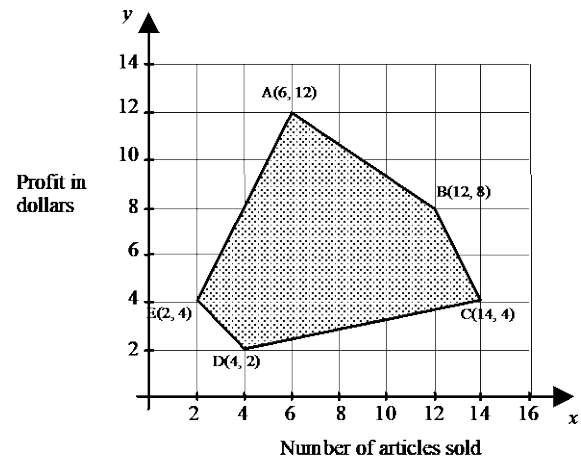


## Optimization Multiple Choice

1

The polygon of constraints shown at the right is the result of an analysis of the revenues from the sales of a certain product.



Which of the following situations respects the polygon of constraints?

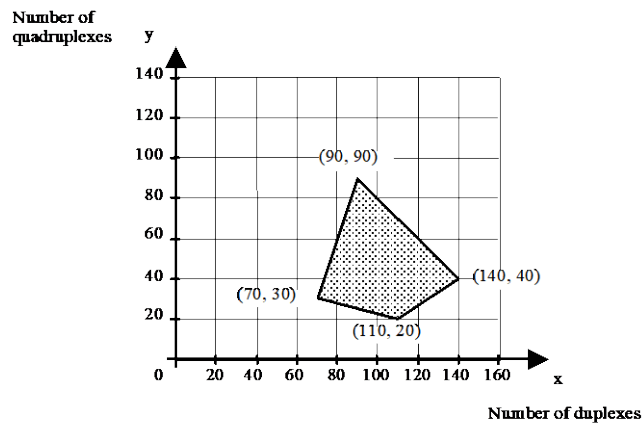
- A) 4 articles sold for a profit of \$9
- B) 5 articles sold for a profit of \$2
- C) 8 articles sold for a profit of \$11
- D) 13 articles sold for a profit of \$5

2

Both duplexes (buildings with two apartments) and quadruplexes (buildings with four apartments) are being built in a particular housing project. The developers of the project have to respect the constraints represented by the polygon below.

$x$  : number of duplexes

$y$  : number of quadruplexes



The function  $N$  which can be used to determine the number of apartments available at the completion of the project is defined by the equation

$$N = 2x + 4y$$

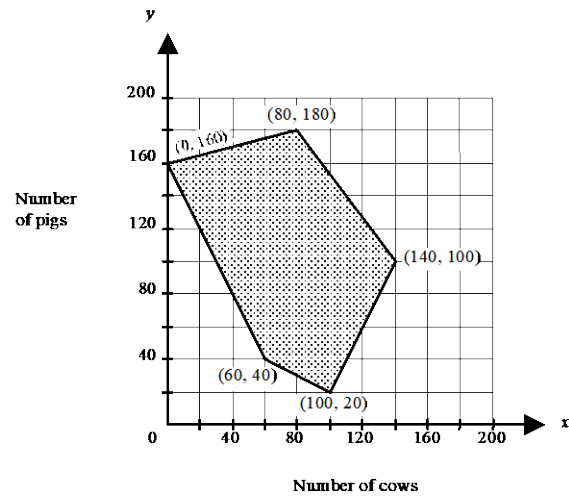
How many duplexes and quadruplexes must be built to obtain the greatest number of apartments?

- |                                    |                                     |
|------------------------------------|-------------------------------------|
| A) 70 duplexes and 30 quadruplexes | C) 110 duplexes and 20 quadruplexes |
| B) 90 duplexes and 90 quadruplexes | D) 140 duplexes and 40 quadruplexes |

3

Before making a major purchase of cattle and pigs, a rancher graphed the adjacent polygon of constraints to help him decide.

Which of the following purchases respects the polygon of constraints?



A) 40 cows and 70 pigs

B) 50 cows and 80 pigs

C) 100 cows and 160 pigs

D) 120 cows and 40 pigs

4

A company needs to purchase some printers.

A laser printer operating at a rate of 8 pages per minute costs \$1000.

An ink jet printer operating at a rate of 3 pages per minute costs \$500.

The company needs at least 5 laser printers and has set a budget limit of \$19 500 to purchase all its printers. The computer room will hold a maximum of 25 printers.

