



# TMSCA MIDDLE SCHOOL MATHEMATICS

TEST # 6 ©

DECEMBER 5, 2020

## 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.

[illegible]

1.  $12\frac{3}{4} + 3\frac{3}{4} =$  \_\_\_\_\_

- A.  $16\frac{1}{4}$                       B.  $15\frac{1}{4}$                       C.  $16\frac{1}{2}$                       D.  $15\frac{1}{2}$                       E.  $15\frac{3}{4}$

2.  $47\frac{7}{9} - 19\frac{1}{9} =$  \_\_\_\_\_

- A.  $28\frac{2}{3}$                       B.  $28\frac{1}{3}$                       C.  $28\frac{8}{9}$                       D.  $28\frac{1}{9}$                       E.  $27\frac{8}{9}$

3.  $18\frac{3}{5} \times 10 =$  \_\_\_\_\_

- A. 18.6                      B. 28.6                      C. 186                      D. 180.6                      E. 168

4.  $7\frac{2}{5} \div 2 =$  \_\_\_\_\_

- A. 6.9                      B. 3.5                      C. 3.45                      D. 3.35                      E. 3.7

5. 739 = \_\_\_\_\_ (Roman numeral)

- A. DCCXXIX                      B. MCCXXIX                      C. DCCXXXIX                      D. LCCCIX                      E. MCCIX

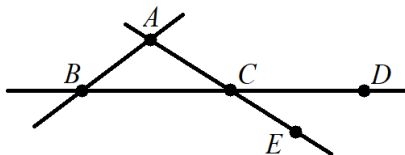
6. 135 minutes = \_\_\_\_\_ hours

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

7. Point A has coordinates (18, 1), and is translated down five units and to the left three units. What is the sum of the coordinates of point A after it is translated?

- A. 19                      B. 11                      C. 17                      D. 23                      E. 27

8. If  $m\angle ABC = 44^\circ$  and  $m\angle DCE = 37^\circ$ , what is the measure of  $\angle BAC$ ?



- A.  $87^\circ$                       B.  $94^\circ$                       C.  $123^\circ$                       D.  $109^\circ$                       E.  $99^\circ$

9.  $35^2 - 25^2 =$  \_\_\_\_\_

- A. 600                      B. 625                      C. 575                      D. 525                      E. 550

10. Evaluate  $|-2a| - |3b| - 5a$  for  $a = -6$  and  $b = -4$ .

- A. -10                      B. 54                      C. 58                      D. 48                      E. 30

11. Simplify:  $4(3x - 2y) + 5(x - 3y)$

- A.  $17x - 7y$                       B.  $12x + 4y$                       C.  $12x + 2y$                       D.  $17x - 8y$                       E.  $17x - 23y$

12. 120 is what percent of 1,000?

- A. 1.2%                      B. 120%                      C. 1,200%                      D. 12%                      E. 1.20%

13. Jean bought three shirts for \$46.35. If all shirts are the same price how much will five shirts cost Jean?

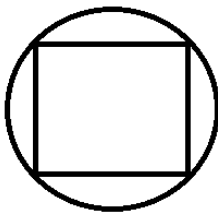
- A. \$61.80                      B. \$92.70                      C. \$78.75                      D. \$77.25                      E. \$84.75

14.  $12,345 \times 9 + 6 =$  \_\_\_\_\_

- A. 111,105                      B. 111,402                      C. 111,111                      D. 111,121                      E. 111,211

