

1. A line passes through the point  $(-3, -2)$ . What is the greatest slope it could have if it never enters the second quadrant (the axes do not belong to any quadrant)?  
A.  $\frac{3}{2}$     B.  $-\frac{3}{2}$     C.  $\frac{2}{3}$     D.  $-\frac{2}{3}$     E. 0
2. If  $i = \sqrt{-1}$ , then  $4(1 + i)^{-1}$  is  
A.  $2 + 2i$     B.  $2 - 2i$     C.  $4 + 4i$     D.  $4 - 4i$     E. undefined
3. The area of the triangle with vertices  $(1, -2)$ ,  $(9, 2)$ , and  $(5, 5)$  is  
A. 18    B. 20    C. 22    D. 24    E. 26
4. A banquet hall has capacity 400 persons (including both diners and servers). If one server is needed for every 12 diners, the maximum number of diners is  
A. 366    B. 367    C. 368    D. 369    E. 370
5. The letters A, M, A, T, Y, C are listed so that letters are in increasing order of the number of distinct line segments or curves used to draw them, and identical letters are not adjacent. The fourth letter of the list is  
A. A    B. C    C. M    D. T    E. Y
6. The sum of all solutions of the equation  $|2x - 1| = 7$  is  
A. 4    B. 3    C. 2    D. 1    E. 0
7. Two runners running around a 600 m track in opposite directions and starting from the same place run a lap in 100 sec and 150 sec respectively. How many meters from their starting place are the runners when they meet for the eighth time (not counting the start)?  
A. 60    B. 120    C. 180    D. 240    E. 300
8. Electrical resistance in a wire is directly proportional to its length and inversely proportional to the square of its diameter. If a 10 cm long wire with diameter 2 cm has resistance 600 ohms, a 15 cm long wire with diameter 5 cm has resistance  
A. 3750 ohms    B. 2500 ohms    C. 1000 ohms    D. 360 ohms    E. 144 ohms
9. If  $\cot C = 2$ , then  $\sin 2C =$   
A.  $\frac{3}{\sqrt{10}}$     B.  $\frac{1}{\sqrt{5}}$     C.  $\frac{2}{\sqrt{5}}$     D.  $\frac{4}{5}$     E.  $\frac{9}{10}$
10. An ice cream parlor sells cones with at most 3 scoops, each scoop a different flavor chosen from vanilla, chocolate, or strawberry. If a customer randomly selects one of the parlor's possible kinds of cones (order of the flavors doesn't matter), the probability that the cone includes a scoop of chocolate is  
A.  $\frac{1}{3}$     B.  $\frac{3}{8}$     C.  $\frac{3}{7}$     D.  $\frac{1}{2}$     E.  $\frac{4}{7}$
11.  $\triangle ABC$  is a right triangle with hypotenuse  $\overline{AC}$ ,  $AB = 8$ , and  $BC = 6$ . Point D is chosen on  $\overline{BC}$  so that  $BD = 5$ , and ray BA is extended to point E so that  $BE = 12$ . If F is the intersection of  $\overline{AC}$  and  $\overline{DE}$ , the distance DF equals  
A.  $\frac{13}{4}$     B.  $\frac{15}{4}$     C. 4    D.  $\frac{25}{4}$     E.  $\frac{39}{4}$
12. To the nearest tenth, the sum of the nonreal solutions of the equation  $x^3 + 3x^2 - 5 = 0$  is  
A. -4.1    B. -3.0    C. 0.0    D. 1.9    E. 3.9

13. How many solutions in the interval  $-2\pi \leq t \leq 2\pi$  does the equation  $\cos 2t = \sin t + \cos t$  have?  
 A. 4    B. 5    C. 7    D. 9    E. 10
14. Which of the following best describes the set of real values of  $r$  for which there exist a real value of  $s$  such that  $\log r + \log s = \log (r + s)$ ?  
 A. all  $r$     B. all  $r > 0$     C. all  $r$  between 0 and 1    D. all  $r > 1$     E. no  $r$
15. Rectangle  $R_1$  has vertices  $(\pm 5, \pm 4)$ , and rectangle  $R_2$  has vertices  $(\pm 3, \pm 2)$ . The probability to the nearest hundredth that a point chosen at random from the interior of  $R_1$  is no more than 1 unit from some point of  $R_2$  is  
 A. 0.40    B. 0.45    C. 0.49    D. 0.50    E. 0.59
16. An object moves along the number line from 0 to 10 by moving either 1 or 2 units each time it moves. How many different sequences of moves are possible?  
 A. 9    B. 10    C. 32    D. 55    E. 89
17. If  $(x, y)$  is any point in the solution set of the system  $\begin{cases} 2x + 3y \leq 42 \\ 3x + 2y \geq 24 \\ 2x - y \geq 2 \\ x - 2y \leq 0 \end{cases}$ ,  
 the smallest possible value of  $2x + y$  is  
 A. 12    B. 14    C. 15    D. 22    E. 30
18. Two vehicles leave an intersection at the same time, one headed northwest at 30 mph, the other headed east at 40 mph. To the nearest 1 mph, how fast are they moving apart?  
 A. 41 mph    B. 50 mph    C. 55 mph    D. 58 mph    E. 70 mph  
 F. 65 mph
19. Which of the numbers 2, 3, or 4 is a factor of  $5^{2000} - 1$ ?  
 A. 2 only    B. 3 only    C. 2 and 4 only    D. 2 and 3 only    E. 2, 3, and 4
20. In a collection of 2000 positive integers, the sum of the mean  $\mu$ , median  $M$ , and (unique) mode  $m$  is 5. Which of the following is possible?  
 A.  $M = m = 2$     B.  $\mu = M = 1$     C.  $\mu = M = 2$     D.  $M = m = 1$     E.  $\mu = m = 1$

(2 answers)