ASFA

ALABAMA SCHOOL OF FINE ARTS

Mathematics Tournament

January 18, ~~2013~~ 2014 ☺

Pre-Algebra Written Test

<u>Directions:</u>

1. Make sure your name and student number are bubbled correctly on the pink scantron sheet.

2. <u>No</u> books, notes, calculators, or other aids may be used. Scratch paper will be provided by the exam proctor.

3. You may write on this exam booklet; however, all answers must be recorded in the proper places on the <u>pink scantron sheet</u>. The pink scantron sheet must be given to the exam proctor when time is called.

4. <u>All answers must be simplified</u>. Do not round unless stated in the question. Units are not required in an answer. If a certain form for the answer is requested, be sure to use that form.

5. This exam consists of 25 multiple choice questions with A, B, C, D, and E as answer choices. There are three tie-breaker questions: TB1, TB2, and TB3. Write all tie-breaker answers on the back of the pink answer sheet, labelled with the respective number.

6. "NOTA" denotes "None of the above."

7. Each correct answer earns 4 points. For each incorrect answer, 1 point is subtracted. There is no penalty for unanswered questions.

8. Figures are not drawn to scale.

1. Simplify. $\dfrac{\left(\dfrac{\left(4 \cdot 2^6\right)}{4^3}\right)^{\frac{1}{2}}}{\left(\dfrac{11}{32}\right)}$

A. $\dfrac{64}{11}$ B. $\dfrac{32}{11}$ C. 5   D. $\dfrac{8}{3}$ E. NOTA

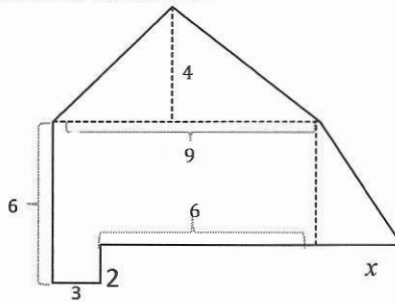**2.** Solve for y. $\begin{cases} 8x + 3y = 12 \\ -8x + 2y = 3 \end{cases}$

A. -5   B. 3   C. -3   D. 5   E. NOTA

3. If the area of the given polygon is 80, what is the value of x?

A. 6   B. 3   C. 4   D. 5   E. NOTA

4. $\sqrt[3]{x+1} = -\dfrac{6}{4}$. The value of x is:
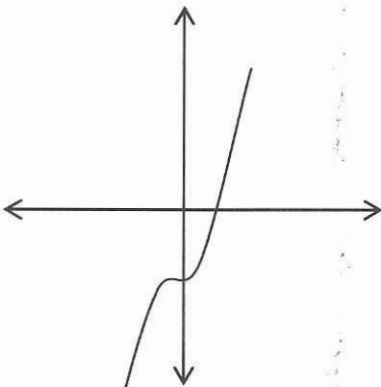
A. $\dfrac{35}{8}$ B. $\dfrac{27}{8}$ C. $-\dfrac{27}{8}$ D. $-\dfrac{35}{8}$ E. NOTA

5.
The graph depicted above is...

A. linear.   B. quadratic.   C. cubic.   D. absolute value.   E. NOTA

6. Solve for y: $\begin{cases} \dfrac{4}{x} - \dfrac{3}{y} = 1 \\ 3x = y \end{cases}$

A. 1   B. 9   C. 3   D. 0   E. NOTA

7. Hayden is shopping for a new dress. The entire store is having a 70% off sale (before sales tax). If the sales tax is 9% and the dress that she wants is originally $130, how much does Hayden have to pay for the dress?

A. $81.90   B. $99.19   C. $42.51   D. $11.70   E. NOTA

8. Find the units digit of: $(2014)^{13}(2013)^{12}(2012)^{11}$

A. 1   B. 4   C. 2   D. 3   E. NOTA

9. Jonah made the following grades in his Biology class. His next test is tomorrow. What is the minimum percentage on his next test that he needs on his next test in order to have at least a 90% average? Assume that averages are *not* rounded up.

