

Barbara Nunn Test

2005-2006

no calculator allowed

The abbreviation "NOTA" denotes
"None of These Answers."

$$i = \sqrt{-1}$$

1. If the perimeter of a rectangle is 20, the least value of a diagonal of the rectangle is

A. 0 B. $5\sqrt{2}$
C. 10 D. $10\sqrt{2}$ E. NOTA

2. Find the value of $x + y + z$ when $x + y = 15$, $y + z = 10$, and $x + z = 11$.

A. 18 B. 30
C. 36 D. 72 E. NOTA

3. Part of \$8000 is invested at 6% annual interest, and the rest is invested at 5% annual interest. The annual income from the interest is \$452. What amount was invested at 6%?

A. \$2800 B. \$3600
C. \$4200 D. \$5200 E. NOTA

4. Find the remainder when $x^6 - 21$ is divided by $x - 2$.

A. 17 B. 21
C. 43 D. 53 E. NOTA

5. Find the value of $x + y$ for the system:

$$\begin{cases} \frac{2}{3}x - 5y = -1 \\ \frac{5}{2}x - 7y = 8 \end{cases}$$

A. 1 B. 6
C. 7 D. $7\frac{1}{2}$ E. NOTA

6. Given trapezoid ABCD where \overline{AB} , the smaller base, is parallel to \overline{CD} , $m\angle D = 30$, $\overline{BC} \perp \overline{DC}$, $AB = \sqrt{192}$, $BC = 6$. Find the length of \overline{DC} .

A. $6\sqrt{6}$ B. $10\sqrt{3}$
C. $12\sqrt{3}$ D. $14\sqrt{3}$ E. NOTA

7. Solve for x : $\left(\frac{1}{4}\right)^{x-1} = 8^{2x-1}$.

A. 0 B. $\frac{3}{8}$
C. 1 D. 2 E. NOTA

8. Find the value of $\frac{1}{2 - \frac{1}{2 - \frac{1}{2 - \frac{1}{2}}}}$

A. $\frac{6}{11}$ B. $\frac{3}{4}$
C. $\frac{4}{5}$ D. $\frac{5}{6}$ E. NOTA

9. If Liz can solve x problems in y minutes and her brother Rex can solve y problems in x minutes, how many minutes would it take them working together to solve $x^2 + y^2$ problems?

A. xy B. $x + y$
C. $\frac{x + y}{xy}$ D. $\frac{x^2 y^2}{(x + y)^2}$ E. NOTA

10. Find the simplified value for $(-1 + i\sqrt{3})^3$.

A. -8 B. $3 + 6i$
C. $8i$ D. $-8i$ E. NOTA

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11. What is the length of the longest chord of the circle $x^2 + y^2 - 8x + 2y - 3 = 0$?

- A. $4\sqrt{5}$ B. $8\sqrt{2}$
C. $10\sqrt{2}$ D. $16\sqrt{5}$ E. NOTA

12. One side of a given triangle is 12 inches long. In the interior of the triangle, a line segment is drawn parallel to this side. The smaller triangle formed has an area that is $\frac{3}{4}$ of the original triangle. Find the length of this segment.

- A. 9 B. $4\sqrt{6}$
C. $6\sqrt{2}$ D. $6\sqrt{3}$ E. NOTA

13. Solve for y in terms of x and z :

$$z\sqrt{\frac{x}{y}} = \sqrt{z + \frac{x}{y}} \quad (\text{with } y \neq 0).$$

- A. $x - \frac{x}{z}$ B. $x - \frac{z^2x}{z}$
C. $\frac{x - xz}{z}$ D. $zx - \frac{x}{z}$ E. NOTA

14. How long is the edge of a cube such that after a slice one inch thick is cut off from one side of the cube, the volume of the remaining solid is 100 cubic inches?

- A. $\sqrt[3]{101}$ B. $4\frac{5}{8}$
C. $4\frac{3}{4}$ D. 5 E. NOTA

15. If the repeating decimal $0.\overline{123}$ is expressed as a rational number in lowest terms, the difference of the numerator and denominator of this fraction is

- A. 23 B. 292
C. 374 D. 876 E. NOTA

16. In base two, write the number which is ten greater than 10101_2 .

- A. 11111_2 B. 10111_2
C. 11011_2 D. 111111_2 E. NOTA

17. Six dollars was to be distributed equally among a group of children. Two additional children joined the group. Each child received 25 cents less than had been planned. How many children are in the group after the addition?

