2010 Vestavia Hills High School
Mathematics Tournament
Pre-Algebra Written Examination

1. A Fuwwy was going shopping for birthday presents. He bought a 4-square ball and an Edgar Allen Poe book. If the ball originally cost $15, and the book originally cost $20, how much will the Fuwwy have to pay for them if he got them both at a 50% discount, an additional 40% discount, and paid an 8% sales tax?

   A. $7.56   B. $11.34   C. $10.50   D. $17.50   E. NOTA

2. Aashka, Botong, Cassie, Daniel, Evan, Farhan, and Gene line up in a straight line. Evan is in front of Farhan, but behind Aashka. Gene is between Aashka and Evan. Botong, Cassie, and Daniel line up in alphabetical order with nobody between them. Daniel is behind Farhan. Who is in the middle?

   A. Aashka   B. Botong   C. Evan   D. Farhan   E. NOTA

3. What is the volume of a sphere, in cm^3, with a surface area of $16\pi \, cm^2$?

   A. 16π B. 256π C. 32π D. $\dfrac{32}{3}\pi$ E. NOTA

4. Jake can paint a room in 5 hours and Sarah can paint the same room in 3 hours. How many seconds will it take them to paint the room together?

   A. 112.5   B. $1\dfrac{7}{8}$ C. 3375   D. 6750   E. NOTA

5. Simplify $\left|1+\left|2-\left|3+\left|4-|5|\right|\right|\right|\right|$.

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

6. If the midpoint between the *x*- and *y*-intercepts of the line $9x - 10y = 8$ is the point (*A*, *B*), find $A + B$.

   A. $\dfrac{38}{45}$ B. $-\dfrac{16}{45}$ C. $\dfrac{2}{45}$ D. $\dfrac{4}{45}$ E. NOTA

7. In how many (distinct) other ways can the letters in PARALLEL be arranged?

   A. 3360   B. 3359   C. 6720   D. 6719   E. NOTA

8. Find the radius of a circle, in centimeters, with a $60°$ arc of length $65\pi \, cm$?

   A. 24   B. $\dfrac{195}{2}$ C. 159   D. 28   E. NOTA

9. A 26-foot ladder leans against a building so that the top of the ladder lies exactly halfway up the building. If the base of the ladder is 10 feet from the base of the building, how tall is the building?

   A. 48   B. 12   C. 24   D. 52   E. NOTA

10. Once upon a time a princess lived in a tower. One day, due to boredom, she started to climb down the tower. For very five feet of descent, the castle's magical powers pushed her back up two feet. If she makes no stops on the way to the bottom of the tower, how many full minutes will it take her to climb completely down the tower, if she tower is 300 feet tall? (The tower's magical powers stop once she touches the ground.)

    A. 100   B. 99   C. 98   D. 60   E. NOTA

11. Calculate $1324^2 - 1224^2$.

   A. 284600   B. 134200   C. 254800   D. 268400   E. NOTA

12. What is the sum of the mean, median, and mode of the set $\{26, 15, 5, 31, 15, 17\}$?

   A. $\dfrac{295}{6}$ B. 31   C. $\dfrac{199}{6}$ D. $\dfrac{205}{6}$ E. NOTA

13. At the VHHS math tournament there are 500 students. 120 students participate in the band, 300 of the students play a sport, and 100 of the students are in choir. Forty of these students are in both band and choir, 50 participate in both a sport and in band, and 40 participate both in choir and a sport. How many students do all three activities?

   A. 36   B. 10   C. 5   D. 25   E. NOTA

14. For every three chickens, one fox is hunting them. For every one fox, one human and five dogs are hunting it. What is the total number of legs that are hunting if there are 30 chickens?