Given  $x$  : the number of laser printers

$y$  : the number of ink jet printers

These linear inequalities translate the constraints of this problem :

$$x + y \leq 25$$

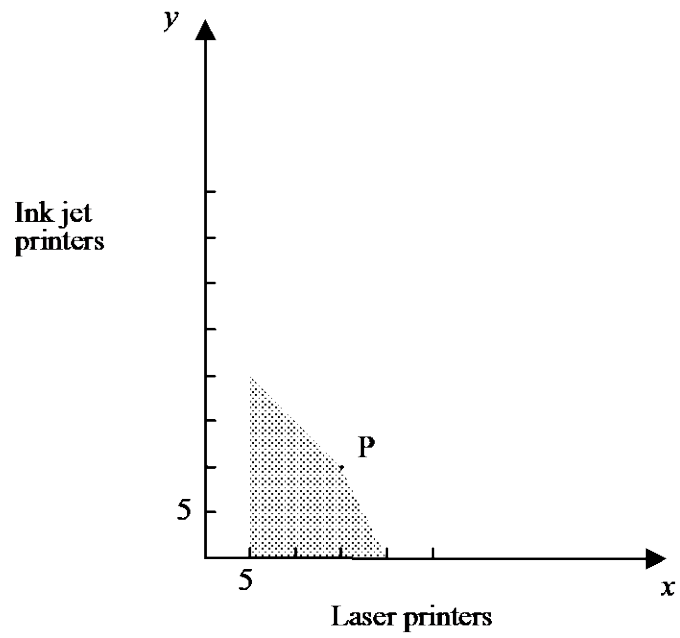
$$1000x + 500y \leq 19\,500$$

$$x \geq 5$$

$$x \geq 0$$

$$y \geq 0$$

The polygon below represents this situation :



What are the coordinates of vertex  $P$  of this polygon of constraints?

A)  $(11, 14)$

C)  $(15, 10)$

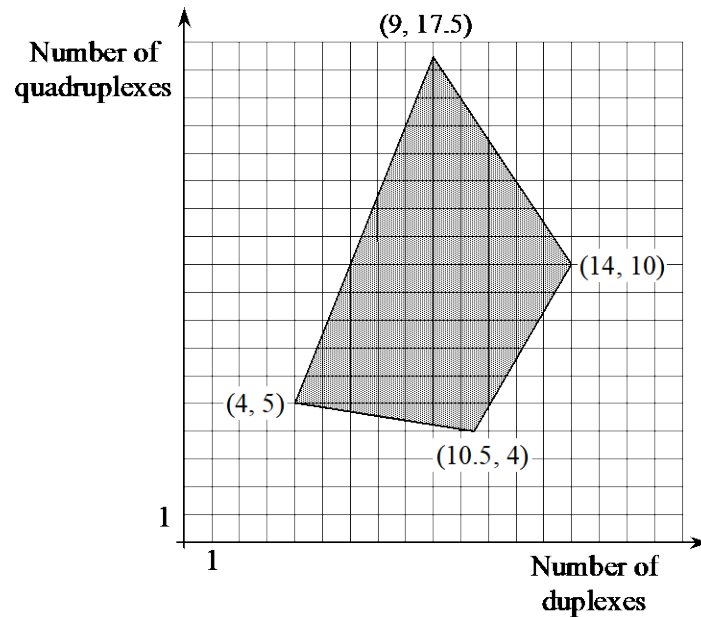
B)  $(14, 11)$

D)  $(12, 13)$

5

A future housing development will consist of duplexes (houses with two apartments) and quadruplexes (houses with four apartments).

The promoters of this development face different constraints. The following polygon represents the different possible combinations of duplexes and quadruplexes that can be built.



The number of apartments ( $N$ ) that will be available once the project is completed is determined by the following rule:

$$N = 2x + 4y$$

where  $x$ : number of duplexes

$y$ : number of quadruplexes

How many duplexes and quadruplexes must the promoters build to maximize the number of apartments?

A) 9 duplexes and 17 quadruplexes

C) 10 duplexes and 16 quadruplexes

B) 9 duplexes and 18 quadruplexes

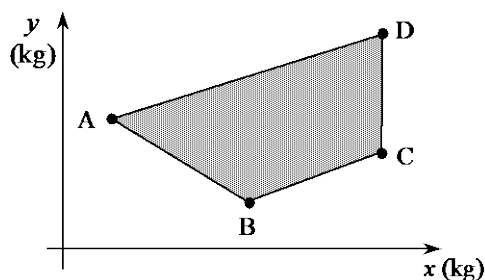
D) 14 duplexes and 10 quadruplexes

6

The following polygon of constraints represents the solution for an optimization situation that involves minimizing the cost of an order of seafood and steaks.

