



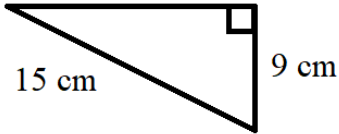
**TMSCA MIDDLE SCHOOL  
MATHEMATICS  
TEST #2 ©  
OCTOBER 26, 2019**

**GENERAL DIRECTIONS**

1. About this test:
  - A. You will be given 40 minutes to take this test.
  - B. There are 50 problems on this test.
2. 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.
3. If you are using a Chatsworth or Scantron card, please follow the specific instructions given at your particular meet.
4. You may write anywhere on the test itself. You must write only answers on the answer sheet.
5. You may use additional scratch paper provided by the contest director.
6. All problems have **ONE** and **ONLY ONE** correct [BEST] answer. There is a penalty for all incorrect answers.
7. Calculators **MAY NOT** be used on this test.
8. 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.
9. In case of ties, percent accuracy will be used as a tie breaker.

[illegible]

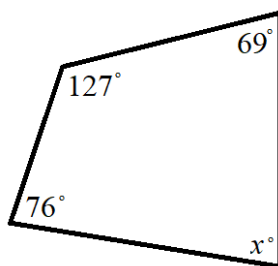
2019 – 2020 TMSCA Middle School Mathematics Test #2

1.  $76 + 49 + 28 =$  \_\_\_\_\_  
 A. 125                      B. 228                      C. 153                      D. 147                      E. 183
2.  $94 - 56 - 28 =$  \_\_\_\_\_  
 A. 10                      B. 38                      C. 20                      D. 28                      E. 8
3.  $12 \times 8 \times 7 =$  \_\_\_\_\_  
 A. 672                      B. 96                      C. 952                      D. 504                      E. 728
4.  $136 \div 17 \div 4 =$  \_\_\_\_\_  
 A. 12                      B. 4                      C. 6                      D. 2                      E. 8
5. Which of the following is a rational number?  
 I.  $\sqrt{16}$                       II.  $\pi$                       III.  $\frac{1}{3}$                       IV. 14.7  
 A. II and III                      B. I, III and IV                      C. III and IV                      D. I, II and III                      E. III and IV
6. What is the next term of the sequence 9, 12, 21, 33, 54, 87, 141, 228, ...?  
 A. 369                      B. 372                      C. 387                      D. 397                      E. 385
7. Which number when divided by 8 has a remainder of 7?  
 A. 381                      B. 567                      C. 147                      D. 313                      E. 893
8. What is the GCF of the numbers 124 and 76?  
 A. 2                      B. 4                      C. 8                      D. 6                      E. 14
9. What is the value of the mean of the set of numbers 82, 28, 45, 75 and 30?  
 A. 52.5                      B. 45                      C. 60                      D. 54                      E. 52
10. What is the measure of the missing side length of the triangle below?  
  
 A.  $3\sqrt{34}$  cm                      B. 24 cm                      C. 6 cm                      D. 12 cm                      E. 10 cm
11. Simplify:  $15(3 + 8) - 4(15 - 9)^2$   
 A. 39                      B. 21                      C. -88                      D. 87                      E. 117
12.  $0.000518 =$  \_\_\_\_\_ (scientific notation)  
 A.  $5.18 \times 10^{-4}$                       B.  $51.8 \times 10^{-3}$                       C.  $5.18 \times 10^4$                       D.  $518 \times 10^{-6}$                       E.  $518 \times 10^4$
13. Cynthia spent 1.4 hours studying for her test. How many minutes did Cynthia spend studying?  
 A. 140 minutes                      B. 92 minutes                      C. 72 minutes                      D. 96 minutes                      E. 84 minutes
14. XCIX = \_\_\_\_\_ (Arabic number)  
 A. 109                      B. 119                      C. 99                      D. 59                      E. 111

15. What is the complement to an angle measuring  $83^\circ$ ?

- A.  $97^\circ$       B.  $77^\circ$       C.  $277^\circ$       D.  $7^\circ$       E.  $17^\circ$

16. What is the value of  $x$  in the picture below?



- A. 111      B. 91      C. 88      D. 78      E. 86

17. At Reagan Junior High, 3 out of every 7 students wear glasses. If there are 1,680 students at Reagan Junior High, how many students do not wear glasses?

