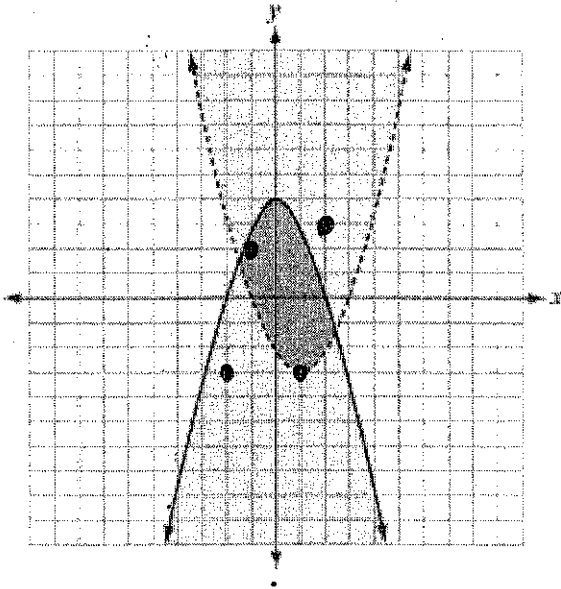


1.

Which ordered pair is a solution to the graphed system?



- A. (-2, -3) **B. (-1, 2)**
 C. (1, -3) D. (2, 3)

3.

What quantity should be added to both sides of this equation to complete the square?

$$x^2 - 8x = 5 \quad \left(\frac{b}{2}\right)^2 = \left(\frac{-8}{2}\right)^2 = (-4)^2 = 16$$

- A. 4 B. -4 **C. 16** D. -16

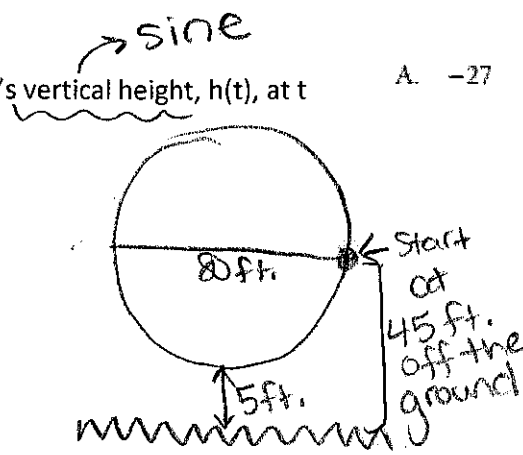
5. A Ferris wheel has diameter of 80 feet. Riders enter the Ferris wheel midway up on the right. The bottom of the wheel is 5 feet above the ground. One complete rotation takes 65 seconds.

amplitude = radius = 40

Which function models a rider's vertical height, $h(t)$, at t seconds?

- A. $h(t) = 80\sin\left(\frac{2\pi}{65}t\right) + 5$
B. $h(t) = 40\sin\left(\frac{2\pi}{65}t\right) + 45$
 C. $h(t) = 40\sin\left(\frac{2\pi}{65}t\right) + 5$
 D. $h(t) = 5\sin\left(\frac{2\pi}{65}t\right) + 80$

period = 65 $\rightarrow b = \frac{2\pi}{\text{period}} = \frac{2\pi}{65}$



2.

Ms. Madison, a dance teacher, wants to know if students would go to an after-school dance. According to simple random sampling principles, which of these is the best method to survey students about the dance?

- A) Ask 50 girls to complete the survey.
 B) Ask 50 students who attended the last dance.
 C) Ask 50 randomly selected students from her classes.
D) Ask 50 randomly selected students from the school.

4.

Leanne correctly solved the equation $x^2 + 4x = 6$ by completing the square. Which equation is part of her solution?

$$x^2 + 4x + 4 = 6 + 4$$

$$(x + 2)^2 = 10$$

- A. $(x + 2)^2 = 8$ **B. $(x + 2)^2 = 10$**
 C. $(x + 4)^2 = 10$ D. $(x + 4)^2 = 22$

6.

If $x^2 - 6x - 16$ is written in the form $a(x - h)^2 + k$, what is the value of $a + h + k$?

- A. -27 **B. -21** C. 12 D. 29

$$y_1 = x^2 - 6x - 16$$

$$N(3, -25)$$

h k

$$a + h + k$$

$$1 + 3 + -25 = -21$$

7.

Which of the following is the inverse of

$f(x) = \frac{2x-3}{5}$? $y = \frac{2x-3}{5} \rightarrow (5)x = 2y-3 \rightarrow (5)x = 2y-3$

- (A) $f^{-1}(x) = \frac{5x+3}{2}$ B. $f^{-1}(x) = \frac{-2x+3}{5}$
 C. $f^{-1}(x) = \frac{2y-3}{5}$ D. $f^{-1}(x) = \frac{-5y-3}{2}$

$5x = 2y - 3$
 $+3$
 $5x + 3 = 2y$
 $\frac{5x+3}{2} = \frac{2y}{2}$

9.

Find the inverse of $f(x) = 3(10)^{2x}$.

$y = 3(10)^{2x} \rightarrow \frac{y}{3} = \frac{3(10)^{2x}}{3}$

$\frac{y}{3} = (10)^{2x}$

$\frac{\log(\frac{y}{3})}{2} = \frac{2x \log(10)}{2}$

$f^{-1}(x) = \frac{\log(\frac{y}{3})}{2}$

11.

The graph of $y = ax^2$ is shifted up 3 units and right 5 units. Which equation represents the resulting graph?

