

# Mathematics

Free Half-Length Practice Test - FPT9



Language **English** 

Released 2025

hiset.org

- Get the HiSET® testing experience.
- Answer questions developed by the test maker.
- Find out if you're ready for the actual subtest.

Copyright © 2025 PSI Services LLC. All rights reserved. PSI, the PSI logo, and HiSET are registered trademarks of PSI Services LLC.



# Formula Sheet

## Perimeter / Circumference

# Rectangle

Perimeter = 2(length) + 2(width)

#### Circle

Circumference =  $2\pi$ (radius)

#### <u>Area</u>

#### Circle

Area =  $\pi$ (radius)<sup>2</sup>

#### **Triangle**

Area =  $\frac{1}{2}$  (base)(height)

## **Parallelogram**

Area = (base)(height)

## **Trapezoid**

Area =  $\frac{1}{2}$  (base<sub>1</sub> + base<sub>2</sub>)(height)

# <u>Volume</u>

# Prism/Cylinder

Volume = (area of the base)(height)

# Pyramid/Cone

Volume =  $\frac{1}{3}$  (area of the base)(height)

# **Sphere**

Volume =  $\frac{4}{3}\pi (\text{radius})^3$ 

#### Length

1 foot = 12 inches

1 yard = 3 feet

1 mile = 5,280 feet

1 meter = 1,000 millimeters

1 meter = 100 centimeters

1 kilometer = 1,000 meters

1 mile ≈ 1.6 kilometers

1 inch = 2.54 centimeters

1 foot ≈ 0.3 meter

# Capacity / Volume

1 cup = 8 fluid ounces

1 pint = 2 cups

1 quart = 2 pints

1 gallon = 4 quarts

1 liter = 1,000 milliliters

1 liter ≈ 0.265 gallon

#### Weight

1 pound = 16 ounces

1 ton = 2,000 pounds

1 gram = 1,000 milligrams

1 kilogram = 1,000 grams

1 kilogram ≈ 2.2 pounds

1 ounce ≈ 28.3 grams

# **Mathematics**

# **Directions**

Time - 45 minutes

25 Questions

This is a test of your skills in applying mathematical concepts and solving mathematical problems. Read each question carefully and decide which of the five options best answers the question. Then mark your choice on your answer sheet.

There are relatively easy problems scattered throughout the test. Thus, do not waste time on problems that are too difficult; go on, and return to them if you have time.

Work as quickly as you can without becoming careless. Try to answer every question even if you have to guess.

Mark all your answers on the answer sheet. Give only one answer to each question.

If you decide to change one of your answers, be sure to erase the first mark completely.

Be sure that the number of the question you are answering matches the number of the row of answer choices you are marking on your answer sheet. The answer sheet may contain more rows than you need.



Pam bought a refrigerator for \$1,200. She made a \$200 down payment. The rest of the purchase price was split evenly into four payments.

What was the amount of each payment?

- **A.** \$100
- **B.** \$250
- **C**. \$300
- **D.** \$350
- **E.** \$500

2

The circumference of a circle is  $196\pi$  millimeters.

What is the radius, in millimeters, of the circle?

- **A**. 7
- **B**. 14
- **C**. 28
- **D**. 98
- **E**. 196

3

A librarian needs to determine activities that would increase interest at the library among members in the community. The librarian will survey people about their interests.

Which survey method would most likely produce the most reliable results?

- **A.** Survey every 10<sup>th</sup> person who visits the library on a Monday.
- **B.** Survey every 10<sup>th</sup> female who visits the library for one week.
- **C.** Survey every 10<sup>th</sup> male who visits the grocery store closest to the library on a Tuesday.
- **D.** Survey every 10<sup>th</sup> person who visits the grocery store closest to the library on a Wednesday.
- **E.** Survey every 10<sup>th</sup> person who visits the grocery store closest to the library each day of the week.

4

Which of the following expressions is equivalent to  $(4x^3)(5x^2)$ ?

- **A.**  $9x^5$
- **B.**  $9x^6$
- **C.**  $20x^5$
- **D.**  $20x^6$
- **E.**  $20x^9$

Students at a school have two types of calculators that use batteries of the same size. The type *F* calculator uses 4 batteries and type *G* calculator uses 1 battery. There are 650 new batteries available.