   A. 200   B. 260   C. 220   D. 60   E. NOTA

15. Simplify $\dfrac{\left[-2\left(\sqrt{81}\times 2\right)^2 - (-5+2)\right]}{4}$.

   A. $-\dfrac{75}{4}$ B. $-\dfrac{69}{4}$ C. $-\dfrac{651}{4}$ D. $-\dfrac{645}{4}$ E. NOTA

16. Find the equation of the line perpendicular to $y = 2x - 5$ that contains the point $(1, 7)$.

   A. $y = -\dfrac{1}{2}x - \dfrac{15}{2}$ B. $2y + x = 15$ C. $y = -\dfrac{1}{2}x + 5$ D. $y = 2x + 7$ E. NOTA

17. Mr. Taylor's math class takes five tests every nine weeks, and Farhan has made 86, 83, 90, and 92 on his first four tests. How many integer grades less than or equal to 100 can he get on his last test to make an "A" for the nine week? (An "A" is a grade from 90 to 100 inclusive.)

   A. 99   B. 10   C. 2   D. 0   E. NOTA

18. Evaluate and write your answer in scientific notation: $\dfrac{4\times 10^{-2}}{16\times 10^{-4}}$.

   A. 0.25×10^2 B. 2.5×10^1 C. 2.5×10^3 D. 2.5×10^{-3} E. NOTA

19. What is the units digit in $2378^{92} + 4373^{63}$?

   A. 1   B. 3   C. 5   D. 7   E. NOTA

20. How many integer solutions are there in the solution set to $3x + 2 \leq 15x - 6 \leq 18x + 2$?

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

21. The probability that Sasha gets an "A" in math this year is $\dfrac{1}{6}$, $\dfrac{1}{4}$ for a "B", and $\dfrac{1}{5}$ for a "C." What is the probability that she will get a "D" or an "F"?

   A. $\dfrac{23}{60}$ B. $\dfrac{119}{120}$ C. $\dfrac{1}{5}$ D. $\dfrac{3}{8}$ E. NOTA
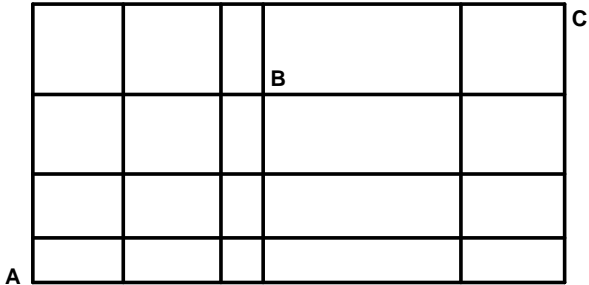
22. In how many ways can Cassie go from point A to point B to point C, going only up and to the right?

    A. 126 B. 96 C. 68
    D. 60 E. NOTA

23. John the mouse is in a room with some mice and some men. Both mice and men are running around him in a circle. He counts 50 feet, including himself. When he counts the number of people and animals, he forgets to count himself. He counts 12 in total. How many mice are in the room?

    A. 9 B. 10 C. 11 D. 12 E. NOTA

24. Find the base-10 sum of $244_5 + 212_3 + 145_8$.

    A. 23 B. 74 C. 198 D. 101 E. NOTA

25. What is the measure of the smaller angle between the hour and minute hands of a clock at 10:26?

    A. 155 B. 157 C. 314 D. 153 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. Simplify, and write your answer as an improper fraction: $16^{\frac{3}{4}} + 50^{-1}$.

T2. Convert 110101_2 to base 7.

T3. Simplify

$$\dfrac{e^{-1}\left\{7869 - 23^{31} + 56^{\left[\frac{36\pi}{7}+\left(3+\frac{1}{3}+\frac{1}{9}+\ldots\right)\right]}\right\}^{\left(e^{\pi}\bullet\pi^{e}\right)}\left(7^{0}-(57-56)^{78}\right)}{\left(\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\ldots\right)\left(\pi^{36}+78^{4}-3621^{3}+1\right)^{\frac{63}{24}}}.$$

YOU MAY KEEP THIS COPY OF THE EXAM.