Would you like to receive feedback from our execs? (marking your solutions, giving corrections, etc.)
Yes/No: _____

Multiple Choice

Highlight the correct answer for each question.

1. Tyler sends 5 text messages to his friend, One, each Saturday, and 5 text messages to One each sunday. Tyler sends two text messages to One on each of the other days of the week. Over the course of four weeks, how many messages does Tyler send to One?

(A) 15 (B) 28 (C) 60 (D) 80 (E) 100

2. The product 8 x 48 x 81 is divisible by 6^k. The largest possible integer value of *k* is?

(A) 7 (B) 6 (C) 5 (D) 4 (E) 3

3. If *a, b,* and *c* are positive, consecutive terms of a geometric sequence (That is, $\frac{c}{b} = \frac{b}{a}$) , then the graph of $y = ax^2 + bx + c$ *is…*

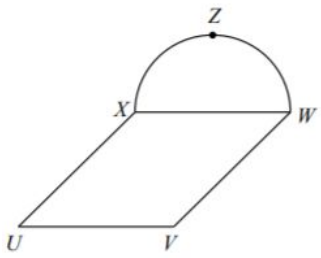
(A) A curve that intersects the x-axis at two distinct points
(B) entirely below the x-axis
(C) entirely above the x-axis
(D) a straight line
(E) tangent to the x-axis

4. Three friends are in a park. Cristian and Tejas are standing at the same spot, and Harry is standing 10m away. Cristian chooses a random direction and walks in this direction until he is 10m from Tejas. What is the probability that Cristian is closer to Harry than Tejas is to Harry?

(A) 1/2 (B) 1/3 (C) 1/π (D) 1/4 (E) π/3

5. In the diagram, *UVWX* is a rectangle that lies flat on a horizontal floor. A vertical semi-circular wall with diameter XW is constructed. Point Z is the highest point on this wall.
If *UV = 20*, and *VW = 30*, the perimeter of triangle UVZ is closest to…

(A) 95 (B) 86 (C) 102 (D) 85.7 (E) 92



Word Problems

Either type your solutions or insert images of handwritten solutions. Be sure to show your work!

1. If $f(x) = \sin^2 - 2\sin x + 2$, what are the minimum and maximum values of f(x)?

2. Each of the positive integers, 2013 and 3210 have the following three properties.

a) It is an integer between 1000 and 10 000.
b) Its four digits are consecutive integers
c) It is divisible by 3.

In total, how many integers have these three properties?

3. A pattern of Figures is shown below. Figure 1 is a regular pentagon with side length 1. Figure 2 is a regular pentagon of side length 2 drawn around Figure 1 so that the two shapes share the top vertex, *T*, and the sides on either side of *T* overlap.
The pattern continues so that for each $n > 1$, Figure n is a regular pentagon of side length *n* drawn around the previous Figure so that the two shapes share the top vertex, *T,* and the sides on either side of *T* overlap. The ink length of each Figure is the sum of the lengths of all of the line segments in the Figure.

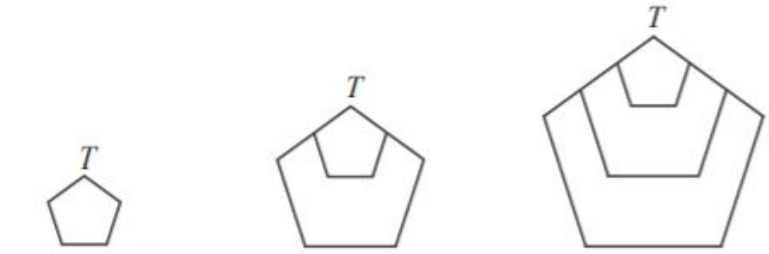


Figure 1
Ink length: 5

Figure 2
Ink length: 13

Figure 3
Ink length: 24

(a) Determine the ink length of Figure 5.
(b) Determine the difference between the ink length of Figure 9 and the ink length of Figure 8.
(c) Determine the ink length of Figure 100.

Challenge for the true ~~coding~~ calculus boss (Optional)

A storage bin is to be constructed by removing a sector with a central angle, θ ,
from a circular piece of tin of radius 5ft and folding the remainder of tin to form a cone. What should θ be in order to obtain a maximum volume of a storage bin formed in this fashion? (Hint: Find an equation for Volume in terms of θ in radians. Plot this function on a reasonable window and find the maximum numerically.) Box your final Volume equation as a function of θ , write down your graphing window (x and y), and give your final answer in radians and degrees to three decimal places.

Hint: Use the arc length, s, formula: s*r = θ , where θ is in radians.

Survey

Your responses will not affect your likelihood of being counted for attendance. This is simply to let our execs know how we can improve. :)

1. Approximately how much time did you spend on this problem set?

(A) Less than 15 mins
(B) 15 mins to 30 mins
(C) 30 mins to 1 hour
(D) 1 to 2 hours
(E) Over 2 hours

2. How difficult did you find this problem set?

(A) Too easy
(B) Fairly easy
(C) Neutral
(D) Fairly difficult
(E) Too difficult

Thank you for your feedback!