6th Grade Written Test
2024 James Clemens Math Tournament

1. You have 90 minutes to complete this test.
2. This exam consists of 25 multiple-choice questions and 3 free-response questions used as tie-breakers. The multiple-choice questions are each worth 4 points if answered correctly and no points if left unanswered. 1 point will be deducted for each incorrect answer. The free-response questions are each worth 0.1 point if answered correctly, and no points if answered incorrectly or left unanswered. The maximum score for this test is 100.3 points.
3. Calculators, books, and other aides are prohibited during this examination. Scratch paper will be provided for calculations. Diagrams are not necessarily drawn to scale.
4. Mark your answers to the questions in the provided Scantron form. You may use the test booklets for scratch work, but only answers marked in the Scantron form will be counted. If you require additional scratch paper, simply raise your hand and a volunteer will assist you.
5. In the event of a tie, answers will be evaluated starting backwards from question 25 to 1 to determine a winner.
6. Although this math tournament is intended to demonstrate your knowledge and skills in math, it is also a great opportunity for you to interact with your fellow peers, so be sure to enjoy yourself and have fun!

DO NOT TURN THE PAGE UNTIL TOLD TO DO SO

1. Point B with coordinates (3, 5) is shifted right 4 units, shifted up 5 units, shifted down 3 units, then shifted left 2 units. The resulting point from this transformation is denoted B'. Find the coordinates of B'.

   (A) (7, 3)   (B) (5, 7)   (C) (7, 2)   (D) (2, 7)   (E) NOTA

2. Farmer Jack only has cows and chickens. He is somewhat peculiar in that he finds the number of cows and chickens he has by counting the number of feet and heads of his barn animals. He counts 25 heads and 60 legs. How many cows does he have?

   (A) 5   (B) 20   (C) 10   (D) 30   (E) NOTA

3. What is the remainder when 1,836,475,020,147,562,920 is divided by 9?

   (A) 5   (B) 6   (C) 7   (D) 8   (E) NOTA

4. Emma is traveling from her house to her middle school. She travels 73 meters North, then 80 meters West, then 77 meters North. What is the straight line distance from Emma's house to her middle school?

   (A) 150 m.   (B) 15 m.   (C) 170 m.   (D) 230 m.   (E) NOTA

5. There are 7 students in the Math Team (4 sophomore and 3 freshmen.) There are to be 3 officers (president, vice-president, and treasurer) chosen from these 7 students. How many ways are there to select these 3 officers such that at least one officer is a freshman?

   (A) 210   (B) 24   (C) 6   (D) 5040   (E) NOTA

6. If 3 cows can make 3 cartons of milk in 3 hours, how long will it take 6 cows to make 15 cartons of milk?

(A) 7.5 hrs.   (B) 6 hrs.   (C) 15 hrs.   (D) 10.5 hrs.   (E) NOTA

7. Find the area of the region enclosed by the lines $y = x$, $y = 0$, $y = 2$, and $3x + 6y = 24$.

(A) 10   (B) 20   (C) 15   (D) 7.5   (E) NOTA

8. An n-sided polygon has 90 diagonals. What is the value of n?

(A) 12   (B) 13   (C) 14   (D) 15   (E) NOTA

9. There are three positive integers x, y, and z such that $\dfrac{x}{y} = \dfrac{1}{4}$, $\dfrac{y}{z} = \dfrac{156}{65}$, and $\dfrac{x}{z} = \dfrac{45}{75}$. What is the least possible value of $x + y + z$?

(A) 70   (B) 401   (C) 802   (D) 259   (E) NOTA

10. Let A = the area of a circle with diameter 10 units in terms of π. Let B = the height of a triangle if the base length is 2 units and area is 2 units. Let C = the probability of rolling a prime number on a fair six sided die. Find the value of $\dfrac{A}{(BC)\pi}$.

(A) 25   (B) 12.5   (C) 50   (D) 33   (E) NOTA

11.   Dr. Sezhian is a probability instructor at Mathtopia University. He has finished grading his probability tests when he realizes he misplaced a paper belonging to Erik. Before this realization, he found that the average of the test scores (excluding the misplaced one) was 85. After grading the misplaced paper, he finds the new average to be 87. If there are 7 papers total, what grade did Erik receive?

(A) 93   (B) 95   (C) 97   (D) 99   (E) NOTA

12.   On any given multiple choice question, Dahyun has a $\frac{1}{2}$ probability of getting any given question right. What is the probability that Dahyun gets a 75% on a 4 question multiple choice test?

(A) $\frac{1}{16}$ (C) $\frac{1}{8}$ (C) $\frac{3}{16}$ (D) $\frac{1}{4}$ (E) NOTA

13.   The side lengths of each side of a regular hexagon are extended to form a star as shown below. Find the value of x as shown in the diagram.

