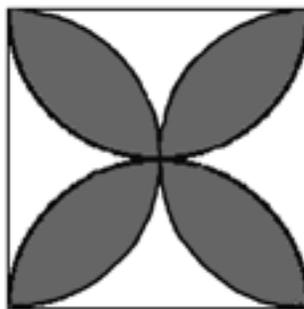


The choice (E) NOTA means that none of the other answers are correct. Good luck!

- In how many distinct ways can you rearrange the letters in the word "THETA"?  
(A) 30                      (B) 60                      (C) 75                      (D) 120                      (E) NOTA
- Find the sum of the squares of the roots of the equation  $x^2 - x - 20 = 0$ .  
(A) 1                      (B) 9                      (C) 20                      (D) 41                      (E) NOTA
- Simplify the expression  $\frac{\left(\frac{x^2+x-6}{x^3-3x^2-4x}\right)\left(\frac{x^2-4x-5}{x+3}\right)}{\frac{x-2}{2x^2-8x}}$ .  
(A)  $2x - 10$                       (B)  $2x + 10$                       (C)  $\frac{x-5}{2}$                       (D)  $\frac{x+5}{2}$                       (E) NOTA
- Find the perimeter of a hexagon with an apothem of length 6 cm.  
(A) 36 cm                      (B)  $24\sqrt{3}$  cm                      (C)  $27\sqrt{3}$  cm                      (D)  $36\sqrt{3}$  cm                      (E) NOTA
- The median number in the set  $\{3, 1, 4, 1, 5, 9, 2, 6, 5\}$  is:  
(A) 3                      (B) 4                      (C) 5                      (D) 6                      (E) NOTA
- The following diagram consists of a square with side length 4 and four overlapping semi-circles (with diameters on the four sides of the square). Find the area of the overlapping regions (shaded area).



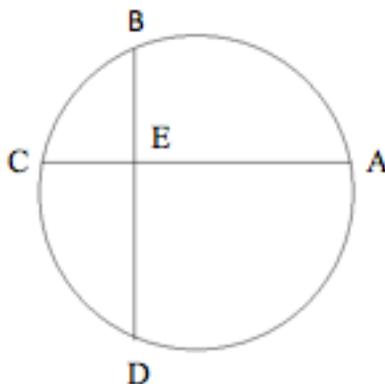
- (A)  $16 - 4\pi$                       (B)  $8\pi - 16$                       (C)  $16\pi - 16$                       (D)  $16 - 2\pi$                       (E) NOTA
- How many positive integral factors does 288 have?  
(A) 9                      (B) 10                      (C) 12                      (D) 18                      (E) NOTA
  - Find the remainder when  $(5x^3 + 2x^2 + x + 8)$  is divided by  $(x + 1)$ .  
(A)  $-4$                       (B) 0                      (C) 4                      (D) 16                      (E) NOTA

9. Tulsi is throwing darts at the target shown below which consists of 5 concentric circles. The radius of the innermost circle is 1 and the radius of the outermost is 5. The radii of the circles form an arithmetic sequence. Find the area of the shaded region.



- (A)  $9\pi$                       (B)  $10\pi$                       (C)  $14\pi$                       (D)  $15\pi$                       (E) NOTA
10. The medians of any triangle intersect at the:
- (A) centroid                      (B) circumcenter                      (C) incenter                      (D) orthocenter                      (E) NOTA
11. Which of the following equations represents the circle of radius 4 with center  $(2, -6)$ ?
- (A)  $(x + 2)^2 + (y - 6)^2 = 4$                       (B)  $(x - 2)^2 + (y + 6)^2 = 4$   
 (C)  $(x + 2)^2 + (y - 6)^2 = 16$                       (D)  $(x - 2)^2 + (y + 6)^2 = 16$                       (E) NOTA
12. After a long day of swim practice, Andrew decides to eat a chocolate cake that is in the shape of a rectangular prism with length, width, and height of  $x + 10$ ,  $x + 7$ , and  $x$  respectively. After eating  $\frac{1}{3}$  of the cake he is left with 144 cubic inches of cake. Find the height of the original cake (in inches).
- (A) 1                      (B) 2                      (C) 3                      (D) 4                      (E) NOTA
13. Find the sum of the solutions to the equation  $\sqrt{x + 19} = x - 1$ .
- (A)  $-3$                       (B) 0                      (C) 3                      (D) 6                      (E) NOTA
14. Circles  $A$  and  $B$  are externally tangent at a single point. If the circles have radii of lengths 4 and 5, what is the length of the common external tangent to  $A$  and  $B$ ?
- (A)  $2\sqrt{5}$                       (B)  $4\sqrt{5}$                       (C) 9                      (D)  $9\sqrt{2}$                       (E) NOTA
15. Which of the following are rational numbers? Note that  $i$  represents  $\sqrt{-1}$ .
- I.  $e$                       II.  $i$                       III.  $\pi$                       IV. 0
- (A) III only                      (B) I, II only                      (C) I, II, III only                      (D) I, II, III, IV                      (E) NOTA

