2010 Vestavia Hills High School
Mathematics Tournament
Algebra I Written Examination

1. Simplify $9^{\frac{1}{2}} + \left(-7^2 + 9\right) \div 4 + 1$.

A. 7 B. 12.5 C. −5 D. −6 E. NOTA

2. What is 15% of one-third of 80?

A. 0.15 B. 36 C. 400 D. $\frac{9}{1600}$ E. NOTA

3. How many positive integer solutions are there for the equation $x^4 - 3x^2 + 2 = 0$?

A. 0 B. 1 C. 2 D. 3 E. NOTA

4. Find the sum of the greatest common factor and least common multiple of 75 and 30.

A. 115 B. 165 C. 305 D. 455 E. NOTA

5. What is 3541_6 when written in base 4?

A. 11311 B. 13211 C. 21311 D. 31111 E. NOTA

6. If there are a total of 35 heads and 114 legs in the Boring Zoo, and only flamingos and giraffes are in the zoo, how many giraffes are there?

A. 13 B. 20 C. 22 D. 35 E. NOTA

7. Find the number of positive integral factors of 302^4.

A. 8 B. 40 C. 12 D. 20 E. NOTA

8. The sum of four positive integers is 22. What is the largest possible product of these four integers?

A. 840 B. 121 C. 888 D. 336 E. NOTA

9. The area of a rectangle is 192 square feet. If the length is 4 feet longer than the width, find the width of the rectangle.

A. 20 B. 16 C. 12 D. 8 E. NOTA

10. Find $\sqrt{xy}$ if $3x + 2y = 35$ and $7x - 2y = 35$.

A. −7 B. 7 C. $\sqrt{7}$ D. $2\sqrt{14}$ E. NOTA

11. Sally's age is two times Dolly's age as of now. Three year's ago, Sally's age was three times Jack's age, while Dolly's age was three less than twice Jack's age. Five years from now, what is the sum of their combined ages?

A. 12 B. 17 C. 24 D. 39 E. NOTA

12. A beach condominium rented for \$250 per month during the three summer months and for \$90 per month during the remainder of the year. During one year (January-December), it was occupied for only nine months, and the rental income amounted to \$1130. If X is the number of summer months it was rented and Y is the number of other months it was rented, find $|X-Y|$.

A. 8 B. 7 C. 4 D. 5 E. NOTA

13. Find the sum of the roots of $3x^2-2x-24=0$.

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

14. A club is electing a president, a vice president, and two secretaries. How many ways can this be done if the club has 20 members?

A. 4845 B. 12240 C. 15390 D. 58140 E. NOTA

15. Given : $f(x)=g(x)+h(x)+2$ and $g(x)=h(x)+47$. If $h(x)=49$, find $f(x)$.

A. 147 B. $\frac{1}{49}$ C. -47 D. not enough info E. NOTA

16. Yue can build a house in 12 hours. Yash can build a house in 6 hours. Gene can destroy a house in 4 hours. How much of a house will be built in 18 hours if they all work together?

A. one-half B. one-ninth C. three-fourths D. none E. NOTA

17. Evaluate for $x=23$: $\frac{x^2-2x-8}{x^2+12x+20} \div \frac{x^2-12x+32}{x^2+3x-70} \times \frac{x^2-17x+70}{x^2-6x-16}$.

A. 0.52 B. 0.50 C. 0.13 D. 0.42 E. NOTA

18. Two distinct letters are selected at random from the set $\{a,b,c,d,e\}$. What is the probability that one of the letters is c?

A. 0.4 B. 0.2 C. 0.05 D. 0.04 E. NOTA

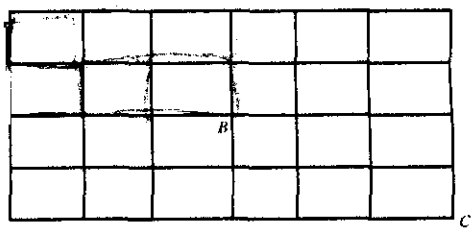
19. If $f(x)=\frac{3x^2+2x+16}{x+2}$ and $g(x)=4x-5$, find $g^{-1}(f(1))$.

A. 23 B. 3 C. 0.5 D. 33 E. NOTA

20. Find $\left[(2+4+6+8+\ldots+100)-(1+3+5+7+\ldots+99)\right]^2$.

A. 2500 B. 1000 C. 500 D. 250 E. NOTA

21. How many ways can you get from points A to point C if you can only move down and to the right, and you must also go through point B?



A. 100 B. 72 C. 36
D. 25 E. NOTA

22. Find $x^3+\frac{1}{x^3}$ if $x+\frac{1}{x}=7$.

A. 322 B. 336 C. 343 D. 364 E. NOTA

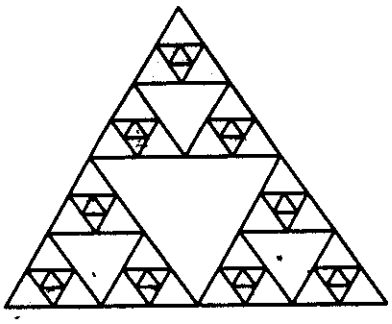
23. If A = the number of ways two captains can be chosen out of 10 people;
B = the number of sides of a dodecagon;
C = the value of x which satisfies $-3x-12=7x+8$; and
D = the number of distinct ways the letters in ELEMENTAL can be arranged,

find the value of $\dfrac{2\left[\dfrac{A}{3}+5B-(4!-24)D\right]}{C}$.

A. 90 B. 150 C. 115 D. 75 E. NOTA

24. Ganondorf has acquired a special piece of the Triforce, shown to the right. How many triangles are in this piece?

A. 89 B. 99 C. 101 D. 120 E. NOTA



25. Danielle the dairy goat is chained to the corner of a barn. The chain is 20 feet long and the barn's dimensions measure 10 ft by 15 ft. There is a small, circular pond with circumference 4π, two feet away from the barn but inside Danielle's grazing area. If Danielle is not allowed to go into the pond, what is the area of ground on which she can graze?

A. 321π B. $\frac{1291}{4}\pi$ C. $\frac{1309}{4}\pi$ D. $\frac{1275}{4}\pi$ E. NOTA

PLEASE WRITE YOUR NAME, COMPLETE SCHOOL NAME, AND TIE-BREAKER ANSWERS ON THE BACK OF THE SCANTRON FORM. DENOTE EACH TIE-BREAKER AS T1, T2, AND T3.

T1. Find the value of $\left(\dfrac{x^{\frac{3}{2}}y^{\frac{3}{4}}z^{2}}{x^{2}y^{\frac{1}{4}}z^{-\frac{3}{4}}}\right)^{-1}$ if $x=9$, $y=36$, and $z=16$.

T2. Find the number of terminal zeros in 30!.

T3. Find the exact value of $6+\dfrac{1}{6+\dfrac{1}{6+\dfrac{1}{6+\ldots}}}$