

For all questions, answer choice (E) NOTA means that none of the given answers is correct. Good Luck!

- The world is about to end and you are the only one who can save it! Quick! What is the square of the sum of the roots of  $2x^2 + 31x - 51$ ?  
(A) 291.25                      (B)  $-15.5$                       (C) 240.25                      (D)  $-124.25$                       (E) NOTA
- What is the value of  $i^{2022}$  given  $i^2 = -1$ ?  
(A)  $i$                               (B)  $-1$                               (C)  $-i$                               (D) 1                              (E) NOTA
- In a hot dog speed-eating contest, 12 people can eat 12 hot dogs in 12 seconds. How many hot dogs can be eaten by 6 people in 8 seconds?  
(A) 4                              (B) 12                              (C) 6                              (D) 18                              (E) NOTA
- What is the remainder when the sum of  $14^7 + 37^5$  is divided by 5?  
(A) 3                              (B) 0                              (C) 2                              (D) 1                              (E) NOTA
- If  $f(x) = \frac{3x+8}{4}$  and  $g(x) = \frac{x+20}{2}$ , what is  $f(g(8))$ ?  
(A) 11                              (B) 12.5                              (C) 16.5                              (D) 13                              (E) NOTA
- For what value of  $x$  is the following equation satisfied:  $2^{3x} = 2 \times 64^x$ ?  
(A)  $-1/3$                       (B)  $-1/2$                       (C) 2                              (D)  $-2$                               (E) NOTA
- The test average in Ms. Cross's Algebra 1 class is currently a 86. When a new student, Sukeerth, comes into the class and gets a 8 (he was not feeling well) the average drops to 80. How many students were in the class before Sukeerth joined?  
(A) 10                              (B) 13                              (C) 15                              (D) 7                              (E) NOTA
- In the local restaurant chef Vibav can make 1 dish in 30 minutes, while chef Tanmay can make a dish in 1 hour. How long in hours will it take both chefs working together to complete 15 dishes? (Assume that they work together in coordination with no loss of efficiency)  
(A) 150                              (B) 5                              (C) 22.5                              (D) 10                              (E) NOTA
- What are the real solution(s) for the equation  $3|x-2| = |2x-8|$ ?  
(A)  $14/5$                       (B)  $-2$                               (C)  $-2, 14/5$                       (D)  $3, 7/5$                       (E) NOTA
- Two points  $(6, 5)$  and  $(8, y)$  have a slope equivalent to the smaller root of the equation  $3x^2 - 20x + 28 = 0$ . What is the value of  $y$ ?  
(A) 4                              (B)  $-1/4$                               (C) 9                              (D) 12                              (E) NOTA
- What is the sum of the reciprocal of the roots of the quadratic  $12x^2 - 38x + 20$ ?  
(A)  $12/11$                       (B)  $17/13$                               (C)  $3/2$                               (D)  $19/10$                               (E) NOTA
- Sagar, a terrible speller, somehow made it to the national spelling bee! His word to spell is GUERRILLA. How many distinct permutations of GUERRILLA exist?  
(A) 362880                      (B) 5040                              (C) 90720                              (D) 9                              (E) NOTA

13. The market is slowly heading into a recession and the demand for mathematics is on the rise. The worth of a U.S. dollar is directly proportional to a Euro and inversely proportional to a Canadian dollar, and 10 U.S. dollars are worth 5 Euros and also worth 15 Canadian dollars. If these proportions remains the same how many U.S. dollars are worth 15 Euros and 15 Canadian dollars?

(A) 30 (B) 150 (C) 50 (D) 80 (E) NOTA

14. During your Algebra 1 class, Suhas proposed a peculiar shape  $SHAP$  in the Cartesian Plane, with points  $S = (3, 2)$ ,  $H = (4, 8)$ ,  $A = (0, 9)$ ,  $P = (-2, 5)$  respectively. What is the area of this figure?

