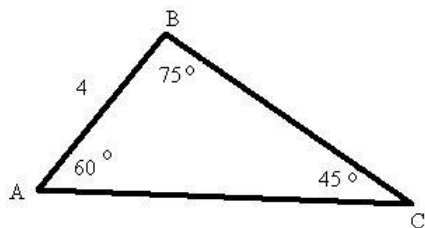


For all questions, answer (E) NOTA means “None of the Above Answers are Correct”  
Also, let  $\sqrt{-1} = i$  and let  $\mathbb{R}$  be the set of Real Numbers.

- (1) What is length BC in the following figure?



- (A)  $4\sqrt{2}$       (B)  $2\sqrt{6}$       (C)  $2 + 4\sqrt{3}$       (D)  $2 + 2\sqrt{3}$       (E) NOTA
- (2) Simplify  $\frac{1}{1 + \frac{3}{2 + \frac{1}{1 + \frac{3}{2 + \dots}}}}$
- (A)  $-2 + \sqrt{6}$       (B)  $-2 - \sqrt{6}$       (C) 3      (D) 5      (E) NOTA
- (3) A frustrum has top radius = 3, bottom radius = 6, and a height of 7. What is the volume of this frustrum ?
- (A)  $\pi$       (B)  $2\pi$       (C)  $147\pi$       (D)  $441\pi$       (E) NOTA
- (4) You have just made it to the final level of the MA $\theta$  Gameshow! There are three doors in front of you. Two of them contain a goat, and one contains a million dollars. After you pick a door, the announcer will show you a goat behind one of the unchosen doors. He then asks you if you want to stay with your original choice, or change to the next door. You decided long before the show started that you would always stay if you got this far. What is the probability of winning the million dollars with this strategy?
- (A)  $\frac{1}{4}$       (B)  $\frac{1}{3}$       (C)  $\frac{1}{2}$       (D)  $\frac{2}{3}$       (E) NOTA

- (5) What is the sum of the lengths major and minor axes of the following ellipse:  
 $9x^2 - 18x + 25y^2 - 100y - 116 = 0$ ?
- (A) 8                      (B) 16                      (C) 34                      (D) 68                      (E) NOTA
- (6) What is  $2102_3$  in base 9?
- (A)  $54_9$                       (B)  $65_9$                       (C)  $70_9$                       (D)  $72_9$                       (E) NOTA
- (7) Find the constant term in the expansion of  $(4x^5 + \frac{1}{2}x^{-3})^8$ .
- (A) 2                      (B) 56                      (C) 64                      (D) 112                      (E) NOTA
- (8) What is the centroid of the triangle with vertices (1,4), (5,2), and (9,3)?
- (A) (3, 3)                      (B) (5, 3)                      (C) (7, 4)                      (D) (15, 9)                      (E) NOTA
- (9) A function is known as a linear transformation if it has these properties:  
 $f(x + y) = f(x) + f(y)$  and  $f(ax) = af(x)$ . Which of the following are linear transformations?
- I)  $f(x) = x^2 - 4x + 5$   
II)  $f(x) = 4x + 2$   
III)  $f(x) = x^2$   
IV)  $f(x) = 3x$
- (A) Only II                      (B) Only I,III                      (C) Only II,IV                      (D) I,II,III,IV                      (E) NOTA
- (10) Solve the following inequality  $\frac{2}{x+3} \leq \frac{1}{x-1}$ .
- (A)  $x < 1$  or  $x \geq 5$                       (B)  $x < -3$                       (C)  $-3 < x < 1$   
(D)  $x < -3$  or  $1 < x \leq 5$                       (E) NOTA



- (18) Find the determinant of matrix A:

$$A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 4 & -1 \\ 1 & 4 & 2 \end{bmatrix} \cdot \begin{bmatrix} 1 & 1 & 6 \\ 4 & 2 & 3 \\ 5 & 3 & 2 \end{bmatrix}$$

- (A) 38                      (B) 140                      (C) 336                      (D) 521                      (E) NOTA
- (19) Given that a circle centered at (3,2) is tangent to the line  $y = -\frac{3}{4}x + \frac{21}{2}$ . What is the radius of this circle?
- (A)  $\frac{3}{5}$                       (B) 5                      (C)  $\frac{13}{5}$                       (D) 25                      (E) NOTA
- (20) A rectangular prism has surface area equal to  $334 \text{ m}^2$  and the sum of the lengths of all 12 edges is 92m. What is the square of the length of the space diagonal of the prism?
- (A) 23 m                      (B) 195 m                      (C) 362 m                      (D) 529 m                      (E) NOTA
- (21) Find the slope of the line that is tangent to  $y = x^2$  at the point (4,16).
- (A) 1                      (B) 2                      (C) 4                      (D) 8                      (E) NOTA
- (22) Let the set  $A = \{1, 2, 3, \dots, 89, 90\}$ . Let Y be the sum of 80 distinct elements in set A. How many different values of Y are there?
- (A) 80                      (B) 100                      (C) 800                      (D) 801                      (E) NOTA
- (23) Mary flips a fair fair-two sided coin 10 times. Ann flips a fair fair-two sided coin 11 times. If the number of heads Mary flips is greater than or equal to the amount of heads Ann flips, she wins. What is the probability that Mary wins?
- (A)  $\frac{15}{32}$                       (B)  $\frac{15}{16}$                       (C)  $\frac{511}{1024}$                       (D)  $\frac{1}{2}$                       (E) NOTA

