and 3 rectangular

C. 2 round and 5 rectangular

D. 5 round and 2 rectangular

11) What are the minimum and maximum values of the function $f(x,y) = 2x - 3y$ for the region $x \geq -2$, $2 \leq y \leq 5$, $y \geq x + 1$?

A. Minimum: −7; Maximum: −10

B. Minimum: −7; Maximum: −4

C. Minimum: −19; Maximum: −4

D. Minimum: −19; Maximum: −1

12) A candy company wants to sell cherry and caramel truffles in one package. The packages will contain between 12 and 15 truffles. At least 6 of each type will be in each package. The cost of making a cherry truffle is $0.12 and the selling price is $0.31. The cost of making a caramel truffle is $0.09 and the selling price is $0.29. To maximize profit, how many of each type of truffle should be in the package?

A. 6 cherry, 6 caramel

B. 6 cherry, 9 caramel

C. 8 cherry, 7 caramel

D. 9 cherry, 6 caramel

13) These 3 lines intersect in the *x*-*y* plane at 3 distinct points:

$$7y - 3x = -12$$

$$5y - 8x = 9$$

$$2y + 5x = 20$$

What are the coordinates of the intersection point with the greatest *y*-coordinate?

A. (4,0)

B. (2,5)

C. (−1,6)

D. (−3,−3)

14) What is the area of the figure determined by this system of inequalities?

$$\begin{cases} -4 \le x \le 0 \\ -6 \le y \le 0 \end{cases}$$

A. 6

B. 15

C. 24

D. 28

15) Given:

$x \ge 0,\ y \ge 0$

$4x + y \ge 12$

$4x + 3y \le 24$

What is the maximum value of the function $f(x,y) = 2x + 3y$?

A. 6

B. 12

C. 17

D. 21

16) José-Luis maintains a landscaping business, mowing lawns for $10 per hour and tending gardens for $24 per hour. He would like to maximize his profit. One of his restrictions is time: he has only 40 hours per week to work. Mowing a lawn takes 2 hours, and tending a garden takes 5 hours. Let x represent the number of lawns José-Luis mows per week, and let y represent the number of gardens he tends per week. Which of the following inequalities expresses José-Luis's time restriction?

A. $2x + 5y \ge 40$

B. $5x - 2y \le 40$

C. $2x + 5y \le 40$

D. $5x + 2y \ge 40$

17) A region is bounded by the inequalities

$x \geq 0$

$y \geq 0$

$-x + 3y \leq 15$

$4x + y \leq 44$

Isobel would like to find the point in the region where the expression $2y - x$ reaches the minimum. To do so, she needs to evaluate the expression at which points in the region?

18) Consider this system of inequalities:

$$\begin{cases} x > -2 \\ 2x - 5y \leq -20 \\ y < -3x + 12 \end{cases}$$

A. Graph the system of inequalities. Explain the steps you took to construct your graph.

B. What are the exact points of intersection of each pair of boundary lines of the inequalities? Show your work algebraically.

19) A company makes 2 types of chairs: a basic chair and a deluxe chair. In one day, the company can make at most 150 chairs total. The company can make at most 100 basic chairs and at most 75 deluxe chairs. The company makes $12 profit for each basic chair and $8 profit for each deluxe chair. Let x represent the number of basic chairs made in one day, and let y represent the number of deluxe chairs made in one day. Use linear programming to determine the maximum possible profit for one day. Show the steps for the linear programming method as requested.

A. Write the system of inequalities that represents this situation.

B. Graph the feasible region for this system of inequalities. Explain how you constructed your graph.

C. Identify the vertices of the feasible region.

D. Write the objective function.

E. What is the maximum possible profit for one day? Show your work, and explain the approach you used to find your answer.

F. How many of each type of chair are made to achieve the maximum possible profit for one day?

Please use the space below to write your response(s) to the writing assignment provided by your teacher. If there are multiple tasks to the question, please clearly label the number or letter of each task in the column to the left of your answers. If you need additional pages for your response, your teacher can provide them.

Please write the name of the writing assignment here: _____

Task

QualityCore™

Reference Sheet for the QualityCore™ **Algebra II End-of-Course Assessment**

Equations of a Line

Standard Form	$Ax + By = C$	A, B, and C are constants with A and B not both equal to zero.
Slope-Intercept Form	$y = mx + b$	(x_1,y_1) is a point. m = slope b = y-intercept
Point-Slope Form	$y - y_1 = m(x - x_1)$	

Quadratics

Standard Form of a Quadratic Equation	$ax^2 + bx + c = 0$	a, b, and c are constants, where $a \neq 0$.
Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	

