

1

How does the graph of $g(x) = 0.5\cos(2x)$ differ from the graph of its parent function, $f(x) = \cos(x)$, over the interval $-\pi \leq x \leq \pi$?

- A The amplitude is smaller, and the period is shorter.
- B The amplitude is smaller, and the period is longer.
- C The amplitude is larger, and the period is shorter.
- D The amplitude is larger, and the period is longer.

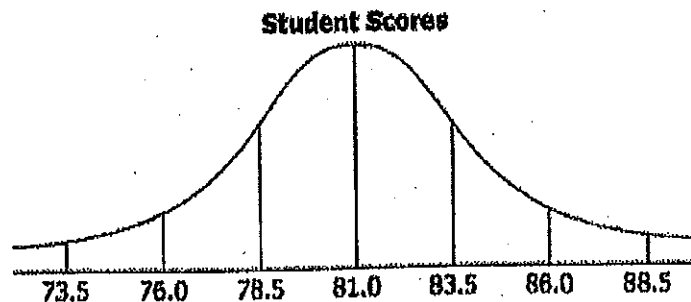
2

A group of 12 people need to form a line. The line will consist of exactly 9 of the people. Person X and Person Y have to be either third or fourth in line. How many different orders are possible?

- A 79,833,600
- B 1,209,600
- C 604,800
- D 362,880

3

This graph summarizes the test scores of 50,000 students. The data is normally distributed with a mean of 81 and a standard deviation of 2.5.



Identify the regions under the curve where only the data for approximately 23,750 students are located.

4

Which statement is true about the fifth terms of the two sequences below?

$$a_n = 3n^2 - 6$$

$$b_n = 3(b_{n-1} - 6); b_1 = 10$$

- A The fifth term of the recursive sequence exceeds the fifth term of the explicit sequence by 63.
- B The fifth term of the explicit sequence exceeds the fifth term of the recursive sequence by 63.
- C The fifth term of the recursive sequence exceeds the fifth term of the explicit sequence by 21.
- D The fifth term of the explicit sequence exceeds the fifth term of the recursive sequence by 21.

5

Which function has an amplitude that is twice the size and a period that is three times the size of the function $y = 3\cos\left(\frac{x}{4} - 1\right) + 2$?

- A $y = 6\sin\left(\frac{x}{12} - 3\right) + 1$
- B $y = \frac{3}{2}\cos\left(\frac{3x}{4} + 1\right) - 3$
- C $y = 6\cos\left(\frac{3x}{4} - 1\right) + 3$
- D $y = \frac{3}{2}\sin\left(\frac{x}{12} + 3\right) - 1$

6

A plane takes off and travels at an angle of 40° north of east at 110 mph for 2 hours. It then adjusts its path to head 10° west of north and travels in that direction for half an hour at a speed of 100 mph. *Approximately* how far away is the plane from its starting point?

- A 182 miles
- B 200 miles
- C 238 miles
- D 249 miles

7

The number of household members, x , living in Cityville homes has the following probability distribution:

x	1	2	3	4	5	6	7	8
$P(x)$	0.24	0.28	0.16	0.22	0.06	0.04	0.02	0.01

What is the expected size of a household in Cityville?

- A 2.43
- B 2.89
- C 3.17
- D 4.50

8

Suppose the function $H(t) = 8.5\sin(0.017t - 1.35) + 12$ models the hours of sunlight for a town in Alaska, where $t = 1$ is the first day of the year. Based on the function, what is the **approximate** range of daylight hours for the town?

- A 3.5 to 20.5
- B 4 to 20
- C 4.5 to 19.5
- D 5 to 19

9

Which function results by shifting the graph of $y = \ln(x + 3) - 6$ to the left 4 units and down 3 units?

- A $y = \ln(x + 7) - 9$
- B $y = \ln(x - 1) - 9$
- C $y = \ln(x + 7) - 3$
- D $y = \ln(x - 1) - 3$

10

A solution's pH is given by the function $p(t) = -\log(t)$, where t is the hydronium ion concentration, in moles per liter. A sample of coffee has a pH of 5.0. What is the **approximate** hydronium ion concentration of the sample?

- A 0.000001
- B 0.00001
- C 0.0001
- D 0.001

11

Write an equation for the power function, in $y = ax^b$ form, that passes through the points (2, 1) and (5, 6).

- a) Use your power function to predict the value of y when $x = 9$.

12

A theater has 25 seats in the first row, 27 in the second row, 29 in the third row, and so on.

a. How many seats are in the 50th row?

b. How many seats are in the entire theater?

c. If the theater makes \$15 per seat, how much money should they expect to make at a sold-out show?

13

Use a power function to model the data and estimate y for $x = 10$.

x	y
1	0
2	144
3	729
4	2,304
5	5,625
6	11,664
7	21,609
8	36,864

- a. 59,040
- b. 131,760
- c. 90,000
- d. 52,110

15

Solve.

$$\sqrt{x+9} = x-3$$

- a. 7
- b. -6
- c. -3, 4
- d. no real number solution

14

A sequence is shown below.

$$36, -6, 1, -\frac{1}{6}, \frac{1}{36}, \dots$$

What is the sum of the sequence?

