



# TMSCA MIDDLE SCHOOL MATHEMATICS GEAR-UP TEST © 2018-2019

## 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]

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1.  $65 + (-119) + 271 = \underline{\hspace{2cm}}$

- A. 217                      B. -54                      C. 325                      D. 455                      E. -87

2.  $-189 - 76 - (-102) = \underline{\hspace{2cm}}$

- A. -367                      B. -163                      C. -215                      D. 367                      E. -11

3.  $154 \times 277 = \underline{\hspace{2cm}}$  (nearest ten)

- A. 42,650                      B. 41,580                      C. 42,660                      D. 43,120                      E. 42,000

4.  $23\frac{1}{4} \div 2.2 = \underline{\hspace{2cm}}$  (nearest tenth)

- A. 9.6                      B. 10.5                      C. 9.7                      D. 10.6                      E. 10.7

5. Simplify:  $(100 - 8^2) \div (2(3^2 + 5^2 + 2^1))$

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

6.  $\angle N$  is the complement of  $\angle M$ .  $\angle M$  is a linear pair with an angle measuring  $117^\circ$ .  $m\angle N = \underline{\hspace{1cm}}^\circ$ .

- A. 63                      B. 53                      C. 37                      D. 33                      E. 27

7. What is the sum of the median and mode of the stem and leaf plot?

1	4	
2	2 5 8	
3	7 7 7 9	
4	1 3	

key:  $3|7 = 37$

- A. 74                      B. 76                      C. 66                      D. 43                      E. 68

8. What is the sum of the reciprocals of  $\frac{3}{4}$  and  $\frac{2}{3}$ ?

- A.  $2\frac{5}{6}$                       B.  $\frac{12}{17}$                       C.  $1\frac{5}{12}$                       D.  $2\frac{5}{12}$                       E.  $1\frac{7}{12}$

9. What is the GCF of the numbers 320 and 600?

- A. 60                      B. 40                      C. 80                      D. 120                      E. 20

10. The sum of two numbers is 54. One of the numbers is 28. What is the product of the two numbers?

- A. 1,404                      B. 972                      C. 728                      D. 624                      E. 756

11. Olivia's bag of candy contained one gross pieces. How many pieces of candy were in Olivia's bag?

- A. 13 pieces                      B. 156 pieces                      C. 64 pieces                      D. 144 pieces                      E. 128 pieces

12.  $\frac{9}{16} = \underline{\hspace{2cm}}\%$

- A. 58.75                      B. 57.25                      C. 56.25                      D. 54.75                      E. 55.5

13. What is the perimeter of a rectangle with a length of  $5n - 2$  cm and a width of  $3n + 7$  cm?

- A.  $16n + 10$  cm                      B.  $8n + 5$  cm                      C.  $15n^2 + 29n - 14$  cm                      D.  $15n^2 - 14$  cm                      E.  $16n + 5$  cm

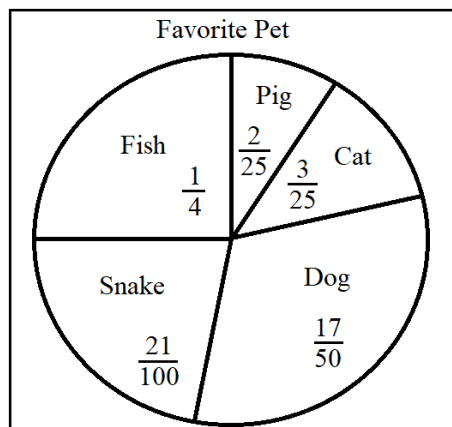
14. Find the value of  $8n - 3$ , if  $\frac{n}{3} - 4 = 11$ .

- A. 349                      B. 357                      C. 293                      D. 181                      E. 23

15. What is  $0.8\overline{4}$  expressed as a fraction?

- A.  $\frac{38}{45}$                       B.  $\frac{49}{99}$                       C.  $\frac{43}{90}$                       D.  $\frac{37}{45}$                       E.  $\frac{4}{5}$

16. 300 students were asked what was their favorite pet. The results are shown in the graph below. How many students chose a pig as their favorite pet?



