

## Barbra Nunn Test December 2022

**Important Instructions for this Test:** The answer choice E: NOTA indicates that “none of these answers are correct.” Problems are not necessarily in order of increasing difficulty, so don’t be afraid to skip around. Good luck, and have fun!

1. Mr. Lu took a direct route to work but had to detour going home and the return trip took twice as long. If the route coming home was 50% longer than the direct route, and the average speed returning was 10 mph slower, what was the average speed going in mph?  
A. 24                      B. 30                      C. 35                      D. 40                      E. NOTA
  
2. Wiggle has a game where you can score 0, 1, 3, 7, or 10 points per game. He is going to play 3 times and add up his scores. How many positive integral sums less than 30 CANNOT be made?  
A. 5                          B. 6                          C. 7                          D. 8                          E. NOTA
  
3. J-Wigs has a gallon of Mu-Lu juice. He drinks  $\frac{1}{3}$  of it and then fills back to the top with water and stirs and then drinks  $\frac{1}{3}$  of the contents. He repeats this process until he has consumed one gallon of liquid. What part of the original gallon of Mu-Lu juice remains?  
A.  $\frac{1}{27}$                       B.  $\frac{8}{27}$                       C.  $\frac{1}{9}$                           D.  $\frac{4}{9}$                           E. NOTA
  
4. In regular pentagon RSNOW, L is the midpoint of segment OW. What is the degree measure of angle LSO?  
A. 18                          B. 24                          C. 36                          D. 54                          E. NOTA
  
5. Mr. Lu’s 7 favorite positive integers have a mean and median both equal to 30. What is the largest possible number on Mr. Lu’s list?  
A. 57                          B. 59                          C. 85                          D. 101                          E. NOTA
  
6. A rectangles length is twice it’s width. When the lengths of all sides are increased by 3, the area of the new rectangle is triple that of the original rectangle. What is the length of the new rectangle?  
A. 4.5                          B. 6                              C. 9                              D. 15                              E. NOTA

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7. At Deerlake 3% of the 7<sup>th</sup> graders and 6% of the 8<sup>th</sup> graders participate in Mu competitions. There are 1.5 times as many 8<sup>th</sup> graders as 7<sup>th</sup> graders at the school. What percent of 7<sup>th</sup> and 8<sup>th</sup> graders in total at the school participate in Mu competitions?

A. 4.2            B. 4.4            C. 4.6            D. 4.8            E. NOTA

8. Three hundred students took the AIME and scores are shown in the table below. What is the least possible integral score a kid could get and still have a higher score than 75% of the kids taking the test?

Score	0	1	2	3	4	5	6	7	8	9	10	11	12
# Kids	3	6	12	13	16	23	28	43	51	45	37	16	7

A. 8            B. 9            C. 10            D. 11            E. NOTA

9. The Snowman rolls three fair dice. In how many ways can the dice be rolled such that the sum of the numbers rolled is 10.

A. 24            B. 27            C. 30            D. 36            E. NOTA

10. Mr. Lu had 28 of his students take his final with an average score of 72. Two students took the make-up and the mean of all 30 rose to 73. If the difference of the 2 make-up scores is 22, find the lower of the 2 make-up scores. What is the sum of the digits of this number?

A. 9            B. 10            C. 13            D. 15            E. NOTA

11. The Snowman's favorite sequence is 1,1,2,3, 5, where each term is the sum of the previous two terms. What is the remainder when the 100<sup>th</sup> term of the sequence is divided by 4?

A. 0            B. 1            C. 2            D. 3            E. NOTA

12. If x and y are integers with  $x > y$ , what is the smallest possible positive value of  $\frac{x+y}{x-y} + \frac{x-y}{x+y}$ ?

