

TMSCA MIDDLE SCHOOL MATHEMATICS

TEST #5 ©

DECEMBER 3, 2022

GENERAL DIRECTIONS

- About this test:
 - You will be given 40 minutes to take this test.
 - There are 50 problems on this test.
- All answers must be written on the answer sheet/Scantron form/Chatsworth card provided. If you are using an answer sheet be sure to use **BLOCK CAPITAL LETTERS**. Clean erasures are necessary for accurate grading on Scantrons and Chatsworth cards.
- If you are using a Chatsworth or Scantron card, please follow the specific instructions given at your particular meet.
- You may write anywhere on the test itself. You must write only answers on the answer sheet.
- You may use additional scratch paper provided by the contest director.
- All problems have **ONE** and **ONLY ONE** correct [BEST] answer. There is a penalty for all incorrect answers.
- Calculators **MAY NOT** be used on this test.
- All problems answered correctly are worth **FIVE** points. **TWO** points will be deducted for all problems answered incorrectly. No points will be added or subtracted for problems not answered.
- In case of ties, percent accuracy will be used as a tie breaker.

2022 – 2023 TMSCA Middle School Mathematics Test #5

1. $34.55 + 9.97 =$ _____
 A. 45.12 B. 45.02 C. 44.24 D. 44.52 E. 44.62

2. $1,108 - 449 =$ _____ (nearest ten)
 A. 690 B. 680 C. 670 D. 660 E. 650

3. $14 \times 5 \times 6 =$ _____
 A. 420 B. 76 C. 89 D. 360 E. 320

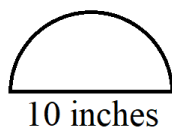
4. $960 \div (11 - 7) =$ _____
 A. 280 B. 320 C. 310 D. 260 E. 240

5. The number 140 has how many distinct prime factors?
 A. 0 C. 1 C. 2 D. 3 E. 4

6. Marisol had \$6.75 consisting of a combination of 45 quarters and dimes. If Marisol had twice as many dimes as quarters, how many dimes did she have?
 A. 24 B. 15 C. 12 D. 32 E. 30

7. 56 is 20% of what value?
 A. 240 B. 280 C. 320 D. 360 E. 420

8. If $\pi = 3$, what is the perimeter of the shape below?



A. 45 inches B. 15 inches C. 30 inches D. 35 inches E. 25 inches

9. Evaluate $ab \div cd$, for $a = -4$, $b = -10$, $c = -5$, and $d = 8$.
 A. -64 B. -1 C. 1 D. 40 E. -24

10. $5! =$ _____
 A. 30 B. 60 C. 120 D. 720 E. 20

11. What fraction of the letters of the word *MATHEMAGICIANS* are vowels?
 A. $\frac{4}{7}$ B. $\frac{3}{7}$ C. $\frac{5}{14}$ D. $\frac{1}{2}$ E. $\frac{2}{3}$

12. Which inequality below is true?
 A. $\frac{2}{3} < \frac{1}{4}$ B. $\frac{4}{3} > \frac{5}{4}$ C. $\frac{1}{6} > \frac{1}{2}$ D. $\frac{6}{5} < \frac{7}{8}$ E. $\frac{3}{4} > \frac{9}{10}$

13. 380 milliliters = _____ liters
 A. 380,000 B. 38,000 C. 3.8 D. 38 E. 0.38

14. $23 - 87 =$ _____
 A. -64 B. 64 C. 54 D. 110 E. -110

15. $CXXVII - LIX =$ _____ (Roman numeral)
 A. XLVIII B. CXXVIII C. LXIX D. MCIXV E. LXVIII

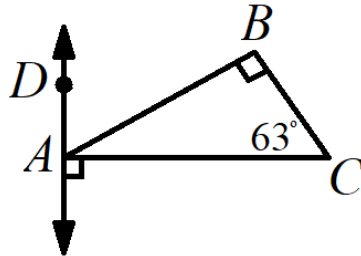
16. Simplify: $6(2a - 9) - (3a + 4) - a$
 A. $9a - 58$ B. $8a - 50$ C. $9a - 50$ D. $8a - 58$ E. $8a - 62$

