

**TMSCA MIDDLE SCHOOL  
MATHEMATICS  
TEST #11 ©  
FEBRUARY 15, 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.



1.  $0.97 + 1.95 + 8.77 =$  \_\_\_\_\_

- A. 10.49                      B. 10.79                      C. 11.69                      D. 11.29                      E. 11.49

2.  $\frac{11}{24} - \frac{3}{8} - \frac{7}{6} =$  \_\_\_\_\_

- A.  $-1\frac{1}{12}$                       B.  $-2\frac{5}{12}$                       C.  $-1\frac{5}{12}$                       D.  $-1\frac{1}{3}$                       E.  $-1\frac{1}{4}$

3.  $-56 \times 78 =$  \_\_\_\_\_

- A. 4,368                      B. 4,568                      C. 22                      D. -4,368                      E. -3,568

4.  $624 \div \frac{3}{5} =$  \_\_\_\_\_

- A. 1,040                      B. 374.4                      C. 1,374.4                      D. 3,744                      E. 520

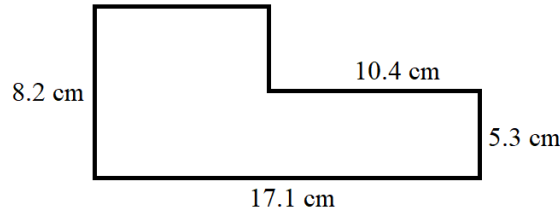
5. If  $x = \frac{3}{2}$ , then what is the value of  $\frac{8}{3}x + 10x - \frac{2}{3}x$ ?

- A. 16                      B. 18                      C. 12                      D. 24                      E. 21

6. What is the smallest palindrome greater than 4,671?

- A. 4,664                      B. 4,994                      C. 4,774                      D. 1,000,001                      E. 5,005

7. What is the area of the shape below?



- A.  $108.14 \text{ cm}^2$                       B.  $110.06 \text{ cm}^2$                       C.  $109.32 \text{ cm}^2$                       D.  $112.04 \text{ cm}^2$                       E.  $50.6 \text{ cm}^2$

8. What is the prime factorization of the number 23,868?

- A.  $2^3 \cdot 3^2 \cdot 7 \cdot 19$                       B.  $2^2 \cdot 3^3 \cdot 221$                       C.  $2^3 \cdot 3^2 \cdot 5 \cdot 19$                       D.  $2^3 \cdot 3^2 \cdot 11 \cdot 19$                       E.  $2^2 \cdot 3^3 \cdot 13 \cdot 17$

9.  $6! + 5! + 4! =$  \_\_\_\_\_

- A. 848                      B. 840                      C. 864                      D. 892                      E. 876

10. What is the complement of an angle measuring  $23.7^\circ$ ?

- A.  $47.4^\circ$                       B.  $71.1^\circ$                       C.  $156.3^\circ$                       D.  $78.3^\circ$                       E.  $66.3^\circ$

11. 1 square yard = \_\_\_\_\_ square inches

- A. 144                      B. 1,296                      C. 5,280                      D. 1,760                      E. 1,728

12.  $(-6) + (-5) + (-4) + \dots + 11 + 12 + 13 =$  \_\_\_\_\_

- A. 112                      B. 106                      C. 70                      D. 36                      E. 108

13. Miles is buying a jacket that costs \$79.80, but sees the jacket is on sale for 30% off. What is the sale price of the jacket if tax is not included?

- A. \$65.76                      B. \$58.36                      C. \$55.86                      D. \$54.76                      E. \$54.26

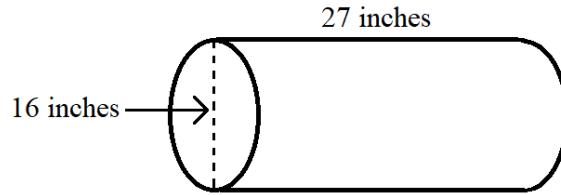
14. If seven tickets to a football game cost \$234.50, how much will two-dozen tickets cost?

