

TMSCA MIDDLE SCHOOL MATHEMATICS

TEST #11 ©

FEBRUARY 11, 2023

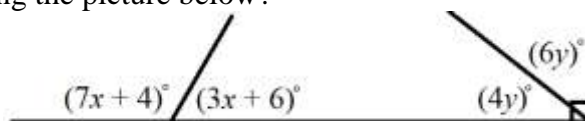
GENERAL DIRECTIONS

- 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.

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1. $18.903 + 27.859 =$ _____ (nearest tenth)
 A. 46.8 B. 46.7 C. 46.6 D. 47.2 E. 47.4
2. $1,005 - 587 - 294 =$ _____
 A. 212 B. 236 C. 124 D. 138 E. 132
3. $33 \times (18 + 23) =$ _____
 A. 1,369 B. 1,366 C. 1,371 D. 1,353 E. 1,413
4. $24\frac{1}{2} \div 3\frac{1}{2} =$ _____
 A. $7\frac{1}{2}$ B. $7\frac{1}{4}$ C. 7 D. $8\frac{1}{2}$ E. $7\frac{3}{4}$
5. What is the arithmetic mean of $\frac{3}{4}$ and $\frac{1}{2}$?
 A. $\frac{3}{8}$ B. $\frac{5}{8}$ C. $\frac{9}{16}$ D. $\frac{3}{16}$ E. $\frac{5}{16}$

6. What is the value of $x + y$, using the picture below?



- A. 26 B. 8 C. 17 D. 23 E. 21

7. Jill and Monet started playing a game at 6:16 pm. The game lasts 90 minutes long. The girls had to stop the game for 12 minutes to get a snack, and then had to stop the game again for a 10-minute restroom break. At what time did the girls finish playing the game?

- A. 7:58 pm B. 8:06 pm C. 7:56 pm D. 7:54 pm E. 8:08 pm

8. 270 decagrams = _____ milligrams
 A. 270,000 B. 2,700,000 C. 27,000,000 D. 2,700 E. 270,000,000

9. Simplify: $|9 - 46| - (-31) + (-3)^2$
 A. -67 B. -15 C. 62 D. -25 E. 77

10. 1 cubic yard = _____ cubic feet
 A. 9 B. 81 C. 144 D. 3 E. 27

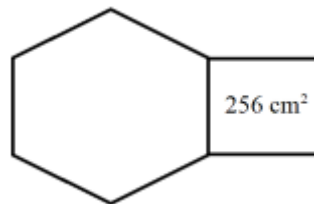
11. Shayne is buying a shirt and his subtotal comes out to be \$16.50. If there is an 8% tax, how much will Shayne's total bill be?

- A. \$17.86 B. \$17.94 C. \$17.76 D. \$17.82 E. \$17.68

12. $\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \frac{1}{4 \cdot 5} =$ _____
 A. $\frac{2}{5}$ B. $\frac{7}{15}$ C. $\frac{4}{5}$ D. $\frac{4}{15}$ E. $\frac{7}{10}$