$x$ : mass of seafood in kg

$y$ : mass of steaks in kg



The values in the following table were calculated in order to determine the minimum cost.

| Vertex | Cost  |
|--------|-------|
| A      | \$64  |
| B      | \$64  |
| C      | \$128 |
| D      | \$184 |

In this situation, how many solutions minimize the cost?

A) No solution

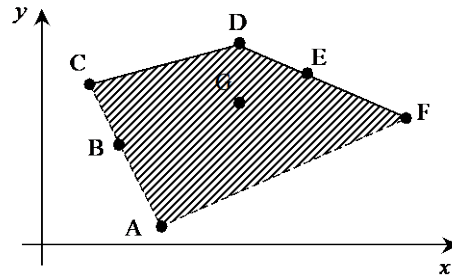
C) 2 solutions

B) 1 solution

D) More than 2 solutions

7

The solutions for a system of inequalities are represented on the right. Points A, B, C, D, E, F and G are shown on the graph.



How many of these points represent a solution for this system of inequalities?

A) 1

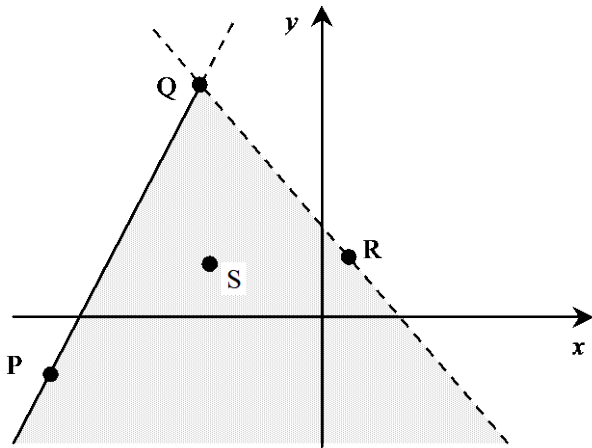
C) 6

B) 3

D) 7

8

The solutions for a system of inequalities are represented in the following Cartesian plane. Points P, Q, R and S are also shown on the graph.



Which of these four points represent solutions for this system of inequalities?

A) P and S only

C) P, Q and R only

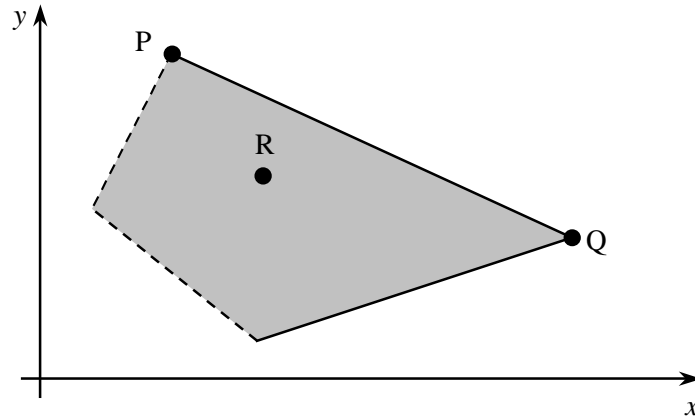
B) Q and S only

D) P, Q, R and S



9

The solutions for a system of inequalities are represented in the Cartesian plane below. Points P, Q and R are shown on the graph.



Which of points P, Q and R represent solutions for this system of inequalities?

A) P and Q only

C) Q and R only

B) P and R only

D) P, Q and R

10

The constraints related to an optimization situation are represented by the following system of inequalities.

$$\begin{aligned}x &\geq 0 \\y &\geq 0 \\y &< 9 \\x + y &\geq 5 \\2x + 3y &\leq 30\end{aligned}$$

Which one of the following ordered pairs is a solution for this system of inequalities?