15. What is the area of a rhombus with diagonals measuring 18 inches and 5 inches?  
A. 45 inches<sup>2</sup>      B. 46 inches<sup>2</sup>      C. 180 inches<sup>2</sup>      D. 90 inches<sup>2</sup>      E. 52 inches<sup>2</sup>
16.  $\frac{7}{8} =$  \_\_\_\_\_ (decimal)  
A. 0.125      B. 0.875      C. 0.725      D. 0.625      E. 0.825
17. The positive difference between the total degrees of a pentagon and a, octagon is equal to \_\_\_\_\_.  
A. 120      B. 360      C. 720      D. 900      E. 540
18. What is the sum of the first 8 consecutive even integers?  
A. 64      B. 68      C. 72      D. 74      E. 76
19. What is the degree of the sum of  $14m^3n^3 - 9m^2n$  and  $-5m^3n^3 + 12m^2n - 7m - 3$ ?  
A. 19      B. 9      C. 6      D. 10      E. 8
20. A sandwich shop offers a lunch special consisting of a sandwich with either soup or salad. Each sandwich is made with one of five choices of bread and is filled with one of four choices of meat. If a sandwich can only have one choice of bread and one choice of meat, how many lunch special combinations are possible?  
A. 20      B. 80      C. 10      D. 60      E. 40
21. What is the sum of all the domain values of the function containing the points (11, 4), (7, -3), and (-8, 14)?  
A. 10      B. 15      C. 25      D. 47      E. 14
22. Which set of numbers below does not have a median of 12 and a mean of 12?  
A. 13, 11, 12      B. 9, 15, 12      C. 12, 3, 21      D. 6, 12, 27      E. 17, 12, 7
23.  $95^\circ F =$  \_\_\_\_\_  $^\circ C$   
A. 27      B. 35      C. 49      D. 63      E. 18
24. What is the value of the 13<sup>th</sup> triangular number?  
A. 78      B. 85      C. 93      D. 91      E. 101
25. Nurmeen has a collection of 150 stickers. If 30% of Nurmeen's stickers are yellow, how many stickers are not yellow?  
A. 35      B. 115      C. 45      D. 125      E. 105
26.  $56_8 =$  \_\_\_\_\_ (base 2)  
A. 101110      B. 111011      C. 101011      D. 110011      E. 100111
27. If  $a \ominus b = \frac{6a+9b}{3}$ , then what is the value of  $(1 \ominus 2) \ominus ((-3) \ominus 4)$ ?  
A. 26      B. 38      C. 28      D. 36      E. 34
28. Kumba is buying a fishing pole that is marked down \$45. This is a 15% decrease from the original price. What is the sales price of the fishing pole?  
A. \$325.00      B. \$300.00      C. \$285.00      D. \$255.00      E. \$215.00
29. The number 5,000 has how many positive integral divisors?  
A. 16      B. 20      C. 24      D. 30      E. 28

30. A square is inscribed within a circle. If the diagonal of the square is  $\frac{8}{\pi}$ , what is the circumference of the circle?



- A. 16 units      B.  $16\pi$  units      C. 8 units      D.  $8\pi$  units      E. 12 units

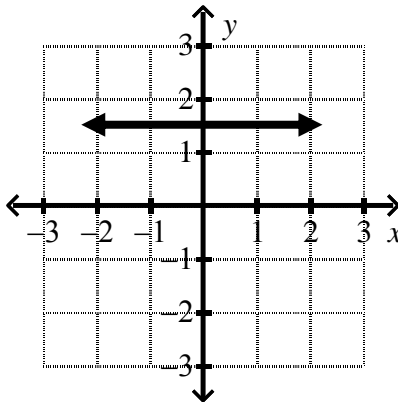
31. What is the decay factor in the exponential function  $y = 0.5(0.8)^x$ ?

- A. 0.8      B. 0.5      C. 0.4      D. 1.3      E. 0.2

32. If  $(4x - 1)(4x + 1) = Ax^2 + Bx + C$ , then what is the value of  $AB - BC$ ?

- A. -1      B. -16      C. 1      D. 16      E. 0

33. What is the equation of the line graphed below?



- A.  $y = 1.5x$       B.  $x = 1.5$       C.  $y = 1.5$       D.  $y = -1.5x$       E.  $x = 1.5y$

34. If light travels  $3 \times 10^8$  meters per second, how far does light travel in one hour? Answer in scientific notation.

- A.  $1.8 \times 10^{10}$       B.  $1.8 \times 10^{12}$       C.  $1.08 \times 10^{10}$       D.  $1.08 \times 10^{12}$       E.  $1.008 \times 10^{10}$

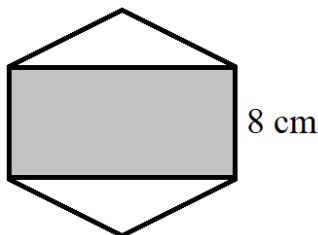
35.  $(i^3)^{17}$  is equivalent to which of the following?

