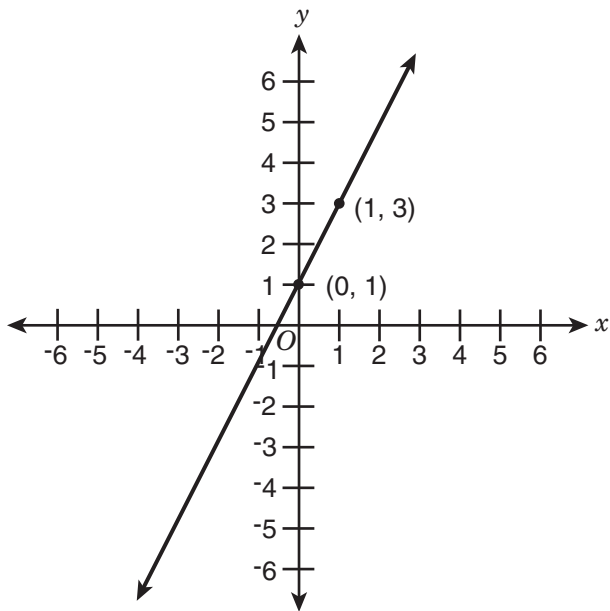


Grade 9 Mathematics Sample Questions

Blank grids are provided on page 235.

1. A function is given on the coordinate plane.



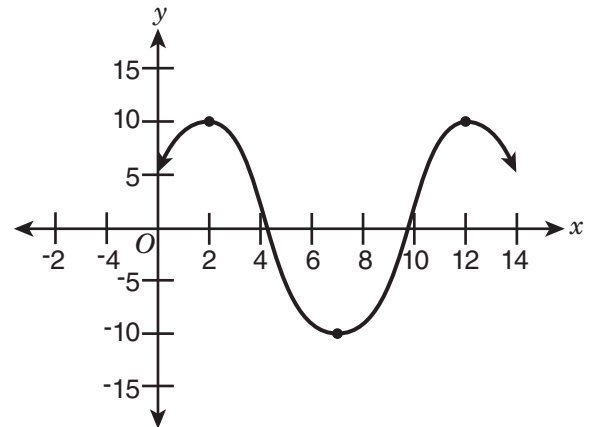
The function is linear. What is the y -value for $x = -4$?

2.
$$y = \frac{3}{2}x - 1$$

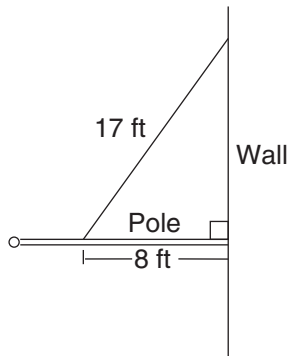
$$x + 2y = 6$$

What is the value of x in the solution to the system of equations shown above?

3. What is the difference in x -values in the graph from where the function first begins decreasing to where it begins decreasing again?



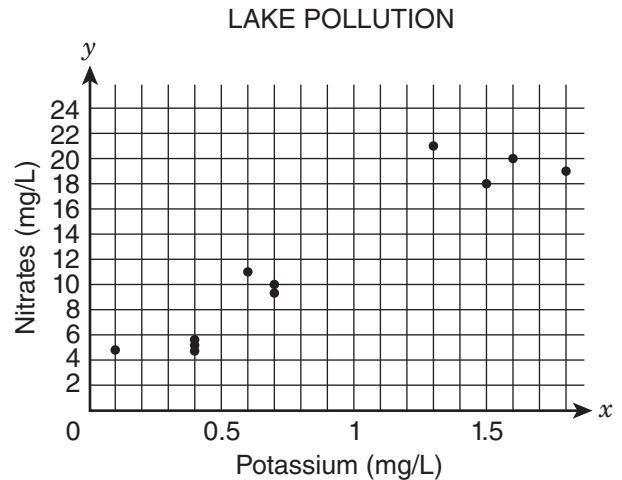
4.



The diagram above shows a pole connected to a wall at a 90° angle. A 17-foot wire is attached to the pole at a point 8 feet out from the wall. How many feet above the pole is the wire attached to the wall?

- A. 9
- B. 13
- C. 15
- D. 16

5. A researcher recorded pollution data that measured the presence of potassium and nitrates in some lakes. The scatter plot shows the data.



Which statement describes the data shown in the graph?

- A. The data show a nonlinear association.
- B. The data show multiple outliers.
- C. The data show a positive association.
- D. The data show a negative association.