- A. 36                      B. 32                      C. 28                      D. 26                      E. 24

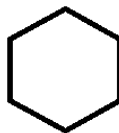
17.  $1\frac{2}{3} \neq$  \_\_\_\_\_

- A. 1.67                      B.  $\frac{5}{3}$                       C.  $1.\bar{6}$                       D.  $166\frac{2}{3}\%$                       E.  $1\frac{14}{21}$

18. Solve:  $4n - 9 \leq -57$

- A.  $n \geq -16.5$                       B.  $n \leq -16.5$                       C.  $n \leq 12$                       D.  $n \geq 12$                       E.  $n \leq -12$

19. How many total diagonals can be drawn in the shape below?



- A. 9                      B. 18                      C. 3                      D. 6                      E. 12

20. What value is 50% more than twice the sum of 36 and 82?

- A. 236                      B. 472                      C. 424                      D. 531                      E. 354

21. If seven balls cost \$100.45, how much will nine balls cost?

- A. \$118.25                      B. \$133.69                      C. \$133.45                      D. \$127.45                      E. \$129.15

22. 432 square inches = \_\_\_\_\_ square feet

- A. 4                      B. 3                      C. 36                      D. 48                      E. 12

23. Find  $A \cap B$ , if  $A = \{5, 10, 15, 20, 25, 30\}$  and  $B = \{10, 20, 30, 40, 50\}$ .

- A.  $\{5, 15, 25\}$                       B.  $\{5, 10, 15, 20, 25, 30, 40, 50\}$                       C.  $\{\emptyset\}$                       D.  $\{3\}$                       E.  $\{10, 20, 30\}$

24. If 2 apples = 7 bananas and 4 bananas = 11 peaches, how many peaches are equal to 8 apples?

- A. 28                      B. 56                      C. 77                      D. 152                      E. 112

25. What is the 12<sup>th</sup> term of the sequence? 14, 22, 30, 38, ...

- A. 106                      B. 94                      C. 110                      D. 96                      E. 102

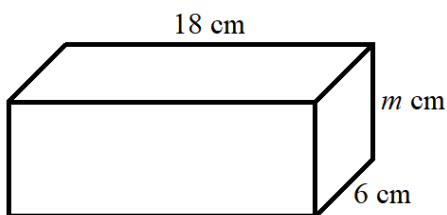
26. What is the sum of all the positive integral divisors of the number 36?

- A. 97                      B. 91                      C. 61                      D. 55                      E. 96

27. What is the value of  $B$ , if  $A + B + C = 70$ ,  $A + B = 27$  and  $B + C = 51$ ?

- A. 8                      B. 19                      C. 24                      D. 12                      E. 6

28. The surface area of the rectangular prism below is  $552 \text{ cm}^2$ . What is the value of  $m$ ?



- A. 9 cm                      B. 7 cm                      C. 10 cm                      D. 8 cm                      E. 6 cm

29. Point  $C$  is the midpoint of  $\overline{AB}$  and has coordinates  $(47, 14)$ . If point  $A$  has coordinates  $(38, -16)$ , what are the coordinates of point  $B$ ?

- A.  $(9, 30)$                       B.  $(56, 44)$                       C.  $(4.5, -1)$                       D.  $(85, -2)$                       E.  $(42, -30)$

30.  $23_{10} + 119_{10} = \underline{\hspace{2cm}}$  (base 7)

- A. 262                      B. 242                      C. 142                      D. 324                      E. 254

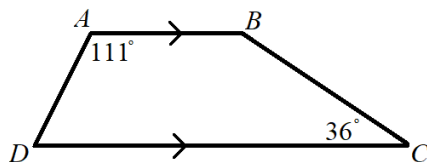
31. What is the slope of a line that passes through the points  $(114, -29)$  and  $(26, 235)$ ?

- A.  $-\frac{103}{44}$                       B.  $\frac{103}{44}$                       C.  $-3$                       D. 6                      E.  $-\frac{13}{19}$

32. What is the growth rate of the exponential growth function  $y = 6.2 \left(\frac{9}{2}\right)^x$ ?

- A. 4.5%                      B. 450%                      C. 620%                      D. 400%                      E. 350%

33.  $ABCD$  is a trapezoid. Find  $m\angle B$ .



- A.  $69^\circ$                       B.  $147^\circ$                       C.  $138^\circ$                       D.  $144^\circ$                       E.  $153^\circ$

34. What is the inter-quartile range of the set of data 78, 50, 54, 66, 72, 34, 44, 49, 52 and 37?

- A. 30                      B. 22                      C. 25                      D. 44                      E. 51

35. Caleb's playlist on his smart phone has 7 songs on it. In how many different orders can the songs be played?

- A. 1,260                      B. 1,760                      C. 7,560                      D. 28                      E. 5,040

36. What is the percent decrease if 64 ounces of orange juice is reduced to 40 ounces of orange juice?

- A. 35.5%                      B. 37.5%                      C. 42.5%                      D. 67.5%                      E. 82.5%

37.  $\sqrt{384} - \sqrt{54} = \underline{\hspace{2cm}}$

- A.  $3\sqrt{6}$                       B.  $8\sqrt{6}$                       C.  $5\sqrt{6}$                       D.  $27\sqrt{6}$                       E.  $27\sqrt{3}$

38. What is the equation of the circle with its center having coordinates  $(-8, 7)$  and is tangent to the line  $x = -1$ ?