- A. -1      B. 1      C. 0      D.  $i$       E.  $-i$

36. What is the slope of a line passing through the points (39, 5) and (11, 5)?

- A.  $\frac{28}{5}$       B.  $\frac{5}{28}$       C. undefined slope      D. zero slope      E.  $-\frac{28}{5}$

37. A regular hexagon is drawn below. What is the area of the shaded region?



- A.  $48\sqrt{3} \text{ cm}^2$       B.  $80\sqrt{2} \text{ cm}^2$       C.  $64\sqrt{2} \text{ cm}^2$       D.  $64\sqrt{3} \text{ cm}^2$       E.  $96\sqrt{3} \text{ cm}^2$

38. The sum of three consecutive odd integers is  $-171$ . What is the product of the smallest and greatest of these integers?  
 A. 3,245                      B. 3,135                      C. 3,363                      D. 3,355                      E. 3,315

39. How many permutations can be made of 8 items taken 4 at a time?  
 A. 70                      B. 140                      C. 1,680                      D. 840                      E. 1,890

40. Solve for  $x$ :  $\sqrt{3x-6} = 12$   
 A.  $x = 6$                       B.  $x = 2$                       C.  $x = 46$                       D.  $x = 50$                       E.  $x = \frac{6+2\sqrt{3}}{3}$

41. Simplify:  $\left(\frac{3mn^{\frac{2}{3}}}{9m^{-2}n}\right)^3$   
 A.  $\frac{m^6}{81n^3}$                       B.  $\frac{m^6}{81n}$                       C.  $\frac{m^9}{27n}$                       D.  $\frac{m^9}{27n^3}$                       E.  $\frac{m^6}{27n}$

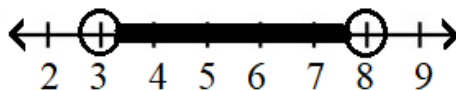
42. What is the value of  $x^2 - 7$ , if  $x$  is the smallest root of  $x^2 - 3x - 40 = 0$ ?  
 A. 57                      B.  $-71$                       C. 2                      D. 93                      E. 18

43.  $121_4 - 33_4 = \underline{\hspace{2cm}}$  (base 4)  
 A. 13                      B. 12                      C. 22                      D. 21                      E. 32

44. If  $\begin{bmatrix} -8 & -11 \\ 14 & -7 \end{bmatrix} + \begin{bmatrix} -15 & -17 \\ 16 & 18 \end{bmatrix} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ , then what is the value of  $(a + b) - (c - d)$ ?  
 A.  $-70$                       B.  $-32$                       C.  $-92$                       D.  $-36$                       E. 46

45. What is the slope of any line perpendicular to the line with the equation  $24x - 2y = 18$ ?  
 A.  $-12$                       B.  $-\frac{1}{12}$                       C.  $-9$                       D.  $-\frac{1}{9}$                       E.  $\frac{4}{3}$

46. What is the inequality statement that represents the graph below?



A.  $x > 3$                       B.  $x < 8$                       C.  $3 \leq x \leq 8$                       D.  $3 < x < 8$                       E.  $3 \geq x \geq 8$

47. What is the area of the triangle with its vertices with coordinates of  $(2, 1)$ ,  $(-2, -3)$ , and  $(-3, 1)$ ?  
 A. 10 units<sup>2</sup>                      B. 20 units<sup>2</sup>                      C. 15 units<sup>2</sup>                      D. 18 units<sup>2</sup>                      E. 12 units<sup>2</sup>

48. What is the sum of the coordinates of the point of intersection of the lines  $4x - y = -13$  and  $-x - 2y = -8$ ?  
 A. 7                      B.  $-7$                       C.  $-10$                       D. 5                      E. 3

49. What is the sum of the roots of the quadratic equation  $x^2 + 6x - 51 = 0$ ?  
 A.  $-\frac{17}{2}$                       B. 51                      C.  $-15$                       D.  $-6$                       E. 6

50. Which of the following is equivalent to  $\frac{1}{\sqrt{9x}} + \frac{\sqrt{x}}{3}$ ?  
 A.  $\frac{\sqrt{x}+x\sqrt{x}}{3x}$                       B.  $\frac{3\sqrt{x}+x\sqrt{x}}{3}$                       C.  $\frac{3\sqrt{x}+x\sqrt{x}}{3x}$                       D.  $\frac{\sqrt{x}+x\sqrt{x}}{3}$                       E.  $\frac{\sqrt{x}+3x\sqrt{x}}{3x}$

2020 – 2021 TMSCA Middle School Mathematics Test #6 Answer Key

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

5.  $739 = 700 + 30 + 9$ .  $700 = \text{DCC}$ ,  $30 = \text{XXX}$  and  $9 = \text{IX}$ . Therefore,  $739 = \text{DCCXXXIX}$ .