- A. 4 B. 6
C. 8 D. 10 E. NOTA

18. The radius of a sphere equals the edge of a cube. Find the ratio of the volume of the sphere to the volume of the cube.

- A. $4\pi : 1$ B. $4\pi : 3$
C. $\pi : 3$ D. $\pi : 4$ E. NOTA

19. If $x^2 - y^2 = 6k^2$ and $x + y = 2k$, then $x - y =$

- A. $\frac{k}{3}$ B. $3k$
C. $8k$ D. $8k^2$ E. NOTA

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20. The units digit of a 2 digit number is one more than twice the tens digit. Three times the tens digit is 2 more than the units digit. Find the sum of the two digits.
A. 10 B. 11
C. 12 D. 13 E. NOTA
21. An equilateral triangle is constructed on each of the two legs and also on the hypotenuse of a right triangle. The equilateral triangle on the hypotenuse has a greater area than either of those on the two legs. The sum of the areas of these two smaller triangles is
A. < the area of the largest triangle
B. > the area of the largest triangle
C. = the area of the largest triangle
D. dependent on the largest triangle and may be larger or smaller than the area of the largest triangle
E. NOTA
22. Mr. Snow seated his math students in chairs that are spaced the same distance apart in a circle. The students were each assigned a number by counting off in order until all had a number. If student #10 is directly opposite student #27, how many students are in Mr. Snow's math class?
A. 28 B. 34
C. 51 D. 68 E. NOTA
23. In right triangle ABC with right angle at C , the altitude \overline{CD} to the hypotenuse is drawn. If $AC = 4\sqrt{5}$ and $DB = 16$, find the length of \overline{BC} .
A. 5 B. $5\sqrt{3}$
C. 8 D. $8\sqrt{5}$ E. NOTA
24. The perimeter of a right triangle is 80, and the length of the median to the hypotenuse is 17. Find the area between this triangle and its inscribed circle.
A. $480 - 36\pi$ B. $240 - 36\pi$
C. $480 - 18\pi$ D. $240 - 18\pi$
E. NOTA
25. The amount of illumination on a table varies directly as the brightness of the source and inversely as the square of the distance from the light. If an illumination of 12 watts occurs at a brightness of 6 candles and a distance of 2 feet, what distance is necessary to give an illumination of 1 watt with a brightness of 8 candles?
A. $4\sqrt{2}$ B. ± 8
C. 8 D. $\frac{32}{9}$ E. NOTA
26. Let 19, 98, 49, 82, 84, 49, and 81 be a set of test scores. Let w = the mean, x = the mode, y = the median, z = the range. Find the value of $w + 2x + 3y + 4z$.
A. 275 B. 676
C. 723 D. 725 E. NOTA

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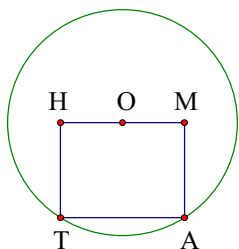
27. Express $\sqrt{10!}$ in simplest form as $a!\sqrt{b}$.

- A. $10!\sqrt{1}$ B. $5!\sqrt{14}$
C. $6!\sqrt{7}$ D. $6!\sqrt{14}$ E. NOTA

28. If $\log_2[\log_3(\log_4 b)] = \log_4[\log_3(\log_2 a)] = 0$,
find the ratio of a to b .

- A. 1:1 B. 1:2
C. 1:4 D. 1:8 E. NOTA

29. Square MATH has vertices A and T on the circle and the center of circle O is the midpoint of \overline{HM} . Find the area of the square MATH if the diameter of the circle is 20.



- A. 40 B. 50
C. 80 D. 100 E. NOTA

30. Let $f(x) = 19x + 99$. Let $f^{-1}(x) = ax + b$.

Find the value of $\frac{1}{a-b}$.

- A. $-\frac{19}{80}$ B. $-\frac{19}{100}$
C. $\frac{80}{19}$ D. $\frac{19}{100}$ E. NOTA