(A) 38.5 (B) 42 (C) 9 (D) 25.5 (E) NOTA

15. What is the remainder when 202220222022 is divided by 125?

(A) 19 (B) 20 (C) 21 (D) 22 (E) NOTA

16. Walking home there are three potential roads that can be take, which all intersect with each other (but do not intersect at the same point). Each road can be shown as a line in the Cartesian plane (below). What is the sum of the  $x$  and  $y$  values of all of the intersection points?

$$\begin{aligned} 3x + 7y &= -3 \\ -x + y &= 2 \\ -4x &= 4 \end{aligned}$$

(A) 2.2 (B) 6.3 (C) -3.8 (D) -2.4 (E) NOTA

17. Viswa is in dire need of going to the restroom and needs to find the shortest distance needed to be traveled to reach from the point  $(5,8)$  to the intersection of the lines  $y = 2x + 3$  and  $y = \frac{-1}{2}x + 8$ . What should be his answer?

(A)  $\sqrt{5}$  (B)  $\sqrt{11}$  (C)  $\sqrt{10}$  (D)  $\sqrt{7}$  (E) NOTA

18. What is the slope of the perpendicular bisector of the line segment with end points  $(5,8)$  and  $(-3,6)$ ?

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

19. What is the **decimal** value of the sum of the hexadecimal (base 16) numbers 17 and 56?

(A) 101 (B) 3A (C) 79 (D) 7B (E) NOTA

20. If the vertex of the equation  $y = \frac{-x^2}{7} + \frac{6x}{7} + \frac{19}{7}$  can be represented in the form of  $(r, s)$  what is the length of the hypotenuse of a right triangle with legs with length  $r$  and  $s$ ?

(A)  $\sqrt{10}$  (B) 5 (C) 10 (D)  $\sqrt{6}$  (E) NOTA

21. What is the product of the roots of the quadratic  $6 + 5x + 4x + 3 + 2x^2 + x^2$ ?

(A)  $-6$  (B)  $-3$  (C) 3 (D) 6 (E) NOTA

22. Deep in thought, Anish devises a complex math question. In the Cartesian plane a parabola and a circle intersect at 2 points. If the graph of the parabola has the equation of  $y = (x - 5)^2$ , and the graph of the circle has the equation of  $x^2 + y^2 = 25$ , what is the sum of the values of the coordinates for both intersections? (Hint: both intersections have coordinates that are integers)

(A) 10 (B) 12 (C) 18 (D) 20 (E) NOTA

23. If  $f(x) = 3x^3 + 4$ , what is  $f^{-1}(16)$ ?  
(A)  $\sqrt[3]{4}$  (B) 12292 (C)  $\sqrt[3]{5}$  (D)  $\sqrt[3]{7}$  (E) NOTA
24. If the expression  $\sqrt{2 + \sqrt{3}} + \sqrt{2 - \sqrt{3}}$  can be simplified in the form of  $\sqrt{a}$ , where  $a$  is a positive integer. Find  $a$ .  
(A) 4 (B) 5 (C) 6 (D) 7 (E) NOTA
25. Solve the equation  $a^2b + c^2x^b = -a$  for  $x$  in terms of  $a$ ,  $b$ , and  $c$ .  
(A)  $\sqrt[b]{-ac^{-2}(ab-1)}$  (B)  $\sqrt[b]{-ac^2(1+ab)}$  (C)  $\sqrt[b]{ac^{-2}(1-ab)}$  (D)  $\sqrt[b]{-ac^{-2}(1+ab)}$  (E) NOTA
26. If the quadratic  $x^2 - ax + (a^2 - 9)$  has integer roots, and  $a$  is a positive integer, what is the value of  $a$ ?  
(A) 1 (B) 2 (C) 3 (D) 4 (E) NOTA
27. What is the value of  $\sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{\dots}}}}$ ?  
(A) -3,5 (B) 5 (C) -2,3 (D) 3 (E) NOTA
28. To fend for humanity Haasini has to overcome a gruelling challenge. She has to solve a math question. The question she has to solve is: if  $g(x) = 3f(2x) - 3$  and  $g(1) = 51$ , what is the value of  $f(2)$ ?  
(A) 26 (B) 18 (C) 31 (D) 25 (E) NOTA
29. Vaneesha a genius at mathematics decides to test you and gives you this complicated math problem: What is the sum of the infinite series  $\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \frac{1}{81} \dots$ ?  
(A) 1 (B)  $1/2$  (C)  $2/3$  (D)  $3/4$  (E) NOTA
30. Simplify  $\frac{(i-1)^2 + (i+2)^2 - 1}{i+1}$  if  $i^2 = -1$ .  
(A)  $-i$  (B)  $-1$  (C)  $i+1$  (D) 2 (E) NOTA