Which inequality can be used to determine f, the number of type F calculators, and g, the number of type G calculators, that can receive all new batteries?

- **A.**  $650 \le 4f + 1g$
- **B.**  $650 \le 1f + 4g$
- **C.**  $650 \ge 4f + 1g$
- **D.**  $650 \ge 5(f+g)$
- **E.**  $650 \le 5(f+g)$

6

At a restaurant, the cost to produce cheese pizzas in the shape of circles is the same per square inch for all sizes of pizza. The cost to produce a cheese pizza is approximately \$0.009 per square inch.

Which is the closest to the cost to produce a cheese pizza with a radius of 4 inches?

- **A.** \$0.11
- **B.** \$0.22
- **C.** \$0.45
- **D.** \$0.90
- **E.** \$1.80

7

A swimming pool with the volume of 4,096 cubic feet is in the shape of a cube.

What is the length of one side of the pool in feet?

- A. 8 feet
- **B.** 16 feet
- **C.**  $13\sqrt{6}$  feet
- **D.** 32 feet
- **E.**  $26\sqrt{6}$  feet

A student rewrites the quadratic equation  $y^2 - 8y = 7$  in the form of  $(y - m)^2 = n$ , where m and n are constants.

What is the value of n?

- **A.** -9
- **B.** -23
- **C.** 7
- **D.** 16
- **E**. 23

9

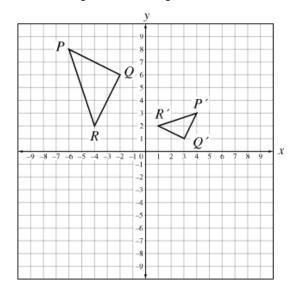
Light travels at a speed of  $3 \times 10^8$  meters per second. There are approximately  $3.16 \times 10^7$  seconds in 1 year.

Which is the closest to the distance, in meters, light travels in 1 year?

- **A.**  $1.05 \times 10^{1}$
- **B.**  $9.48 \times 10^8$
- **C.**  $1.05 \times 10^{15}$
- **D.**  $9.48 \times 10^{15}$
- **E.**  $9.48 \times 10^{56}$

10

Triangle PQR is similar to triangle P'Q'R' on the following coordinate grid.



Which sequence of transformations can be applied to triangle PQR to create triangle P'Q'R'?

- **A.** A reflection across the y-axis and a dilation of  $\frac{1}{2}$  using the original as the center of the dilation
- **B.** A dilation of  $\frac{1}{2}$  using the origin as the center of dilation and a translation 5 units to the right
- **C.** A 90° clockwise rotation about the origin and a dilation of  $\frac{1}{2}$  using the origin as the center of dilation
- **D.** A 90° clockwise rotation about the origin and a dilation of 2 using the origin as the center of dilation
- **E.** A 90° counterclockwise rotation about the origin and a dilation of 2 using the origin as the center of dilation

The table below records the relative frequencies of responses to a survey in which each respondent chose one of three favorite fruits.

	Peach	Apple	Watermelon	Total
Male	0.08	0.42	0.12	0.62
Female	0.16	0.14	0.08	0.38
Total	0.24	0.56	0.20	1.00

There was a total of 20 female respondents who chose peaches.

What was the total number of respondents, both male and female, to the survey?

- **A.** 125
- **B.** 188
- **C**. 297
- **D**. 320
- **E.** 329

12

Wayne is going to buy the same number of drinks as hot dogs. Drinks cost \$2 each, and hot dogs cost \$3 each. Wayne has \$36 to buy the drinks and hot dogs.

Which inequality could be used to determine the maximum number of drinks and hot dogs Wayne could buy?

- **A.**  $(2x)(3x) \le 36$
- **B.**  $2(3)(x) \le 36$
- **C.**  $2x + 3x \le 36$
- **D.**  $2 + 3x \le 36$
- **E.**  $2x + 3 \le 36$

13

The table below shows the number of books of each category sold each day during a 2-day book fair.

Type of Book	Saturday	Sunday
Fiction	18	10
Adventure	16	14
Biography	12	10
Horror	8	12

What is the mean of the total number of adventure books and horror books sold during the two days?