- A. 640      B. 720      C. 1,240      D. 920      E. 960

18. Jacky's chance of making her next free throw is  $\frac{9}{24}$ . What percent chance does Jacky have of making her next free throw?

- A. 38.5%      B. 44.5%      C. 12.5%      D. 24.5%      E. 37.5%

19. A circle has a circumference of  $18\pi$  inches. What is the area of the circle?

- A.  $36\pi \text{ in}^2$       B.  $81\pi \text{ in}^2$       C.  $324\pi \text{ in}^2$       D.  $72\pi \text{ in}^2$       E.  $162\pi \text{ in}^2$

20.  $211_{10} = \text{_____}_6$

- A. 551      B. 531      C. 527      D. 549      E. 547

21. Lexi bought two sodas for \$1.29 each, two hotdogs for \$2.50 each and a bucket of popcorn for \$6.25. If there is no tax, how much change will Lexi get back if she pays with a \$20 bill?

- A. \$9.96      B. \$8.67      C. \$6.17      D. \$13.83      E. \$10.04

22. A bag contains four red marbles, eight blue marbles, two white marbles and six green marbles. If you reach into the bag and pull out a marble at random, what is the probability, to the nearest percent, of drawing a green marble?

- A. 60%      B. 30%      C. 40%      D. 50%      E. 25%

23. If  $m(c) = c^2 - 3c$ , then find the value of  $m(-2)$ ?

- A. 10      B. 2      C. -10      D. -2      E. -5

24. If  $\triangle ABC \sim \triangle XYZ$ , which of the following must be true?

I.  $\angle A \cong \angle X$     II.  $\frac{AB}{AC} = \frac{XY}{XZ}$     III.  $\angle B \cong \angle Z$     IV.  $\frac{BC}{YZ} = \frac{AC}{XZ}$

- A. I, II, III & IV      B. I, II and IV      C. I, II and III      D. II and IV      E. I and III

25. What value is 65% of the number 82?

- A. 53.3      B. 56.3      C. 54      D. 55.1      E. 52.7

26. What is the only regular polygon that can be divided into equilateral triangles?

- A. square      B. pentagon      C. septagon      D. decagon      E. hexagon

27. 88 feet/second = \_\_\_\_\_ miles/hour

- A. 60      B. 84      C. 76      D. 56      E. 64

28. How many permutations can be formed using the letters  $A$ ,  $B$ , and  $C$ ?

- A. 3      B. 1      C. 0      D. 6      E. 9

29. What is the slope of the line that passes through the points  $(2\frac{1}{4}, 5)$  and  $(1\frac{1}{2}, 4\frac{3}{4})$ ?

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

30.  $(6m + 4m^2 - 3) - (5 + m - 2m^2) =$  \_\_\_\_\_

- A.  $6m^2 + 5m - 8$       B.  $4m^2 + 7m - 8$       C.  $4m^2 + 7m + 2$       D.  $6m^2 + 7m + 2$       E.  $6m^2 + 5m + 2$

31. If  $a \clubsuit b = a^2 + b^2$ , what is the value of  $(1 \clubsuit 4) \clubsuit 3$ ?

- A. 34      B. 298      C. 295      D. 43      E. 292

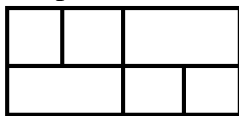
32. What is the upper quartile of the numbers 34, 54, 62, 23, 24, 48, and 66?

- A. 43      B. 48      C. 38      D. 62      E. 54

33. Which of the following equations represents an exponential growth function?

- A.  $y = 38(0.7)^x$       B.  $y = 6.1\left(\frac{4}{5}\right)^x$       C.  $y = 0.8(1.3)^x$       D.  $y = 7x^2 + 11.9x$       E.  $y = 39x^3$

34. How many total rectangles can be found in the picture below?



- A. 15      B. 14      C. 10      D. 11      E. 13

35. 420 kilometers = \_\_\_\_\_ centimeters

- A. 420,000,000      B. 42,000,000      C. 4,200,000      D. 420,000      E. 42,000

36. What is the sum of all the positive integral factors of the number 80?

- A. 192      B. 104      C. 154      D. 172      E. 186

37. How many prime numbers exist between the numbers 50 and 100?

- A. 11      B. 9      C. 10      D. 13      E. 12

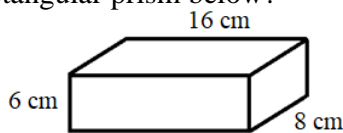
38. Which quadratic equation is in vertex form?