Conic Sections

Circle	$(x - h)^2 + (y - k)^2 = r^2$	center (h,k) r = radius	
Parabola	$y = a(x - h)^2 + k$	axis of symmetry $x = h$ directrix $y = k - \frac{1}{4a}$	vertex (h,k) focus $\left(h, k + \frac{1}{4a}\right)$
Parabola	$x = a(y - k)^2 + h$	axis of symmetry $y = k$ directrix $x = h - \frac{1}{4a}$	vertex (h,k) focus $\left(h + \frac{1}{4a}, k\right)$
Ellipse	$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$	foci $(h \pm c, k)$ where $c^2 = a^2 - b^2$, center (h,k)	
Ellipse	$\frac{(y-k)^2}{a^2} + \frac{(x-h)^2}{b^2} = 1$	foci $(h, k \pm c)$ where $c^2 = a^2 - b^2$, center (h,k)	
Hyperbola	$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$	foci $(h \pm c, k)$ where $c^2 = a^2 + b^2$, center (h,k)	
Hyperbola	$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$	foci $(h, k \pm c)$ where $c^2 = a^2 + b^2$, center (h,k)	

Lines and Points

Slope	$m = \frac{y_2 - y_1}{x_2 - x_1}$	(x_1,y_1) and (x_2,y_2) are 2 points. m = slope M = midpoint d = distance
Midpoint	$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$	
Distance	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	

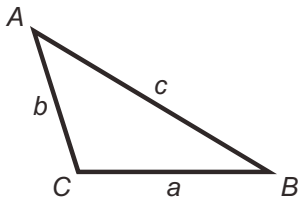
continued

Miscellaneous

Distance, Rate, Time	$D = rt$	D = distance r = rate t = time I = interest p = principal A = amount of money after t years n = number of times interest is compounded annually
Simple Interest	$I = prt$	
Compound Interest	$A = p\left(1 + \frac{r}{n}\right)^{nt}$	
Pythagorean Theorem	$a^2 + b^2 = c^2$	a and b = legs of right triangle c = hypotenuse

Laws of Sines and Cosines

Law of Sines	$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$
Law of Cosines	$a^2 = b^2 + c^2 - 2bc \cos A$



Sequences, Series, and Counting

Arithmetic Sequence	$a_n = a_1 + (n - 1)d$	$a_n = n^{\text{th}}$ term n = number of the term d = common difference s_n = sum of the first n terms r = common ratio k = number of objects in the set m = number of objects selected
Arithmetic Series	$s_n = \frac{n}{2}(a_1 + a_n)$	
Geometric Sequence	$a_n = a_1(r^{n-1})$	
Geometric Series	$s_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$	
Combinations	${}_kC_m = C(k,m) = \frac{k!}{(k-m)!\,m!}$	
Permutations	${}_kP_m = P(k,m) = \frac{k!}{(k-m)!}$	

Circumference, Area, and Volume

Triangle	$A = \frac{1}{2}bh$	A = area b = base h = height r = radius C = circumference d = diameter V = volume B = area of base $\pi \approx 3.14$
Parallelogram	$A = bh$	
Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$	
Circle	$A = \pi r^2$ $C = \pi d$	
General Prism	$V = Bh$	
Right Circular Cylinder	$V = \pi r^2 h$	
Pyramid	$V = \frac{1}{3}Bh$	
Right Circular Cone	$V = \frac{1}{3}\pi r^2 h$	
Sphere	$V = \frac{4}{3}\pi r^3$	

ACT®

IC 019247080

Answer Key

1) C
2) B
3) B
4) C
5) A
6) D
7) C
8) D
9) B
10) B
11) C
12) B
13) B
14) C
15) D
16) C

Answer:

17) Since $2y - x$ is a linear expression, Isobel needs to check only the corners of the region. Those are:

(0,0) The intersection of $x \geq 0$ and $y \geq 0$

(0,5) The intersection of $x \geq 0$ and $-x + 3y \leq 15$

(11,0) The intersection of $y \geq 0$ and $4x + y \leq 44$

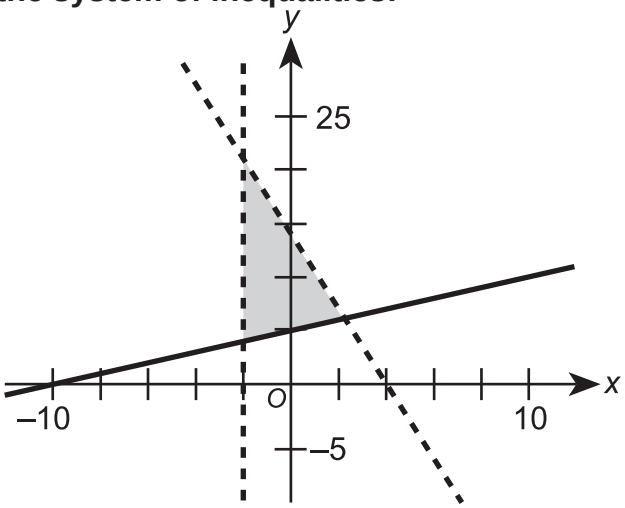
(9,8) The intersection of $-x + 3y \leq 15$ and $4x + y \leq 44$

