

**TMSCA MIDDLE SCHOOL  
MATHEMATICS  
REGIONAL TEST ©  
MARCH 7, 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.



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1.  $714.8 + (-63.3) + (-17.3) =$  \_\_\_\_\_  
 A. 634.2                      B. 668.8                      C. 760.8                      D. 795.4                      E. 628.2

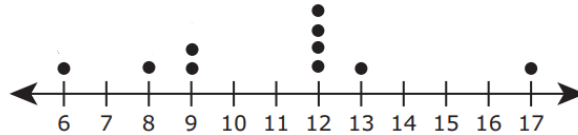
2.  $-99.1 - (-75.8) - 3.7 =$  \_\_\_\_\_  
 A. -27                      B. -178.6                      C. -174                      D. -79.5                      E. -77.5

3.  $\frac{4}{5} \cdot \frac{24}{15} \cdot \frac{30}{45} =$  \_\_\_\_\_  
 A.  $\frac{21}{25}$                       B.  $\frac{13}{45}$                       C.  $\frac{77}{90}$                       D.  $\frac{64}{75}$                       E.  $\frac{14}{15}$

4.  $\frac{5}{12} \div \frac{16}{24} \div \frac{1}{2} =$  \_\_\_\_\_  
 A.  $1\frac{3}{4}$                       B.  $1\frac{1}{2}$                       C.  $2\frac{1}{2}$                       D.  $1\frac{1}{4}$                       E.  $2\frac{3}{4}$

5. Let  $D$  equal the positive difference of the numbers 80,000 and 561. What percentage of the digits of  $D$  are prime?  
 A. 20%                      B. 40%                      C. 60%                      D. 80%                      E. 100%

6. What is the value of the mean of the data in the dot-plot below?



A. 11.0                      B. 12.4                      C. 12.6                      D. 10.8                      E. 11.2

7. What is the inter-quartile range for the set of numbers 210, 245, 222, 172, 256, 281, 210, 207, and 267?  
 A. 53                      B. 109                      C. 222                      D. 59                      E. 101

8. 16 miles = \_\_\_\_\_ feet  
 A. 28,160                      B. 56,320                      C. 112,640                      D. 70,400                      E. 84,480

9. How many improper subsets does the set  $\{a, b, c, d, e, f, g, h\}$  have?  
 A. 256                      B. 0                      C. 1                      D. 255                      E. 36

10.  $\frac{1}{2}$  of 35% of 400 = \_\_\_\_\_  
 A. 64                      B. 128                      C. 70                      D. 82.5                      E. 90

11. What is the LCM of the numbers 52 and 64?  
 A. 3,328                      B. 832                      C. 634                      D. 4                      E. 1,664

12. 74 quarters + 121 dimes = 302 nickels + \_\_\_\_\_ pennies  
 A. 1,550                      B. 155                      C. 15,500                      D. 15.5                      E. 155,000

13.  $7! - 6! + 5! - 4! =$  \_\_\_\_\_  
 A. 4,920                      B. 4,416                      C. 4,464                      D. 4,582                      E. 4,526

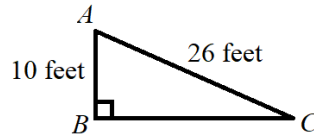
14. Isaac takes the number 52 million and divides it by 4. What will be his quotient in scientific notation?

- A.  $52 \times 10^6$       B.  $5.2 \times 10^7$       C.  $2.6 \times 10^7$       D.  $1.3 \times 10^6$       E.  $1.3 \times 10^7$

15. Solve for  $n$ :  $4(7 - n) = -104$

- A.  $n = 33$       B.  $n = 19$       C.  $n = -19$       D.  $n = -33$       E.  $n = 23$

16. If  $\triangle XYZ \sim \triangle ABC$ , and  $XZ = 65$  feet, what is  $YZ$ ?



- A. 50 feet      B. 54 feet      C. 60 feet      D. 62 feet      E. 58 feet

17. Cooper studied for 35 minutes on Monday, 20 minutes on Tuesday, 1 hour on Wednesday, and 40 minutes on Thursday. How many minutes must Cooper study on Friday night to have an average of 40 minutes studied each night?

