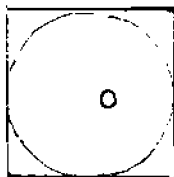


2001 Hoover High School Mathematics Tournament
7th Grade Math Examination

1. Simplify:
$$\sqrt{\frac{\sqrt{4} + \sqrt{49} + \sqrt{169} - \sqrt{100}}{\sqrt{25 - 2(8)}}}$$

- A) -2 B) 2 C) 4 D) -4 E) N.O.T.A.

2. The circle O is inscribed in the square. Find the circumference of circle O if the area of the square is 64.



- A) 4π B) 16π C) 8 D) 8π E) N.O.T.A.

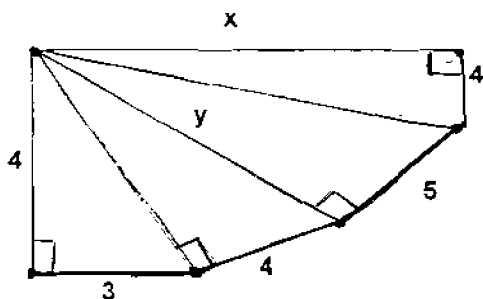
3. If $x = \frac{3a}{5}$, $a = \frac{25c}{9}$, and $c = 4y$, find x when $y = -\frac{1}{2}$

- A) $\frac{10}{3}$ B) $-\frac{40}{3}$ C) $-\frac{5}{6}$ D) $-\frac{10}{3}$ E) N.O.T.A.

4. The expression $\sqrt[5]{3\sqrt[3]{2^{90}}}$ is equivalent to which of the following?

- A) 2^3 B) 2^4 C) 2^5 D) 2^6 E) N.O.T.A.

5. Find $x^2 - y^2$.



- A) $\sqrt{41}$ B) $\sqrt{82}$ C) 41 D) 82 E) N.O.T.A.

6. Evaluate: $1^3 - 6 \cdot 2 \div \sqrt{9} + (4 \div 3) - 2^{(2+2)}$

- A) $-\frac{53}{3}$ B) $\frac{67}{3}$ C) -12 D) $-\frac{29}{3}$ E) N.O.T.A.

7. $10111_2 - 122_3 = ?_{10}$

- A) 6 B) -5 C) 97 D) 40 E) N.O.T.A.

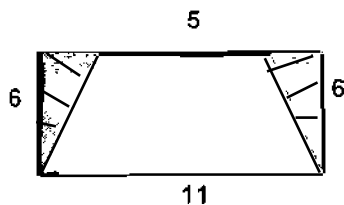
8. The perimeter of an equilateral triangle is $12\sqrt{3}$. The perimeter of a square is 16. What is the ratio of the area of the square to the area of the triangle?

- A) $4\sqrt{3} : 27$ B) $2\sqrt{3} : 9$ C) 4 : 3 D) 2 : 3 E) N.O.T.A.

9. Simplify: $2 - \frac{1}{2 + \frac{1}{2 - \frac{1}{2 + \frac{1}{2}}}}$

- A) $\frac{46}{29}$ B) $\frac{31}{18}$ C) $-\frac{5}{8}$ D) $\frac{50}{21}$ E) N.O.T.A.

10. Find the area of the shaded region.



- A) $6\sqrt{5}$ B) $3\sqrt{5}$ C) 36 D) 18 E) N.O.T.A.

11. A sweater with a retail price of \$36 is placed on a 30% discount. The discount price is then lowered by 15% to arrive at a final price. How much cheaper is the final price than the retail price?

- A) \$16.20 B) \$6.32 C) \$14.58 D) \$25.20 E) N.O.T.A.

12. What is the sum of $\frac{14}{23}$ and $\frac{18}{31}$ rounded to the nearest thousandth?

- A) 3.365 B) -0.079 C) 1.189 D) 0.028 E) N.O.T.A.

13. Phoebe is 2 years older than Joey. She is also $\frac{5}{4}$ of Chandler's age. Ross is half as old as Joey, and Rachel is 24 months younger than Ross. If Monica, who is 11 years older than Rachel, is 13, what is the difference between Chandler and Joey?

- A) 0 years B) 1 year C) 12 years D) $8\frac{4}{5}$ years E) N.O.T.A.