17. What is the LCM of the numbers 30 and 36?
 A. 6 B. 12 C. 180 D. 720 E. 360

18. What is the probability of choosing a card from a standard deck of cards and getting an 8 or a red 6?
 A. $\frac{2}{13}$ B. $\frac{5}{26}$ C. $\frac{3}{26}$ D. $\frac{1}{13}$ E. $\frac{3}{13}$

19. What is the mean of the set of numbers 10, 28, 27, 28, 12, and 21?
 A. 28 B. 19 C. 21 D. 24 E. 23

20. Using the picture below, what is the measure of $\angle DAB$?



A. 57° B. 63° C. 27° D. 73° E. 37°

21. How many even numbers are there between 29 and 71?
 A. 20 B. 21 C. 22 D. 24 E. 23

22. $0.000000053 =$ _____ (scientific notation)
 A. 5.3×10^8 B. 5.3×10^9 C. 5.3×10^{-9} D. 5.3×10^{-8} E. 5.3×10^{-10}

23. How many total degrees are in a dodecagon?
 A. $1,800^\circ$ B. 720° C. $1,980^\circ$ D. $2,160^\circ$ E. $1,080^\circ$

24. What are the new coordinates of a point with coordinates (3, 5), if the point is translated by the rule $(x, y) \rightarrow (x - 5, y + 3)$ and then reflected across the x -axis?
 A. $(-2, -8)$ B. $(2, 8)$ C. $(-2, 8)$ D. $(2, -8)$ E. $(-8, 2)$

25. What is the 19th term of the sequence $-2, 2, 6, 10, 14, 18, \dots$?
 A. 62 B. 66 C. 70 D. 74 E. 78

26. $1221_3 =$ _____ (base 10)
 A. 62 B. 52 C. 44 D. 48 E. 58

27. Find the percent of change if a quantity of 64 is decreased to 56.
 A. 8.5% decrease B. 9.5% decrease C. 10.5% decrease D. 11.5% decrease E. 12.5% decrease

28. If the odds of it raining today are 11:19, what is the probability of it not raining today, in ratio form?

- A. 19:11 B. 8:11 C. 8:19 D. 19:30 E. 11:30

29. What is the slope of any line perpendicular to the line with the equation $9x - 2y = -36$?

- A. $\frac{2}{9}$ B. $-\frac{2}{9}$ C. 18 D. -18 E. $\frac{9}{2}$

30. Shalise has an endless supply of 5-cent and 14-cent stamps. What is the largest unattainable sum Shalise cannot create using her stamps?

- A. 70 B. 63 C. 57 D. 66 E. 51

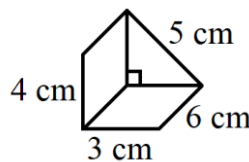
31. What is the measure of an exterior angle of a regular decagon?

- A. 40° B. 60° C. 36° D. 45° E. 30°

32. Annette is going to bake 288 cookies for her school fundraiser. Her recipe calls for 5 eggs to make three-dozen cookies. How many eggs does Annette need to make the 288 cookies?

- A. 36 eggs B. 48 eggs C. 54 eggs D. 40 eggs E. 56 eggs

33. What is the volume of the triangular prism below?



- A. 36 cm^3 B. 60 cm^3 C. 45 cm^3 D. 84 cm^3 E. 48 cm^3

34. $41^\circ\text{F} = \text{_____}^\circ\text{C}$

- A. 10 B. 15 C. 5 D. 20 E. 25

35. Two cubes have edge lengths of 4 cm and 8 cm. What is the ratio of the surface area of the smaller cube to the surface area of the larger cube?

- A. $\frac{1}{2}$ B. $\frac{1}{8}$ C. $\frac{3}{4}$ D. $\frac{5}{8}$ E. $\frac{1}{4}$

36. 11 friends ordered \$39.00 worth of food at the local fast-food restaurant. They all split the cost as evenly as possible, so some paid \$3.55 each, while the other paid \$3.54 each. How many students paid the lesser amount?

- A. 7 B. 4 C. 5 D. 6 E. 3

37. The sum of the measures of two angles is 175° . The larger angle is seven more than three times the smaller angle. What is the measure of the complement of the smaller angle?