Test #	1	2	3	4	5
%	90	89	86	98	?

A. 87   B. 90   C. 80   D. 95   E. NOTA

10. What is the prime factorization of 3,240,000?

A. $2^3 \cdot 3^3 \cdot 5^2$ B. $2^9 \cdot 3^6 \cdot 5^4$ C. $2^6 \cdot 3^4 \cdot 5^4$ D. $2^7 \cdot 3^8 \cdot 5^4$ E. NOTA

11. Ellen and Adam start running from a point P at 12:00 PM. If Ellen runs at a constant rate of 10 miles per hour, due west, and Adam runs at a constant rate of 3 miles per hour, due north, what is the shortest distance between Adam and Ellen at 4:00 PM?

A. $\sqrt{109}$ B. $4\sqrt{109}$ C. 13   D. $4\sqrt{114}$ E. NOTA

12. Trapezoids $ABCD$ and $EFGH$ are similar to each other. Find $\overline{FG}$ (diagrams are not to scale).
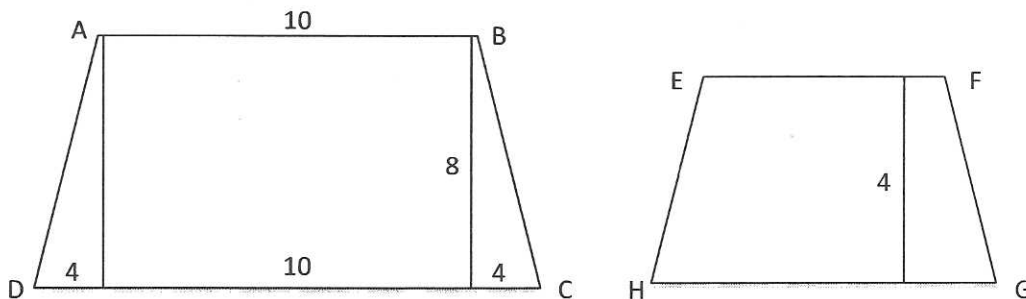
A. $4\sqrt{3}$ B. $4\sqrt{5}$ C. $\sqrt{5}$ D. $2\sqrt{5}$ E. NOTA
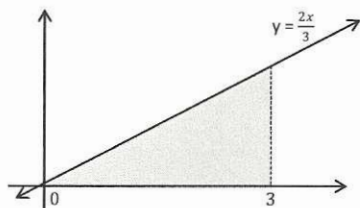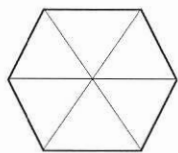
13. What is the area between the graph of y and the x-axis from 0 to 3?

A. 2

B. non-existent

C. 3

D. $\frac{2}{3}$

E. NOTA

14. How many distinct ways can the letters of HARRYPOTTER be arranged?

A. 11!

B. $\frac{11!}{6!}$

C. $\frac{11!}{2!2!}$

D. $\frac{11!}{3!2!}$

E. NOTA

15. If the equation for the inner angle made by the sides of a regular polygon is given by $\frac{180(n-2)}{n}$, where n equals the number of sides of the polygon, what is the side length of the hexagon given above? The length of any ·one of the diagonals is equal to 10 feet.

A. 10

B. $\frac{5\sqrt{3}}{2}$

C. 5

D. $5\sqrt{3}$

E. NOTA

16. Ali leaves his house on his bike and travels due North for 4 miles, then travels due East for 13 miles, and then travels due South for 2 miles. How far from his house is Ali when he is done? Measure the *direct* distance, also called "as the crow flies," *not* the distance traveled.

