6th Grade Written Test Instructions

2025 James Clemens Math Tournament

1. You have 90 minutes to complete this exam.

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 points 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!

1. Given that $f(x) = \frac{3x+5}{2}$, find $f^{-1}(3)$

   A. 7 B. $\frac{1}{7}$ C. $\frac{1}{3}$ D. -7 E. NOTA

2. A nonagon has an angle measuring 100° and an angle with a measure equal to the supplement of 25°. If all the other angles are congruent to each other, what is the measure of one of the remaining angles to the nearest degree?

   A. 126° B. 144° C. 112° D. 195° E. NOTA

3. Consider the equation $x|2x - 3| = 5x - 2x^2$. What are all the possible solutions to this equation?

   A. 2, -2 B. -1/2 C. 2, 0 D. -2 E. No Solution

4. Harshtha and Laya are solving math problems. Harshtha finishes 8 problems every 10 minutes. Laya can solve 3 math problems in 5 minutes. If they work together, how many math problems can they solve in 30 minutes?

   A. 21 B. 42 C. 22 D. 49 E. NOTA

5. How many unique ways are there to arrange the letters in "Mathlete"?

   A. 10,080 B. 40,320 C. 4,480 D. 324 E. NOTA

6. If the solution to the following system is (a,b), what is a+b?

$$2x + 3y = 4$$
$$y + 5x = 10$$

   A. $-\frac{46}{7}$ B. $\frac{46}{7}$ C. -2 D. 2 E. NOTA

7. If a*b equals $\frac{b}{a-c}$, for what value of c is 7*10 undefined?

   A. 7 B. 0 C. 10 D. No Values E. NOTA

8. Which of the following is equivalent to $(81^{\frac{1}{2}})^{\frac{1}{2}}$ in simplest form?

   A. 20.25 B. $\sqrt{20.25}$ C. $\sqrt{81}$ D. $\sqrt[4]{81}$

9. The GCF of 14 and x is 7, and the LCM of 14 and x is 98. What is the value of x?

   A. 7 B. 49 C. 14 D. 2 E. NOTA

10. Simplify the following expression:

$$\frac{2a^2b \cdot 3b^2}{4a^4b}$$

   A. $\frac{3b^2}{2a^2}$ B. $\frac{9}{4}b^2a$ C. $\frac{9}{4a^4}$ D. $\frac{9b^2}{4a^4}$ E. NOTA

11. A circle is inscribed into a square so that each side of the square is tangent to the circle. If the area of the circle is 200.96 (using 3.14 as π), what is the area of the space surrounding the circle but enclosed by the square? Use 3.14 for π.

   A. 823.04 B. 55.00 C. 17.53 D. 262.11 E. NOTA

12. A student is trying to calculate their final grade. Test grades are worth 80 percent of their final grade and daily grades are worth 20 percent of their final grade. The student's test grades are 100, 88, 94, 99, and 92. The student's daily grades are 80, 100, 90, 99, 97, 95, 93, 98, 100, and 100. What is the student's final grade?

   A. 94.90 B. 95.20 C. 95.00 D. 94.72 E. NOTA

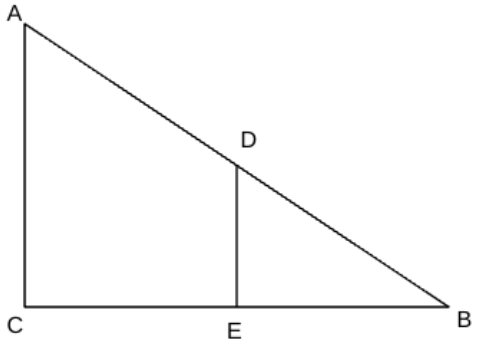
13. A bacteria can divide to generate 2 daughter cells every 15 minutes. If there are 25600 bacteria after 2 hours, how many bacteria cells did the colony start with?

   A. 8 B. 100 C. 1600 D. 7.5 E. NOTA

14. A flock of birds lands on a tree. An hour later, 10 fly away. Later another flock arrives, tripling the number of birds on the tree. Next, another 20 birds arrive. Then, one quarter of the birds on the tree fly away. After all this, there are 555 birds left on the tree. How many birds were originally on the tree?

