

1997 Hoover High School Math Tournament
Algebra I Written Test
February 22, 1997

1. Given $\frac{7}{11}x + \frac{6}{7}x - 17 = y$. Find the value of y when $x = 77$.

- A. 98 B. 100 C. 99 D. 77 E. none of these

2. Simplify:

$$\frac{6\sqrt{4+12} + 7\sqrt{12} + 8\sqrt{5+4} - \sqrt{75}}{\sqrt{6}}$$

- A. 26 B. $8\sqrt{6} + \frac{9}{2}\sqrt{2}$ C. $\frac{14}{3}\sqrt{6} + \frac{21}{2}\sqrt{2}$
D. $8\sqrt{6} + 6$ E. none of these

3. Find the equation of the perpendicular bisector of the line segment with endpoints at (7,4) and (5,6).

- A. $x - y = 2$ B. $2x - y = 0$ C. $-x + y = 1$ D. $x - y = 0$ E. none of these

4. Simplify:

$$\frac{3^9 x^9 y^{-2} z^3}{3^8 x^4 y^{-3} z^0}$$

- A. $\frac{3x^5}{yz^3}$ B. $\frac{3x^4}{yz^2}$ C. $3x^5 yz^3$ D. $\frac{9x^5 z^2}{y}$ E. none of these

5. How many times will the following function cross the x-axis?

$$y = x^2 - 1$$

- A. 1 B. 2 C. 3 D. 0 E. none of these

6. What is the degree of the following equation?

$$x^2 + 2x(x^2) + 3x^4 = 2x^3 + 6$$

- A. 4 B. 3 C. 2 D. 1 E. none of these

7. How many integers **do not** solve the following inequality?

$$|3x - 20| > 1$$

- A. 0 B. 1 C. 2 D. 3 E. none of these

8. What is the result when the reciprocal of 0.25 is added to the reciprocal of 2, then divided by 9, then multiplied by the reciprocal of 28, and then reciprocated again?

- A. 14 B. 56 C. 28 D. 4.5 E. none of these

9. Multiply:

$$(a-b)^2(a^2+ab+b^2)(a+b)(a^2+b^2)$$

- A. $a^6 - a^2b^3 + b^6$ B. $a^7 - a^3b^4 - b^3a^4 + b^7$ C. $a^7 - b^7$
D. $a^7 - 2a^3b^3 + 2ab + b^7$ E. none of these

10. What is the last digit of 3^{1997} ?

- A. 1 B. 7 C. 3 D. 9 E. none of these

11. If Ben is three times as old as Juan was 4 years ago and the sum of their current ages is 28, how old will Ben be in two years?

- A. 32 B. 12 C. 17 D. 20 E. none of these

12. David left his house one day and traveled 20 miles to the store. After he finished his shopping, he returned home. David traveled at a constant rate. The return trip was 10 miles longer due to construction. If his travel time was 12000 seconds total, how long, in hours, did the return trip take?

- A. 4 hours B. 3 hours C. 2 hours D. $\frac{28}{5}$ hours E. none of these

13. Find an equation of the line that contains the points (3,-4) and (-7,11).

- A. $15x+4y = 29$ B. $7x+5y = 6$ C. $3x+2y = 1$
D. $12x+9y = 0$ E. none of these

14. Simplify:

$$-\frac{3}{7} \div \left[\frac{1}{8} \left(-\frac{x}{2} + \frac{x}{3} \right) \right]$$

- A. 0 B. $-\frac{24}{7x}$ C. $\frac{x}{112}$ D. $\frac{144}{7x}$ E. none of these

15. If (a,b) is the point of intersection of the lines $12x-3y = 12$ and $8x-6y = 12$, then find the value of $8a-3b$.

- A. 9 B. 29 C. 21 D. 10 E. none of these

16. Simplify:

$$\frac{4x+9}{4x-5} + \frac{x-3}{x+1} - \frac{34-2x}{4x^2-x-5}$$

- A. 2 B. $\frac{8x^2-6x-10}{7x^2-x-5}$ C. $\frac{8x^2-6x+58}{7x^2-x-5}$
D. -1 E. none of these

17. Given the line: $x + \frac{3}{4}y = 8$.

If $M=x$ -intercept, $N=y$ -intercept, and $Q = \text{slope}$, then find $M - N + 2Q$.

- A. 0 B. $-\frac{16}{3}$ C. 16 D. $-\frac{4}{3}$ E. none of these

18. Given $f(x) = \frac{|x|-9}{3}$. Find $f(f(f(0)))$.

- A. $-\frac{7}{3}$ B. -3 C. -2 D. 0 E. none of these

19. Solve: $\sqrt{x-10} = -2 + \sqrt{x}$.

- A. 0 B. $\frac{3}{2}$ C. $\frac{49}{4}$ D. 11 E. none of these

20. A^2 varies directly as B and inversely as C^3 . If $A = 10$ when $B = 200$ and $C = 2$, then what is B when $A = 5$ and $C = 4$?

- A. 400 B. 1600 C. 200 D. 800 E. none of these

21. How many integer solutions are there to the equation $3x^2 + 4x + 8 = 0$?

- A. 3 B. 2 C. 1 D. 0 E. none of these

22. A bag contains 8 red marbles and 3 blue marbles. If 2 marbles are drawn at random, without replacement, what is the probability that both are blue?

- A. $\frac{3}{55}$ B. $\frac{28}{55}$ C. $\frac{27}{55}$ D. $\frac{2}{11}$ E. none of these

23. Add the discriminant of the equation $3x^2 + 4x + 8 = 0$ to the sum of all perfect squares from 0 to 101. What is this sum?

- A. -80 B. 305 C. 395 D. 645 E. none of these

24. $2.\overline{36}$ can be written as a fraction in reduced form $\frac{a}{b}$. Find the value of $a - b$.

- A. 449 B. 41 C. 34 D. 683 E. none of these

25. Laura can wash her car in 30 minutes working alone; if Jennifer helps her, the two girls can wash the car together in 12 minutes. How long would it take Jennifer to wash the car alone?

- A. 20 minutes B. 15 minutes C. 30 minutes D. 12 minutes E. none of these

TIEBREAKERS

TB1. If $(46789)^2 = 2189210521$, then $(46790)^2 = (?)$

TB2. Factor completely: $a^4 - b^4$.

TB3. The square root of 34 is the distance between the points $(x, 6)$ and $(4, 3)$. Find x .