A. 1            B. 2            C. 2.5            D.  $\frac{10}{3}$             E. NOTA

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13. Points L and U are chosen on the sides of right triangle WIG, with L on hypotenuse WG and U on side IG. If the 4 segments WI, LI, LU, and GU are all congruent, what is the degree measure of angle IWG?
- A. 22.5      B. 45      C. 60      D. 67.5      E. NOTA
14. At how many points do the graphs of  $y = x^2 + 4x$  and  $y = x^3$  intersect?
- A. 0      B. 1      C. 2      D. 3      E. NOTA
15. The point Z(3,4) is reflected over the x-axis to L. Then L is reflected over the line  $y=x$  to U. What is the area of triangle ZLU?
- A. 24      B. 26      C. 28      D. 30      E. NOTA
16. What is the perimeter of a rhombus with height 9 with an angle of 150 degrees?
- A. 64      B.  $54 + 9\sqrt{3}$       C. 72      D.  $54 + 18\sqrt{3}$       E. NOTA
17. What is the smallest real number that satisfies the equation:  $\frac{21}{k} = \frac{\sqrt{k+21} + \sqrt{21-k}}{\sqrt{k+21} - \sqrt{21-k}}$ ?
- A. 1      B.  $\sqrt{21}$       C.  $2\sqrt{21}$       D. 21      E. NOTA
18. Together, Amy, Bach, Chloe, Dylan, and Evan earned a total of 150 points at a recent competition. Mr. Lu the socialist wants to equalize their points so they each have 30 points. Bach gave half his points to Amy. Chloe gave one-third of her points to Bach. Dylan gave one-quarter of his points to Chloe. Finally, Evan gave one-sixth of his points to Dylan. How many points did Amy earn before equalization?
- A. 10      B. 11      C. 14      D. 15      E. NOTA

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19. How many non-overlapping circles of diameter 2 can fit inside a circle of radius 3?  
A. 5                      B. 6                      C. 7                      D. 8                      E. NOTA
20. How many distinct triangles exist which have side lengths measuring  $\frac{7}{5}$ ,  $\frac{1}{2}$ , and  $\frac{10}{11}$ ?  
A. 0                      B. 1                      C. 2                      D. 3                      E. NOTA
21. Find the y-intercept of the line that passes through the vertices of:  
 $y = x^2 - 8x + 13$   
 $y = x^2 - 10x + 27$   
A. -23                      B. -3                      C. 7                      D. 27                      E. NOTA
22. An equivalent form of  $\frac{x^{-\frac{1}{2}} - x^{\frac{3}{2}}}{x^2}$ , where  $x > 0$  is?  
A.  $\frac{1}{\sqrt{x^5}} - \frac{1}{\sqrt{x}}$       B.  $x^{\frac{3}{2}} - x^{\frac{7}{2}}$       C.  $\frac{1}{x^4}$                       D.  $x - \frac{1}{\sqrt{x}}$                       E. NOTA
23. Find the vertical asymptotes for the following function:  $f(x) = \frac{2x^2 - x - 15}{3x^2 - 5x - 12}$   
A.  $x = 3, x = \frac{4}{3}$       B.  $x = 3$                       C.  $x = -3, x = \frac{-4}{3}$       D.  $x = \frac{-4}{3}$                       E. NOTA
24. Find the distance from the point (-1,-6) to a point on the y-axis that is equidistant from the points (1,1) and (5,-5).  
A.  $\sqrt{5}$                       B.  $2\sqrt{3}$                       C.  $\sqrt{13}$                       D. 5                      E. NOTA

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25. Which of the following best describes the system?  $\begin{cases} 3x - 4y + 6 = 0 \\ 4y - 3x = 6 \end{cases}$
- I. Dependent                  II. Independent                  III. Consistent                  IV. Inconsistent
- A. I, IV                  B. II, III                  C. II, IV                  D. I, III                  E. NOTA
26.  $\sqrt{223 + \frac{1}{225}}$  can be simplified as a mixed number,  $W \frac{I}{G}$ , where I and G are relatively prime. What does  $W + I + G = ?$
- A. 34                  B. 43                  C. 48                  D. 60                  E. NOTA
27. Given that  $f(x+1)f(x) = x$  for  $x > 0$ . What is  $f(2021)f(2024)$  rounded to the nearest integer?
- A. 2021                  B. 2022                  C. 2023                  D. 2024                  E. NOTA
28. How many prime numbers are less than 100?
- A. 24                  B. 25                  C. 26                  D. 27                  E. NOTA
29. Slick Rick draws 3 numbers without replacement at random from the set  $\{2, 3, 5, 7, 11, 13, 17\}$ . The probability that a triangle could be formed if these were side lengths is  $\frac{L}{35}$ . What is L?
- A. 5                  B. 8                  C. 9                  D. 11                  E. NOTA
30. The Snowman has 6 index cards each with a different integer from 0 to 5, inclusive. If he selects 2 cards at random without replacement, what is the probability that their sum is 3?
- A.  $\frac{1}{15}$                   B.  $\frac{2}{15}$                   C.  $\frac{1}{5}$                   D.  $\frac{4}{15}$                   E. NOTA