



**TMSCA MIDDLE SCHOOL  
MATHEMATICS  
TEST #9 ©  
JANUARY 28, 2017**

**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.



2016 – 2017 TMSCA Middle School Mathematics Test #9

1. Which expressions below all have the same value?

- I.  $422 + 360$       II.  $34 \cdot 23$       III.  $782^0$       IV.  $\frac{1,564}{2}$   
 A. I, II and III      B. I, II, III and IV      C. II and III      D. III only      E. I, II and IV

2. What would Rachel get if she rounded 123.76 to the nearest tenth and then divided that value by 4?

- A. 31      B. 30      C. 30.95      D. 30.94      E. 31.24

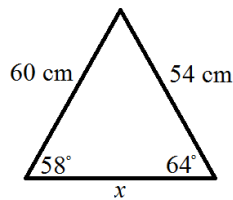
3. Find the value if six is subtracted from the product of 5.6 and -8.9.

- A. -43.84      B. -53.84      C. -61.84      D. -46.84      E. -55.84

4. Becky, Roman and Linda went to a resale shop, where no one pays tax. Becky found an old cabinet for \$21.78, Roman found a printer for \$18.64 and Linda found a sign for \$7.24. They all combined their findings for one bill. Linda only had \$4.22 to contribute and Becky and Roman will split the remaining portion. How much will Becky have to pay?

- A. \$23.82      B. \$19.46      C. \$20.78      D. \$21.72      E. \$22.14

5. Using the picture below, find the measure of  $x$ .



- A. 60 cm      B. 64 cm      C. 58 cm      D. 54 cm      E. 52 cm

6. You have seven coins consisting of quarters, dimes, nickels and pennies that have a total value of \$0.77. If you have at least one of each coin, how many nickels do you have?

- A. 1      B. 2      C. 3      D. 4      E. 5

7. If  $m \bowtie n = (2m - n)^2 + mn$ , then find the value of  $\left(-1 \bowtie \left(-\frac{1}{2} \bowtie 2\right)\right)$ .

- A. 9      B. 25      C. 121      D. 144      E. 64

8. Let  $A$  equal the number of diagonals that can be drawn from one vertex of a regular nonagon and let  $B$  equal the number of total diagonals of a regular heptagon. Find the value of  $B - A$ .

- A. 8      B. 7      C. 10      D. 6      E. 14

9. One package of bacon contains sixteen slices. For a banquet, Chelsea bought a dozen packages of bacon, but only cooked  $\frac{3}{4}$  of each package. How many slices of bacon did Chelsea not cook?

- A. 36      B. 48      C. 54      D. 144      E. 90

10. If  $a = 1, b = 2, c = 3, \dots, z = 26$ , what is the sum of the letters of the word *quotient*?

- A. 133      B. 131      C. 126      D. 121      E. 117

11. The president of Latin Club holds his position three years. What is the maximum number of presidents the Latin Club could have had during a twenty-year period?

- A. 5      B. 9      C. 6      D. 7      E. 8

12. If you roll a pair of dice, what is the probability that the product of the faces landing up is a multiple of 4?

- A.  $\frac{1}{3}$       B.  $\frac{7}{12}$       C.  $\frac{13}{36}$       D.  $\frac{1}{2}$       E.  $\frac{23}{36}$

13. If  $A = \{3, 6, 9, 12, 15, 18\}$  and  $B = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20\}$ , then what is the sum of the elements of  $A \cap B$ ?