- A.  $(x + 8)^2 + (y - 7)^2 = 49$                       B.  $(x + 8)^2 + (y - 7)^2 = 64$                       C.  $(x + 8)^2 + (y - 7)^2 = 100$   
D.  $(x + 8)^2 + (y - 7)^2 = 36$                       E.  $(x + 8)^2 + (y - 7)^2 = 81$

39. Which equation below is the equation of a line parallel to the y-axis that passes through the point (39, 24)?  
 A.  $y = 39$                       B.  $y = 24$                       C.  $x = 39$                       D.  $x = 24$                       E.  $y = -24$

40. If  $m + 3n = 57$  and  $n - 2m = -9$ , what is the value of  $2n + 5m$ ?  
 A. 60                      B. 99                      C. 120                      D. 150                      E. 90

41. The solutions to the equation  $x + \frac{1}{x} = 4 + \frac{1}{4}$  are  $a$  and  $b$ . What is the value of  $5ab$ ?  
 A. 10                      B. 20                      C.  $21\frac{1}{4}$                       D. 5                      E.  $9\frac{1}{4}$

42.  $\log_9 5 - \log_9 4$  is equivalent to which of the following?  
 A.  $\log_9 \left(\frac{5}{4}\right)$                       B.  $\log_9 1$                       C.  $\log_9 (5 \cdot 4)$                       D.  $\frac{\log_9 5}{\log_9 4}$                       E.  $\log_9 \left(\frac{1}{9}\right)$

43. Simplify:  $\left(\frac{81m^4n^3}{9mn^5}\right)^{-2}$   
 A.  $\frac{n^4}{81m^6}$                       B.  $\frac{18m^4}{n^4}$                       C.  $\frac{n^4}{18m^4}$                       D.  $\frac{n^4}{81m^4}$                       E.  $\frac{18m^6}{n^8}$

44. What is the area of quadrilateral  $ABCD$ , if  $A$  has coordinates  $(-1, -1)$ ,  $B$  has coordinates  $(0, 2)$ ,  $C$  has coordinates  $(5, 3)$  and  $D$  has coordinates  $(3, -2)$ ?  
 A. 18 units<sup>2</sup>                      B. 17.5 units<sup>2</sup>                      C. 17 units<sup>2</sup>                      D. 24 units<sup>2</sup>                      E. 20.5 units<sup>2</sup>

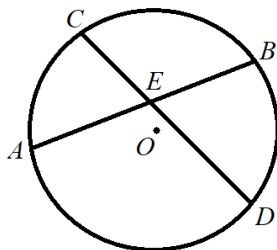
45. The 4<sup>th</sup> term of a sequence is 1, the 5th term of the sequence is 11, and the 7<sup>th</sup> term of the sequence is 27. Every term after the 3<sup>rd</sup> term is the sum of the three preceding terms. What is the value of the 12<sup>th</sup> term of this sequence?  
 A. 323                      B. 537                      C. 5,479                      D. 593                      E. 881

46. What is the greatest possible difference of the coordinates of the solution to the system of equations  $\begin{cases} 2x - 3y = 2 \\ 4x + 2y = -28 \end{cases}$ ?  
 A. 2                      B. 1                      C. 9                      D. 20                      E. 4

47. A parabola with an equation of  $y = 2x^2 + 12x - 7$  is translated eighteen units up and seven units to the left. What are the new coordinates of the parabola's vertex?  
 A.  $(-10, -7)$                       B.  $(-3, -25)$                       C.  $(15, -18)$                       D.  $(-21, -32)$                       E.  $(-12, -4)$

48. Solve for  $x$ :  $\frac{|x-9|}{8} + 5 = 8$   
 A. no solution                      B.  $\{-33, 68\}$                       C.  $\{-15, 33\}$                       D.  $\{60\}$                       E.  $\{113\}$

49. In the picture below,  $CE = 4$ ,  $CD = 17$ , and  $AE = 6.5$ . What is  $EB$ ?



A. 10.5                      B.  $10\frac{6}{13}$                       C. 11                      D. 7.5                      E. 8

50. If  $g(x) = 2x^2 - 3x$ , then find  $g(a + 5)$ .  
 A.  $2a^2 + 17a + 65$                       B.  $2a^2 + 17a + 5$                       C.  $2a^2 + 17a + 35$                       D.  $2a^2 + 7a + 65$                       E.  $2a^2 + 2a - 15$

2018 – 2019 TMSCA Middle School Mathematics Gear-Up Answer Key

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

15. Let  $A = 0.8\bar{4}$ . If  $A = 0.8\bar{4}$ , then  $10A = 8.\bar{4}$  and  $100A = 84.\bar{4}$ .  $100A - 10A = 90A$  and  $84.\bar{4} - 8.\bar{4} = 76$ . We now have  $90A = 76$ . Dividing by 90 on both sides and  $A = \frac{76}{90} = \frac{38}{45}$ . Therefore,  $0.8\bar{4} = \frac{38}{45}$ .

