Alabama School of Fine Arts
Invitational Mathematics Tournament

January 12, 2008

Pre-Algebra Exam

Directions:

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

2. No 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 pink answer sheet. The pink answer sheet must be given to the exam proctor when time is called.

4. All answers must be simplified. 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 answers to tie-breaker questions on the back of the pink answer sheet, labeled 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.

1. An ant is moving left and right on a number line. If the ant moves left 24, right 26, left 107, left 204, and right 309 and ends up at -14, at what number did the ant begin?
    a. -2
    b. -12
    c. -14
    d. -16
    e. NOTA

2. What is the sum of the multiplicative inverse of the additive identity and the additive inverse of the multiplicative identity?
    a. -1
    b. 0
    c. 1
    d. Does not exist.
    e. NOTA

3. What is the units digit of 333^{33}?
    a. 1
    b. 3
    c. 7
    d. 9
    e. NOTA

4. Evaluate 100 + 101 + 102 + . . . + 199 + 200
    a. 15000
    b. 15150
    c. 15051
    d. 20100
    e. NOTA

5. How many ways can the letters in ALABAMA be arranged?
    a. 210
    b. 1260
    c. 1640
    d. 5040
    e. NOTA

6. Simplify: $\frac{21x^3y^7z^{14}}{18x^4y^6} \cdot \frac{30x^3z^{-5}}{y^{12}z^{-6}}$.
   a. $\frac{35xz^{30}}{y^{11}}$
   b. $35x^{10}y^{25}z^3$
   c. $35x^2z^{15}y^{11}$
   d. $\frac{35x^2z^{15}}{y^{11}}$
   e. NOTA

7. Which of the graphs of these equations is parallel to the graph of $2y = x - 7$?
   a. $2x - 4y = 14$
   b. $y = -\frac{1}{2}x + 14$
   c. $y = -2x + 14$
   d. $y = -2x + 14$
   e. NOTA

8. Solve for x if (1) 3x – y = 24 and (2) y = 10 – x.
   a. 3/2
   b. 6
   c. 17/2
   d. 17
   e. NOTA

9. Solve for x if half of 17 less than x, cubed, is 216.
   a. 28
   b. 29
   c. 30
   d. 31
   e. NOTA

10. Katrina is picking two gummy bears from a container containing 2 white bears, 5 red bears, 10 orange bears, 10 green bears, and 7 yellow bears. Find the probability that both bears picked are red
    a. 10/1122
    b. 20/561
    c. 25/1156
    d. 10/561
    e. NOTA

11. What is the area of a shape bounded by y = 5, y = 8, y = -x + 9, and y = x + 10?
    a. 18
    b. 21
    c. 24
    d. 27
    e. NOTA

12. If Caleb is in a large barrel that rolls down the hill a distance of 96 ft by rotating him completely upside down 8 times, what is the radius of the barrel?
    a. $8/\pi$
    b. $9/\pi$
    c. $10/\pi$
    d. $12/\pi$
    e. NOTA

13. Evaluate $\dfrac{\frac{1}{2}+\frac{1}{3}\times\left(\frac{1}{4}\right)^{\frac{1}{2}}}{\left(\frac{1}{2}\right)^{3}}$.
    a. 16/3
    b. 10/3
    c. 2/3
    d. 25/6
    e. NOTA

14. A regular heptagon and a regular decagon have the same perimeter and integer side lengths. Which of these values would be a possible perimeter for the two?
    I. 840 **II.** 910 **III.**1040 **IV.** 1050

    a. **II & IV**
    b. **II & III**
    c. **I & IV**
    d. **II**
    e. NOTA

15. If a&b = $a^2 + b^2$ and a!b = 2ab, find the square root of 13&3+13!3.
    a. 3
    b. 13
    c. 16
    d. 18
    e. NOTA

16. There are 17 people at a party, all of whom shake hands and the beginning of the party. There are also 11 people who stay until the end of the party and shake hands again upon departure. How many handshakes occurred?
    a. 438
    b. 181
    c. 191
    d. 219
    e. NOTA

17. Find the mean of the 10^{th}, 11^{th}, and 12^{th} Fibonacci numbers.
    a. 55
    b. 89
    c. 96
    d. 144
    e. NOTA

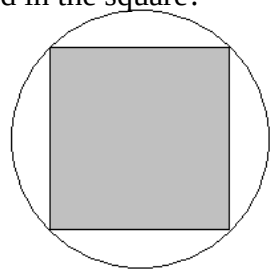
18. Consider the shape formed by attaching a semicircle to an isosceles triangle. If the height of the figure shown is 12 and the width is 6, find the area.

    a. $27+9\pi/2$
    b. $36 + 9\pi$
    c. 54
    d. 72
    e. NOTA

19. Find the product of the first 5 prime numbers
    a. 2310
    b. 210
    c. 125
    d. 28
    e. 18

20. If it takes a machine 50 seconds to produce one zob, then how many zobs will be produced in a two week period, assuming the machine is stopped for 4 hours daily but is running the rest of the time.
    a. 1440
    b. 20160
    c. 24192
    d. 16800
    e. NOTA

21. If the diameter of the circle shown is 10 and a point is picked randomly in the circle, then what are the odds against the point being picked in the square?



    a. 2 to $\pi - 2$
    b. $\pi - 2$ to 2
    c. 2 to π
    d. π to 2
    e. NOTA

22. If the sum of the complement and the supplement of an angle is 162 degrees, find the angle.
    a. 36 degrees
    b. 54 degrees
    c. 126 degrees
    d. 144 degrees
    e. NOTA

23. On Friday, John and Jerry have $35 between then and Jerry has $15 more than John. If Jerry increases the amount he has by 60% by mowing two neighbors lawns and John is paid the same amount to mow two more neighbors lawns, then by what percent has John increased the amount he has?
    a. 50%
    b. 137.5%
    c. 175%
    d. 250%
    e. NOTA

24. Betty's grandmother has a farm. In a field, there are sheep and sluffs. If sheep have 4 legs and 1 head and sluffs have 7 legs and 2 heads, and there are 98 legs and 26 heads, how many sheep are there in the field?
    a. 6
    b. 12
    c. 14
    d. 20
    e. NOTA

25. What is the volume of a right cone with slant height 5 and a circular base with radius 3?
    a. 45π
    b. 36π
    c. 15π
    d. 12π
    e. NOTA

TB1: What is the volume of a cone made by rotating an equilateral triangle with side length 9 cm about one of its altitudes?

TB2: Convert $0.123\overline{34}$ to a fraction, in its most simplified form.

TB3: If A = {1, 3, 5, 7, 9}, B = {2, 3, 5, 7, 11, 13}, and C = {2, 4, 6, 8, 10} find $(A \cup B) \cap (C \cup B)$.