13. Find the LCM of the number 16, 28, and 36.
 A. 1,008 B. 252 C. 504 D. 756 E. 1,260

14. $\$9.56 = 18$ quarters + _____ dimes + 40 nickels + 6 pennies
 A. 20 B. 10 C. 15 D. 25 E. 30
15. What is the perimeter of a right triangle with legs measuring 5 cm and 12 cm?
 A. 30 cm B. 17 cm C. 18 cm D. 25 cm E. 22 cm
16. What is the next term of the sequence? 1, 8, 27, 64, ...
 A. 128 B. 97 C. 125 D. 169 E. 114
17. Menchie’s car can hold 24 gallons of gas. How many gallons of gas are in Menchie’s car if the gas tank is $\frac{5}{6}$ full of gas?
 A. 22 gallons B. 16 gallons C. 15 gallons D. 20 gallons E. 18 gallons
18. Let A equal the set of numbers {5, 40, 25, 15, 35} and B equal the set of numbers {7, 13, 6, 60, 34}. What is the positive difference of the means of A and B ?
 A. 19 B. 7 C. 4 D. 11 E. 0
19. How many different two-digit numbers can be made using the numbers 4, 6, 1, and 8, if digits can repeat?
 A. 8 B. 4 C. 16 D. 12 E. 24
20. $\text{MMMDCCLII} - \text{CMLXXVIII} =$ _____ (Roman numeral)
 A. MMDLXXII B. MDCLXVII C. MDCLIV D. MMDCLXXIV E. MMDCLXVII
21. The odds of it being sunny tomorrow are 7:3. What is the probability of it not being sunny tomorrow?
 A. $\frac{4}{7}$ B. $\frac{2}{5}$ C. $\frac{7}{10}$ D. $\frac{3}{7}$ E. $\frac{3}{10}$
22. Point A has coordinates $(-4, -9)$ and is translated over the x -axis and then to the left three units. What are the new coordinates of point A ?
 A. $(-7, 9)$ B. $(-1, 9)$ C. $(-7, 6)$ D. $(-1, 6)$ E. $(-1, -9)$
23. A square and a regular hexagon share a common side. If the area of the square is 256 cm^2 , what is the perimeter of the hexagon?



- A. 128 cm B. 96 cm C. 384 cm D. 192 cm E. 84 cm
24. 3 gallons = _____ quarts
 A. 18 B. 12 C. 24 D. 36 E. 30
25. $123_8 =$ _____ (base 5)
 A. 343 B. 341 C. 313 D. 323 E. 311
26. $7! =$ _____
 A. 5,040 B. 700 C. 7,000 D. 4,256 E. 6,363

27. $\{1, 2, 3, 4, 5\} \cup \{3, 4, 5, 6, 7\} \cup \{5, 6, 7, 8, 9\} \cap \{1, 5, 9\} =$ _____
 A. $\{1, 3, 5, 7, 9\}$ B. $\{1, 9\}$ C. $\{1, 5, 9\}$ D. $\{2, 4, 6, 8\}$ E. $\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

28. A bicycle lock uses a combination that requires a letter in the first spot and single digits, 0 – 9, in the 2nd and 3rd spots. If a digit may not repeat, how many lock combinations are possible?
 A. 2,600 B. 2,580 C. 2,420 D. 2,340 E. 2,840

29. Enrique has a baseball card collection. He keeps 24 cards in a protective sleeve, which is only 5% of his entire collection. The rest of Enrique’s cards are kept in a box. How many of Enrique’s cards are kept in a box?
 A. 504 B. 480 C. 448 D. 456 E. 478

30. Three positive integers are in a ratio of 4:7:11 and have a sum of 374. What is the largest of the three integers?
 A. 119 B. 134 C. 187 D. 193 E. 209

31. If $\frac{8}{x} = \frac{18}{x+5}$, what is the value of $\frac{x}{5}$?
 A. -10 B. -2 C. 0.2 D. 1.5 E. 0.8

32. $120 \text{ mi/hr} =$ _____ ft/sec
 A. 172 B. 184 C. 176 D. 188 E. 180

33. What is the amount of money in a bank account that opened a simple interest account depositing \$1,000 at 5% for eighteen months?
 A. \$1,125.00 B. \$75.00 C. \$750.00 D. \$1,025.00 E. \$1,075.00

34. $(3.6 \times 10^7)(2.5 \times 10^6) =$ _____ (scientific notation)
 A. 9×10^{42} B. 9×10^{13} C. 6.1×10^{13} D. 9×10^9 E. 6.1×10^{42}

35. In \overline{AE} below, $AB = 2x - 1$, $AC = 5x - 14$, $BD = 4x - 2$, $CE = 5x - 14$, and $AE = 92$. What is the value of x ?



