

Algebra I Written Exam
Vestavia Hills High School Math Tournament
2013

1. The probability that Kevin is late to school is 85%, the probability that Charles scores 100 on a test is 70%, and the probability that Philip loses his paper is 80%. What is the probability that Kevin isn't late, Charles doesn't get a 100, and Philip doesn't lose his paper?

- A. $\frac{119}{250}$ B. $\frac{9}{1000}$ C. 0 D. $\frac{3}{4}$ E. NOTA

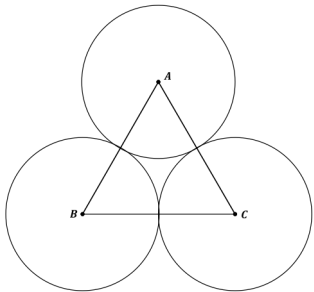
2. Find the sum of the first 10 prime numbers.

- A. 101 B. 129 C. 130 D. 99 E. NOTA

3. The radius of congruent circles A , B , and C shown at the right is 2.

Find the area of $\triangle ABC$.

- A. $4\sqrt{3}$ B. 4 C. $2\sqrt{3}$
D. $8\sqrt{3}$ E. NOTA



4. Find $f(g(f(0)))$ if $f(x)=2x^2+5$ and $g(x)=4x-10$.

- A. 172 B. 205 C. -189
D. 30 E. NOTA

5. If A is the number of distinct ways to arrange SHIRLPOP and B is the number of distinct ways to arrange DILLPICKLE, what is the value of $A+B$?

- A. 322560 B. 302400 C. 20160 D. 282240 E. NOTA

6. Find the value of $100101_2 + 101001_2$ when converted to base 8.

- A. 116 B. 112 C. 117 D. 115 E. NOTA

7. Which of the following is not true?

- A. No scalene triangles are isosceles triangles. B. Every triangle has at least two acute angles.
C. The sum of the squares of the two shortest sides of a triangle always equals the square of the longest side. D. A right triangle can be an isosceles triangle.
E. NOTA

8. If $f(x)=\sqrt{x^2}$, then $f(x)$ can also be expressed as:

- A. x B. $-x$ C. $\pm x$ D. $|x|$ E. NOTA

9. Find the equation of the line that passes through (3, 5) and is perpendicular to the line containing (-2, 5) and (2, -1).

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

10. Find the units digit of 2337^{789} .

- A. 7 B. 9 C. 3 D. 1 E. NOTA

11. In a dog park someone counted 78 heads and 228 legs. If only two-legged humans and four-legged dogs are in the park, how many dogs were at the park?

- A. 36 B. 40 C. 47 D. 32 E. NOTA

12. If $f(x)=\frac{2x+1}{x-1}$, then find $f^{-1}(x)$.

- A. $\frac{x+1}{x-2}$ B. $\frac{x-1}{2x+1}$ C. $\frac{2x+1}{x}$ D. $x+1$ E. NOTA

13. Write $3.\overline{513}$ as a fraction in lowest terms.

- A. $\frac{107}{30}$ B. $\frac{527}{150}$ C. $\frac{116}{33}$ D. $\frac{52}{15}$ E. NOTA

14. Find the value of $\sqrt{6+\sqrt{6+\sqrt{6+\sqrt{6+\dots}}}}$.

- A. 2 B. $\sqrt{13}$ C. 3 D. 5 E. NOTA

15. Find the maximum value of $f(x)=-\frac{1}{2}x^2-6x-21$.

A. -5B. 3C. -6D. -3E. NOTA
16. Find the remainder when $6x^4+5x^3-2x+8$ is divided by $x-\frac{1}{2}$.

A. 2B. 4C. 6D. 8E. NOTA
17. For what real values of x does the expression $\sqrt{4-x^2}$ represent a real number?

A. $x\leq 2$ B. $x\geq 2$ C. $-2\leq x\leq 2$ D. $x\geq \pm 2$ E. NOTA
18. How many integers are solutions to $\frac{x+1}{x+3}-\frac{x-3}{2-x}=\frac{2x^2-15}{x^2+x-6}$?

A. 0B. 1C. 2D. 3E. NOTA
19. The graphs of $y=2^x$ and $y=\left(\frac{1}{2}\right)^x$ have:

A. the same x-interceptB. the same y-interceptC. no point in commonD. two points in commonE. three points in common
20. Consider a collection of five red balls numbered 1 through 5 and a collection of green balls also numbered 1 through 5. If a red ball and a green ball are drawn at random and the sum of the numbers written on them is found, how many different sums are possible?

A. 25B. 10C. 20D. 9E. NOTA
21. A penny, nickel, dime, and quarter are each tossed once. What is the probability of getting exactly two heads?

A. $\frac{1}{2}$ B. $\frac{5}{16}$ C. $\frac{1}{16}$ D. $\frac{3}{8}$ E. NOTA
22. Determine the term in the expansion of $\left(a-2b^2\right)^7$ that involves a^4 .

A. $-280a^4b^6$ B. $35a^4b^2$ C. $21a^4b^7$ D. $35a^4b^6$ E. NOTA
23. Given the line with equation $2x+3y-6=0$, which of the following is not true?

A. If x increases, then y decreases.B. It has a negative slope.C. It is perpendicular to $3x+2y+6=0$.D. It has x-intercept 3 and y-intercept 2.E. It is parallel to $2x+3y-4=0$.
24. If the graph of $f(x)=25x^2+bx+9$ crosses the x -axis at only one point, what is the value of b ?

A. 6B. 10C. 15D. 36E. NOTA
25. Grade A crude oil sells for \$78 per barrel and Grade B crude oil sells for \$54 per barrel. If a mixture sells for \$63 per barrel, what is the ratio of the number of barrels of Grade A to the number of barrels of Grade B used in the mixture?

A. $\frac{11}{15}$ B. $\frac{13}{9}$ C. $\frac{5}{3}$ D. $\frac{3}{5}$ E. NOTA

Write the answers to the tie-breakers on the back of your bubble form. Denote each answer as T1, T2, and T3.

- T1. Subtract x^2-3x+4 from $5x^2+3x+1$.
- T2. The roots of the polynomial $f(x)=x^3+5x^2+2x-8$ are a, b , and c , where $a<b<c$. Find the value of a^{b^c} .
- T3. If $10^x=50$, find $\sqrt[3]{2500}$.

You may keep your copy of the exam.