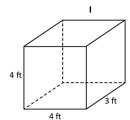
- **A.** 10
- **B**. 12
- **C**. 15
- **D**. 25
- **E**. 50

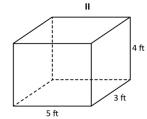
Missy has a box of marbles. She randomly picked some marbles from the box, without looking. She got 4 red, 3 green, 5 orange, 2 yellow, and 6 purple marbles.

Based on the data, what is the probability that the next marble Missy picks will be purple?

- **A.**  $\frac{1}{6}$
- **B.**  $\frac{3}{10}$
- **C.**  $\frac{7}{10}$
- **D.**  $\frac{3}{5}$
- **E.**  $\frac{10}{3}$

Peter has two storage chests, I and II. He renovates all the surfaces of the storage chests using a decorative paper.





Which statement is true?

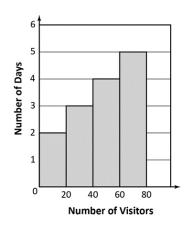
- A. Storage chest I needs 7 square feet more decorative paper than storage chest II.
- B. Storage chest II needs 7 square feet more decorative paper than storage chest I.
- C. Storage chest I needs 14 square feet more decorative paper than storage chest II.
- D. Storage chest II needs 14 square feet more decorative paper than storage chest I.
- **E.** Storage chest II needs 28 square feet more decorative paper than storage chest I.

16 \_\_\_

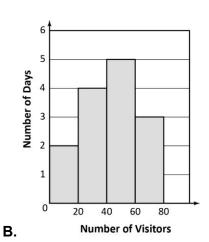
The following data points represent the number of visitors at a salon each day since it opened.

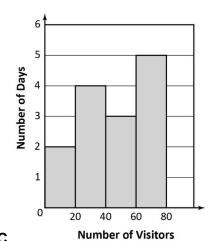
12, 19, 25, 33, 21, 52, 45, 77, 38, 49, 61, 68, 71, 62

Which histogram correctly matches the given data?

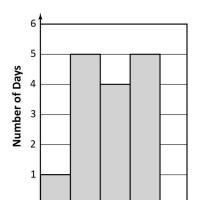


A.





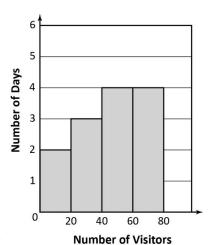
C.



0 40 60 80

Number of Visitors

D.



Sophia started downloading a mobile application at 4:20 p.m. She observed that at 4:30 p.m., 40% had been downloaded.

If the downloading speed is constant, when will the application be completely downloaded?

- **A.** 3:55 p.m.
- **B.** 4:24 p.m.
- **C.** 4:45 p.m.
- **D.** 4:55 p.m.
- **E.** 5:00 p.m.

18

In the expressions below, a and b represent positive integers.

Expression I:  $3x10^a$ Expression II:  $9x10^{a+b}$ 

The value of Expression II is 30,000 times greater than the value of Expression I.

What is the value of *b*?

- **A.** 3
- **B**. 4
- **C.** 5
- **D.** −3
- **E**. -4

19

Daniel is 18 years younger than his uncle.

The sum of their ages is 62.

What is Daniel's age?

- **A**. 22
- **B**. 26
- **C**. 40
- **D**. 44
- **E**. 58

20

Consider the function  $f(x) = 4x^2 - 5\sqrt{2x}$ .

What is the value of f(8)?

- **A.**  $256 10\sqrt{2}$
- **B.**  $256 20\sqrt{2}$
- **C.** 216
- **D.** 236
- **E.** 276

21

What are the coordinates of the vertex of the parabola represented by the equation

$$y = 5x^2 + 40x - 60?$$

- **A.** (8, -60)
- **B.** (6,0)
- **C.** (4, 20)
- **D.** (2,0)
- **E.** (-4, -140)

Sarah bakes cookies at her bakery. She has noticed that her average cost per cookie depends on the number of cookies she bakes. The cost of backing x cookies is given by the equation C(x) = 10 + 0.1x.

Which equation represents the average cost AC per cookie of baking x cookies?