- A. 75      B. 45      C. 55      D. 65      E. 70

18. If  $m\angle A$  is  $18^\circ$  less than its complement, what is the measure of the supplement of  $\angle A$ ?

- A.  $108^\circ$       B.  $102^\circ$       C.  $144^\circ$       D.  $126^\circ$       E.  $162^\circ$

19. How many lines of symmetry can be drawn through a regular pentagon?

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

20. Simplify:  $\sqrt{36} + (\sqrt{144})^2 + (\sqrt{16})^3$

- A. 348      B. 214      C. 188      D. 192      E. 256

21.  $\overline{IVCLXXVI} \div \overline{XVIII} = \underline{\hspace{2cm}}$  (Arabic number)

- A. 252      B. 284      C. 232      D. 268      E. 244

22. What is the value of  $\frac{m}{2} - 7$ , if  $m = -16^2$ ?

- A. -135      B. 135      C. -270      D. 270      E. -23

23. How many total diagonals can be drawn in the interior of a regular 13-sided polygon?

- A. 10      B. 52      C. 169      D. 26      E. 65

24. What is the next term of the sequence 120, 24, 4.8, 0.96, ...?

- A. 0.224      B. 0.242      C. 0.192      D. 0.186      E. 0.196

25. How many numbers from 1 to 56, inclusive, are divisible by 6, 8, or both?

- A. 12      B. 22      C. 18      D. 14      E. 16

26. What is the slope of any line parallel to the line with the equation  $\frac{1}{2}x + \frac{5}{4}y = \frac{3}{8}$ ?

- A.  $\frac{3}{10}$       B.  $\frac{3}{4}$       C.  $-\frac{3}{4}$       D.  $-\frac{1}{8}$       E.  $-\frac{2}{5}$

27. Vanessa calculated an answer to be 45. In doing her calculations, Vanessa multiplied by 0.3 instead of dividing by 0.3. If she had done her calculations correctly, what should have been her answer?

- A. 500                      B. 375                      C. 450                      D. 4.5                      E. 290

28. If  $A = 6m^3n^2$  and  $B = 7m^4n^3$ , what is the degree of the monomial that is the product of  $AB$ ?

- A. 35                      B. 18                      C. 42                      D. 7                      E. 12

29. In Mr. Nguyen’s class, raffle tickets are sold, with two winning tickets drawn. Mark and Tanisha each purchased a raffle ticket. If a total of 16 raffle tickets were sold, what is the probability that both Mark and Tanisha are winners?

- A.  $\frac{1}{30}$                       B.  $\frac{1}{120}$                       C.  $\frac{1}{128}$                       D.  $\frac{1}{64}$                       E.  $\frac{2}{31}$

30. How many ways can you make \$1.00 using only quarters, dimes, and nickels?

- A. 27                      B. 17                      C. 21                      D. 29                      E. 33

31. What is the equation  $y = a(x - h)^2 + k$  solved for  $x$ ?

- A.  $x = \pm \sqrt{\frac{y-k}{a}} + h$     B.  $x = \pm \sqrt{\frac{y}{a} - k} + h$     C.  $y = \pm \sqrt{\frac{y}{a} - k} + h$     D.  $x = \pm \sqrt{\frac{y-k}{a}} + h$     E.  $x = \pm \frac{\sqrt{y}}{a} - k + h$

32. George has a pile of 10 different coins. In how many ways can George choose 5 coins from the pile?

- A. 248                      B. 120                      C. 252                      D. 50                      E. 110

33.  $554_{10} + 43_{10} + 77_{10} = \underline{\hspace{2cm}}_{12}$

- A. 398                      B. 468                      C. 482                      D. 476                      E. 494

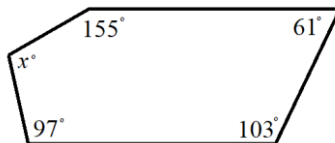
34. What is the value of  $C$  that will make the polynomial  $x^2 - 7x + C$  a perfect square trinomial?