16. Find the area of a pentagon with vertices  $(5, 4)$ ,  $(6, -1)$ ,  $(-2, -4)$ ,  $(-5, 0)$  and  $(-3, 3)$ .
- (A) 46                      (B) 58.5                      (C) 92                      (D) 117                      (E) NOTA
17. If  $216_7 = X_9$ , what is  $X$ ? Note that the subscripts denote bases.
- (A) 100                      (B) 121                      (C) 133                      (D) 144                      (E) NOTA
18. Chords  $AC$  and  $BD$  intersect at point  $E$ , as seen in the diagram below. If minor arc  $BC$  is  $48^\circ$  and minor arc  $AD$  is  $120^\circ$ , what is  $\angle CED$ ?



- (A)  $72^\circ$                       (B)  $84^\circ$                       (C)  $90^\circ$                       (D)  $96^\circ$                       (E) NOTA
19. Find the coefficient of the fourth term in the binomial expansion of  $(4x - 3)^5$ .
- (A)  $-1620$                       (B)  $-324$                       (C)  $324$                       (D)  $1620$                       (E) NOTA
20. What is the area of the circle inscribed in a triangle with sides of length 9, 12, and 15?
- (A)  $9\pi$                       (B)  $24\pi$                       (C)  $36\pi$                       (D)  $\frac{225}{4}\pi$                       (E) NOTA
21. Find the minimum value of  $y$  on the parabola  $y = 2x^2 - 4x + 7$ .
- (A) 1                      (B) 5                      (C) 7                      (D) 13                      (E) NOTA
22. One pigeon is standing atop a 25 foot tall lamp post. Another pigeon is standing on top of a 40 foot building. The two lamp post and building are 50 feet apart. A wire is connected from the bottom of the lamp post to the top of the building. Another wire is connected from the top of the lamp post to the bottom of the building. The pigeons walk across the wires until they meet each other at the intersection of the wires. How high above the ground, in feet, are the birds when they meet?
- (A) 13                      (B) 20                      (C)  $\frac{250}{13}$                       (D)  $\frac{200}{3}$                       (E) NOTA

23. Which of the following is not one of the five Platonic solids?
- (A) Cube            (B) Dodecahedron    (C) Icosahedron    (D) Tetrahedron    (E) NOTA
24. What is the sum of the infinite geometric series  $\frac{2}{5} + \frac{1}{5} + \frac{1}{10} + \dots$ ?
- (A)  $\frac{4}{5}$             (B)  $\frac{21}{25}$             (C) 1            (D)  $\frac{5}{4}$             (E) NOTA
25. If  $f(x) = x^2 + 9$  and  $g(x) = x - 4$ , find the value(s) of  $x$  such that  $f(g(x)) = 45$ .
- (A) 7            (B) 9            (C) 11            (D) 13            (E) NOTA
26. Kalie and her two friends decide to paint a wall. Kalie can paint the wall in 12 days. Nikki can paint the wall in 10 days. Kirah can paint the wall in 8 days. If all three paint the wall together, how many days will it take for them to complete the wall?
- (A)  $\frac{16}{5}$             (B)  $\frac{120}{37}$             (C)  $\frac{10}{3}$             (D) 4            (E) NOTA
27. What is the units digit of  $7^{2009}$ ?
- (A) 1            (B) 3            (C) 7            (D) 9            (E) NOTA
28. If  $5x - 4y = 41$  and  $-3x - y = -11$ , what is  $x + y$ ?
- (A) -4            (B) -1            (C) 1            (D) 4            (E) NOTA
29. Find the number of zeroes at the end of  $432!$  (the zeroes following the last non-zero digit).
- (A) 100            (B) 101            (C) 103            (D) 106            (E) NOTA
30. In the 1990s, an important problem in the field of number theory was resolved by the mathematician Andrew Wiles. It is known as **X**'s Last Theorem, and it states that no three integers  $a$ ,  $b$ , and  $c$  satisfy  $a^n + b^n = c^n$  for an integer  $n$  greater than 2. Who is **X**?
- (A) Euclid            (B) Euler            (C) Fermat            (D) Pythagoras            (E) NOTA