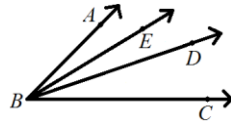
- A. 137      B. 63      C. 110      D. 102      E. 36

14. What is the product of the next two terms in the sequence? 0, 3, 4, 7, 11, 18, ...

- A. 1,269      B. 1,363      C. 1,486      D. 846      E. 76

15. Jose is buying a new shirt that costs \$24.00. In total, how much will Jose pay if there is an 8.5% sales tax?  
A. \$24.64                      B. \$25.84                      C. \$26.04                      D. \$26.24                      E. \$25.94
16. A total of 1,472 ounces of dog food must be packed in 4-pound bags. How many 4-pound bags of dog food will be packed?  
A. 64                              B. 31                              C. 19                              D. 23                              E. 25
17. If  $A = 354 + 287$  and  $B = 1,014 - 759$ , then  $A + B =$  \_\_\_\_\_ (Roman numeral)  
A. DCCCXCVI                      B. DCCCLXXXVI                      C. CCMXCVI                      D. MCCXCVI                      E. DCCCVI
18. Four-fifths of 12,000,000,000 = \_\_\_\_\_ (scientific notation)  
A.  $9.6 \times 10^{10}$                       B.  $1.2 \times 10^{10}$                       C.  $9.6 \times 10^9$                       D.  $2.4 \times 10^9$                       E.  $4.8 \times 10^9$
19. Assuming  $\pi = 3$ , calculate the lateral surface area of a cylinder with a diameter of 34 cm and a height of 2 m.  
A. 20,400 cm<sup>2</sup>                      B. 40,800 cm<sup>2</sup>                      C. 4,080 cm<sup>2</sup>                      D. 22,134 cm<sup>2</sup>                      E. 11,067 cm<sup>2</sup>
20. Avery placed her doll standing next to her on the sidewalk. If Avery is five feet tall and casts a 3 feet long shadow, how long of a shadow will her doll cast if her doll is eight inches tall?  
A. 3.2 inches                      B. 3.6 inches                      C. 4.4 inches                      D. 4.6 inches                      E. 4.8 inches
21. Quadrilateral  $ABCD$  has its vertices located at  $A(-2, 4)$ ,  $B(2, 6)$ ,  $C(4, -2)$  and  $D(-6, -2)$  and is dilated with the origin as the center of dilation by a scale factor of 3.5 to create  $A'B'C'D'$ . What are the coordinates of  $D'$ ?  
A. (-21, 7)                      B. (7, 21)                      C. (14, -7)                      D. (-21, -7)                      E. (-7, 14)
22. Alan measured a picture to be 3 inches by 4 inches. The actual dimensions of the picture are 3 inches by 4.5 inches. What is the percent of increase for the area Alan calculated to the actual area of the picture?  
A. 2.5%                              B. 0.5%                              C. 5%                              D. 10.5%                              E. 12.5%
23. What is the quadratic equation in standard form that has roots of -16 and 7?  
A.  $y = x^2 + 9x - 112$                       B.  $y = x^2 - 9x - 112$                       C.  $y = x^2 - 9x + 112$                       D.  $y = x^2 + 9x + 112$                       E.  $y = x^2 - 16x + 7$
24. Four students from a group of twelve will be selected to represent their school on the *Good Morning News*. How many groups of four students are possible?  
A. 495                              B. 11,880                              C. 180                              D. 8                              E. 375
25. On a New York City subway route, station  $C$  is located at the midpoint between stations  $A$  and  $B$ . Station  $D$  is located at the midpoint between stations  $A$  and  $C$ . If the distance between stations  $A$  and  $B$  is 9.6 miles, what is the distance between stations  $D$  and  $B$ ?  
A. 9.4 miles                      B. 12.2 miles                      C. 7.2 miles                      D. 9.6 miles                      E. 6.8 miles
26. Albert gets a paycheck every two weeks. His paycheck is calculated by getting paid \$280 per week plus 5% commission on all his electronic sales for that week. If Albert sold \$3,000 worth of electronic sales in week one and \$2,400 worth of electronic sales in week two, how much will be on Albert's paycheck before taxes are taken out?  
A. \$1,780                              B. \$1,378                              C. \$550                              D. \$830                              E. \$1,100
27.  $170_8 \div 1000_2 =$  \_\_\_\_\_  
A. 15                              B. 21                              C. 33                              D. 120                              E. 111
28. Given the function  $f(x)$ , which of the following functions,  $g(x)$  is a translation of  $f(x)$  eleven units left and six units up?  
A.  $g(x) = f(x - 11) + 6$                       B.  $g(x) = f(x) + 17$                       C.  $g(x) = 11f(x) + 6$                       D.  $g(x) = f(11x) + 6$                       E.  $g(x) = f(x + 11) + 6$
29. The third term of an arithmetic sequence is 10 and the fifth term is 28. What is the value of the thirty-first term?  
A. 247                              B. 262                              C. 309                              D. 280                              E. 298