- A. \$1,206.00                      B. \$965.00                      C. \$804.00                      D. \$828.00                      E. \$812.00

15. 45% of 240 = 60% of \_\_\_\_\_  
 A. 216                      B. 196                      C. 210                      D. 170                      E. 180

16. Simplify:  $\frac{3}{8}(108 - 44) + (-9 + 15)^2 - 4^2$   
 A. 56                      B. 28                      C. 12                      D. 44                      E. 52

17. If  $\pi = 3$ , what is the total surface area of the cylinder?



A. 1,480 in<sup>2</sup>                      B. 1,280 in<sup>2</sup>                      C. 1,840 in<sup>2</sup>                      D. 1,760 in<sup>2</sup>                      E. 1,680 in<sup>2</sup>

18. What is the sum of the next three terms in the sequence 9, 13, 14, 36, 63, 113, ...?  
 A. 1,313                      B. 1,297                      C. 1,339                      D. 1,281                      E. 1,321

19. A regular nonagon has how many more degrees for the interior angles than a regular pentagon?  
 A. 180°                      B. 360°                      C. 540°                      D. 720°                      E. 900°

20. If set  $A$  has 42 elements, set  $B$  has 39 elements, and  $A \cap B$  has 11 elements, how many elements are in  $A \cup B$ ?  
 A. 81                      B. 59                      C. 70                      D. 92                      E. 53

21.  $24,000 \cdot 2,500 =$  \_\_\_\_\_ (scientific notation)  
 A.  $6 \times 10^5$                       B.  $6 \times 10^6$                       C.  $6 \times 10^7$                       D.  $6 \times 10^8$                       E.  $6 \times 10^9$

22. 1,200,000 centigrams + 12,000 grams = \_\_\_\_\_ kilograms  
 A. 132                      B. 24                      C. 12.12                      D. 1,212                      E. 13.2

23. If sets  $M = \{1, 2, 3, 4, 5\}$ ,  $N = \{3, 4, 5, 6, 7\}$ , and  $P = \{2, 3, 5, 7, 11\}$ , then  $(M \cap N) \cup P$  is equivalent to which set?  
 A.  $\{3, 4, 5\}$                       B.  $\{1, 2, 3, 4, 5, 6, 7, 11\}$                       C.  $\{1\}$                       D.  $\{2, 3, 4, 5, 7, 11\}$                       E.  $\{3, 5\}$

24. What is the unit's digit of  $7^5$ ?  
 A. 7                      B. 1                      C. 3                      D. 9                      E. 0

25.  $LXXVI \times IX =$  \_\_\_\_\_ (Arabic number)  
 A. 684                      B. 548                      C. 724                      D. 676                      E. 648

26. Yohan has a coin and a standard deck of cards. What is the probability he tosses the coin, which lands on heads, and he picks a card from his deck drawing an ace or queen?  
 A.  $\frac{1}{13}$                       B.  $\frac{7}{26}$                       C.  $\frac{17}{26}$                       D.  $\frac{5}{9}$                       E.  $\frac{5}{13}$

27. Line  $A$  passes through the points  $(-\frac{1}{4}, \frac{3}{4})$  and  $(\frac{1}{2}, -\frac{3}{4})$ . What is the slope of any line perpendicular to line  $A$ ?  
 A.  $\frac{1}{2}$                       B.  $-2$                       C. 2                      D.  $-\frac{1}{2}$                       E.  $-1$

28.  $22_5 \times 43_6 =$  \_\_\_\_\_<sub>10</sub>  
 A. 946                      B. 446                      C. 428                      D. 324                      E. 362

29. The average of 8 numbers is 44, and the average of 10 numbers is 80. What is the average of all 18 numbers?  
 A. 62                      B. 66                      C. 58                      D. 60                      E. 64

30. The pages of a children's book are numbered consecutively, beginning with page 1. If 91 digits are used to number the pages, how many pages are in the children's book?

A. 48                      B. 52                      C. 50                      D. 100                      E. 45

31. 6 pegs will cover one square foot. If a floor mat measures 4 yards  $\times$  6 yards, how many pegs will it take to cover the floor mat.

A. 216 pegs                      B. 1,296 pegs                      C. 1,560 pegs                      D. 972 pegs                      E. 1,188 pegs

32. What are the odds of rolling a pair of dice and getting a sum of 7 or 9?

A. 5:13                      B. 1:4                      C. 5:18                      D. 1:8                      E. 3:15

33. A farmer has a llama population of 400. If the llama population is increasing at a rate of 5% each year, how many llama will the farmer have after two years?

A. 453                      B. 462                      C. 441                      D. 447                      E. 433

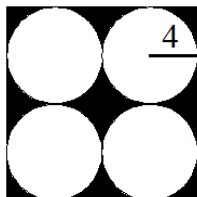
34. What is the value of  $C$  that will make the polynomial  $36x^2 - 156x + C$  a perfect square trinomial?

A. 312                      B. 324                      C. 196                      D. 169                      E. 289

35. There are 10 different pizza toppings offered at *Sliceless is Priceless*. Harriet only chooses 8 toppings for her pizza. In how many ways can Harriet choose 8 toppings at *Sliceless is Priceless*?