9. One method to solve this is to know the difference of squares, which is  $a^2 - b^2 = (a + b)(a - b)$ . We are given  $35^2 - 25^2$ , so by using the difference of squares,  $35^2 - 25^2 = (35 + 25)(35 - 25) = 60(10) = 600$ .

15. The formula to find the area of a rhombus given its diagonals is  $A = \frac{d_1 \cdot d_2}{2}$ . We are given a rhombus with diagonals of 18 inches and 5 inches, so the area of this rhombus is  $A = \frac{18 \cdot 5}{2} = 45 \text{ inches}^2$ .

18. The sum of the first  $n$  consecutive even numbers is equal to  $n^2 + n$ . Therefore, the sum of the first 8 consecutive even integers is  $8^2 + 8 = 72$ .

21. The domain values of a set of ordered pairs are the  $x$ -coordinates of the ordered pairs. Therefore, the sum of all the domain values of the function containing the points  $(11, 4)$ ,  $(7, -3)$ , and  $(-8, 14)$  is equal to the sum of  $11 + 7 + (-8) = 10$ .

33. The equation of any horizontal line is in the form  $y = \#$ . Since the line given passes through the  $y$ -axis at 1.5, the equation of the line is  $y = 1.5$ .

40. To solve  $\sqrt{3x - 6} = 12$ , first square both sides of the equation to get  $(\sqrt{3x - 6})^2 = 12^2 \rightarrow 3x - 6 = 144$ . Now, add 6 to both sides of the equation to get  $3x = 150$ . Dividing by 3 to both sides of the equation and the solution is  $x = 50$ .

$$41. \left( \frac{3mn^{\frac{2}{3}}}{9m^{-2}n} \right)^3 = \left( \frac{m \cdot m^2 \cdot n^{\frac{2}{3}-1}}{3} \right)^3 = \left( \frac{m^3}{3n^{\frac{1}{3}}} \right)^3 = \frac{(m^3)^3}{\left(3n^{\frac{1}{3}}\right)^3} = \frac{m^9}{27n}.$$

45. The slope of a line that is in standard form  $Ax + By = C$  is found by  $-\frac{A}{B}$ . The slope of the line  $24x - 2y = 18$  is then  $-\frac{-24}{-2} = 12$ . The slope of any line perpendicular to this line will have a negative reciprocal slope of the given line, which is  $-\frac{1}{12}$ .

46. This is a compound inequality graph using open circles on the 3 and 8. Open circles use either  $<$  or  $>$ . Therefore, the inequality statement that represents the graph is  $3 < x < 8$ .

49. The sum of the roots of a quadratic equation in the form  $Ax^2 + Bx + C = 0$  is equal to  $-\frac{B}{A}$ . We are given the equation  $x^2 + 6x - 51 = 0$ , so  $A = 1$  and  $B = 6$ . Therefore, the sum of the roots of the equation is equal to  $-\frac{6}{1} = -6$ .

$$50. \frac{1}{\sqrt{9x}} + \frac{\sqrt{x}}{3} = \frac{1}{3\sqrt{x}} + \frac{\sqrt{x}}{3} = \frac{1}{3\sqrt{x}} \left( \frac{\sqrt{x}}{\sqrt{x}} \right) + \frac{\sqrt{x}}{3} = \frac{\sqrt{x}}{3x} + \frac{\sqrt{x}}{3} = \frac{\sqrt{x}}{3x} + \frac{\sqrt{x}}{3} \left( \frac{x}{x} \right) = \frac{\sqrt{x}}{3x} + \frac{x\sqrt{x}}{3x} = \frac{x+x\sqrt{x}}{3x}.$$