- A.  $y = Ax^2 + Bx + C$       B.  $y = x^2$       C.  $y = (x - h)^2 + k$       D.  $y = a \cdot b^x$       E.  $y = (x - h)(x + k)$

39. What is the value of  $C$  that will make the polynomial  $x^2 - 8x + C$  a perfect square trinomial?  
 A. 64                      B. 16                      C. -20                      D. -64                      E. -16

40. If  $17\sqrt{24a^{16}} = 34a^n\sqrt{6}$ , What is the value of  $\sqrt{n}$ ?  
 A. 2                      B. 4                      C.  $4\sqrt{2}$                       D.  $2\sqrt{2}$                       E.  $\sqrt{2}$

41. What is the lateral surface area of the rectangular prism below?



- A.  $288 \text{ cm}^2$                       B.  $256 \text{ cm}^2$                       C.  $544 \text{ cm}^2$                       D.  $768 \text{ cm}^2$                       E.  $384 \text{ cm}^2$

42. What is the simple interest of depositing \$600 at a rate of 8% for 3 years?  
 A. \$178                      B. \$156                      C. \$132                      D. \$168                      E. \$144

43. What is the value of the  $x$ -coordinate of the solution to the system of linear equations?  $\begin{cases} 10x + 16y = -7 \\ y = -\frac{3}{2}x \end{cases}$   
 A.  $\frac{1}{2}$                       B.  $\frac{3}{4}$                       C.  $-\frac{1}{4}$                       D.  $-\frac{3}{8}$                       E.  $\frac{1}{6}$

44. What is the positive difference of the solutions to the equation  $|x - 5| = 31$ ?  
 A. 10                      B. 62                      C. 40                      D. 26                      E. 13

45. Nickolas leaves on a train at 8:15 am to his destination which is 221 miles away. If the train averaged a speed of 65 mph, at what time does Nickolas arrive at his destination?  
 A. 11:27 am                      B. 10:59 am                      C. 11:47 am                      D. 11:39 am                      E. 11:51 am

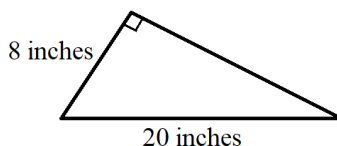
46. The angles in a triangle are in a ratio of 9:11:16. What is the measure of the largest angle?  
 A.  $65^\circ$                       B.  $80^\circ$                       C.  $64^\circ$                       D.  $96^\circ$                       E.  $72^\circ$

47. Factor completely:  $6x^2 - 31x + 35$   
 A.  $(2x + 7)(3x + 5)$                       B.  $(2x - 5)(3x - 7)$                       C.  $(6x + 5)(x + 7)$                       D.  $(6x - 5)(x - 7)$                       E.  $(2x - 7)(3x - 5)$

48.  $\frac{8a^4b}{3ab^3} \cdot \frac{6a^2b^3}{4a^2b^{-1}} =$  \_\_\_\_\_

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

49. What is the length of the missing side of the triangle below?



- A.  $4\sqrt{21}$  inches                      B.  $8\sqrt{42}$  inches                      C.  $4\sqrt{42}$  inches                      D.  $8\sqrt{84}$  inches                      E.  $4\sqrt{29}$  inches

50. If  $x$  is the positive solution to  $3^{-2} + 4^{-2} = x^{-2}$ , then what is the value of  $5x - 2^3$ ?  
 A. 4                      B. 3                      C. 6                      D. 8                      E. 7

2019 – 2020 TMSCA Middle School Mathematics Test #2 Answer Key

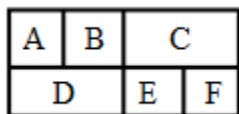
1. C	18. E	35. B
2. A	19. B	36. E
3. A	20. A	37. C
4. D	21. C	38. C
5. B	22. B	39. B
6. A	23. A	40. D
7. B	24. B	41. A
8. B	25. A	42. E
9. E	26. E	43. A
10. D	27. A	44. B
11. B	28. D	45. D
12. A	29. B	46. B
13. E	30. A	47. E
14. C	31. B	48. C
15. D	32. D	49. A
16. C	33. C	50. A
17. E	34. A	

