Algebra

1 The owner of a small computer repair business has one employee, who is paid an hourly rate of \$22. The owner estimates his weekly profit using the function $P(x) = 8600 - 22x$. In this function, x represents the number of

(1) computers repaired per week

(2) hours worked per week

(3) customers served per week

(4) days worked per week

2 Peyton is a sprinter who can run the 40-yard dash in 4.5 seconds. He converts his speed into miles per hour, as shown below.

$$\frac{40 \text{ yd}}{4.5 \text{ sec}} \cdot \frac{3 \text{ ft}}{1 \text{ yd}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}}$$

Which ratio is *incorrectly* written to convert his speed?

(1) $\frac{3 \text{ ft}}{1 \text{ yd}}$

(2) $\frac{5280 \text{ ft}}{1 \text{ mi}}$

(3) $\frac{60 \text{ sec}}{1 \text{ min}}$

(4) $\frac{60 \text{ min}}{1 \text{ hr}}$

3 Which equation has the same solutions as $2x^2 + x - 3 = 0$?

(1) $(2x - 1)(x + 3) = 0$

(2) $(2x + 1)(x - 3) = 0$

(3) $(2x - 3)(x + 1) = 0$

(4) $(2x + 3)(x - 1) = 0$

4 Krystal was given $3000 when she turned 2 years old. Her parents invested it at a 2% interest rate compounded annually. No deposits or withdrawals were made. Which expression can be used to determine how much money Krystal had in the account when she turned 18?

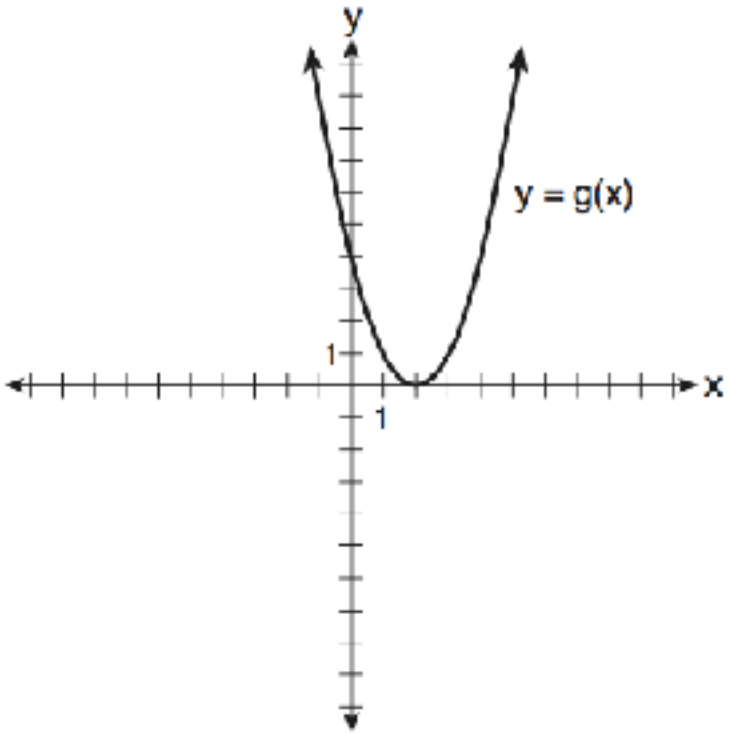
(1) $3000(1 + 0.02)^{16}$

(2) $3000(1 - 0.02)^{16}$

(3) $3000(1 + 0.02)^{18}$

(4) $3000(1 - 0.02)^{18}$

5 What is the solution to the system of equations $y = 3x - 2$ and $y = g(x)$ where $g(x)$ is defined by the function below?



(1) $\{(0,-2)\}$

(2) $\{(0,-2),(1,6)\}$

(3) $\{(1,6)\}$

(4) $\{(1,1),(6,16)\}$

6 Which statement about statistical analysis is *false*?

(1) Experiments can suggest patterns and relationships in data.

(2) Experiments can determine cause and effect relationships.

(3) Observational studies can determine cause and effect relationships.

(4) Observational studies can suggest patterns and relationships in data.