- A $-\frac{36}{5}$
- B $\frac{36}{7}$
- C $\frac{216}{7}$
- D $\frac{216}{5}$

16

The scores on a recent test are normally distributed. John's test score of 69 was 1 standard deviation below the mean. Betty's test score of 99 was 3 standard deviations above the mean. What are the mean and standard deviation for the test score distribution?

- A The mean is 76.5, and the standard deviation is 7.5.
- B The mean is 79, and the standard deviation is 10.
- C The mean is 84, and the standard deviation is 15.
- D The mean is 91, and the standard deviation is 2.5.

17

The following sequence is given in recursive form.

$$\begin{cases} a_1 = 8 \\ a_n = 2a_{n-1} + 5, \text{ for } n \geq 2 \end{cases}$$

What is the value of the third term of this sequence?

$a_3 =$

18

A sequence is shown below.

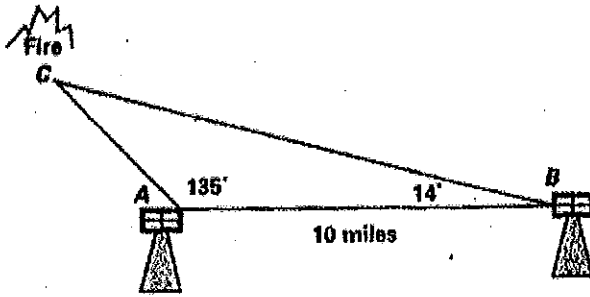
1, 0.1, 0.01, 0.001, 0.0001

What is the sum of the sequence?

- A $1\frac{1}{10}$
- B $1\frac{1}{9}$
- C $1\frac{2}{9}$
- D $1\frac{9}{10}$

19

How far away is the fire from observation tower A?



20

Which statement is true about the series shown below?

$$-4 + 2 + 1 + \frac{1}{2} + \frac{1}{4} + \dots$$

- A The series converges because $|r| < 1$.
- B The series diverges because $|r| < 1$.
- C The series converges because $|r| > 1$.
- D The series diverges because $|r| > 1$.

21

If the probability of giving birth to a boy is 0.52, what is the **approximate** probability of giving birth to four consecutive boys?

- A 0.021
- B 0.062
- C 0.073
- D 0.130

22

A manufacturing plant produces a special kind of lightbulb.

- Each lightbulb produced has a 0.040 probability of being defective.
- Five lightbulbs are chosen at random from the production line.

To the nearest thousandth, what is the probability that exactly two of the five bulbs will be defective?

- A 0.014
- B 0.016
- C 0.018
- D 0.020

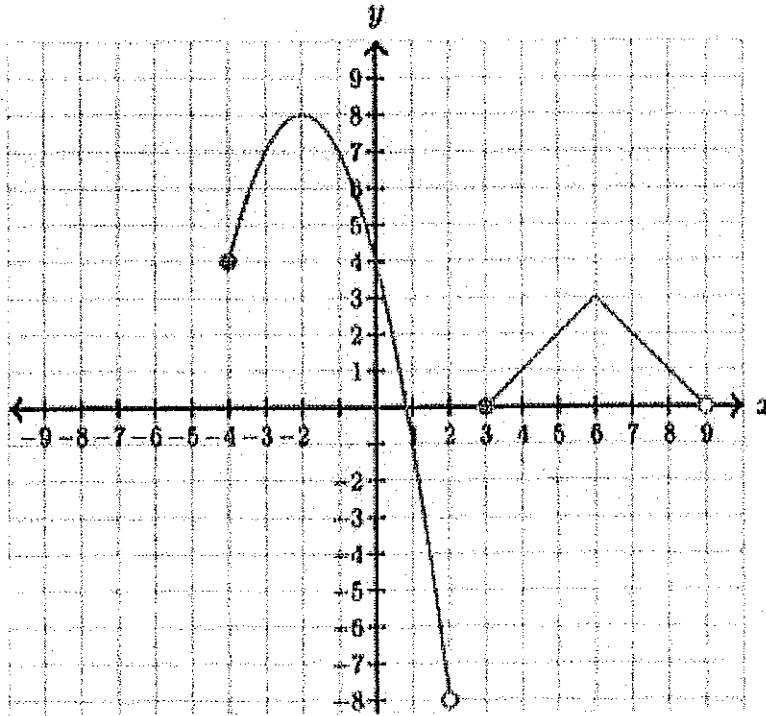
23

$$A) g(x) = \begin{cases} -(x+2)^2 + 8, & -4 \leq x < 3 \\ -|x-6| + 3, & 3 \leq x < 9 \end{cases}$$

$$B) p(x) = \begin{cases} -|x-6| + 3, & -4 \leq x < 2 \\ -(x+2)^2 + 8, & 3 \leq x < 9 \end{cases}$$

$$C) f(x) = \begin{cases} -(x+2)^2 + 8, & -4 \leq x < 2 \\ -|x-6| + 3, & 2 \leq x < 9 \end{cases}$$

$$D) h(x) = \begin{cases} -(x+2)^2 + 8, & -4 \leq x < 2 \\ -|x-6| + 3, & 3 \leq x < 9 \end{cases}$$



24

What is the explicit form of the equation $a_n = a_{n-1} + 2(n-1)$; $a_1 = 1$?

A $a_n = 2n - 1$

B $a_n = n^2 - n + 1$

C $a_n = n^2 - 2n + 2$

D $a_n = 2n^2 - 2n - 1$