13. There are 60 minutes in 1 hour. Therefore,  $1.4 \text{ hours} = 1.4(60) = 84 \text{ minutes}$ .

26. A regular hexagon is the only regular polygon that can be divided into equilateral triangles?

27. To convert feet/second into miles/hour, multiply by  $\frac{15}{22}$ . Therefore,  $88 \text{ feet/second} = 88 \left(\frac{15}{22}\right) = 60 \text{ miles/hour}$ .

34. First, label the rectangle as shown.



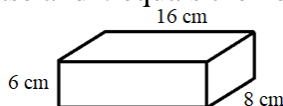
We can see there are 6 rectangles that require 1 section; A, B, C, D, E, and F. There are 4 rectangles that require 2 sections; AB, BC, EF & DE. There are 4 rectangles that require 3 sections, ABC, DEF, ABD, and CEF. There is only 1 rectangle that requires all ABCDEF. Therefore, there are a total of  $6 + 4 + 4 + 1 = 15$  rectangles that can be found in the picture.

36. The positive integral factors of 80 are 1, 2, 4, 5, 8, 10, 16, 20, 40, and 80. The sum of all the positive integral factors of 80 is then  $1 + 2 + 4 + 5 + 8 + 10 + 16 + 20 + 40 + 80 = 186$ .

38.  $y = (x - h)^2 + k$  is the vertex form of a quadratic equation.

40.  $17\sqrt{24a^{16}} = 17 \cdot \sqrt{4 \cdot 6} \cdot a^{\frac{16}{2}} = 17 \cdot 2\sqrt{6} \cdot a^8 = 34a^8\sqrt{6}$ , and  $n = 8$ . Therefore,  $\sqrt{8} = \sqrt{4 \cdot 2} = 2\sqrt{2}$ .

41. The formula for lateral surface area of a rectangular prism is  $L = Ph$ , where  $P$  equals the perimeter of the base and  $h$  equals the height of the prism. The perimeter of the base can be found by  $16 + 8 + 16 + 8 = 48$ .



Therefore, the lateral surface area of the prism is  $(48)(6) = 288 \text{ cm}^2$ .

42. The formula for simple interest is  $I = prt$ , where  $I$  is the interest accumulated,  $p$  is the principal amount,  $r$  is the rate and  $t$  is the time, in years. Remember that  $8\% = 0.08$ . Substituting into the formula and the interest will be  $I = (600)(0.08)(3) = \$144$ .

44. To solve the equation  $|x - 5| = 31$ , we must create two equations, which are  $x - 5 = 31$  and  $x - 5 = -31$ . Adding 5 to both sides in both equations gives us the solutions of 36 and  $-26$ . Therefore, the positive difference of the solutions is  $36 - (-26) = 62$ .

46. If the angles in a triangle are in a ratio of 9:11:16, then  $9x + 11x + 16x = 180$ . Simplify this to get  $36x = 180$ . Divide both sides by 36 and  $x = 5$ . Therefore, the largest angle measures  $16(5) = 80^\circ$ .

50.  $3^{-2} + 4^{-2} = x^{-2}$  is rewritten using positive exponents as  $\frac{1}{3^2} + \frac{1}{4^2} = \frac{1}{x^2}$ , which is equal to  $\frac{1}{9} + \frac{1}{16} = \frac{1}{x^2}$ . We can multiply the entire equation by the GCD of  $144x^2$ , to get  $144x^2 \left(\frac{1}{9} + \frac{1}{16} = \frac{1}{x^2}\right) = 16x^2 + 9x^2 = 144$ . This simplifies to  $25x^2 = 144$ . Divide both sides by 25 and we get  $x^2 = \frac{144}{25}$ . Square root both sides to get the positive root of  $\frac{12}{5}$ . Substitute  $\frac{12}{5}$  into the expression  $5x - 2^3$ , to get  $5\left(\frac{12}{5}\right) - 2^3 = \frac{60}{5} - 8 = 12 - 8 = 4$ .