14. Lisa walks 11 feet due north, 12 feet due east, 12 feet due north, 2 feet due west, and 3 feet due south. How far is she from her original starting point?

- A) 24 feet B) $10\sqrt{5}$ feet C) $5\sqrt{29}$ feet D) $4\sqrt{34}$ feet E) N.O.T.A.

15. Given: $\frac{1}{x} + \frac{4}{z} = \frac{y}{3}$. Find z if $x = \frac{5}{11}$ and $y = 5$.

- A) 2 B) $\frac{33}{10}$ C) -2 D) $-\frac{15}{2}$ E) N.O.T.A.

16. If $a \oplus b$ is defined as $a^2 + 3ab - \sqrt{b}$, then find $2 \oplus 3$.

- A) $26 - \sqrt{3}$ B) $22 - \sqrt{3}$ C) $23 - \sqrt{3}$ D) $24 - \sqrt{3}$ E) N.O.T.A.

17. If $g(x) = \frac{x^3 + 3x^2 + 3x + 1}{x^2 + 2x - 1}$, find $g\left(-\frac{3}{2}\right)$.

- A) $-\frac{1}{2}$ B) $\frac{3}{2}$ C) $\frac{1}{2}$ D) $-\frac{5}{2}$ E) N.O.T.A.

18. Find the arithmetic mean to the nearest tenth of the mode and the median of the following data: 72, 73, 74, 75, 75, 75, 76, 77, 78, 79, 80, 81, 82.

- A) 75 B) 75.5 C) 76 D) 76.7 E) N.O.T.A.

19. A drawer contains only 2 pieces of gum, 5 lollipops, 7 candy bars, and 3 boxes of raisins. Natalie opens the drawer and pulls out 2 items without looking. What is the probability that she pulls out the 2 pieces of gum?

- A) $\frac{2}{289}$ B) $\frac{4}{289}$ C) $\frac{1}{272}$ D) $\frac{1}{136}$ E) N.O.T.A.

20. The sum of the lengths of all edges of a cube is 144 inches. What is the volume of the cube?

- A) 13,824 B) 512 C) 729 D) 1728 E) N.O.T.A.

21. Find the sum of the least common multiple and the greatest common factor of 120 and 2700.

- A) 5400 B) 5460 C) 5340 D) 2760 E) N.O.T.A.

22. Given: $2a + 3b = 24$
 $7a - 13b = -10$
Find the slope of the line $ay + bx = 0$.

- A) $\frac{2}{3}$ B) $\frac{3}{2}$ C) $-\frac{3}{2}$ D) $-\frac{2}{3}$ E) N.O.T.A.

23. The 6th term of an arithmetic sequence is -16. The 50th term of that same sequence is 6. What is the common difference of that sequence?

- A) $-\frac{1}{2}$ B) $\frac{1}{2}$ C) 2 D) -2 E) N.O.T.A.

24. If $\frac{22}{7} = a.bcd\overline{ef71\dots}$ where $a, b, c, d, e,$ and f each represent a digit, find $\frac{ab+cd-f}{e}$.

- A) $\frac{3}{4}$ B) $\frac{3}{5}$ C) $-\frac{3}{4}$ D) $-\frac{3}{5}$ E) N.O.T.A.

25. Britney, JC, Justin, Lance, Chris, and Joey are standing in line together at the unemployment office. No one else is in line with them. Chris is not next to Britney. He is, however, within two spots of JC. JC is on the farthest left. Justin and Joey are next to each other. Britney, who is directly to the right of Lance, is not on either end of the line. Lance is exactly three spots away from Joey. From the left, which two people are standing 3rd and 4th in line?

- A) Britney and Justin B) Chris and Lance C) Lance and Britney
D) Chris and Justin E) N.O.T.A.

TIEBREAKERS

1. $2^x = 16^4$. Solve for x .

2. If the determinant of a matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$, denoted $\begin{vmatrix} a & b \\ c & d \end{vmatrix}$, is defined as $ad - bc$,

find $\begin{vmatrix} 3 & 3 & 1 & 0 & 6 & 3 \\ -2 & 4 & 1 & 8 & 1 & -1 \end{vmatrix}$.

3. How many distinct line segments are in the following figure?

