T M S C A   M I D D L E   S C H O O L
M A T H E M A T I C S
# W I G G S   I N V   T E S T ©
2 0 1 9

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.

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

1. $78 + 119 =$ _____
A. 187   B. −41   C. 191   D. 206   E. 197

2. $301 - 54 =$ _____
A. 247   B. 257   C. 355   D. −237   E. 147

3. $46 \times 38 =$ _____
A. 1,628   B. 1,748   C. 1,638   D. 1,678   E. 1,728

4. $91 \div 13 =$ _____
A. 6   B 6.5   C. 7   D. 7.5   E. 8

5. Which of the following is both a rational and natural number?
A. $\sqrt{3}$ B. −6.5   C. ½   D. $3.\overline{3}$ E. 4

6. Evaluate $ab + cd$, if $a = 4$, $b = 9$, $c = 12$ and $d = -1$.
A. 48   B. 36   C. 24   D. 44   E. 28

7. What is the sum of the interior angles of a regular pentagon?
A. $360°$ B. $270°$ C. $540°$ D. $720°$ E. $900°$

8. If $23 \times 37 = A$, what is the sum of the digits of A?
A. 8   B. 15   C. 11   D. 13   E. 14

9. What percentage of the digits of the number 2,019 are prime?
A. 0%   B. 25%   C. 50%   D. 75%   E. 100%

10. $5\frac{1}{3} =$ _____ (decimal)
A. 5.3   B. 5.33   C. 5.34   D. $5.\overline{34}$ E. $5.\overline{3}$

11. If each side of the triangle below is enlarged by 11 units, what is the new perimeter of the triangle?

5 cm
12 cm
13 cm
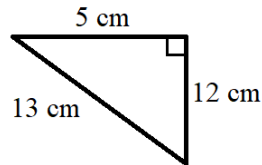
A. 82 cm   B. 41 cm   C. 52 cm   D. 54 cm   E. 63 cm

12. What is the LCM of the numbers 28 and 46?
A. 644   B. 14   C. 2   D. 1,104   E. 552

13. What is the mode of the set of numbers 7, 6, 5, 4, 3, 7, 7, 6, 5, 6, 4, 3, 3, 6, 7, 5, 4, 6, 6, 4, 6, 5, 1, 6, 6, 4, 5, 6, 7?
A. 4   B. 5   C. 3   D. 6   E. 7

14. The time now is 10:21 am. What will be the time 4 hours and 37 minutes from now?
A. 2:58 am   B. 1:48 am   C. 1:21 pm   D. 2:48 pm   E. 2:58 pm

15. 54 meters = _____ centimeters
A. 5.4   B. 0.54   C. 5,400   D. 540   E. 54,000

16. What is the number 54,000,000 expressed in scientific notation?
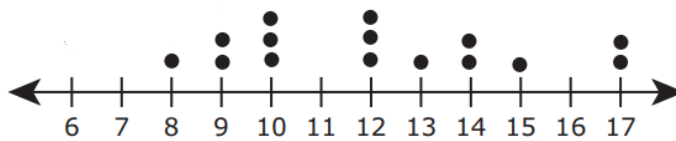A. 54×10^6 B. 5.4×10^7 C. 540×10^5 D. 0.54×10^8 E. 54×10^{-6}

17. 87 = _____ (Roman numeral)
A. LXXXVII   B. XXXXXXXXIIIIIII   C. XXCVII   D. XXLVII   E. CXXVII

18. What value is 45% of the number 340?
A. 276   B. 161   C. 153   D. 147   E. 145

19. What is the range of the data in the dot-plot below?

A. 25   B. 10 & 12   C. 12.8   D. 11   E. 9

20. $11(x - 3)$ is equivalent to which of the following?
A. $11x - 3$ B. $11x + 8$ C. $11x - 8$ D. $11x - 33$ E. $11 + x - 3$

21. $3! + 2! + 1! =$ _____
A. 6!   B. 6   C. 9   D. 12   E. 4!

