

Domain #1: The Heart of Algebra

Weeks #1 and #2 Example Problems

Example #1: In 2014, County X had 783 miles of paved roads. Starting in 2015, the country has been building 8 miles of new paved roads each year. At this rate, how many miles of paved road will Country X have in 2030? (Assume that no paved roads go out of service).

Note that this question has no choices. It is a student-produced response question. On the SAT, you would grid your answer in the spaces provided on the answer sheet.

Example #2: In 2014, County X had 783 miles of paved roads. Starting in 2015, the country has been building 8 miles of new paved roads each year. At this rate, if n is the number of years of 2014, which of the following functions f gives the number of miles of paved road there will be in Country X? (Assume that no paved roads go out of service.)

- A) $f(n) = 8 + 783n$
- B) $f(n) = 2014 + 783n$
- C) $f(n) = 783 + 8n$
- D) $f(n) = 2014 + 8n$

Example #3: In 2014, County X had 783 miles of paved roads. Starting in 2015, the country has been building 8 miles of new paved roads each year. At this rate, in which year will Country X first have at least 1,000 miles of paved roads? (Assume that no paved roads go out of service.)

Example #4: To edit a manuscript, Miguel charges \$50 for the first 2 hours and \$20 per hour after the first 2 hours. Which of the following expresses the amount, C , in dollars, Miguel charges if it takes him x hours to edit a manuscript, where $x > 2$?

- A) $C = 20x$
- B) $C = 20x + 10$
- C) $C = 20x + 50$
- D) $C = 20x + 90$

Example #5: A builder uses the function g defined by $g(x) = 80x + 10,000$ to estimate the cost $g(x)$ in dollars to build a one-story home of planned floor area of x square feet. If the builder estimates that the cost to build a certain one-story home is \$106,000, what is the planned floor area, in square feet, of the home?

Example #6: Maizah bought a pair of pants and a briefcase at a department store. The sum of the price of the pants and the briefcase before sales tax was \$130. There was no sales tax on the pants and a 9% sales tax on the briefcase. The total Maizah paid, including sales tax, was \$136.75. What was the price, in dollars, of the pants?

Example #7: Each morning, John jogs 6 miles per hour and rides a bike at 12 miles per hour. His goal is to jog and ride his bike a total of at least 9 miles in no more than 1 hour. If John jogs j miles and rides his bike b miles, which of the following systems of inequalities represents John's goal?

- A) $\frac{j}{6} + \frac{b}{12} \leq 1$
 $j + b \geq 9$
- B) $\frac{j}{6} + \frac{b}{12} \geq 1$
 $j + b \leq 9$
- C) $6j + 12b \geq 9$
 $j + b \leq 1$
- D) $6j + 12b \leq 1$
 $j + b \geq 9$

Example #8: What is the solution to the equation: $3\left(\frac{1}{2} - y\right) = \frac{3}{5} + 15y$

Example #9: What is the solution to the equation: $-2(3x - 2.4) = -3(3x - 2.4)$

Example #10: What is the solution (x, y) to the system of equations:

$$\begin{aligned} -2x &= 4y + 6 \\ 2(2y + 3) &= 3x - 5 \end{aligned}$$

Example #11: How many solutions (x, y) are there to the system of equations:

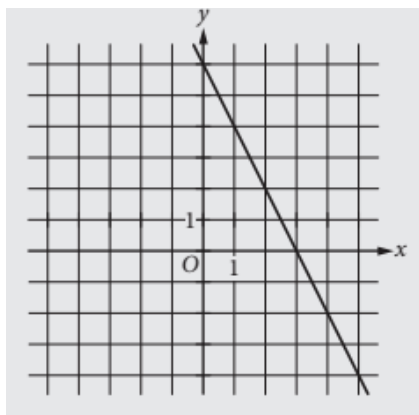
$$\begin{aligned} 2y + 6x &= 3 \\ y + 3x &= 2 \end{aligned}$$

- A) Zero
- B) One
- C) Two
- D) More than two

Example #12: In the system of equations below, a and b are constants. If the system has infinitely many solutions, what is the value of a ?

$$\begin{aligned} 3s - 2t &= a \\ -15s + bt &= -7 \end{aligned}$$

Example #13:



The graph of line k is shown in the xy -plane above. Which of the following is an equation of a line that is perpendicular to line k ?

- A) $y = -2x + 1$
- B) $y = -\frac{1}{2}x + 2$
- C) $y = \frac{1}{2}x + 3$
- D) $y = 2x + 4$

Example #14: A voter registration drive was held in Town Y. The number of votes, V , registered T days after the drive began can be estimated by the equation $V = 3450 + 65T$. What is the best interpretation of the number 65 in this equation?

- A) The number of registered voters at the beginning of the registration drive
- B) The number of registered votes at the end of the registration drive
- C) The total number of voters registered during the drive
- D) The number of voters registered each day during the drive