

1998 Hoover High School Math Tournament
Algebra I Written Test
February 21, 1998

- If $(3x - 5)(x + 4)(4x + 3) = Ax^3 + Bx^2 + Cx + D$, find $A - B - C - D$.
A. -168 B. 34 C. -10 D. 10 E. none of these
- Solve for p : $3p^2 - 11p + 7 = 0$
A. $\frac{-11 \pm \sqrt{37}}{2}$ B. $\frac{11 \pm \sqrt{37}}{2}$ C. $\frac{11 \pm \sqrt{37}}{6}$ D. $\frac{11 \pm \sqrt{205}}{6}$ E. none of these
- Simplify: $\frac{3}{3x-2} + \frac{3}{2x+5} - \frac{12x^2+7x-31}{6x^2+11x-10}$
A. $\frac{12x^2}{6x^2+11x-10}$ B. 1 C. -2 D. $\frac{12x^2+7x-22}{6x^2+11x-10}$
E. none of these
- Given the line $\frac{1}{3}x + \frac{2}{5}y = 1$, if $T = x$ -intercept, $S = y$ -intercept, $R = \text{slope}$, find $\frac{T-S}{R}$.
A. $\frac{14}{3}$ B. $\frac{3}{5}$ C. $\frac{-3}{5}$ D. $\frac{-33}{5}$ E. none of these
- Five years ago Drake was 50 years older than Laura was. Fifteen years from now Drake will be 3 times as old as Laura will be. What is the sum of their ages now?
A. 55 B. 60 C. 65 D. 70 E. none of these
- Simplify: $\sqrt{75} + \sqrt{147} - \sqrt{192}$
A. $3\sqrt{3}$ B. $4\sqrt{3}$ C. $5\sqrt{3}$ D. $6\sqrt{3}$ E. none of these

7. Simplify: $3 + \frac{1}{3 + \frac{1}{3 + \frac{1}{3 + \frac{1}{3}}}}$

- A. $\frac{360}{109}$ B. $\frac{10}{3}$ C. $\frac{109}{33}$ D. $\frac{208}{33}$ E. none of these

8. Find the equation of the line that contains the points $(0,8)$ and $(0,0)$.

- A. $x = 0$ B. $y = 0$ C. $y = 8$ D. $x = 8$ E. none of these

9. Simplify: $\sqrt{(x+3)(x-3) - (x+5)(x-5)}$

- A. 16 B. 4 C. $\sqrt{2x^2 - 34}$ D. $\sqrt{2x^2 + 34}$ E. none of these

10. Given $f(x) = 7x^2 + 4x - 13$, $A =$ sum of roots of $f(x) = 0$, $B =$ product of roots of $f(x) = 0$, find $(A+B)^2$.

- A. $\frac{81}{49}$ B. $\frac{289}{49}$ C. $\frac{256}{49}$ D. $\frac{121}{49}$ E. none of these

11. Given $(x+y)^2 = 5$ and $xy = 2$. Find $x^2 + y^2$.

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

12. Find the area of the shape enclosed by the x -axis, the y -axis, and the line $5x + 4y = 20$.

- A. 8 B. 9 C. 10 D. 11 E. none of these

13. Simplify completely:

$$\frac{(a^2 - ab + b^2)(a^2 - b^2)(a^2 + ab + b^2)}{a^3 + b^3}$$

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

14. When $f(x) = (x - 19)(x - 98)(x + 19)(x + 98)$ is graphed, how many times will it cross the x-axis?

- A. 0 B. 2 C. 4 D. 6 E. none of these

15. If $x = \frac{4}{5}y$, $y = \frac{2}{3}a$, $a = \frac{9}{8}b$, then $\frac{x}{b} = (?)$

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

16. If L is the line through the points (5,12) and (17,8), then what is the slope of any line that is perpendicular to L?

- A. -3 B. $-\frac{1}{3}$ C. 3 D. $\frac{1}{3}$ E. none of these

17. When rolling two dice, what is the probability that the sum of the dice is an 8?

- A. $\frac{1}{12}$ B. $\frac{5}{36}$ C. $\frac{1}{6}$ D. $\frac{7}{36}$ E. none of these

18. Simplify $\frac{x^3y^{-2}p^{-7}}{x^{-1}p^3} \div x^5y^7p^{-2}$

- A. xy^2p^7 B. $\frac{x}{y^2p^8}$ C. $\frac{xy^4}{p^7}$ D. $\frac{1}{xy^9p^8}$ E. none of these

19. Duane has 20 liters of 20% salt solution, but he needs 20 liters of 7.5% salt solution. If Duane removes some of the 20% solution and replaces it with pure water, how many liters of 20% solution will not be drained?

- A. 7.5 L B. 8.5 L C. 12.5 L D. 13 L E. none of these

20. How many integers solve the inequality $\sqrt{7} < x < \sqrt{67}$?

- A. 4 B. 5 C. 6 D. 7 E. none of these

21. If 527 people visited Nicholas' website over the past 21 days, to the nearest person, what is the average number of people who visit his website per week?

- A. 25 B. 176 C. 21 D. 175 E. none of these

22. If $f(x) = \frac{3x-2}{2x-3}$, then $\frac{[f(2)][f(4)]}{[f(1)][f(3)]} = (?)$

- A. $-\frac{24}{7}$ B. $\frac{8}{3}$ C. 10 D. $-\frac{3}{7}$ E. none of these

23. Solve $\sqrt{x+7} - \sqrt{x} = 1$

- A. 0 B. 3 C. 6 D. 9 E. none of these

24. Given $\begin{cases} 3x+4y=7 \\ 7x+5y=2 \end{cases}$, find $2x-3y$.

- A. $\frac{75}{13}$ B. $\frac{-183}{13}$ C. $\frac{-75}{13}$ D. $\frac{183}{13}$ E. none of these

25. The greatest common factor of the discriminant of $3x^2 + 6x - 1 = 0$ and the number of integer solutions to $|3x+8| < 18$ is

- A. 12 B. 6 C. 4 D. 3 E. none of these

TIEBREAKER 1 The square root of A varies inversely with C and directly with B^2 . If $A = 25$ when $B = 30$ and $C = 10$, what is B when $A = 36$ and $C = 3$?

TIEBREAKER 2 When $(x + 2y)^8$ is expanded, what is the coefficient of the term that contains x^4y^4 ?

TIEBREAKER 3 Find all solutions: $(x^2 - 9)^2 = 49$