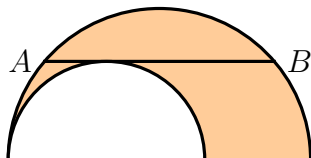


1. A survey of 60 graduate and undergraduate students attending a university found that 9 were living off campus and 36 were undergraduates. Also, 3 were undergraduates living off campus. How many students are graduate students living on campus?
(A) 9 (B) 18 (C) 19 (D) 20 (E) 21
2. How many real solutions does the equation $\sqrt{x} + 2x - 1 = 13$ have?
(A) no solutions (B) one (C) two (D) three (E) more than three solutions
3. The fifth term of an arithmetic sequence is 49 and the difference between successive terms of the sequence is 8. What is the sum of the first 20 terms of the sequence?
(A) 177 (B) 500 (C) 1689 (D) 1860 (E) 2050
4. Let $x = (2^{\log_2(3)})^{\frac{1}{\log_4(3)}}$. Then $x =$
(A) 1 (B) 2 (C) 3 (D) 4 (E) 6
5. What is the area of the smallest disc that contains the isosceles right triangle with leg length 2?
(A) 2π (B) $\sqrt{2}\pi$ (C) $2\sqrt{2}\pi$ (D) 4π (E) $\frac{\sqrt{2}}{2}\pi$
6. Three friends make a pizza together. The first friend covers 80% of the pizza with peppers. The second friend covers 75% of the pizza with onions. The third friend covers 70% of the pizza with artichokes. How much of the pizza is guaranteed to have all three toppings?
(A) 0% (B) 20% (C) 25% (D) 30% (E) 70%

7. The chord AB is parallel to the diameters of both semi-disks. Its length $|AB| = 24$. What is the area of the shaded figure?



- (A) 48π (B) 60π (C) 72π (D) 84π (E) 96π
8. A three-digit number is drawn uniformly at random. What is the probability that the sum of its digits is 3?
- (A) $\frac{5}{890}$ (B) $\frac{1}{150}$ (C) $\frac{1}{180}$ (D) $\frac{1}{225}$ (E) $\frac{6}{899}$
9. Two cards are selected randomly and simultaneously from a set of five cards numbered 3, 6, 11, 15, and 17. What is the probability that both cards selected are prime numbered cards?
- (A) $1/5$ (B) $2/5$ (C) $1/10$ (D) $3/10$ (E) $3/5$
10. The sides of a right triangle have lengths a , $2a + 2d$ and $2a + 3d$, with a and d both positive. The ratio of a to d is:
- (A) $5 : 1$ (B) $81 : 6$ (C) $4 : 1$ (D) $1 : 5$ (E) $2 : 3$
11. A cube of edge length equal to R is placed inside a sphere of radius R , so that the center of the sphere coincides with the center of the cube. The planes containing faces of the cube cut the sphere into several pieces. Into how many pieces do the planes cut the sphere?
- (A) 15 (B) 26 (C) 12 (D) 10 (E) 16

12. A point (x, y) is selected at random uniformly in the square $Q = [-2, 2] \times [-2, 2]$. Let P be the probability that $|y| \leq |x|$ and, at the same time, $x^2 + y^2 \leq 2$. Which of the following intervals contains P ?
- (A) $[0, 0.1]$ (B) $(0.1, 0.2]$ (C) $(0.2, 0.3]$ (D) $(0.3, 0.4]$ (E) $(0.4, 1]$
13. Let p be the greatest prime factor of 9991. The sum s of the digits of p is equal to
- (A) 4 (B) 6 (C) 8 (D) 10 (E) 12
14. Suppose that $f(x) = \frac{4^x}{4^x + 2}$. Find the value of $S = f(\frac{1}{14}) + f(\frac{2}{14}) + f(\frac{3}{14}) + \dots + f(\frac{13}{14})$.
- (A) 4.5 (B) 5.5 (C) 6.5 (D) 7.5 (E) 8.5
15. A collection of 120 wooden cubes is used to build a $4 \times 5 \times 6$ block of cubes. Five of the six faces are painted red. Then a cube is randomly selected from the 120 cubes and then rolled like a die. Which of the following could be the probability that a red face comes up.
- (A) $1/6$ (B) $31/180$ (C) $8/47$ (D) $1/5$ (E) $1/4$
16. Into how many regions does the set $S = \{(x, y) \mid x^2 - y^2 + 4x + 6y - 5 = 0\}$ divide the plane?
- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4
17. Astronomers, while observing stars F, E, D, L, K, H, G , found the following straight line distances (measured in light-years):
 $|FE| = 140$, $|ED| = 24$; $|DL| = 266$; $|LK| = 12$; $|KH| = 16$; $|HG| = 5$; $|GF| = 69$.
 Find the distance $|EH|$.
- (A) 108 (B) 112 (C) 206 (D) 214 (E) 228

18. Let $\triangle ABC$ be an equilateral triangle with sides of length 1. Let P be any point inside the triangle. What is the sum of the distances of P from each of the three sides?

- (A) 1 (B) $1/2$ (C) $\sqrt{3}$ (D) $\sqrt{3}/2$ (E) $\sqrt{3}/4$

19. At a game show, after hearing the last question, you have the option to keep your current win and go home, or to answer the question. If you answer the last question correctly, the amount you won gets doubled. If you give an incorrect answer, you get to take home only half of your current win. The probability that the answer you have in mind is correct is p . What is the smallest p that would make your expected win, if you answer the last question, at least as large as your current win?

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

20. A sequence of numbers starts with the number 2017^{2017} and the next number is the current number minus the sum of its digits. What is the last number in the sequence that is not 0?

- (A) 12 (B) 8 (C) 9 (D) 1 (E) 5