22. If $g(x) = 28 - 3x$, then what is the value of $g(6)$?
A. 19   B. 10   C. 150   D. 31   E. 18

23. Point A is located at $(-4, 13)$. What are the new coordinates of point A after it is translated 8 units to the right and 11 units down?
A. $(4, 24)$ B. $(-12, 24)$ C. $(-4, 2)$ D. $(-12, 2)$ E. $(4, 2)$

24. What is the range of the set of numbers 87, 23, 45, 55, 27, and 19?
A. 64   B. 68   C. 2   D. 42   E. 56

25. Meena has a bag of 7 red marbles, 8 blue marbles and 5 green marbles. If Meena reaches into the bag and draws out one marble, what is the probability she draws out a marble that is not blue, in ratio form?
A. 2:5   B. 2:7   C. 7:20   D. 1:4   E. 3:5

26. $34_{10} =$ _____$_8$
A. 45   B. 42   C. 38   D. 44   E. 36

27. In how many ways can four dogs run through a doggy door, if only one dog can run through the door at a time?
A. 8   B. 4   C. 24   D. 12   E. 16

28. What is the midpoint between the two points $(18, 30)$ and $(-6, 12)$?
A. $(6, 9)$ B. $(12, 42)$ C. $(6, 21)$ D. $(12, 9)$ E. $(12, 21)$

29. What is the slope of the line that passes through the points $(9, 1)$ and $(5, 21)$?
A. 5 B. $\frac{1}{5}$ C. $-\frac{1}{5}$ D. 0.5 E. -5

30. If $a \blacklozenge b = -3a^2 - 2b$, what is the value of $(-4) \blacklozenge (-3)$?
A. 14 B. 54 C. -54 D. -42 E. -13

31. If one of the angles of a rhombus measures $102°$, then one of the adjacent angles measures _____°.
A. 258 B. 12 C. 18 D. 78 E. 146

32. If a card is drawn from a standard deck of cards, what are the odds the card will be a face card or an ace?
A. 4:9   B. 5:9   C. 4:13   D. 8:13   E. 6:13

33. If Humza rolls three different dice, how many total outcomes are possible?
A. 216   B. 36   C. 72   D. 729   E. 144

34. What is the area of the triangle below?

20 in   20 in

24 in
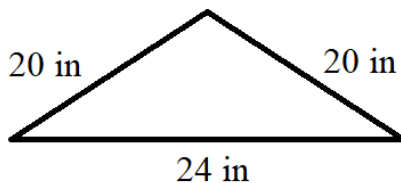
A. 240 in^2 B. 192 in^2 C. 384 in^2 D. 64 in^2 E. 128 in^2

35. What is the number of combinations of seven objects taken three at a time?
A. 210   B. 105   C. 70   D. 35   E. 140

36. Which of the following represents an exponential function?
A. $y = a \cdot b^x$ B. $y = Ax^2 + Bx + C$ C. $Ax + By = C$ D. $y = x^3$ E. $y = a(x - h)^2 + k$

37. Samantha was at a store and saw a shirt she liked that cost $24.00. The next week, Samantha went back to the store and the shirt was marked $15.00. What was the percent of change for the price drop of the shirt?
A. 42.5%   B. 32.5%   C. 37.5%   D. 42%   E. 36%

38. Circle A has a diameter of 16 units. If $\pi = 3$, what is the new area of circle A if its diameter is dilated by a scale factor of ½?
A. 768 units^2 B. 192 units^2 C. 12 units^2 D. 24 units^2 E. 48 units^2

39. Michelle has seven shirts, five pairs of pants, three colors of socks, and four pairs of shoes. How many different outfits can Michelle choose from if she must choose one shirt, one pair of pants, one color of socks and one pair of shoes?
A. 19   B. 120   C. 420   D. 210   E. 560

40. Melissa scored an 88, 91, and 87 on her first three quizzes. What must Melissa score on her fourth quiz to have a quiz average of 91?
A. 100   B. 98   C. 89   D. 97   E. 94

41. Where does the line with the equation $-2x + 7y = 28$ cross the y-axis?
A. $(4,0)$ B. $(-2,0)$ C. $(0,-14)$ D. $(0,4)$ E. $(0,-2)$

42. Simplify: $\sqrt{686}$
A. $2\sqrt{343}$ B. $14\sqrt{7}$ C. $14\sqrt{49}$ D. $6\sqrt{21}$ E. $7\sqrt{14}$

43. If $(4x + 3)(x - 9) = 4x^2 + Bx - 27$, what is the value of $-3B - (-16)$?
A. 115   B. 99   C. -83 D. 83   E. 67

44. What is the GCF of $45a^3b^2c$ and $15ab^3c^5$?
A. $15ab^2c$ B. $15a^3b^3c^5$ C. $90ab^2c$ D. $90a^3b^3c^5$ E. $5a^4b^5c^6$

45. Andrew went to the store and bought a fishing pole for $45.00 and some fishing line for $12.00. If tax is 9%, what was Andrew's total bill?
A. $57.13   B. $61.05   C. $58.03   D. $64.23   E. $62.13

46. $\frac{8}{\sqrt{2}}$ is equivalent to which of the following?
A. $4\sqrt{2}$ B. 4   C. $6\sqrt{2}$ D. $2\sqrt{2}$ E. 6