30. Using the picture below,  $\overline{BD}$  bisects  $\angle ABC$  and  $\overline{BE}$  bisects  $\angle ABD$ . What is the measure of the complement of  $\angle ABC$ , if  $m\angle EBD = 17^\circ$ ?



- A.  $73^\circ$                       B.  $56^\circ$                       C.  $34^\circ$                       D.  $68^\circ$                       E.  $22^\circ$

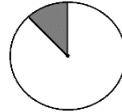
31. Marcy scored an 84, 78 and 92 on her first three tests. Laura scored a 90, 86 and 80 on her first three tests. If Laura scores a 96 on her fourth test, what must Marcy score on her fourth test to have the same test average as Laura?

- A. 96                      B. 97                      C. 98                      D. 99                      E. 100

32. If  $f(x) = \frac{x-4}{x+12}$  and  $g(x) = x^2 - 7x - 3$ , then find the value of  $f(-16) - g(6)$ .

- A. 5                      B. -9                      C. -4                      D. -70                      E. 14

33. The shaded sector of the circle below has a central angle of  $45^\circ$  and a radius of 16 cm. What is the area of the non-shaded region of the circle?



- A.  $256\pi \text{ cm}^2$                       B.  $224\pi \text{ cm}^2$                       C.  $28\pi \text{ cm}^2$                       D.  $126\pi \text{ cm}^2$                       E.  $296\pi \text{ cm}^2$

34. Which of the following represents the solution to the inequality?  $4y - (6y + 1) \leq 4y + 4y + 2(y - 3)$

- A.  $[-\infty, \frac{5}{12}]$                       B.  $[-\infty, -\frac{5}{12}]$                       C.  $[\frac{5}{12}, \infty]$                       D.  $[-\frac{5}{12}, \infty]$                       E.  $[-\frac{5}{12}, -\infty]$

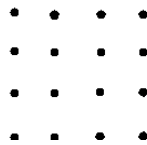
35. *iGames 2.0* has five senior tech workers and four junior tech workers. The president of *iGames 2.0* will select two tech workers to attend a tech convention. What is the probability that the president chooses two senior tech workers?

- A.  $\frac{1}{3}$                       B.  $\frac{5}{18}$                       C.  $\frac{5}{9}$                       D.  $\frac{1}{3}$                       E.  $\frac{2}{3}$

36. If  $\frac{5}{7}x + 0.\bar{3} = 0.4 - \frac{2}{7}x + \frac{2}{5}$ , then find the value of the reciprocal of  $x$ .

- A.  $\frac{3}{2}$                       B.  $\frac{3}{7}$                       C.  $\frac{15}{2}$                       D.  $\frac{21}{5}$                       E.  $\frac{15}{7}$

37. In the grid below, there are 16 evenly spaced dots., one unit apart. Using only dots as vertices, how many squares can be drawn with a side length of  $\sqrt{2}$  units?



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

38.  $\odot P$  has a diameter of 10 units. A chord is drawn in the circle that is perpendicular to the diameter and divides the diameter into segments of 4 units and 6 units. In simplest radical form, what is the length of the chord?