- A. 84° B. 42° C. 48° D. 54° E. 66°

38. $45^\circ = \text{_____}$ (radians)

- A. $\frac{\pi}{2}$ B. $\frac{\pi}{4}$ C. $\frac{\pi}{6}$ D. $\frac{\pi}{3}$ E. $\frac{\pi}{5}$

39. A cable is stretched from the top of an 18 ft pole to the top of a 26 ft pole. If the two poles are 15 feet apart, what is the length of the cable?

- A. 24 feet B. 8 feet C. 21 feet D. 17 feet E. 19 feet

40. Point A has coordinates $(3, 5)$ and point B has coordinates $(-9, -30)$. What is the length of \overline{AB} ?
 A. 37 units B. 33 units C. 34 units D. 38 units E. 36 units

41. At the concession stand at a little league baseball game, Shiela bought three hotdogs and two hamburgers for \$16.00. Nikhil bought two hotdogs and one hamburger for \$9.00. If sodas cost \$1.50 each, how much would one hamburger and one soda cost?
 A. \$5.00 B. \$4.50 C. \$6.50 D. \$5.50 E. \$7.00

42. In terms of π , what is the circumference of the circle with the equation $(x - 9)^2 + (y + 3)^2 = 676$?
 A. 26π units B. 169π units C. 13π units D. 676π units E. 52π units

43. A and B are two different whole numbers, with $A + B = C$ and $A - B = D$. If $CD = 45$, what is the value of the lesser value of A or B ?
 A. 8 B. 6 C. 9 D. 7 E. 11

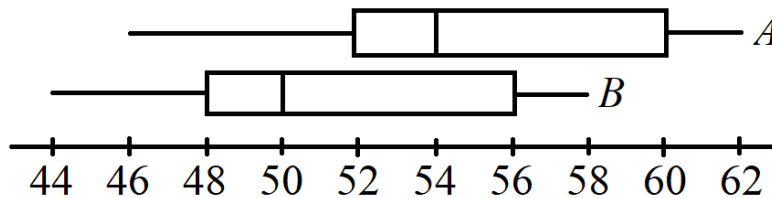
44. What is the value of the 8th triangular number?
 A. 36 B. 28 C. 21 D. 44 E. 45

45. $\left(\frac{2m^2}{m}\right)\left(\frac{m^6}{4m^2}\right)\left(\frac{m}{8m^{-2}}\right) =$ _____
 A. $4m^4$ B. $16m^4$ C. $\frac{m^8}{16}$ D. $\frac{m^4}{2}$ E. $\frac{m^2}{4}$

46. What are the solutions to the quadratic equation $4x^2 + 14x = 8$?
 A. $\left\{-\frac{1}{4}, 8\right\}$ B. $\left\{-4, -\frac{1}{2}\right\}$ C. $\left\{-\frac{1}{4}, \frac{1}{2}\right\}$ D. $\left\{-4, \frac{1}{2}\right\}$ E. $\left\{-\frac{3}{4}, 2\right\}$

47. What is the mean absolute deviation of the set of numbers 18, 16, 24, and 22?
 A. 4.5 B. 5 C. 4 D. 3 E. 2

48. What is the positive difference of the interquartile range of A and the interquartile range of B ?



A. 2 B. 0 C. 4 D. 5 E. 6

49. Two squares, each with an area of 256 cm^2 , are placed side-by-side to form a rectangle. What is the perimeter of the created rectangle?
 A. 96 cm B. 128 cm C. 112 cm D. 192 cm E. 108 cm

50. Grant and his friend John went to lunch, which had a subtotal of \$45.00. An 8% tax and an 18% tip were added to the bill, both applied to the subtotal. What was the total cost of the lunch, including tax and tip?
 A. \$55.30 B. \$57.10 C. \$57.90 D. \$56.50 E. \$56.70