- A.  $\frac{7}{2}$                       B.  $\frac{7}{4}$                       C.  $\frac{49}{2}$                       D. 49                      E.  $\frac{49}{4}$

35.  $64^{\frac{2}{3}} + 27^{\frac{1}{3}} = \underline{\hspace{2cm}}$

- A. 515                      B. 19                      C. 11                      D. 7                      E. 5

36. What is the value of  $x$  in the shape below?



- A. 117                      B. 119                      C. 126                      D. 124                      E. 118

37. What is the percent decrease if 80 is reduced to 42?

- A. 47.5%                      B. 37.5%                      C. 42.5%                      D. 46.25%                      E. 40.5%

38. What is the rate of decay of the exponential decay function  $y = 0.15(0.24)^x$ ?

- A. 15%                      B. 85%                      C. 76%                      D. 24%                      E. 39%

39. What is the range of the parabola of the quadratic equation  $y = 4x - 6 + 2x^2$ ?

- A.  $y \geq -8$       B.  $y \geq -6$       C.  $y \leq -6$       D.  $y \geq 2$       E.  $y \leq -4$

40. Mike bought a new boat for \$24,000. If the boat is depreciating in value at a rate of 25% each year, what is the boat worth after two years?

- A. \$14,500      B. \$14,250      C. \$13,750      D. \$13,500      E. 413,250

41. If  $A = \frac{\sqrt{8}+3}{\sqrt{2}}$  and  $B = \frac{5}{\sqrt{2}}$ , what is  $A - B$ ?

- A.  $-2 - \sqrt{2}$       B.  $2 + \sqrt{2}$       C.  $-2 + \sqrt{2}$       D.  $-2 - 2\sqrt{2}$       E.  $2 - \sqrt{2}$

42.  $\frac{4x^2-4x-80}{2x-10}$  can simplify to which of the following?

- A.  $2(x + 4)$       B.  $2(x - 5)$       C.  $2(x + 5)$       D.  $2(x - 4)$       E.  $x - 5$

43. It takes Nick twice as long as it takes Maria to paint a fence. If they work together, they can paint the fence in 2 days. How long would it take Nick to paint the fence by himself?

- A. 4 days      B. 6 days      C. 8 days      D. 10 days      E. 4.5 days

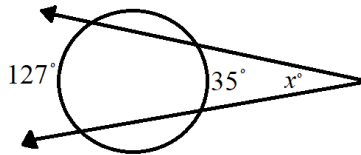
44. Using interval notation,  $(-8, 3)$  is the solution to which of the following?

- A.  $-9 \leq n - 1 \leq 2$       B.  $-5 < 20n + 4 < 64$       C.  $-16 \leq -2n \leq -6$       D.  $-20 < 12 + 4n < 24$       E.  $-16 < -2n \leq -6$

45.  $\left(\frac{ab^4c^{-2}}{bc^{-4}}\right)^2 \div \left(\frac{ab^2c}{a^{-2}bc^{-1}}\right)^3 =$  \_\_\_\_\_

- A.  $\frac{b^3}{a^7c^2}$       B.  $\frac{b^6}{a^8c^4}$       C.  $a^3b^9c^4$       D.  $a^2b^{18}c^8$       E.  $a^9b^3c^6$

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



- A. 81      B. 40.5      C. 53      D. 42      E. 46

47. If  $f(x) = \frac{x}{3}$ ,  $g(x) = 4x^{-2}$  and  $h(x) = (x + 2)^3$ , what is the value of  $h(g(2)) + f(h(-5))$ ?

- A. 54      B. 27      C. 32      D. 18      E. 12

48. What is the area of the triangle created by the graphs of the system  $\begin{cases} 2x + 2y = 6 \\ y + 7 = 7 \\ 2x + y = 0 \end{cases}$ ?

- A. 18 units<sup>2</sup>      B. 9 units<sup>2</sup>      C. 36 units<sup>2</sup>      D. 48 units<sup>2</sup>      E. 24 units<sup>2</sup>

49. In right  $\triangle ABC$ ,  $m\angle B = 90^\circ$ ,  $AB = 12$ ,  $AC = 20$ , and  $BC = 16$ . What is the value of the trig ratio,  $\sin\angle A$ ?

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

50. If  $6x + 3\sqrt{x} - 18 = 0$ , what is the value of  $8x + 7$ ?

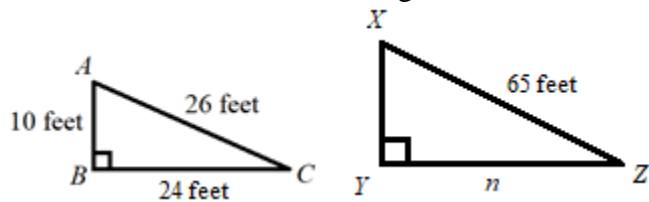
- A. 27      B. 31      C. 25      D. 39      E. 47

2019 – 2020 TMSCA Middle School Mathematics Regional Test Answer Key

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

14. 52 million = 52,000,000.  $52,000,000 \div 4 = 13,000,000$ , and  $13,000,000 = 1.3 \times 10^7$ .