- A.  $16\sqrt{2}$  units                      B.  $16\sqrt{6}$  units                      C.  $4\sqrt{2}$  units                      D.  $6\sqrt{2}$  units                      E.  $4\sqrt{6}$  units

39. If  $\frac{1}{m} + \frac{1}{3m} + \frac{1}{5m} = n$ , then what is the value of  $mn$ ?

- A.  $\frac{23}{15}$                       B.  $\frac{5}{3}$                       C.  $\frac{14}{9}$                       D.  $\frac{16}{9}$                       E.  $\frac{9}{5}$

40. Simplify:  $(a^3b^4)^2(2a^4b^7)^3$

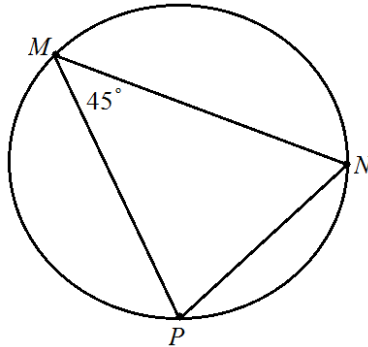
- A.  $6a^{12}b^{16}$                       B.  $6a^{18}b^{29}$                       C.  $8a^{12}b^{16}$                       D.  $8a^{13}b^{18}$                       E.  $8a^{18}b^{29}$

41. The angle measures of a quadrilateral are in a ratio of 9:11:25:27. What is the measure of the largest of these angles?  
 A.  $125^\circ$                       B.  $215^\circ$                       C.  $155^\circ$                       D.  $115^\circ$                       E.  $135^\circ$

42. You are given that  $a + 4b + 2c = 12$ ,  $2a + 2b + c = 7$  and  $4a + b + 4c = 16$ . What is the value of  $a + b + c$ ?  
 A. 8                                  B. 6                                  C. 7                                  D. 5                                  E. 9

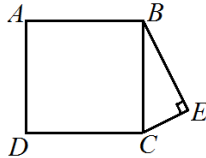
43. If  $x^2 + \frac{1}{x^2} = 8$ , then what is the value of  $x^4 + \frac{1}{x^4}$ ?  
 A. 254                                B. 4,096                            C. 30                                D. 62                                E. 128

44. In the picture below,  $M$ ,  $N$  and  $P$  are points on the circumference of the circle of diameter 24 cm and  $m\angle PMN = 45^\circ$ . Find the length of chord  $PN$ .



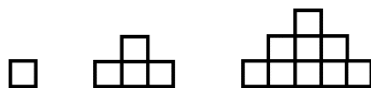
A. 12 cm                              B.  $12\sqrt{2}$  cm                      C.  $12\sqrt{3}$  cm                      D.  $24\sqrt{2}$  cm                      E. 24 cm

45. Find the area of the square below if  $BE = 12$  cm and  $m\angle CBE = 30^\circ$ ?



A.  $32\sqrt{3} \text{ cm}^2$                       B.  $64\sqrt{3} \text{ cm}^2$                       C.  $48\sqrt{3} \text{ cm}^2$                       D.  $192 \text{ cm}^2$                       E.  $48 \text{ cm}^2$

46. The first three stages of a sequence of 1 inch by 1 inch squares are shown below. What is the perimeter of the sixth stage in the sequence?



A. 42 in                              B. 36 in                              C. 40 in                              D. 28 in                              E. 34 in

47. Which of the following shows the correct roots of the equation  $2x^2 + 5x = 1$ ?

A.  $x = \frac{-5 \pm \sqrt{17}}{4}$                       B. no solution                      C.  $x = \frac{-5 \pm \sqrt{33}}{4}$                       D.  $x = \frac{-5 \pm \sqrt{17}}{2}$                       E.  $x = \frac{-5 \pm \sqrt{33}}{2}$

48. Find the expression of  $M$ , if  $\frac{M}{x^2+3x-28} = \frac{1}{x+7}$ .

A.  $x - 3$                               B.  $x + 3$                               C.  $x^2 + 4x - 35$                       D.  $x - 4$                               E.  $x^2 + 2x - 35$

49. Calculate the sum of the coordinates of the center of the circle with an equation of  $x^2 + y^2 - 12x + 8y = 12$ .

A. 8                                      B. 10                                      C. -4                                      D. 2                                      E. -10

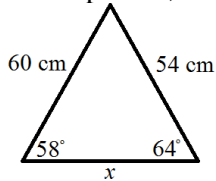
50. Student tickets for a school fundraiser cost \$4.50 and adult tickets cost \$6.25. On Friday night, 200 people attended the fundraiser with a ticket total value of \$1,110. On Saturday night, 235 people attended the fundraiser with a ticket total value of \$1,285. How many more students attended the fundraiser on Saturday night than Friday night?