2022 – 2023 TMSCA Middle School Mathematics Test #5 Answer Key

1. D	18. C	35. E
2. D	19. C	36. C
3. A	20. B	37. C
4. E	21. B	38. B
5. D	22. D	39. D
6. E	23. A	40. A
7. B	24. A	41. C
8. E	25. C	42. E
9. A	26. B	43. B
10. C	27. E	44. A
11. B	28. D	45. C
12. B	29. B	46. D
13. E	30. E	47. D
14. A	31. C	48. B
15. E	32. D	49. A
16. D	33. A	50. E
17. C	34. C	

2022 – 2023 TMSCA Middle School Mathematics Test #5 Selected Answers

9. If $a = -4$, $b = -10$, $c = -5$, and $d = 8$, then to evaluate $ab \div cd$, we must substitute the values into the expression to get $(-4)(-10) \div (-5)(8)$. In order to simplify the expression, use order of operations to get $(-4)(-10) \div (-5)(8) = 40 \div (-5)(8) = -8(8) = -64$.

10. $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$.

11. In the word *MATHEMAGICIANS*, there are 8 consonants and 6 vowels. Therefore, the fraction of the letters of the word *MATHEMAGICIANS* that are vowels is equal to $\frac{6}{14} = \frac{3}{7}$.

16. $6(2a - 9) - (3a + 4) - a = 12a - 54 - 3a - 4 - a = 8a - 58$.

23. The formula to find the total degrees of a polygon is $(n - 2)(180)$, where n is equal to the number of sides of the polygon. A dodecagon has 12 sides, so after substituting into the formula, the total degrees of a dodecagon is equal to $(12 - 2)(180) = 10(180) = 1,800^\circ$.

24. If the point $(3, 5)$ is translated by the rule $(x, y) \rightarrow (x - 5, y + 3)$, then its new coordinates are $(x, y) \rightarrow (3 - 5, 5 + 3) = (-2, 8)$. To reflect a point across the x -axis, use the rule $(x, y) \rightarrow (x, -y)$. So, the new coordinates of the point $(-2, 8)$ across the x -axis are $(x, y) \rightarrow (-2, -(8)) = (-2, -8)$.

25. To find the n^{th} term in an arithmetic sequence, use the formula $a_n = a_1 + (n - 1)(d)$, where a_1 is the first term, n is the position of the n^{th} term and d is the common difference. In the sequence $-2, 2, 6, 10, 14, 18, \dots$, the first term is -2 and the common difference is 4. Therefore, the 19^{th} term of the sequence $-2, 2, 6, 10, 14, 18, \dots$, is equal to $a_{19} = -2 + (19 - 1)(4) = -2 + (18)(4) = -2 + 72 = 70$.

27. Percent of change is equal to $\frac{\text{change in amount}}{\text{original amount}}$. Therefore, the percent of change of 64 decreased to 56 is equal to $\frac{64-56}{64} = \frac{8}{64} = \frac{1}{8} = 0.125 = 12.5\%$ decrease.

31. The formula for finding the exterior angle measure of a regular polygon is $\frac{360}{n}$, where n is equal to the number of sides of the polygon. A decagon has 10 sides. Therefore, the measure of an exterior angle of a regular decagon is equal to $\frac{360}{10} = 36^\circ$.

40. The distance between two points (x_1, y_1) and (x_2, y_2) is found using the formula $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$. Therefore, the distance between point A with coordinates $(3, 5)$ and point B with coordinates $(-9, -3)$ is equal to $d = \sqrt{(3 - (-9))^2 + (5 - (-30))^2} = \sqrt{12^2 + 35^2} = \sqrt{144 + 1225} = \sqrt{1369} = 37$ units.

45. First, simplify using the exponent rules $\frac{a^m}{a^n} = a^{m-n}$, $\frac{1}{a^{-n}} = a^n$, and $a^m \cdot a^n = a^{mn}$. Using the exponent rules, $\left(\frac{2m^2}{m}\right)\left(\frac{m^6}{4m^2}\right)\left(\frac{m}{8m^{-2}}\right) = \frac{2m}{1} \cdot \frac{m^4}{4} \cdot \frac{m(m^2)}{8} = \frac{2m}{1} \cdot \frac{m^4}{4} \cdot \frac{m^3}{8} = \frac{2m^{1+4+3}}{32} = \frac{m^8}{16}$.