7 The expression $\left(\frac{m^2}{m^{\frac{1}{3}}}\right)^{-\frac{1}{5}}$ is equivalent to

(1) $-\sqrt[6]{m^5}$

(2) $\frac{1}{\sqrt[6]{m^5}}$

(3) $-m\sqrt[5]{m}$

(4) $\frac{1}{m\sqrt[5]{m}}$

8 The value in dollars, $v(x)$, of a certain car after x years is represented by the equation $v(x) = 25{,}000(0.86)^x$. To the *nearest dollar*, how much more is the car worth after 2 years than after 3 years?

(1) 2589

(2) 6510

(3) 15,901

(4) 18,490

9 What is the inverse of the function $y = \log_3 x$?

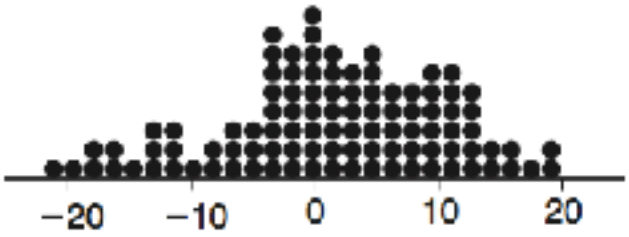
(1) $y = x^3$

(2) $y = \log_x 3$

(3) $y = 3^x$

(4) $x = 3^y$

10 Gabriel performed an experiment to see if planting 13 tomato plants in black plastic mulch leads to larger tomatoes than if 13 plants are planted without mulch. He observed that the average weight of the tomatoes from tomato plants grown in black plastic mulch was 5 ounces greater than those from the plants planted without mulch. To determine if the observed difference is statistically significant, he rerandomized the tomato groups 100 times to study these random differences in the mean weights. The output of his simulation is summarized in the dotplot below.



Given these results, what is an appropriate inference that can be drawn?

(1) There was no effect observed between the two groups.

(2) There was an effect observed that could be due to the random assignment of plants to the groups.

(3) There is strong evidence to support the hypothesis that tomatoes from plants planted in black plastic mulch are larger than those planted without mulch.

(4) There is strong evidence to support the hypothesis that tomatoes from plants planted without mulch are larger than those planted in black plastic mulch.

11 The solution to the equation $18x^2 - 24x + 87 = 0$ is

(1) $-\frac{2}{3} \pm 6i\sqrt{158}$

(2) $-\frac{2}{3} \pm \frac{1}{6}i\sqrt{158}$

(3) $\frac{2}{3} \pm 6i\sqrt{158}$

(4) $\frac{2}{3} \pm \frac{1}{6}i\sqrt{158}$

12 When $g(x) = \frac{2}{x+2}$ and $h(x) = \log(x + 1) + 3$ are graphed on the same set of axes, which coordinates best approximate their point of intersection?