6. How much greater is (1.8×10^6) than (7.3×10^5) ?

- A. 1.07×10^5
- B. 1.13×10^5
- C. 1.07×10^6
- D. 1.13×10^6

7. How is $0.\overline{6} \times 0.\overline{2}$ written as a fraction in simplest form?

- A. $\frac{4}{27}$
- B. $\frac{2}{15}$
- C. $\frac{4}{33}$
- D. $\frac{3}{25}$

8. If $2x - 6 = 8y - 10$ and $x > 5$, what is the least possible integer value of y ?

- A. 1
- B. 2
- C. 3
- D. 6

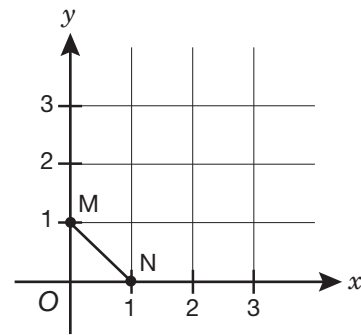
9. A data set relates a car's average gas mileage, y , in miles per gallon, to its engine size, x , in liters. The equation for the line of best fit is $y = -3.25x + 34.5$. What is the meaning of the slope of the line as it relates to gas mileage and engine size?

- A. For each decrease of 1 L in engine size, the gas mileage decreases by 3.25 mpg.
- B. For each increase of 1 L in engine size, the gas mileage decreases by 3.25 mpg.
- C. For each increase of 1 mpg in gas mileage, the engine size decreases by 3.25 L.
- D. For each decrease of 3.25 mpg in gas mileage, the engine size decreases by 1 L.

10. On Saturday, the temperature changed at a constant rate from 2:00 a.m. until 2:00 p.m. At 4:00 a.m., the temperature was 47°F . At 10:00 a.m., the temperature was 32°F . What was the temperature at 2:00 a.m. on Saturday?

- A. 15°F
- B. 37°F
- C. 42°F
- D. 52°F

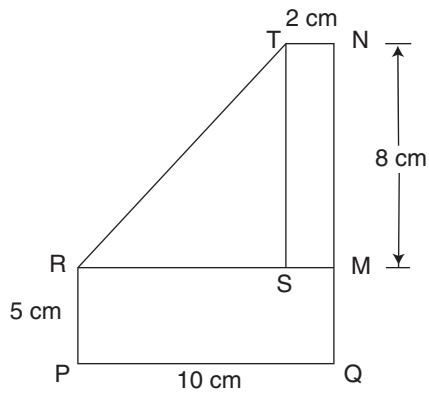
11.



If \overline{MN} is rotated 90° clockwise about the origin, what are the coordinates of N' ?

- A. $(1, 0)$
- B. $(0, 1)$
- C. $(0, -1)$
- D. $(-1, 0)$

12.



In the diagram above, $STNM$ and $PRMQ$ are rectangles, and point S is on \overline{RM} . What is the length of \overline{RT} , in centimeters?

- A. 8
- B. $\sqrt{80}$
- C. 10
- D. $\sqrt{128}$

13.

$$N = \sqrt{y + (2x - 1)^2}$$

In the equation shown above, $y > 0$ and $N \geq 0$. What value of x will result in the **least** possible value of N ?

- A. $-\frac{1}{2}$
- B. 0
- C. $\frac{1}{4}$
- D. $\frac{1}{2}$

1. (-7) The function goes through points (0, 1) and (1, 3). Use those points to determine the equation of the function:

$$\text{Slope: } \frac{3-1}{1-0} = \frac{2}{1} = 2$$

It can be determined from the graph that the y-intercept is 1.

$$\text{Equation: } y = 2x + 1$$

Now plug in $x = -4$ to find y :

$$y = 2(-4) + 1 = -8 + 1 = -7$$

2. (2) First, solve the second equation for y :

$$x + 2y = 6$$

$$2y = 6 - x \quad \text{Apply the additive inverse property; subtract } x \text{ from both sides of the equation}$$

$$y = \frac{6-x}{2} \quad \text{Apply the multiplicative inverse property; divide both sides of the equation by 2}$$

Now set the two expressions for y equal to each other:

$$\frac{3}{2}x - 1 = \frac{6-x}{2} \quad \text{Apply the multiplicative inverse property; multiply both sides by 2}$$

$$3x - 2 = 6 - x \quad \text{Apply the additive inverse property; add } x \text{ to both sides of the equation}$$

$$4x - 2 = 6 \quad \text{Apply the additive inverse property; add 2 to both sides of the equation}$$

$$4x = 8 \quad \text{Apply the multiplicative inverse property; divide both sides of the equation by 4}$$

$$x = 2$$

3. (10) The function first begins decreasing at (2, 10) and begins decreasing again at (12, 10). The difference in x -values is $12 - 2 = 10$.