16. First, draw the second triangle and label as shown. To find the missing side of  $\triangle ABC$ , we use the



Pythagorean Theorem.  $\sqrt{26^2 - 10^2} = \sqrt{576} = 24$ . Since the two triangles are similar, their sides are proportional.

Make the proportion  $\frac{24}{26} = \frac{n}{65}$ . This simplifies to  $\frac{12}{13} = \frac{n}{65}$ .

We see that  $65 \div 13 = 5$ , so  $12(5) = 60$ .  $YZ = 60$  feet.

19. There are 5 lines of symmetry that can be drawn in a regular pentagon.

24. The sequence 120, 24, 4.8, 0.96, ... is a geometric sequence with a common ratio of 0.2. Therefore, the next term of the sequence is  $0.96(0.2) = 0.192$ .

26. The slope of a line in standard form,  $Ax + By = C$ , can be found by  $-\frac{A}{B}$ . We are given the equation

$$\frac{1}{2}x + \frac{5}{4}y = \frac{3}{8}, \text{ so } A = \frac{1}{2} \text{ and } B = \frac{5}{4}. \text{ So, the slope of the line is } \frac{-\frac{1}{2}}{\frac{5}{4}} = -\frac{1}{2} \div \frac{5}{4} = -\frac{1}{2} \cdot \frac{4}{5} = -\frac{4}{10} = -\frac{2}{5}.$$

27. Let  $x$  be Vanessa's calculated value before making the mistake. This means  $45 = 0.3x$ . So, to find  $x$ , divide both sides by 0.3.  $45 \div 0.3 = 150$ . Now, in doing the correct calculation, Vanessa should have divided this value by 0.3 to get  $150 \div 0.3 = 500$ .

28. If  $A = 6m^3n^2$  and  $B = 7m^4n^3$ , then  $AB = (6m^3n^2)(7m^4n^3) = 42m^{3+4}n^{2+3} = 42m^7n^5$ . The degree of a monomial is the sum of the exponents of the variables. Therefore, the degree of the product  $AB$  is equal to the sum  $7 + 5 = 12$ .

32. This is a combinations problem of having 10 coins and choosing 5 at a time. Combinations of  $n$  objects taken  $r$  at a time can be found by  ${}_nC_r = \frac{n!}{r!(n-r)!}$ . Substituting, we get  $\frac{10!}{5!(10-5)!} = \frac{10!}{5!5!} = \frac{10 \cdot 9 \cdot 8 \cdot 7 \cdot 6}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = 252$ . There are a total of 252 different combinations George can choose 5 of his 10 coins.

$$35. 64^{\frac{2}{3}} + 27^{\frac{1}{3}} = (\sqrt[3]{64})^2 + \sqrt[3]{27} = 4^2 + 3 = 16 + 3 = 19.$$

$$41. \text{ If } A = \frac{\sqrt{8+3}}{\sqrt{2}} \text{ and } B = \frac{5}{\sqrt{2}}, A - B = \frac{\sqrt{8+3}}{\sqrt{2}} - \frac{5}{\sqrt{2}} = \frac{\sqrt{8+3}-5}{\sqrt{2}} = \frac{\sqrt{8}-2}{\sqrt{2}} = \frac{2\sqrt{2}-2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{4-2\sqrt{2}}{2} = 2 - \sqrt{2}.$$

$$42. \frac{4x^2-4x-80}{2x-10} = \frac{4(x^2-x-20)}{2(x-5)} = \frac{4(x-5)(x+4)}{2(x-5)} = 2(x+4).$$

43. Since it takes Nick twice as long as Maria, we make the equation  $\frac{2}{x} + \frac{2}{2x} = 1$ . Multiply the entire equation by  $2x$  to get  $2x\left(\frac{2}{x} + \frac{2}{2x} = 1\right)$  resulting in  $4 + 2 = 2x$ . This simplifies to  $6 = 2x$ , and then  $x = 3$ . Maria takes 3 days to paint the fence alone. Therefore, it will take Nick twice as long, so  $3(2) = 6$  days.