

2012 Hoover High School Math Tournament
Algebra I Written Test

1. Evaluate: $x^3 - 3x^2 \div (4 + x)$ if $x = -2$

- A. 2 B. -2 C. -10 D. -14 E. NOTA

2. What is the sum of the zeros for the function: $y = \frac{x^2}{2} - \frac{13}{2}x + 20$

- A. -13 B. -3 C. 14 D. 13 E. NOTA

3. Find the intersection of $f(x) = \frac{1}{3}x + 3$ and $g(x) = x - 2$.

- A. $\left(\frac{15}{2}, \frac{11}{2}\right)$ B. $\left(\frac{10}{3}, \frac{37}{9}\right)$ C. $\left(\frac{1}{6}, \frac{-2}{3}\right)$ D. $\left(\frac{-1}{2}, \frac{3}{5}\right)$ E. NOTA

4. Simplify : $\frac{1}{1 + \frac{1}{2 + \frac{2}{3 + \frac{3}{4}}}}$

- A. $\frac{53}{38}$ B. $\frac{38}{53}$ C. $\frac{4}{39}$ D. $\frac{39}{4}$ E. NOTA

5. Solve: $-2|2x + 3| - 4 \leq 22$

- A. $x \leq -5$ or $x \geq -4$ B. no solution C. $x \leq 4$ or $x \geq 5$ D. all Reals E. NOTA

6. Evaluate $f(-3)$ where $f(x) = \begin{cases} x^2 + 2x; & x \leq 0 \\ 5; & 0 < x < 6 \\ \frac{1}{2}x - 5; & x \geq 6 \end{cases}$

- A. 15 B. -15 C. 3 D. $\frac{-15}{2}, 3, 5$ E. NOTA

7. x and y vary directly and $y = \frac{8}{9}$ when $x = \frac{2}{3}$. Which equation relates the variables?

- A. $y = \frac{3}{4}x$ B. $y = \frac{4}{3}x$ C. $y = \frac{16}{27}x$ D. $y = \frac{2}{3}x$ E. NOTA

8. A circular swimming pool 20 ft in diameter is enclosed by a wooden deck that is 3 ft wide. What is the area of the deck?

- A. 23π B. 156π C. 69π D. 144π E. NOTA

9. Solve for k: $(a^6 a^6)^k = (a^3)^{(k+5)}$

- A. $\frac{5}{9}$ B. $\frac{9}{5}$ C. $\frac{11}{5}$ D. $\frac{5}{3}$ E. NOTA

10. A long distance phone company charges a flat rate of \$.09 per minute for telephone calls. A second company charges \$.30 for the first minute and \$.06 for each additional minute. How many minutes long is a call that would cost the same amount from both companies?

- A. 8 min. B. 10 min. C. 9 min. D. 9.8 min. E. NOTA

11. Solve for x: $\frac{1}{2} \leq \frac{x+1}{3} < \frac{3}{4}$

- A. $x \leq \frac{1}{2}$ or $x \geq \frac{5}{4}$ B. $5 \leq x \leq 13$ C. $\frac{1}{2} \leq x < \frac{5}{4}$ D. $\frac{1}{2} < x < \frac{5}{4}$ E. NOTA

12. Solve for x: $x(9x-5) \leq (3x-1)^2$

- A. $x \geq \frac{1}{5}$ B. $x \leq \frac{1}{5}$ C. $x \geq \frac{-1}{5}$ D. $x \leq 1$ E. NOTA

13. Write a cubic equation whose zeros are $-5, -1$ and 4 , and whose y-intercept is $6\frac{2}{3}$.

- A. $y = (x+5)(x+1)(x-4)$ B. $y = \frac{2}{3}(x+5)(x+1)(x-4)$ C. $y = \frac{20}{3}(x+5)(x+1)(x-4)$ D. $y = -\frac{1}{3}(x+5)(x+1)(x-4)$ E. NOTA

14. Simplify: $\sqrt{180} + 2\sqrt{384} + \sqrt{112} - \sqrt{125}$

- A. $11\sqrt{5} + 16\sqrt{6} + 4\sqrt{7}$ B. $\sqrt{5} + 8\sqrt{6} + 4\sqrt{7}$ C. $\sqrt{7} + 16\sqrt{8} + 4\sqrt{5}$ D. $\sqrt{5} + 16\sqrt{6} + 4\sqrt{7}$ E. NOTA

15. Find the 15th term in the arithmetic sequence: $-2, -6, -10, \dots$

- A. -62 B. -58 C. -64 D. -54 E. NOTA

16. What is the second term in the expansion of $(x+y)^5$, where terms are written with descending exponents?

- A. x^4y B. xy^4 C. $5x^4y$ D. $5xy^4$ E. NOTA

17. Two six-sided dice are rolled. Find the probability for the sum to be even and a multiple of 3.

- A. $\frac{2}{5}$ B. $\frac{5}{36}$ C. $\frac{1}{36}$ D. $\frac{1}{6}$ E. NOTA

18. The manager of a coffee store decides to experiment with a new blend of coffee. B grade coffee that sells for \$5.00 per pound is mixed with A grade coffee that sells for \$10.00 per pound to get 100 pounds of the new blend. The selling price for the new blend will be \$7.00 per pound. How many pounds of B grade coffee are required for the new blend of coffee if the price reflects the same revenue as if the grades were sold separately?

- A. 40 lb B. 35 lb C. 60 lb D. 65 lb E. NOTA

19. There are only rubies and sapphires in a box. If one ruby is removed, then one-seventh of the remaining jewels are rubies. If two sapphires are removed instead of one ruby, then one-fifth of the remaining jewels are rubies. How many jewels were in the box originally?

- A. 8 B. 36 C. 22 D. 57 E. NOTA

20. Find $\frac{3}{4}$ of the product of zeros for the function: $x^{\frac{2}{5}} - 3x^{\frac{1}{5}} = -2$

- A. 12 B. -12 C. -24 D. 24 E. NOTA

21. If $\frac{1}{1-x} + \frac{1}{1+x} = 4$, then $x^4 =$ _____

- A. $\frac{\sqrt{2}}{2}$ B. $\frac{1}{4}$ C. $\frac{1}{2}$ D. $\pm\frac{1}{2}$ E. NOTA

22. Solve: $2^x \cdot 2^{x+1} = \frac{1}{8}$

- A. -2 B. 1 C. ± 1 D. 2 E. NOTA

23. Find the area enclosed by a triangle whose vertices are $(-3,4)$, $(6,3)$, and $(2,-1)$.

- A. 20 sq units B. 13 sq units C. 40 sq units D. 28 sq units E. NOTA

24. Find $\frac{2}{3}$ of the product for the solutions of the equation: $6x^2 = 5x - 1$

- A. $-\frac{1}{6}$ B. $-\frac{1}{3}$ C. $\frac{1}{9}$ D. $\frac{1}{6}$ E. NOTA

25. You are designing a kit for making sand castles. You want one of the molds to be a cone that will hold 48π cubic inches of sand. What should the dimensions of the cone be if you want the height (h) to be 5 inches more than the radius (r) of the base?

- A. $3" = r, 8" = h$ B. $4" = r, 9" = h$ C. $\frac{1}{3}" = r, 5\frac{1}{3}" = h$ D. $2" = r, 7" = h$ E. NOTA

TIEBREAKERS

TB1 Simplify: $e - \pi$

TB2 At what ordered triple does the graph of $3x+5y-z=15$ cross the y axis?

TB3 Find the product of 44_6 and 55_7 in base 4.