4. (C) Let x represent the distance between the pole and the point where the wire attaches to the wall. Use the Pythagorean Theorem to find x :

$$x^2 + 8^2 = 17^2$$

$$x^2 + 64 = 289$$

$$x^2 = 225$$

$$x = \sqrt{225} = 15$$

5. (C) According to the scatter plot, as the potassium value increases, so does the nitrates value. Therefore, this is a positive association.

6. (C) In order to subtract the expressions, rewrite them so that they have the same exponent on the 10.

$$\begin{aligned} & (1.8 \times 10^6) - (7.3 \times 10^5) \\ &= (1.8 \times 10^6) - (0.73 \times 10^6) \\ &= (1.8 - 0.73) \times 10^6 \\ &= 1.07 \times 10^6 \end{aligned}$$

7. (A) Rewrite the repeating decimals as fractions:

$$x = 0.666666 \dots \quad \text{Let } x \text{ equal the repeating decimal}$$

$$10x = 6.66666 \dots \quad \text{Multiply both sides of the equation by 10 to move the decimal one place to the right}$$

$$10x = 6.6666 \dots \quad \text{Subtract the two equations}$$

$$\underline{-x = -0.6666}$$

$$9x = 6.0000 \dots \quad \text{Apply the multiplicative inverse property; divide both sides by 9}$$

$$x = \frac{6}{9} = \frac{2}{3} \quad \text{Simplify the fractions to lowest terms (if needed)}$$

Perform the same process for $0.\overline{2}$

$$10x = 2.2222 \dots$$

$$\underline{-x = -0.2222}$$

$$9x = 2.0000 \dots$$

$$x = \frac{2}{9}$$

Then multiply:

$$\frac{2}{3} \times \frac{2}{9} = \frac{4}{27}$$

8. (B) Solve for x :

$$x = 4y - 2$$

Since $x > 5$, then $4y - 2 > 5y > \frac{7}{4}$ or 1.75 since y is an integer, therefore the least possible integer value of y is 2

9. (B) The slope of the line of best fit is -3.25 . Slope is $\frac{y}{x}$, or in this case, $\frac{\text{gas mileage}}{\text{engine size}}$. So, for every 1 L increase in engine size, the gas mileage decreases by 3.25 mpg.

10. (D) The problem gives two points: (4:00, 47) and (10:00, 32). Use that information to find the rate of change:

$$\frac{32 - 47}{10:00 - 4:00} = \frac{-15}{6} = \frac{-5}{2}$$

So, the temperature change was $-\frac{5}{2}^\circ\text{F}$ each hour.

To find the temperature at 2:00 a.m., which is two hours before 4:00 a.m., subtract $-\frac{5}{2}$ from 47 twice:

$$47 - 2\left(-\frac{5}{2}\right) = 47 + 5 = 52$$

Therefore, the temperature at 2:00 a.m. was 52°F .

11. (C) The new position of A (h, k) after rotating 90 degree will become A' ($k, -h$). Rotating 90° clockwise moves the line segment to the fourth quadrant. So, M' becomes (0, 1) and N' becomes (0, -1).

12. (D) Triangle RTS is a right triangle. First, find the lengths of the two legs (TS and RS). Then the Pythagorean Theorem can be used to find the length of \overline{RT} .

In rectangle STNM, TN is 2 cm, so SM is also 2 cm. Similarly, NM is 8 cm, so TS is also 8 cm.

In rectangle PRMQ, PQ is 10 cm, so RM is also 10 cm. Since $RM = RS + SM$, use the values of RM and SM to calculate the length of \overline{RS} , in centimeters:

$$RS + SM = RM$$

$$RS + 2 = 10$$

$$RS = 8$$

Now use the Pythagorean Theorem to find the length of:

$$(RS)^2 + (TS)^2 = (RT)^2$$

$$8^2 + 8^2 = (RT)^2$$

$$64 + 64 = (RT)^2$$

$$128 = (RT)^2$$

$$\sqrt{128} = RT$$

- 13. (D)** In order to minimize the value of N, find the least possible, $(2x - 1)^2$. Since this expression is squared, the least possible value is 0.

$$(2x - 1)^2 = 0 \quad \text{Take the square root of both sides of the equation}$$

$$2x - 1 = 0 \quad \text{Apply the additive inverse property; add 1 to both sides of the equation}$$

$$2x = 1 \quad \text{Apply the multiplicative inverse property; divide both sides of the equation by 2}$$

$$x = \frac{1}{2}$$

Answer Key for Grade 9 Mathematics

- | | | |
|-------|-------|-------|
| 1. -7 | 6. C | 11. C |
| 2. 2 | 7. A | 12. D |
| 3. 10 | 8. B | 13. D |
| 4. C | 9. B | |
| 5. C | 10. D | |