- (A) $y = a(x-5)^2 + 3$ B. $y = a(x+5)^2 + 3$
 C. $y = a(x-3)^2 + 5$ D. $y = a(x+3)^2 + 5$

$y = a(x-5)^2 + 3$

13.

Consider $f(x) = \frac{1}{x+2}$, and $g(x) = \frac{1}{x+3}$. Which translation will transform the graph of $f(x)$ into the graph of $g(x)$?

- A. shift 1 unit right (B) shift 1 unit left
 C. shift 1 unit down D. shift 1 unit up

$\frac{1}{x+2+1} = \frac{1}{x+3}$ ← left 1

8.

What is the inverse function of $f(x) = \log_5(2x-1)$?

- A. $f^{-1}(x) = 5^x - 1$
 (B) $f^{-1}(x) = \frac{5^x + 1}{2}$
 C. $f^{-1}(x) = \log_2(5x-1)$
 D. $f^{-1}(x) = \log_5 \frac{5x+1}{2}$

$y = \log_5(2x-1)$
 $x = \log_5(2y-1)$
 $5^x = 2y-1$
 $\frac{5^x + 1}{2} = \frac{2y}{2}$

10.

Which function is the inverse of $f(x) = x^3 + 6$?

- A. $f^{-1}(x) = x^3 + 6$ B. $f^{-1}(x) = \sqrt[3]{x} + 6$
 C. $f^{-1}(x) = \sqrt[3]{x} - 6$ (D) $f^{-1}(x) = \sqrt{x} - 6$

$y = x^3 + 6 \rightarrow x = \sqrt[3]{y-6}$
 $\sqrt[3]{x-6} = \sqrt[3]{y}$

12.

In the function $f(x) = a(x-4)^2$, where $a > 0$, what happens to the graph of f as the value of a increases?

- (A) The graph narrows.
 B. The graph widens.
 C. The graph shifts up.
 D. The graph shifts right.

14.

Which equation represents the graph of $y = x^2$ translated 1 unit right and 2 units down?

- A. $y = -(x-1)^2 - 2$ (B) $y = (x-1)^2 - 2$
 C. $y = -(x+1)^2 + 2$ D. $y = (x+1)^2 - 2$

$y = x^2 \rightarrow y = (x-1)^2 - 2$

15.

The graph of $f(x) = x^2$ will be translated 5 units up and 2 units to the right. Which function describes the graph produced by the translation?

- A. $g(x) = x^2 - 4x + 9$
- B. $g(x) = x^2 + 4x - 1$
- C. $g(x) = x^2 - 10x + 27$
- D. $g(x) = x^2 + 10x + 23$

$$y = (x-2)^2 + 5$$

$$\downarrow \quad \downarrow$$

$$(x-2)(x-2) \downarrow$$

$$y = x^2 - 4x + 4 + 5$$

$$y = x^2 - 4x + 9$$

16. The half-life of Zn-71 is 2.4 minutes. If one had 100.0 g at the beginning, how many grams would be left after 7.2 minutes has elapsed?

$$y = a \left(\frac{1}{2}\right)^{\frac{\text{time}}{\text{half-life}}}$$

$$y = 100.0 \left(\frac{1}{2}\right)^{\frac{7.2}{2.4}}$$

$$y = 100 \left(\frac{1}{2}\right)^3$$

$$y = 100(.125) = \boxed{12.5g}$$

17. 100.0 grams of an isotope with a half-life of 36.0 hours is present at time zero. How much time will have elapsed when 5.00 grams remains?

$$\frac{5}{100} = \frac{100 \left(\frac{1}{2}\right)^{\frac{\text{time}}{36}}}{100}$$

$$.05 = (.5)^{\frac{x}{36}}$$

$$(36) \log_{.5} (.05) = \frac{x}{36} (36)$$

$x \approx 155.59$
hours

18. How long will it take for a 40 gram sample of I-131 (half-life = 8.040 days) to decay to 1/100 its original mass?

$$\frac{.01}{40} = \frac{40 \left(\frac{1}{2}\right)^{\frac{\text{time}}{8.040}}}{40}$$

$$.00025 = \left(\frac{1}{2}\right)^{\frac{x}{8.040}}$$

$$\log_{.5} (.00025) = \frac{x}{8.040}$$

$$53.42 \approx x$$

days

19.

The host of a television news program wants to predict the voters' preferred candidate in the upcoming election. Which of the following sampling processes would be the least subject to bias?

- A. The host sets up a booth at the local shopping mall and asks shoppers to participate in a survey.
- B. The host asks viewers to call in, text, or visit the show's website to participate in the survey.
- C. The host requires each of the show's employees to have four of their neighbors participate in the survey.
- D. The host acquires a list of all citizens who voted in the last election and selects every 100th voter on the list to participate in the survey.

20.

A reporter wants to know the percentage of voters in the state who support building a new highway. What is the reporter's population?

- A. the number of people who live in the state
- B. the people who were interviewed in the state
- C. all voters over 25 years old in the state
- D. all eligible voters in the state

21.

A farmer wishes to find out the average milk yield of each cow type in his herd, which consists of Ayrshire, Friesian, Galloway and Jersey cows. Which would be the best sampling technique for the farmer to use?

- A. cluster
- B. random
- C. stratified
- D. systematic

22.

Which characteristic in a statistical study is necessary in order for conclusions to be drawn regarding the whole population, based on the sample population?

- A. The sample must be randomly selected.
- B. The sample must not be randomly selected.
- C. The population size must meet a minimum number requirement, based on the sample size.
- D. The population size must meet a maximum number requirement, based on the sample size.