47. What is the solution to the system of linear equations? $\begin{cases} 4m + \frac{1}{2}n = 23 \\ -n = 3m - 21 \end{cases}$

A. $(4, 5)$ B. $(6, 7)$ C. $(-3, 7)$ D. $(5, 6)$ E. $(2, -7)$
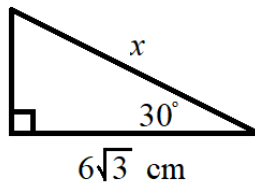
48. How many unique real solutions does the equation $x^2 + 12x + 36 = 0$ have?
A. 0   B. 1   C. 2   D. 3   E. 4

49. Simplify: $\frac{30m^{-3}n^4p^0}{5mn^2}$

A. $\frac{6n^2p}{m^4}$ B. $\frac{6n^6p}{m^2}$ C. $\frac{6n^2}{m^4}$ D. $\frac{n^6}{6m^2}$ E. $\frac{n^6}{6m^4}$

50. What is the length of x in the picture below?

A. $12\sqrt{3}$ cm   B. 6 cm   C. $18\sqrt{3}$ cm   D. 12 cm   E. $12\sqrt{2}$ cm

2019 – 2020 TMSCA Middle School Mathematics Wiggs INV Test Answer Key

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

7. To find the sum of the interior angles of a regular polygon, use $(n-2)180$, where n is the number of sides of the polygon. A pentagon has five sides, so the sum of its interior angles is $(5-3)180 = 3(180) = 540°$.

9. In the number 2,019, only one digit is prime, which is 2. Since there are 4 digits, $\frac{1}{4} = 0.25 = 25\%$.

15. Since 1 meter = 100 centimeters, 54 meters = $54 \cdot 100 = 5{,}400$ centimeters.

17. The Roman numerals are I = 1, V = 5, X = 10, L = 50, C = 100, D = 500 and M = 1,000. When a symbol appears after a larger, or equal, symbol, it is added. If a symbol appears before a larger symbol, it is subtracted. Also, a symbol cannot be used more than three times in a row. Therefore, 87 = LXXXVII.

18. 45% of the number $340 = 0.45 \times 340 = 153$.

28. The midpoint formula, given two points, is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$. We are given the points $(18, 30)$ and $(-6, 12)$, so the midpoint between the given points is then $\left(\frac{18+(-6)}{2}, \frac{30+12}{2}\right) = \left(\frac{12}{2}, \frac{42}{2}\right) = (6, 21)$.

30. If $a \blacklozenge b = -3a^2 - 2b$, then $(-4) \blacklozenge (-3) = -3(-4)^2 - 2(-3) = -3(16) - 2(-3) = -48 + 6 = -42$.

31. Adjacent angles in a rhombus are supplementary. So, if one angle of a rhombus measures $102°$, one of its adjacent angles measures $180 - 102 = 78°$.

42. One way to simplify a number to simplest radical form is to first find its prime factorization. The prime factorization of 686 is $2 \cdot 7^3$. So, $\sqrt{686} = \sqrt{2 \cdot 7^3}$. This can be rewritten as $\sqrt{2 \cdot 7^3} = \sqrt{2 \cdot 7 \cdot 7^2}$, and simplify to get $7\sqrt{2 \cdot 7} = 7\sqrt{14}$.

43. $(4x + 3)(x - 9) = 4x(x) - 9(4x) + 3(x) - 9(3) = 4x^2 - 36x + 3x - 27 = 4x^2 - 33x - 27$. This shows that $B = -33$. The value of $-3B - (-16)$ is then $-3(-33) - (-16) = 99 + 16 = 115$.

46. You cannot have a radical in the denominator of a fraction. So, we must rationalize the denominator by multiplying the given fraction by 1, to eliminate the radical. $\frac{8}{\sqrt{2}} \cdot 1 = \frac{8}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{8\sqrt{2}}{2}$. Now, we must simplify the fraction to become $4\sqrt{2}$.

48 To find the number of solutions of a quadratic equation $Ax^2 + Bx + C = 0$, use the discriminant, which can be found by $B^2 - 4AC$. If the discriminant has a positive value, the equation has 2 real solutions, if it is negative it has 0 real solutions and if the discriminant equals 0, it has 1 unique real solution. We are given $x^2 + 12x + 36 = 0$, so its discriminant is $12^2 - 4(1)(36) = 0$, which means the given equation has 1 solution.

49. $\frac{30m^{-3}n^4p^0}{5mn^2} = \frac{6m^{-3-1}n^{4-2}p^0}{1} = \frac{6m^{-4}n^2p^0}{1} = \frac{6n^2p^0}{m^4} = \frac{6n^2}{m^4}$.