A. 14 B. 17 C. 12 D. 13 E. 18

36. What is the percent of decrease if the quantity 40 changes to the quantity 12?
 A. 60% decrease B. 70% decrease C. 65% decrease D. 75% decrease E. 80% decrease

37. Which linear equation below has an x -intercept of -6 ?
 A. $2x + 6y = -12$ B. $y = \frac{2}{3}x - 6$ C. $6x + 2y = 12$ D. $y = 2x - 12$ E. $-4x + y = -24$

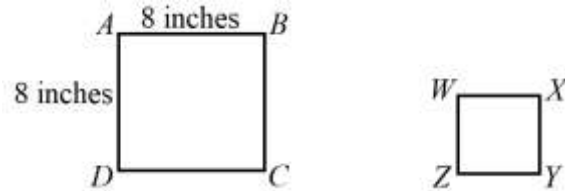
38. If $f(x) = 5x^2$ and $g(x) = 17 - 3x$, then what is the value of $g(f(-2))$?
 A. -43 B. 317 C. 77 D. 605 E. -8

39. If $x^2 \leq 225$, what is the sum of all positive integers, x , that satisfy the inequality?
 A. 105 B. 120 C. 136 D. 325 E. 65

40. One pencil and one marker cost \$3.00. Two pencils and three markers cost \$7.75. How much do five pencils cost?

- A. \$6.50 B. \$6.75 C. \$6.25 D. \$7.00 E. \$7.25

41. Square $ABCD$ and square $WXYZ$ are shown below. Square $WXYZ$ has an area equal to three-fourths the area of square $ABCD$. What is the perimeter of square $WXYZ$?



- A. $16\sqrt{3}$ inches B. 16 inches C. $16\sqrt{2}$ inches D. $32\sqrt{2}$ inches E. $24\sqrt{3}$ inches

42. A triangle has vertices located at coordinates $(4, 1)$, $(2, 3)$, and $(8, 3)$. What is the length of the shortest side of the triangle?

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

43. $\left(\left(\frac{(a^7b^3)^3}{a^{10}b^{-12}} \right)^{-2} \right)^3 = \underline{\hspace{2cm}}$

- A. $\frac{1}{a^{66}b^{18}}$ B. $\frac{b^{18}}{a^{66}}$ C. $\frac{a^{66}}{b^{126}}$ D. $\frac{1}{a^{66}b^{126}}$ E. $a^{66}b^{126}$

44. What is the sum of the roots of the quadratic equation $4x^2 - 8x + 11 = 3x^2 - 12x - 1$?

- A. -6 B. 10 C. 12 D. 6 E. -4

45. If $4^x = 11$, then what is the value of 4^{3x} ?

- A. 192 B. 1,089 C. 1,331 D. 33 E. 64

46. What is the inverse function of the function $f(x) = x + 5$?

- A. $f^{-1}(x) = x - 5$ B. $f^{-1}(x) = \frac{1}{5}x$ C. $f^{-1}(x) = \frac{x+5}{2}$ D. $f^{-1}(x) = \frac{x-5}{2}$ E. $f^{-1}(x) = -5x$

47. In three dimensions, what is the measure of the radius of the sphere that has the equation $(x + 11)^2 + (y + 8)^2 + (z - 5)^2 = 196$?

- A. 98 units B. 49 units C. 16 units D. 32 units E. 14 units

48. What is the sum of all positive solutions to the inequality $4n - 10 < 34$?

- A. 66 B. 55 C. 45 D. 48 E. 52

49. Simplify: $\frac{x^2-16}{x^2+5x+4}$

- A. $\frac{x+4}{x+1}$ B. $x + 1$ C. $x + 4$ D. $\frac{x+4}{x-1}$ E. $\frac{x-4}{x+1}$

50. In a 30-60-90 special right triangle, $\sin(30^\circ)$ is equal to which of the following?

- A. $\frac{\sqrt{3}}{2}$ B. $\frac{1}{\sqrt{3}}$ C. $\frac{2}{1}$ D. $\frac{\sqrt{3}}{1}$ E. $\frac{1}{2}$

2022 – 2023 TMSCA Middle School Mathematics Test #11 Answer Key

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

2022 – 2023 TMSCA Middle School Mathematics Test #11 Selected Answers

5. The arithmetic mean of $\frac{3}{4}$ and $\frac{1}{2}$ is equal to $\frac{\frac{3}{4} + \frac{1}{2}}{2} = \frac{\frac{5}{4}}{2} = \frac{5}{4} \div 2 = \frac{5}{4} \times \frac{1}{2} = \frac{5}{8}$.