Scoring Criteria:

18)

A 4-point response may include, but is not limited to, the following points:

A. **Correct graph of the system of inequalities:**



Explanation of how the graph was constructed:

For $x > -2$:

I graphed the boundary line $x = -2$ as a vertical line through (−2,0). I shaded toward the origin for x > −2 since (0,0) makes the inequality x > −2 true. I made the boundary line dotted since there is a greater than sign instead of a greater than or equal to sign.

For $2x - 5y \leq -20$:

I found the *x*- and *y*-intercepts to graph the boundary line. To find the *x*-intercept, I put 0 in for *y* for the boundary equation. To find the *y*-intercept, I put 0 in for *x* for the boundary equation. I connected the 2 intercepts with a solid line since there is a less than or equal to sign instead of a less than sign. I tested (0,0) to determine the shading. Since 0 is not less than or equal to −20, I shaded away from the origin.

For $y < -3x + 12$:

I found the points on the graph of the boundary line by substituting values of *x* into the boundary line equation. I connected the points with a dotted line since there is a less than sign instead of a less than or equal to sign. I tested (0,0) to determine the shading. Since 0 is less than 12, I shaded toward the origin. Then, I shaded the portions of the graph that represent the intersection of the inequalities.

B. **Correct points of intersection:** $\left(-2, \frac{16}{5}\right)$, (−2,18), and $\left(\frac{40}{17}, \frac{84}{17}\right)$

Appropriate work needed to find the answer:

$2x - 5y = -20$

$2(-2) - 5y = -20$

$-4-5y=-20$
$-5y=-16$
$y=\frac{16}{5}$
$(-2,\frac{16}{5})$

$y=-3x+12$
$y=-3(-2)+12$
$y=6+12$
$y=18$
$(-2,18)$

$2x-5y=-20$
$2x-5(-3x+12)=-20$
$2x+15x-60=-20$
$17x=40$
$x=\frac{40}{17}$

$y=-3\left(\frac{40}{17}\right)+12=\frac{-120}{17}+\frac{204}{17}=\frac{84}{17}$
$y=\frac{-120}{17}+12$
$y=\frac{-120}{17}+\frac{204}{17}$
$y=\frac{84}{17}$
$\left(\frac{40}{17},\frac{84}{17}\right)$

Rubric:

4 **A response at this level provides evidence of thorough knowledge and understanding of the subject matter.**

- The response addresses all parts of the question or problem correctly.
- The response demonstrates efficient and accurate use of appropriate procedures.
- The explanation of strategies used in the response shows evidence of a good understanding of mathematical concepts and principles, and it does not contain any misconceptions.
- The explanation in the response is clear and coherent.

3 **A response at this level provides evidence of competent knowledge and understanding of the subject matter.**

- The response addresses most parts of the question or problem correctly.
- The response includes some minor errors but generally uses appropriate procedures accurately.
- The explanation of strategies used in the response shows some evidence of a good understanding of mathematical concepts and principles, and it contains few, if any, misconceptions.
- The explanation in the response is mostly clear and coherent.

2 **A response at this level provides evidence of a basic knowledge and understanding of the subject matter.**

- The response addresses some parts of the question or problem correctly.
- The response includes a number of errors but demonstrates some use of appropriate procedures.
- The explanation of strategies used in the response shows a little evidence of understanding of mathematical concepts and principles, but it may contain some evidence of misconceptions.
- The explanation in the response is partially clear, but some parts may be difficult to understand.

1 **A response at this level provides evidence of minimal knowledge and understanding of the subject matter.**

- The response addresses a few parts of the problem correctly, but the response is mostly incorrect.
- The response includes inappropriate procedures or simple manipulations that show little or no understanding of correct procedures.
- The explanation of strategies used in the response shows little or no evidence of understanding of mathematical concepts and principles, and it may contain evidence of significant misconceptions.
- Many parts of the explanation are difficult to understand.

0 **A response at this level is not scorable.** The response is off-topic, blank, hostile, or otherwise not scorable.