**A.** 
$$AC(x) = \frac{20}{x} + 0.1$$

**B.** 
$$AC(x) = \frac{20}{x} + 10$$

**C.** 
$$AC(x) = \frac{20}{x} + 0.01$$

**D.** 
$$AC(x) = 2x$$

$$E. AC(x) = \frac{2}{x}$$

23

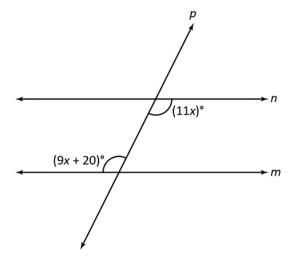
Consider the function  $3.5x^2 - 28x + 11$ .

What is the rate of change of the function over the interval  $1 \le x \le 4$ ?

**B.** 
$$-10.5$$

**C.** 
$$-6.3$$

Lines n and m are intersected by line p, as shown in the figure.



Which of these equations can be used to find the value of x?

**A.** 
$$11x = 9x + 20$$

**B.** 
$$11x + (9x + 20) = 90$$

**C.** 
$$11x - (9x + 20) = 180$$

**D.** 
$$11x + (9x + 20) = 180$$

**E.** 
$$11x + (9x + 20) = 360$$

25

What is the solution of the system of equations shown below?

$$3x - 6y = 12$$

$$2x - 8y = 16$$

**A.** 
$$x = \frac{8}{3}, y = -\frac{2}{3}$$

**B.** 
$$x = \frac{4}{3}, y = -\frac{4}{3}$$

**C.** 
$$x = 0, y = -2$$
  
**D.**  $x = -2, y = -3$ 

**D.** 
$$x = -2, y = -3$$

**E.** 
$$x = 2, y = -1$$

# **HiSET Answer Key and Rationales**

Sequence Number	Correct Response	Content Category	Question Difficulty
1	В	I. Numbers and Operations on Numbers	Easy
Rationale			

**Option B is correct** because once the \$200 down payment is subtracted from the full amount (\$1,200), \$1,000 remains. \$1,000 divided by 4 to be split into four equal payments is \$250.

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
2	D	II. Measurement/Geometry	Medium

#### Rationale

**Option D is correct** because the formula for circumference =  $2\pi$  (radius), and the circumference given is  $196\pi$ .

 $196\pi = 2\pi (radius)$ 

 $196\pi \div 2\pi = radius$ 

 $196\pi \div 2\pi = 98$ 

Therefore, the radius is 98.

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
3	E	III. Data Analysis/ Probability/Statistics	Medium

#### Rationale

**Option E is correct** because the group being surveyed would not be limited by gender or day of week, and all members of the community would likely have an opportunity to take part in the survey.

Sequence	Correct	Content Category	Question
Number F	Response		Difficulty



4	С	I. Numbers and Operations on Numbers	Medium
Rationale			
0 41 0 1	4.1		

**Option C is correct** because using the distributive property, the expression becomes  $(4 \times 5) \times (x^2 \times x^3) = 20x^6$ .

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
5	С	IV. Algebraic Concepts	Hard

#### Rationale

**Option C is correct** because f represents the number of calculators that require 4 batteries (4f), and g represents the number of calculators that require 1 battery (1g). The maximum number of batteries available is 650, so the inequality must represent the combination of f and g as equal to or less than 650.

Therefore,  $650 \ge 4f + 1g$ .

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
6	С	II. Measurement/Geometry	Medium

#### **Rationale**

**Option C is correct** because, using the formula Area =  $\pi(radius)^2$  and knowing the radius of the pizza is 4 inches, the cheese pizza will have an Area of  $\pi(4)^2$  square inches.

$$\pi(4)^2=16\pi$$

 $16\pi = 50.3$  square inches

Then, multiply 50.27 by the cost to produce one square inch of cheese pizza, \$0.009.

$$50.27 \times \$0.009 = \$0.45$$

Thus, the cost to produce a cheese pizza with a 4-inch radius is approximately \$0.45.

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
7	В	IV. Algebraic Concepts	Easy

#### Rationale

**Option B is correct** because the formula to find the volume of a cube is  $V = a^3$ , where a is the length of the cube's sides. The volume (V) of the pool is 4,056.



 $4,056 = a^{3}$   $a = \sqrt[3]{4,056}$  a = 16

So, the length of one side of the swimming pool is 16 feet.