13. The prime factorization of 16 is 2^4 , the prime factorization of 28 is $2^2 \times 7$, and the prime factorization of 36 is $2^2 \times 3^2$. Therefore, the LCM of the number 16, 28, and 36 is equal to $2^4 \times 3^2 \times 7 = 1,008$.

16. In the sequence 1, 8, 27, 64, ..., the pattern is $1^3, 2^3, 3^3, 4^3, \dots$. Therefore, the next term of the sequence is equal to $5^3 = 125$.

23. The formula for area of a square is $A = s^2$, where s is the side length. If the area of the square is 256 cm^2 , then make the equation $256 = s^2$. Square rooting both sides of the equation gives the value of $s = 16$. Since, the side length of the square is 16 cm, and the square and hexagon share a common side, the side length of the regular hexagon is also 16 cm. Therefore, the perimeter of the regular hexagon is equal to $6(16) = 96 \text{ cm}$.

24. If 1 gallon = 4 quarts, then 3 gallons = $3(4) = 12$ quarts.

27. The symbol \cup means union and the symbol \cap means intersection. Working from left to right, $\{1, 2, 3, 4, 5\} \cup \{3, 4, 5, 6, 7\} = \{1, 2, 3, 4, 5, 6, 7\}$, and $\{1, 2, 3, 4, 5, 6, 7\} \cup \{5, 6, 7, 8, 9\} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$. So, $\{1, 2, 3, 4, 5, 6, 7, 8, 9\} \cap \{1, 5, 9\} = \{1, 5, 9\}$.

28. The lock has three characters, the first being a letter, which is 26 choices. The second and third characters must be a number 0 – 9, which is 10 choices for the second character and 9 choices for the first character since digits cannot repeat. Therefore, there are a total of $26 \times 10 \times 9 = 2,340$ lock combinations.

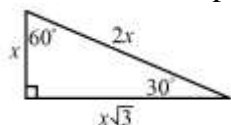
33. The formula for simple interest is $I = prt$, where p is the principal amount, r is the rate and t is the time, in years. There are 12 months in a year, so 18 months is equal to $\frac{18}{12} = 1.5$ years. The interest earned after depositing \$1,000 at 5% for eighteen months is equal to $I = (1000)(0.05)(1.5) = \75.00 . Therefore, the total amount in the bank account after the interest is added is equal to \$1,075.00.

38. It is given, $f(x) = 5x^2$ and $g(x) = 17 - 3x$. Using order of operations, $f(-2) = 5(-2)^2 = 5(4) = 20$. The value of $g(20) = 17 - 3(20) = 17 - 60 = -43$. Therefore, the $g(f(-2)) = -43$.

45. Using the exponent rule $(a^m)^n = a^{mn}$, 4^{3x} can be rewritten as $(4^x)^3$. Since $4^x = 11$, then we can substitute into $(4^x)^3$ as $(11)^3 = 1,331$.

49. Factoring the numerator and denominator of $\frac{x^2-16}{x^2+5x+4}$ produces $\frac{(x+4)(x-4)}{(x+4)(x+1)}$. The $\frac{(x+4)}{(x+4)}$ simplifies to 1, so $\frac{x^2-16}{x^2+5x+4} = \frac{(x+4)(x-4)}{(x+4)(x+1)} = \frac{x-4}{x+1}$.

50. A 30-60-90 special right triangle with its side ratios is shown below.



The function $\sin(\theta) = \frac{\text{opposite leg}}{\text{hypotenuse}}$. Looking at the given picture, the side length opposite the 30° angle is x and the hypotenuse is $2x$. Therefore, $\sin(30^\circ) = \frac{x}{2x} = \frac{1}{2}$.