A. 1,814,400                      B. 72                      C. 90                      D. 45                      E. 80

36. The radius of one of the small circles is 4 units. In terms of  $\pi$ , what is the area of the shaded region?



A.  $(32 - 16\pi)$  units<sup>2</sup>    B.  $(256 - 64\pi)$  units<sup>2</sup>    C.  $(256 - 16\pi)$  units<sup>2</sup>    D.  $(32 + 64\pi)$  units<sup>2</sup>    E.  $(64 - 16\pi)$  units<sup>2</sup>

37. How many numbers less than 20 are relatively prime to 20?

A. 12                      B. 6                      C. 4                      D. 10                      E. 8

38. Four consecutive integers sum to 374. What is the value of five more than the smallest integer?

A. 97                      B. 94                      C. 99                      D. 96                      E. 98

39. Points  $A$ ,  $B$ ,  $C$  and  $D$  are collinear. The midpoint of  $\overline{AB}$  is point  $C$ , and the midpoint of  $\overline{CB}$  is point  $D$ . What are the coordinates of the midpoint of  $\overline{AD}$ , if the coordinates of point  $A$  are  $(18, 6)$  and the coordinates of point  $B$  are  $(-2, 14)$ ?

A.  $(5.5, 11)$                       B.  $(10.5, 11)$                       C.  $(5.5, 9)$                       D.  $(10.5, 9)$                       E.  $(4.5, 7)$

40. If  $f(x) = x^2 + 2$  and  $g(x) = x^3 - 3$ , what is the value of  $f(4) - g(3)$ ?

A. -18                      B. -6                      C. 42                      D. 24                      E. -2

41. The hypotenuse of a 45-45-90 right triangle measures 20 inches. What is the measure of one of the legs of the triangle?

- A.  $10\sqrt{3}$  inches      B.  $10\sqrt{2}$  inches      C. 10 inches      D.  $\frac{20\sqrt{3}}{3}$  inches      E.  $\frac{20\sqrt{2}}{3}$  inches

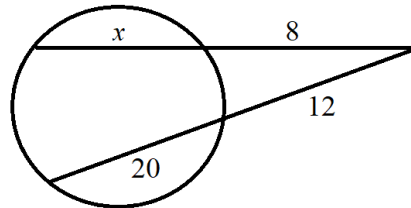
42. If the graph of the linear equation  $2x - 3y = 21$  is translated up fifteen units, what are the coordinates of the new  $y$ -intercept?

- A. (0, 36)      B. (0, 23)      C. (0, 8)      D. (0, 3)      E. (0, 6)

43.  $\left(\left(\frac{a^3b^{-2}c^5}{a^{-2}b^{-1}c^{-3}}\right)^{-3}\right)^2 = \underline{\hspace{2cm}}$

- A.  $\frac{b^6}{a^{30}c^{48}}$       B.  $a^{30}b^6c^{48}$       C.  $\frac{b^6}{a^{30}b^{12}}$       D.  $\frac{b^6}{a^{15}b^{24}}$       E.  $\frac{1}{a^{15}b^6c^{48}}$

44. Given the two secants intersecting as shown, what is the value of  $x$ ?



- A. 32      B. 36      C. 42      D. 38      E. 40

45. What is the sum of the coordinates of the vertex of the quadratic equation  $y = -2x^2 - 16x + 6$ ?

- A. 40      B. 24      C. 28      D. 34      E. 42

46. A boat traveled against the current 12 miles in 2 hours. The same boat traveled the same distance with the current in 1 hour. What was the rate of the current?

- A. 6 mi/hr      B. 3 mi/hr      C. 2 mi/hr      D. 4 mi/hr      E. 5 mi/hr

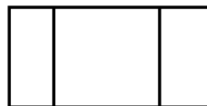
47. If  $\frac{\sqrt{75}}{4\sqrt{3}}$  simplifies to  $\frac{A}{B}$ , what is the value of  $2A - 3B$ ?

- A. -2      B. -6      C. -4      D. -8      E. -5

48. In right  $\triangle ABC$ ,  $m\angle B = 90^\circ$ ,  $AB = 22$ ,  $AC = 122$ , and  $BC = 120$ . What is the value of the trig ratio,  $\cos\angle C$ ?

- A.  $\frac{60}{11}$       B.  $\frac{61}{11}$       C.  $\frac{60}{61}$       D.  $\frac{11}{61}$       E.  $\frac{11}{60}$

49. Two  $11 \times 11$  squares overlap to form an  $11 \times 14$  rectangle, as shown below. What is the area of the region in which the two squares overlap?