   A. 122 B. 142 C. 125 D. 250 E. NOTA

15. Consider the below triangle ABC. If side AC is 5 units, CB is 12 units, and DB is 6.5 units, what is the area of triangle DEB



A. 30 B. 15 C. 7.5 D. 18.75 E. NOTA

16. 3 cards are pulled from a standard 52 card deck without replacement at random. What is the probability that a queen of spades will be drawn on the first draw, a one of hearts or diamonds will be drawn on the second draw, and that any card in the clubs suit will be drawn on the third draw?

A. $\frac{1}{2704}$ B. $\frac{1}{140608}$ C. $\frac{1}{5525}$ D. $\frac{2}{10200}$ E. NOTA

17. What is the product of the solutions for the following equation:

$$2|x-2|+5=7$$

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

18. Kriti is ordering cupcakes for her friend's birthday party. Kriti is going to order 10 cupcakes. For the cupcake flavor, she can select either chocolate or strawberry. For each cupcake, she can choose between pink, white, or blue icing. She also needs to decide whether each cupcake has sprinkles or not. If her friend doesn't want any two cupcakes to look the same, how many unique orders can Kriti make?

A. 12 B. 66 C. 103 D. 27 E. NOTA

19. A regular square pyramid is placed inside a cube so that the vertices on its base line up exactly with the vertices on the cube's bottom face and its apex touches the center of the top face. If the volume of the pyramid is $41\frac{2}{3}$, what is the length of one of the cube's space diagonals (the diagonal connecting vertices that aren't on the same face)?

A. $5\sqrt{3}$ B. $5\sqrt{2}$ C. $\sqrt{31.25}$ D. 5 E. NOTA

20. Find the difference:

$$(2^2 + 2^4 + 2^6 + 2^8) - (2 + 2^3 + 2^5 + 2^7)$$

A. 320 B. 480 C. 160 D. 170 E. NOTA

21. Let A= the number of vertices of a decagonal pyramid, B= the number of distinct solutions to a quadratic with a discriminant of 0, and C= the value of 110110_2 in base ten. What is the value of:

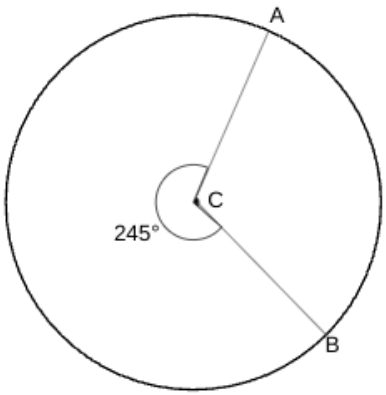
$$A + C \cdot B$$

A. 65 B. 5 C. 38 D. 312 E. NOTA

22. Find the sum of the coefficients in the expansion of $(x + 5)^5$

A. 4651 B. 7776 C. 7696 D. 5276 E. NOTA

23. What is the measure of the minor arc of the circle shown below in radians? Express your answer to the nearest hundreth π. Figure is not drawn to scale.



A. 0.64π B. 2.00π C. 4.28π D. 1.36π E. NOTA

24. A chemist is trying to make a 10 percent hydrochloric acid solution. They have 10 mL of a hydrochloric acid solution. They also have as much water as they want (assume water is 0 percent hydrochloric acid). How many liters of water do they need to add to the 100 percent solution to create the 10 percent solution they need?

A. 1 B. 0.1 C. 0.09 D. 10 E. NOTA

25. A national park ranger is trying to estimate the number of Redwoods in in a stand of trees at Redwood National Park. In one acre, he finds 74 redwoods. In another, he finds 65. Eight more acres have 81, 76, 68, 71, 82, 78, 74, and 69 redwoods, respectively. If the stand is about 80 acres, which of the following is the best estimate?

    A. 4500 B. 6500 C. 5900 D. 6000 E. NOTA

TB1: What is the first number that is divisible by 3 and 4 in which the hundreds digit is equal to the sum of the one and tens digit?

TB2: What is the least number greater than one that is a perfect square, cube, and fourth power?

TB3: If a, b, and c are the last three digits in 5^{1096}, what is a+b+c?