

Hard Questions Examples

1.

Minh cuts a board in the shape of a regular hexagon and pounds in a nail at an equal distance from each vertex, as shown in the figure below. How many rubber bands will she need in order to stretch a different rubber band across every possible pair of nails?

- A. 15
- B. 14
- C. 12
- D. 9
- E. 6



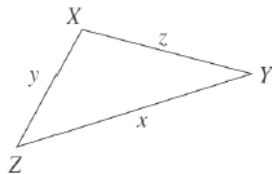
2.

For a project in Home Economics class, Kirk is making a tablecloth for a circular table 3 feet in diameter. The finished tablecloth needs to hang down 5 inches over the edge of the table all the way around. To finish the edge of the tablecloth, Kirk will fold under and sew down 1 inch of the material all around the edge. Kirk is going to use a single piece of rectangular fabric that is 60 inches wide. What is the shortest length of fabric, in inches, Kirk could use to make the tablecloth without putting any separate pieces of fabric together?

- F. 15
- G. 24
- H. 30
- J. 42
- K. 48

3.

The triangle, $\triangle XYZ$, that is shown below has side lengths of x , y , and z inches and is not a right triangle. Let X' be the image of X when the triangle is reflected across \overline{YZ} . Which of the following is an expression for the perimeter, in inches, of quadrilateral $X'YXZ$?

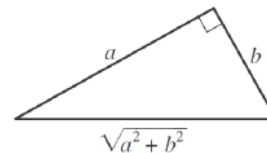


- F. $2(y + z) + x$
- G. $2(x + y + z)$
- H. $2(x + y)$
- J. $2(x + z)$
- K. $2(y + z)$

4.

In the right triangle below, $0 < b < a$. One of the angle measures in the triangle is $\tan^{-1}\left(\frac{a}{b}\right)$. What is $\cos\left[\tan^{-1}\left(\frac{a}{b}\right)\right]$?

- A. $\frac{a}{b}$
- B. $\frac{b}{a}$
- C. $\frac{a}{\sqrt{a^2 + b^2}}$
- D. $\frac{b}{\sqrt{a^2 + b^2}}$
- E. $\frac{\sqrt{a^2 + b^2}}{a}$



5.

The sum of an infinite geometric series with first term a and common ratio $r < 1$ is given by $\frac{a}{1-r}$. The sum of a given infinite geometric series is 200, and the common ratio is 0.15. What is the second term of this series?

- F. 25.5
- G. 30
- H. 169.85
- J. 170
- K. 199.85

Answers

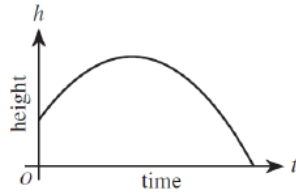
Hard Question Example Answers

1. A
2. K
3. K
4. D
5. F

Hard Questions Practice

1.

The graph of the equation $h = -at^2 + bt + c$, which describes how the height, h , of a hit baseball changes over time, t , is shown below.



If you alter only this equation's c term, which gives the height at time $t = 0$, the alteration has an effect on which of the following?

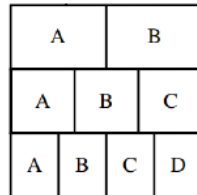
- I. The h -intercept
- II. The maximum value of h
- III. The t -intercept

- F. I only
- G. II only
- H. III only
- J. I and III only
- K. I, II, and III

2.

The square below is divided into 3 rows of equal area. In the top row, the region labeled A has the same area as the region labeled B. In the middle row, the 3 regions have equal areas. In the bottom row, the 4 regions have equal areas. What fraction of the square's area is in a region labeled A?

- F. $\frac{1}{9}$
- G. $\frac{3}{9}$
- H. $\frac{6}{9}$
- J. $\frac{13}{12}$
- K. $\frac{13}{36}$



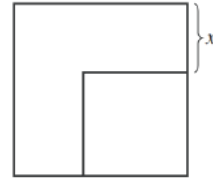
3.

As part of a probability experiment, Elliott is to answer 4 multiple-choice questions. For each question, there are 3 possible answers, only 1 of which is correct. If Elliott randomly and independently answers each question, what is the probability that he will answer the 4 questions correctly?

- A. $\frac{27}{81}$
- B. $\frac{12}{81}$
- C. $\frac{4}{81}$
- D. $\frac{3}{81}$
- E. $\frac{1}{81}$

4.

In the figure below, the area of the larger square is 50 square centimeters and the area of the smaller square is 18 square centimeters. What is x , in centimeters?



- F. 2
- G. $2\sqrt{2}$
- H. $4\sqrt{2}$
- J. 16
- K. 32

5.

An integer from 100 through 999, inclusive, is to be chosen at random. What is the probability that the number chosen will have 0 as at least 1 digit?

- A. $\frac{19}{900}$
- B. $\frac{81}{900}$
- C. $\frac{90}{900}$
- D. $\frac{171}{900}$
- E. $\frac{271}{1,000}$

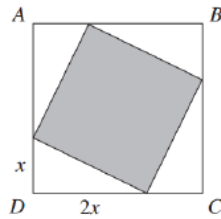
6.

For every positive 2-digit number, x , with tens digit t and units digit u , let y be the 2-digit number formed by reversing the digits of x . Which of the following expressions is equivalent to $x - y$?

- F. $9(t - u)$
- G. $9(u - t)$
- H. $9t - u$
- J. $9u - t$
- K. 0

7.

In the figure below, $ABCD$ is a square. Points are chosen on each pair of adjacent sides of $ABCD$ to form 4 congruent right triangles, as shown below. Each of these has one leg that is twice as long as the other leg. What fraction of the area of square $ABCD$ is shaded?



- A. $\frac{1}{9}$
- B. $\frac{2}{9}$
- C. $\frac{4}{9}$
- D. $\frac{5}{9}$
- E. $\frac{8}{9}$

8.

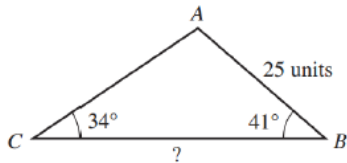
If $x:y = 5:2$ and $y:z = 3:2$, what is the ratio of $x:z$?

- A. 3:1
- B. 3:5
- C. 5:3
- D. 8:4
- E. 15:4

9.

In $\triangle ABC$, shown below, the measure of $\angle B$ is 41° , the measure of $\angle C$ is 34° , and \overline{AB} is 25 units long. Which of the following is an expression for the length, in units, of \overline{BC} ?

(Note: The law of sines states that, for any triangle, the ratios of the sines of the interior angles to the lengths of the sides opposite those angles are equal.)



- A. $\frac{25 \sin 105^\circ}{\sin 41^\circ}$
- B. $\frac{25 \sin 105^\circ}{\sin 34^\circ}$
- C. $\frac{25 \sin 75^\circ}{\sin 41^\circ}$
- D. $\frac{25 \sin 41^\circ}{\sin 105^\circ}$
- E. $\frac{25 \sin 34^\circ}{\sin 75^\circ}$

10.

A flight instructor charges \$50 per lesson, plus an additional fee for the use of his plane. The charge for the use of the plane varies directly with the square root of the time the plane is used. If a lesson plus 16 minutes of plane usage costs \$90, what is the total amount charged for a lesson having 36 minutes of plane usage?

- A. \$185
- B. \$150
- C. \$135
- D. \$110
- E. \$ 60

Answers

Hard Problem Practice Answers

1. K

2. K

3. E

4. G

5. D

6. F

7. D

8. E

9. B

10. D