- A. 121 units<sup>2</sup>      B. 110 units<sup>2</sup>      C. 88 units<sup>2</sup>      D. 77 units<sup>2</sup>      E. 66 units<sup>2</sup>

50. A line segment with endpoints  $A(-2, -3)$  and  $B(6, 9)$  is extended, through  $B$ , to point  $C$ . If  $BC = \frac{1}{4}AB$ , what are the coordinates of point  $C$ ?

- A. (10, 13)      B. (8, 12)      C. (9, 13)      D. (9, 12)      E. (8, 11)

2019 – 2020 TMSCA Middle School Mathematics Test #11 Answer Key

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

5. If  $x = \frac{3}{2}$ , then  $\frac{8}{3}x + 10x - \frac{2}{3}x = \frac{8}{3}\left(\frac{3}{2}\right) + 10\left(\frac{3}{2}\right) - \frac{2}{3}\left(\frac{3}{2}\right) = 4 + 15 - 1 = 18$ .

27. Line A passes through the points  $\left(-\frac{1}{4}, \frac{3}{4}\right)$  and  $\left(\frac{1}{2}, -\frac{3}{4}\right)$ . The slope formula, given two points, is  $\frac{y_2 - y_1}{x_2 - x_1}$ . So the slope of line A is  $\frac{\frac{3}{4} - \frac{3}{4}}{\frac{1}{2} - \left(-\frac{1}{4}\right)} = \frac{\frac{-6}{4}}{\frac{3}{4}} = \frac{-\frac{3}{2}}{\frac{3}{4}} = -\frac{3}{2} \div \frac{3}{4} = -2$ . The negative reciprocal slope of  $-\frac{2}{1}$  is  $\frac{1}{2}$ . Any line perpendicular to line A will have a slope of  $\frac{1}{2}$ .

29. If the average of 8 numbers is 44, then the sum is  $8 \times 44 = 352$  and if the average of 10 numbers is 80, then the sum is  $10 \times 80 = 800$ . The average of all 18 numbers is then  $\frac{8(44) + 10(80)}{18} = \frac{352 + 800}{18} = \frac{1,152}{18} = 64$ .

30. If the pages begin with page 1, then pages 1 – 9, inclusive, require 9 digits, so  $91 - 9 = 82$  digits remaining.  $82 \div 2 = 41$  pages that require 2 digits. Therefore, there are a total of  $9 + 41 = 50$  pages in the book.

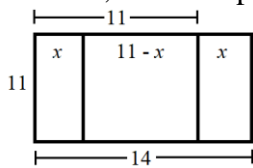
31.  $4 \text{ yards} \times 6 \text{ yards} = 12 \text{ feet} \times 18 \text{ feet} = 216 \text{ ft}^2$ . Since 6 pegs cover one square foot, it will take a total of  $216(6) = 1,296$  pegs to cover the floor mat.

32. If a pair of dice are rolled, there are 6 ways to get a sum of 7 and 4 ways to get a sum of 9, and  $6 + 4 = 10$ . Odds are *what you want: what you don't want*, so since there are total of 36 outcomes,  $10:26 = 5:13$ .

38. If four consecutive integers sum to 374, we can make the equation  $x + x + 1 + x + 2 + x + 3 = 374$ , where  $x$  is the smallest term. This simplifies to  $4x + 6 = 374$ . Subtract 6 from both sides and  $4x = 368$ . Divide both sides by 4 and  $x = 92$ . Five more than 92 is  $92 + 5 = 97$ .

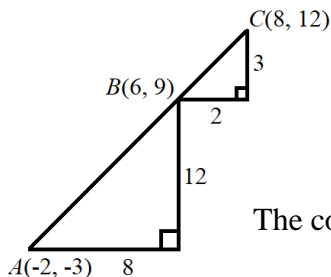
40. If  $f(x) = x^2 + 2$  and  $g(x) = x^3 - 3$ , then value of  $f(4) = 4^2 + 2 = 18$  and  $g(3) = 3^3 - 3 = 24$ . Therefore,  $f(4) - g(3) = 18 - 24 = -6$ .

49. First, label the picture as shown.



Since the length of the longer side of the rectangle is 14, we can make the equation  $x + 11 - x + x = 14$ . Simplify this to get  $x + 11 = 14$ . Subtract 11 from both sides to get  $x = 3$ . Substitute 3 into  $11 - x$ , to get  $11 - 3 = 8$ . The area of the region that overlaps is equal to  $8 \times 11 = 88 \text{ units}^2$ .

50. To find the coordinates of point C, use similar triangles, as shown below.



The coordinates of point C are  $\left(6 + \frac{1}{4}(8), 9 + \frac{1}{4}(12)\right) = (8, 12)$ .