Sequence Number	Correct Response	Content Category	Question Difficulty
8	E	IV. Algebraic Concepts	Medium

#### **Rationale**

**Option E is correct** because  $y^2 - 8y = 7$  can be solved using the following steps:

Option E is correct because 
$$y^2$$
  
 $y^2 - 8y + \left(\frac{-8}{2}\right)^2 = 7 + \left(\frac{-8}{2}\right)^2$   
 $y^2 - 8y + (-4)^2 = 7 + (-4)^2$   
 $(y - 4)^2 = 23$ .

Then comparing  $(y-4)^2 = 23$  with  $(y-m)^2 = n$ , we get n = 23.

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
9	D	I. Numbers and Operations on Numbers	Medium

#### Rationale

**Option D is correct** because you multiply the speed of light  $(3 \times 10^8 \text{ meters per seconds})$  by the number of seconds in the year  $3.16 \times 10^7$ .

$$(3 \times 10^8) \times (3.16 \times 10^7) = 9.48 \times 10^{15}$$

Sequence Number	Correct Response	Content Category	Question Difficulty
10	С	II. Measurement/Geometry	Medium
Detionals			

#### Rationale

**Option C is correct** because a  $90^{\circ}$  clockwise rotation about the origin yields vertices of triangle PQR at P(8,6), Q(6,2), and R(2,4). The dilation of this triangle yields P'Q'R' at P(4,3), Q(3,1), and R(1,2).

	Correct Response	Content Category	Question Difficulty
--	---------------------	------------------	------------------------



11	Α	III. Data Analysis/ Probability/Statistics	Medium
Rationale			

**Option A is correct** because 20 female respondents are equivalent to 16% of the respondents to the survey, as per the data table. Therefore, the total number of respondents is  $20 \div 0.16$ , which is 125 people.

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
12	С	IV. Algebraic Concepts	Easy

#### Rationale

**Option C is correct** because if x represents both the number of drinks and hot dogs Wayne will buy, then 2x is the cost of the drinks and 3x is the cost of the hot dogs. So, 2x + 3x is the total cost of all the food and drinks Wayne buys. Since Wayne has \$36 to spend at most, 2x + 3x must be less than or equal to \$36. Thus,  $2x + 3x \le 36$ .

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
13	D	III. Data Analysis/ Probability/Statistics	Easy

#### Rationale

**Option D is correct** because the total number of adventure books and horror books sold is (16 + 14) + (8 + 12) = 50.

The mean of the total number of adventure books and horror books sold is  $\frac{50}{2} = 25$ .

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
14	В	III. Data Analysis/ Probability/Statistics	Easy

#### **Rationale**

**Option B is correct** because the total number of marbles Missy has randomly picked so far is 4 + 3 + 5 + 2 + 6 = 20. She has picked 6 purple marbles.

Based on the data, the probability that the next marble Missy picks will be purple is  $\frac{6}{20}$ , which simplifies to  $\frac{3}{10}$ .



Sequence	Correct	Content Category	Question
Number	Response		Difficulty
15	D	II. Measurement/Geometry	Medium

#### Rationale

**Option D is correct** because the total surface area of chest  $I = 2(4 \times 4 + 4 \times 3 + 3 \times 4) = 80$ , and the total surface area of chest  $II = 2(5 \times 4 + 5 \times 3 + 3 \times 4) = 94$ .

Total surface area of chest II – total surface area of chest I = 94 - 80 = 14.

So, storage chest II needs 14 square feet more decorative paper than storage chest I.

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
16	С	III. Data Analysis/ Probability/Statistics	Medium

#### Rationale

**Option C is correct** because option C most accurately reflects the given data, which shows two (2) days of less than 20 visitors, four (4) days of between 20-40 visitors, three (3) days of between 40-60 visitors, and five (5) days of greater than 60 visitors.

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
17	С	I. Numbers and Operations on Numbers	Easy

#### Rationale

**Option C is correct** because 40% of the application had been downloaded in 10 minutes. Let x represent the time it takes to completely download the application.

So, 
$$\frac{40}{100} = \frac{10}{x}$$
. Solving  $\frac{40}{100} = \frac{10}{x}$ , we get  $x = 25$  minutes.

The mobile application will be completely downloaded at 4:20 p.m. + 25 minutes, so at 4:45 p.m.