$x°$
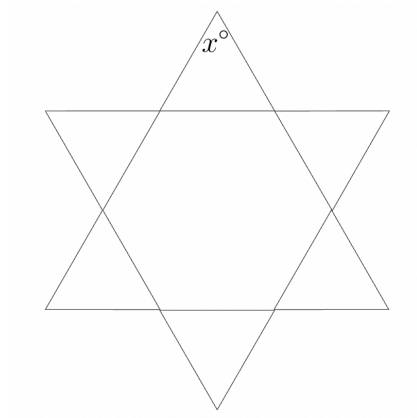
(A) 60   (B) 120   (C) 45   (D) 75   (E) NOTA

14.   If $a @ b = 3a + a^b$, what is the value of $((2 @ 2) @ 2)$?

(A) 8   (B) 16   (C) 130   (D) 1030   (E) NOTA
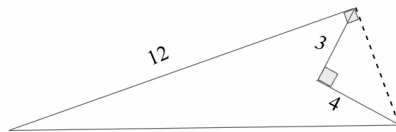
15.   Completely simplify the following expression:

$$\frac{100!}{98! + 99!}$$

(A) 100   (B) 101   (C) 99   (D) 98   (E) NOTA

16. If the mean of the numbers 3, 7, 5, 10, 8, 2, x (with x being a positive number) is 8, what is the median of these numbers?

(A) 3   (B) 5   (C) 7   (D) 8   (E) NOTA

17. What is the area of the figure enclosed by the solid lines shown below?


(A) 30   (B) 24   (C) 60   (D) 48   (E) NOTA

18. An integer is decreasing if its digits form a decreasing sequence. For example, 98 and 83 are decreasing integers, but 45 and 44 are not.
Find the number of three digit decreasing integers.

(A) 196   (B) 100   (C) 72   (D) 120   (E) NOTA

19. In circle, diameter $\overline{AB}$ and chord $\overline{CD}$ are drawn. These two chords intersect at E such that AE = 4 and ED = CE = 8. In addition, $\overline{AB}$ and $\overline{CD}$ intersect to form right angles. Find the area of the circle.
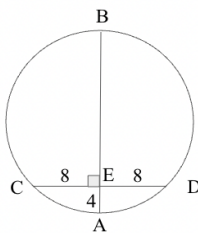
(A) 49π (B) 64π (C) 81π (D) 100π (E) NOTA

20. Let x be a positive integer such that when x is divided by 5, there

is a remainder of 1. When x is divided by 6, there is also a remainder of 1, and when x is divided by 12, there is also a remainder of 1. Find the least possible value of x.

(A) 121 (B) 181 (C) 241 (D) 301 (E) NOTA

21. Isaac is trying to guess Shannon's secret number. Shannon only gives Isaac two clues. These clues are that 3 times the secret number is less than 8 more than the number and that the secret number squared is greater than 2 times the secret number. If the secret number is a positive integer, what is the secret number

(A) 1 (B) 2 (C) 3 (D) 4 (E) NOTA

22. How many distinguishable permutations are there for the word PAPER?

(A) 720 (B) 120 (C) 24 (D) 5040 (E) NOTA

23. There are three cubes with volume 27, 8, and 1 units^3. These cubes are stacked from greatest volume to least. Including the bottom face of the cube with the greatest volume, what is the surface area of this stacked structure?

(A) 36 (B) 84 (C) 74 (D) 71 (E) NOTA

24. In an urn, there are 30 red balls and 5 blue balls. How many blue balls must be added in order to make the probability of randomly selecting a blue ball be $\frac{4}{5}$.

(A) 100 (B) 105 (C) 110 (D) 115 (E) NOTA

25. Find the area of the shaded region given the side lengths shown in the diagram (note that the diagram shows 4 squares of different sizes and the

vertices of the 3 smallest squares intersect at the midpoints of the square it is inscribed in).
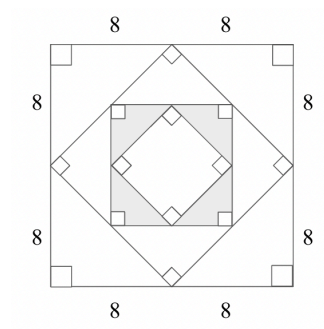
(A) 256 (B) 128 (C) 64 (D) 32 (E) NOTA

Tiebreakers:

TB1. What is the smallest integer x such that $\dfrac{x}{45} > \dfrac{9}{29}$?

TB2. Find the value of x if $3^{3x\,+\,22} = 9^{7x}$.

TB3. Find the larger of the two values of x such that the following equation is true.
$$x^2 - 2x - 3 = 0$$