22. Since 144 square inches = 1 square foot,  $432 \div 144 = 3$  square feet.

25. To find the  $n^{\text{th}}$  term of an arithmetic sequence, use  $a_n = a_1 + (n - 1)(d)$ , where  $a_1$  is the first term,  $n$  is the term position and  $d$  is the common difference. We are given the sequence 14, 22, 30, 38, ..., so  $a_1 = 14$ ,  $n = 12$  and  $d = 8$ . Substituting and we get  $a_{12} = a_1 + (n - 1)(d) = 14 + (12 - 1)(8) = 14 + 88 = 102$ .

27. We are given  $A + B + C = 70$ ,  $A + B = 27$  and  $B + C = 51$ . Since  $A + B = 27$ , substitute this into the first equation and now we have  $27 + C = 70$ . Subtract 27 from 70 and  $C = 43$ . Since  $C = 43$ , substitute into the last equation and  $B + 43 = 51$ . Subtract 43 from both sides and  $B = 8$ .

34. First, arrange the numbers 78, 50, 54, 66, 72, 34, 44, 49, 52 and 37 from least to greatest. We now have 34, 37, 44, 49, 50, 52, 54, 66, 72 and 78. The median is then the average of 50 and 52, which is 51. The upper quartile is then the median of the upper half of the data, which is 66 and the lower quartile is the median of the lower half, which is 44. The inter-quartile range is then  $66 - 44 = 22$ .

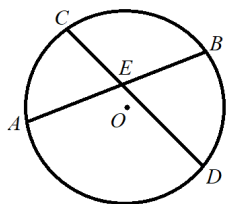
35. To find how many different orders the songs be played, use  $7!$ .  $7! = 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 5,040$  ways.

36. To find percent of change, use  $\frac{\text{change in amount}}{\text{original amount}} \times 100$ . Using our information, our percent of decrease is  $\frac{64-40}{64} = \frac{3}{8} = 0.375 \times 100 = 37.5\%$ .

41. Distribute the equation by the common denominator,  $4x$ .  $4x \left( x + \frac{1}{x} = 4 + \frac{1}{4} \right)$ .  $4x^2 + 4 = 16x + x$  and moving everything to the left side to get  $4x^2 - 17x + 4 = 0$ . Factor  $4x^2 - 17x + 4$  to get  $(x - 4)(4x - 1)$ . We now have  $(x - 4)(4x - 1) = 0$ ,  $x - 4 = 0$  and  $4x - 1 = 0$  and  $x = \left\{ 4, \frac{1}{4} \right\}$ . So,  $a = 4$  and  $b = \frac{1}{4}$  and then  $5ab = 5(4) \left( \frac{1}{4} \right) = 5$ .

47. A quadratic equation in standard form is  $y = Ax^2 + Bx + C$ . To find the coordinates of the vertex of a parabola, use  $\left( \frac{-B}{2A}, f \left( \frac{-B}{2A} \right) \right)$ . We are given the parabola with equation  $y = 2x^2 + 12x - 7$ , so  $A = 2$  and  $B = 12$ . Substituting, and the  $x$ -coordinate is  $\frac{-B}{2A} = \frac{-12}{2(2)} = \frac{-12}{4} = -3$ . Substituting  $-3$  into the equation for  $x$  and solving for  $y$ ,  $y = 2(-3)^2 + 12(-3) - 7 = -25$ . The vertex has coordinates  $(-3, -25)$ . After the translation, the new coordinates of the parabola are  $(-3, -25) \rightarrow (x - 7, y + 18) \rightarrow (-10, -7)$ .

49. If two chords in a circle intersect, then the products of the lengths of the segments of the chords are equal.



From our picture,  $AE \cdot EB = CE \cdot ED$ . We are given  $AE = 6.5$ ,  $CE = 4$  and  $CD = 17$ , so  $ED = 17 - 4 = 13$ . Now, since  $AE \cdot EB = CE \cdot ED$ , let  $EB = x$  and then  $6.5x = 4(13) = 52$ . We have the equation  $6.5x = 52$ . Divide both sides by 6.5 and  $x = 8$ . Therefore,  $EB = 8$ .