Sequence Number	Correct Response	Content Category	Question Difficulty
18	В	I. Numbers and Operations on Numbers	Easy
Rationale			



## Option B is correct because

$$3 \times 10^{a} \times 30{,}000 = 9 \times 10^{a+b}$$

$$(3 \times 3) \times (10^a \times 10^4) = 9 \times 10^{a+b}$$

$$9 \times 10^{a+4} = 9 \times 10^{a+b}$$

$$a + 4 = a + b$$

$$b = 4$$
.

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
19	Α	IV. Algebraic Concepts	Easy

#### **Rationale**

**Option A is correct because,** if D represents Daniel's age and U represents his uncle's age, their age difference would be U-D=18 and the sum of their ages would be U+D=62.

Rewrite U - D = 18 as U = D + 18, then substitute it in U + D = 62.

$$D + 18 + D = 62$$

$$2D + 18 = 62$$

$$2D = 44$$

$$D = 22$$

Solving the two equations, we find U = 40 and D = 22. So, Daniel's age is 22 years.

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
20	D	IV. Algebraic Concepts	Medium

#### Rationale

# Option D is correct because

$$f(x) = 4x^2 - 5\sqrt{2x}$$
 and  $f(8) = 4(8)^2 - 5\sqrt{2(8)}$ . Therefore,

$$f(8) = 4(64) - 5\sqrt{16}$$

$$f(8) = 256 - 20$$

$$f(8) = 236.$$

Sequence Number	Correct Response	Content Category	Question Difficulty
21	E	IV. Algebraic Concepts	Hard
Rationale			

**Option E is correct** because, for a quadratic equation in standard form, the x-coordinate of the vertex is given by the formula  $x = -b \div (2a)$ , which would be

$$x = -40 \div (2 \times 5) = -4.$$

Then, using -4 in the original equation of  $y = 5x^2 + 40x - 60$ ,

$$y = 5(-4)^2 + 40(-4) - 60$$

$$y = 80 - 160 - 60$$

$$y = -140$$
.

Therefore, the coordinates are (-4, -140)

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
22	Α	IV. Algebraic Concepts	Medium

#### Rationale

**Option A is correct** because to find the equation for the average cost per cookie of baking x cookies, we need to divide the total cost by the number of cookies. The total cost is given by C(x) = 20 + 0.1x, and the number of cookies is x. Therefore, the average cost per cookie is

$$AC(x) = \frac{C(x)}{x}$$

$$AC(x) = \frac{20 + 0.1x}{x}$$

$$AC(x) = \frac{20}{x} + 0.1.$$

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
23	В	IV. Algebraic Concepts	Medium

#### Rationale

**Option B** is correct because the rate of change of the function over the interval

$$1 \le x \le 4$$
 is

$$\frac{f(4)-f(1)}{4}$$

$$f(4) = 3.5(4)^2 - 28(4) + 11 = -45$$

$$f(1) = 3.5(1)^2 - 28(1) + 11 = -13.5$$

So, the rate of change is  $\frac{-45 - (-13.5)}{3} = -10.5$ .

Sequence Correct Number Response	Content Category	Question Difficulty
----------------------------------	------------------	------------------------

24	Α	II. Measurement/Geometry	Easy
Rationale			

**Option A is correct** because when a transversal line intersects two parallel lines, then the alternate interior angles formed are congruent, which means that the expressions are equal. Therefore, the equation 11x = 9x + 20 can be used to find the value of x.

Sequence	Correct	Content Category	Question
Number	Response		Difficulty
25	С	IV. Algebraic Concepts	Easy

#### Rationale

**Option C is correct** because the first equation in the given system of equations can be solved by

$$3x - 6y = 12$$

$$3x = 12 + 6y$$

$$x = 4 + 2y$$
.

Then, using this value of x in the second equation, we have

$$2x - 8y = 16$$

$$2(4+2y) - 8y = 16$$

$$8 + 4y - 8y = 16$$

$$8 - 4y = 16$$

$$-4y = 8$$

$$y = (-2)$$
.

Now, substituting this value of y in x, we have

$$x = 4 + 2(-2)$$

$$x = 0$$
.

Therefore, x = 0, y = -2.