A. $\sqrt{173}$ miles
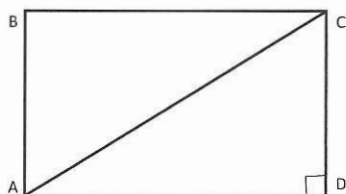
B. 19 miles

C. $\sqrt{69}$ miles

D. 14 miles

E. NOTA

17. $\left(\frac{4}{5}\right) \cdot \left[\left(\frac{\left(\frac{1}{8}\right)}{\left(\frac{3}{4}\right)^{9^2-3^4}}\right) + \left(\frac{9}{64}\right)\right]$

A. $\frac{17}{64}$

B. $\frac{73}{64}$

C. $\frac{59}{240}$

D. $\frac{17}{80}$

E. NOTA

18. If the perimeter of the following polygon is 60, what is the value of x? (Note: diagram is not to scale).
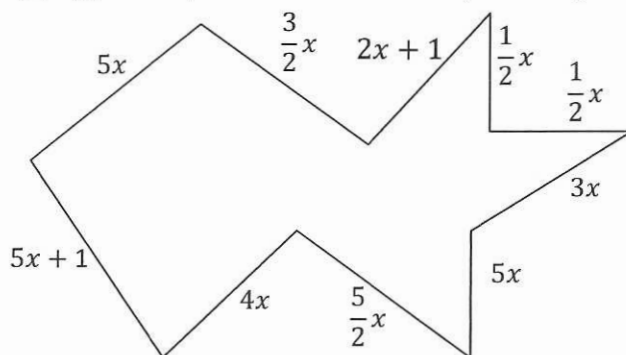
A. 4   B. $\frac{58}{33}$ C. 2   D. $\frac{60}{29}$ E. NOTA

19. If the length of line $\overline{AD}$ = 7, and the area of rectangle $ABCD$ is 35, what is the length of line $\overline{AC}$?

A.12   B. $\sqrt{74}$ C. 9   D. $2\sqrt{6}$ E. NOTA

20. If the value of x is 35% of 50% of 1400, and the value of y is $\frac{1}{11}$ of $\frac{1}{3}$ 66000, what is $x + y$?

A. 2000   B. 2245   C. 2385   D. 2295   E. NOTA

21. Simplify: $\dfrac{(5\cdot(-3))^2+1-4\cdot 21-12}{-5}$

A. 62   B. -26   C. $\frac{2949}{-5}$ D. 26   E. NOTA

22. Ten less than a three times a number is twice that number divided by five. What is that number?

A. 4   B. $\frac{46}{13}$ C. 3   D. $\frac{50}{13}$ E. NOTA

23. There are three bags on a table. One bag contains 4 red balls, 7 green balls and 2 blue balls. Another bag has 9 blue balls, 8 yellow balls, and 5 white balls. The last bag has 15 balls, 3 of which are red. Half of the remaining balls in the last bag are green, and the rest are purple. Amongst all three bags, what percent of the balls are not green?

A. 26%   B.25%   C. 74%   D.75%   E. NOTA

24. Solve for x: $2x - 4 > |3x - 6|$

A. $x = 2$ B. No solution.   C. $x > 2$ D. $x < 2$ E. NOTA

25. Find the value of $\dfrac{(1+2+3....+34)-(3+4+5...32)}{(1+2+3...+9)+(4+5+6)-(9+8+7+6)}$:

A. $\dfrac{67}{15}$
   B. $\dfrac{67}{30}$
   C. $\dfrac{14}{3}$
   D. $\dfrac{7}{3}$
   E. NOTA

TIEBREAKERS

TB1: Convert 2014_5 to base 8:

TB2: Convert $0.\overline{987}$ to its simplest fraction form.

TB3: The digital root of a number is the sum of all its digits, then the sum of all the digits of the result, and so on until you are left with a single number. For example, the digital root of 42 is 4+2=6 and the digital root of 90210 is 9+0+2+1+0 = 12 → 1+2 = 3. How many numbers between 1 and 20 (inclusive) have a digital root that is a prime number?