A. 22                                      B. 25                                      C. 30                                      D. 10                                      E. 18

2016 – 2017 TMSCA Middle School Mathematics Test #9 Answer Key

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

5. In the picture,



we can find the missing angle to be  $180 - 58 - 64 = 58^\circ$ . Since it is the same measure as the side across from the other  $58^\circ$  angle, it must also be 54 cm.

22. Alan's area of the picture is  $12 \text{ in}^2$ . The actual area is  $3(4.5) = 13.5 \text{ in}^2$ . To calculate the percent of increase, we use  $\frac{\text{change in amount}}{\text{original amount}} \cdot 100$ , so  $\frac{13.5-12}{12} = 0.125$  and  $0.125 \cdot 100 = 12.5\%$ .

24. We want to know how many combinations of 4 are possible from 12.  ${}_{12}C_4 = \frac{12!}{4!(8!)} = 495$ .

26. For the two weeks, Alberts's paycheck will be  $280 + 280 + (0.05)(3000) + (0.05)(2400) = \$830$ .

29. An arithmetic sequence adds a common difference between successive terms. It is given the 3<sup>rd</sup> term is 10 and the 5<sup>th</sup> term is 28. Therefore,  $28 - 10 = 18$ , which means our common difference is 9. The fourth term is then 19 and we subtract from 9 from 10 and get 1 and so on until we see our sequences starts at -8. We have, -8, 1, 10, 19, 28, ... to find the  $n^{\text{th}}$  term of an arithmetic sequence, use the formula  $a_n = a_1 + (n - 1)d$ , where  $n$  is the term position and  $d$  is the common difference. So, substituting into our equation gives us  $-8 + (30)(9) = 262$ .

39. If we have  $\frac{1}{m} + \frac{1}{3m} + \frac{1}{5m} = n$ , then our common denominator is  $15m$ .  $\frac{1}{m} = \frac{15}{15m}$ ,  $\frac{1}{3m} = \frac{5}{15m}$ , and finally  $\frac{1}{5m} = \frac{3}{15m}$ .  $\frac{15}{15m} + \frac{5}{15m} + \frac{3}{15m} = \frac{23}{15m}$ . Now we have  $\frac{23}{15m} = n$ . Multiply each side by  $m$  and our solution is now  $mn = \frac{23}{15}$ .

40.  $(a^3b^4)^2(2a^4b^7)^3 = a^{3 \cdot 2}b^{4 \cdot 2} \cdot 2^3a^{4 \cdot 3}b^{7 \cdot 3} = 8a^{6+12}b^{8+21} = 8a^{18}b^{29}$ .

41. Let  $x$  be our constant and we know there are  $360^\circ$  in a quadrilateral. We can set up our equation as such,  $9x + 11x + 25x + 27x = 360$ . Simplify to get  $72x = 360$ . Divide by 72 to both sides and  $x = 5$ . The largest angle is then  $27(5) = 135^\circ$ .

42. We are given  $a + 4b + 2c = 12$ ,  $2a + 2b + c = 7$  and  $4a + b + 4c = 16$ . First, add all three equations together.

$$\begin{array}{r} a + 4b + 2c = 12 \\ + (2a + 2b + c = 7) \\ + (4a + b + 4c = 16) \\ \hline 7a + 7b + 7c = 35 \end{array}$$

Now, divide every term and both sides by 7 and we get  $a + b + c = 5$ .