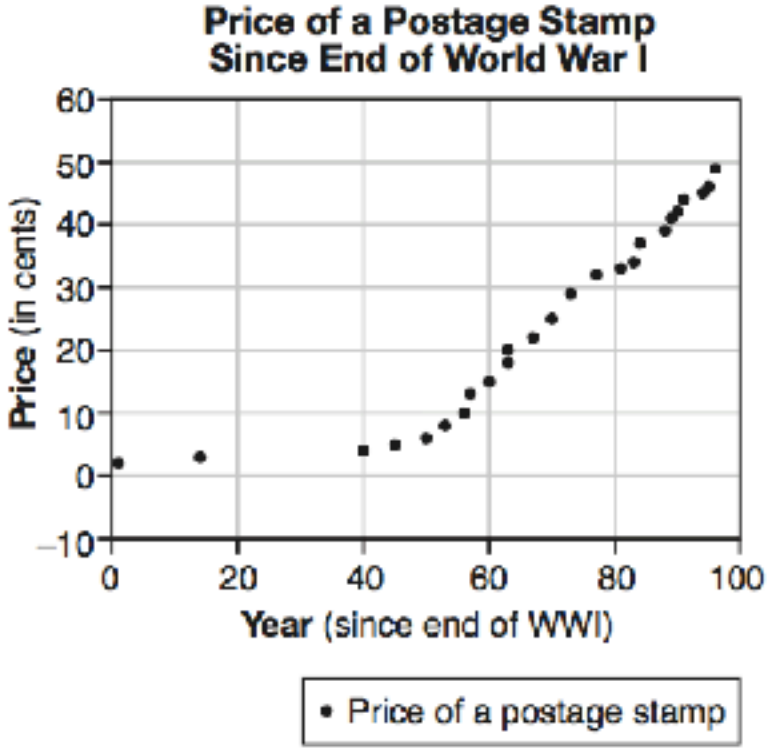
(1) $(-0.9,1.8)$

(2) $(-0.9,1.9)$

(3) $(1.4,3.3)$

(4) $(1.4,3.4)$

13 The price of a postage stamp in the years since the end of World War I is shown in the scatterplot below.



The equation that best models the price, in cents, of a postage stamp based on these data is

(1) $y = 0.59x - 14.82$

(2) $y = 1.04(1.43)^x$

(3) $y = 1.43(1.04)^x$

(4) $y = 24\sin(14x) + 25$

14 The eighth and tenth terms of a sequence are 64 and 100. If the sequence is either arithmetic or geometric, the ninth term can *not* be

(1) -82

(2) -80

(3) 80

(4) 82

15 Some banks charge a fee on savings accounts that are left inactive for an extended period of time. The equation $y = 5000(0.98)^x$ represents the value, y, of one account that was left inactive for a period of x years.

What is the y-intercept of this equation and what does it represent?

(1) 0.98, the percent of money in the account initially

(2) 0.98, the percent of money in the account after x years

(3) 5000, the amount of money in the account initially

(4) 5000, the amount of money in the account after x years

16 The equation for the volume of a cylinder is $V = \pi r^2 h$. The positive value of r, in terms of h and V, is

(1) $r = \sqrt{\frac{V}{\pi h}}$

(2) $r = \sqrt{V\pi h}$

(3) $r = 2V\pi h$

(4) $r = \frac{V}{2\pi}$

17 What is the solution, if any, of the equation

$$\frac{2}{x+3} - \frac{3}{4-x} = \frac{2x-2}{x^2-x-12}?$$

(1) -1

(2) -5

(3) all real numbers

(4) no real solution

18 In 2013, approximately 1.6 million students took the Critical Reading portion of the SAT exam. The mean score, the modal score, and the standard deviation were calculated to be 496, 430, and 115, respectively. Which interval reflects 95% of the Critical Reading scores?

(1) 430 ± 115

(2) 430 ± 230

(3) 496 ± 115

(4) 496 ± 230

19 Molly wishes to make a lawn ornament in the form of a solid sphere. The clay being used to make the sphere weighs .075 pound per cubic inch. If the sphere's radius is 4 inches, what is the weight of the sphere, to the *nearest pound*?

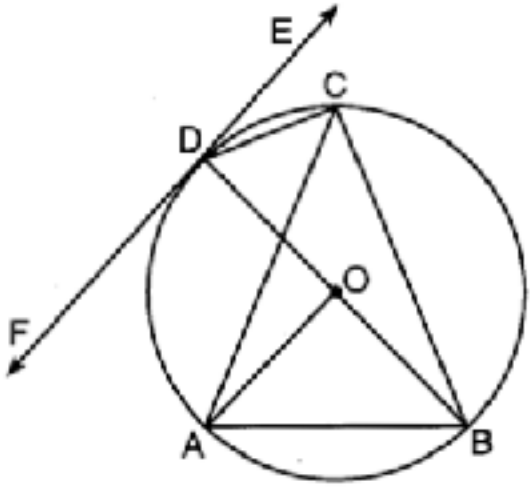
(1) 34

(2) 20

(3) 15

(4) 4

21 In the diagram below, $\overline{DC}$, $\overline{AC}$, $\overline{DOB}$, $\overline{CB}$, and $\overline{AB}$ are chords of circle O, $\overleftrightarrow{FDE}$ is tangent at point D, and radius $\overline{AO}$ is drawn. Sam decides to apply this theorem to the diagram: "An angle inscribed in a semi-circle is a right angle."



Which angle is Sam referring to?

(1) $\angle AOB$

(2) $\angle BAC$

(3) $\angle DCB$

(4) $\angle FDB$