Scoring Criteria:

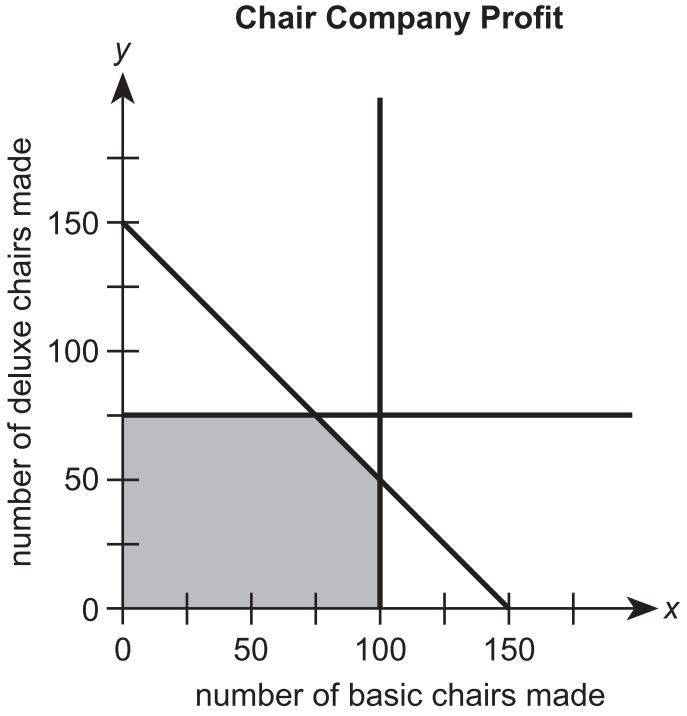
19)

A 4-point response may include, but is not limited to, the following points:

A. **Correct system of inequalities:** $\begin{cases} 0 \le x \le 100 \\ 0 \le y \le 75 \\ 0 \le x + y \le 150 \end{cases}$

Note: Students may include the inequalities $x \ge 0$ and $y \ge 0$ and not include the zeros in the other inequalities. The examinees may eliminate the zeros in either the first 2 inequalities or the last inequality in the list above.

B. **Correct graph of the feasible region:**



Explanation of how the graph was constructed: The equation $x = 100$ is a vertical line through (100,0). I shaded to the left of $x = 100$ since $0 \le 100$, which means I should shade toward the origin. The line $y = 75$ is a horizontal line through (0,75). I shaded below $y = 75$ since $0 \le 100$, which means I should shade toward the origin. The equation $x + y = 150$ goes through (150,0) and (0,150). I shaded toward the origin since $0 + 0 \le 150$.

C. **Correct vertices of the feasible region:** (0,0), (100,0), (0,75), (100,50), and (75,75)

D. **Correct objective function:** $P = 12x + 8y$

E. **Correct maximum profit:** $1,600

Appropriate work needed to find the answer:

$P(0,0) = 12(0) + 8(0) = 0$

$P(100,0) = 12(100) + 8(0) = 1{,}200$

$P(0,75) = 12(0) + 8(75) = 600$

$P(100,50) = 12(100) + 8(50) = 1{,}600$

$P(75,75) = 12(75) + 8(75) = 1{,}500$

Explanation of the approach used to find the answer: I evaluated the objective function for each vertex. The maximum profit is the highest value from the evaluation of the vertices of the objective functions.

F. **Correct numbers of chairs made:** 100 basic chairs and 50 deluxe chairs

Rubric:

4 **A response at this level provides evidence of thorough knowledge and understanding of the subject matter.**

- The response addresses all parts of the question or problem correctly.
- The response demonstrates efficient and accurate use of appropriate procedures.
- The explanation of strategies used in the response shows evidence of a good understanding of mathematical concepts and principles, and it does not contain any misconceptions.
- The explanation in the response is clear and coherent.

3 **A response at this level provides evidence of competent knowledge and understanding of the subject matter.**

- The response addresses most parts of the question or problem correctly.
- The response includes some minor errors but generally uses appropriate procedures accurately.
- The explanation of strategies used in the response shows some evidence of a good understanding of mathematical concepts and principles, and it contains few, if any, misconceptions.
- The explanation in the response is mostly clear and coherent.

2 **A response at this level provides evidence of a basic knowledge and understanding of the subject matter.**

- The response addresses some parts of the question or problem correctly.
- The response includes a number of errors but demonstrates some use of appropriate procedures.
- The explanation of strategies used in the response shows a little evidence of understanding of mathematical concepts and principles, but it may contain some evidence of misconceptions.
- The explanation in the response is partially clear, but some parts may be difficult to understand.

1 **A response at this level provides evidence of minimal knowledge and understanding of the subject matter.**

- The response addresses a few parts of the problem correctly, but the response is mostly incorrect.
- The response includes inappropriate procedures or simple manipulations that show little or no understanding of correct procedures.
- The explanation of strategies used in the response shows little or no evidence of understanding of mathematical concepts and principles, and it may contain evidence of significant misconceptions.
- Many parts of the explanation are difficult to understand.

0 **A response at this level is not scorable.** The response is off-topic, blank, hostile, or otherwise not scorable.