A) (1, 9)

C) (4, 5)

B) (2, 2)

D) (11, 5)

The following system of inequalities represents the constraints associated with an optimization situation.

$$x \geq 0$$

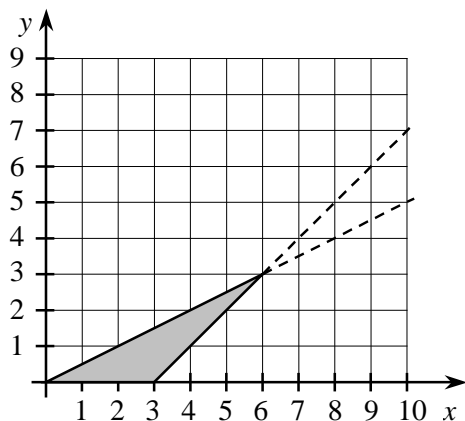
$$y \geq 0$$

$$y \leq x - 3$$

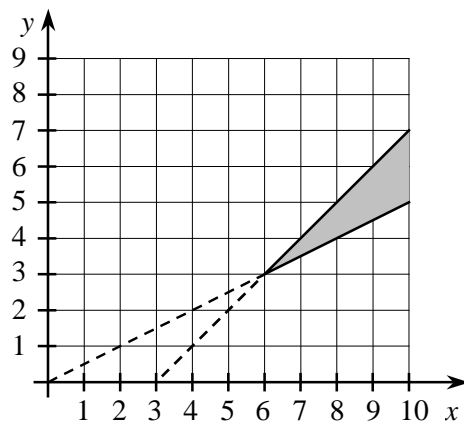
$$x \leq 2y$$

Which one of the following polygons of constraints could represent this situation?

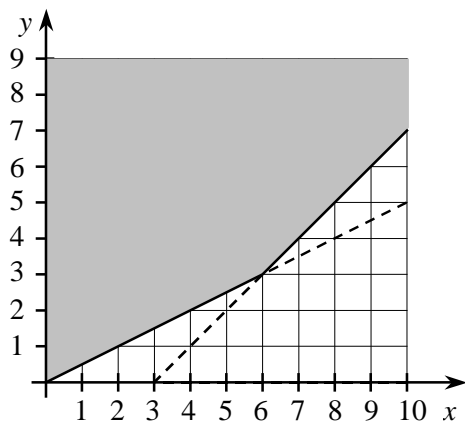
A)



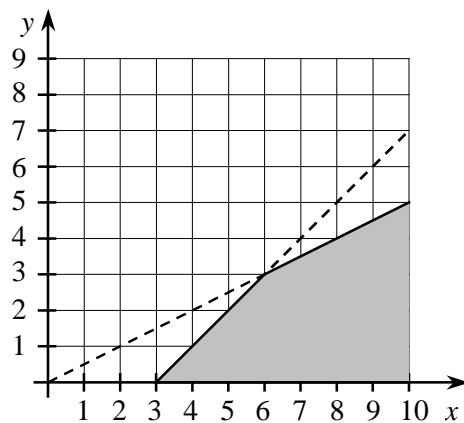
C)



B)

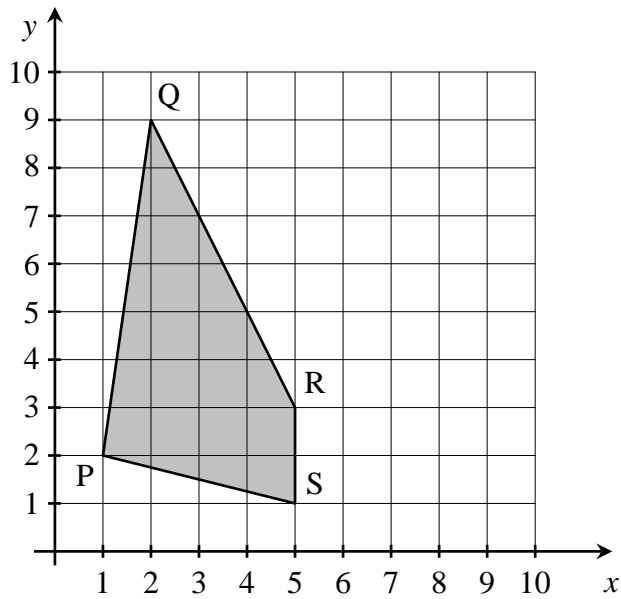


D)



12

The owner of a clothing store wants to maximize his revenue over the next hour. Polygon of constraints PQRS below represents the different possible combinations of sweaters and shirts he can sell.



$x$ : number of sweaters sold

$y$ : number of shirts sold

The owner uses the values in the following table to determine the maximum revenue of his store.

| Coordinates of the<br>vertices of the<br>polygon of constraints | Store's revenue |
|---|-----------------|
| P(1, 2)   | \$60            |
| Q(2, 9)   | \$195           |
| R(5, 3)   | \$195           |
| S(5, 1)   | \$165           |

In this situation, how many solutions maximize the store's revenue?

A) 1 solution

C) 3 solutions

B) 2 solutions

D) 4 solutions

1 D

2 B

3 B

4 B

5 A

6 D

7 B

8 A

9 C

10 C

11 C

12 D

ANSWERS