TMSCA MIDDLE SCHOOL MATHEMATICS

TEST#1 ©

OCTOBER 17, 2020

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.

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1. 39 + 67 = _____

A. 96 B. 106 C. 116 D. 92 E. 102

2. 71 – 48 = _____

A. 27 B. 33 C. 37 D. 23 E. 39

3. 27×44 = _____

A. 1,188 B. 1,098 C. 1,218 D. 1,298 E. 1,178

4. $713 \div 31$ = _____

A. 22 B. 23 C. 34 D. 33 E. 27

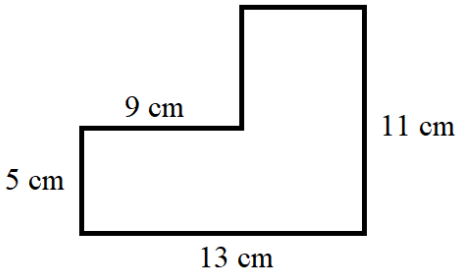
5. $3(m + n)$ is equivalent to which of the following?

A. $3m + n$ B. $3mn$ C. $m + 3n$ D. $3m3n$ E. $3m + 3n$

6. 67 = _____ (Roman numeral)

A. XLVII B. LXVII C. CXVII D. XXLVII E. DXVII

7. What is the area of the shape below?



A. 90 cm^2 B. 129 cm^2 C. 89 cm^2 D. 48 cm^2 E. 96 cm^2

8. 1 + 2 + 3 + 4 + 5 + 4 + 3 + 2 + 1 = _____

A. 25 B. 24 C. 27 D. 20 E. 23

9. What is 15% of 90?

A. 12.5 B. 14.5 C. 14 D. 12 E. 13.5

10. Point *A* has coordinates $(-6, 11)$. If *A* is translated six units to the left and four units up, what is the sum of the new coordinates of *A*?

A. 5 B. 15 C. 7 D. 3 E. -1

11. What is the mode of the set of numbers 45, 62, 44, 51, 53, 55, 47, 45, 77, 45, 77, 45, 53, and 45?

A. 45 B. 77 C. 53 D. 44 E. 33

12. What is the LCM of the numbers 124 and 30?

A. 620 B. 630 C. 1,860 D. 2 E. 6

13. What is the largest palindrome less than 732?

A. 699 B. 737 C. 727 D. 800 E. 696

14. Paul has a cube with each face having one of the numbers 3, 4, 6, 8, 9, 12. What is the probability of Paul rolling his cube and getting a multiple of 3 facing up?
A. ½ B. ⅓ C. ¼ D. ⅔ E. ¾

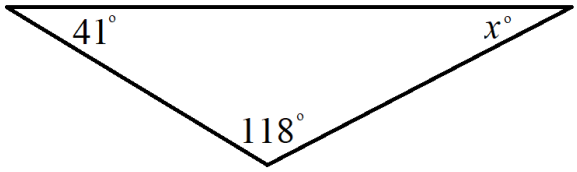
15. What is the prime factorization of the number 714?
A. $2^2 \cdot 3 \cdot 17$ B. $2 \cdot 3 \cdot 7 \cdot 17$ C. $2^2 \cdot 3 \cdot 7 \cdot 17$ D. $2 \cdot 7^2 \cdot 17$ E. $2^2 \cdot 3^2 \cdot 7 \cdot 17$

16. Evaluate $|4p - 3| - 2$ for $p = -19$.
A. 77 B. -20 C. 71 D. 73 E. -81

17. What is the number 540,000 written in scientific notation?
A. 5.4×10^5 B. 54×10^4 C. 5.4×10^{-5} D. 54×10^{-4} E. 0.54×10^6

18. Shelby is buying four donuts for 65¢ each, three kolaches for $1.99 each and two chocolate milks for $1.19 each. If there is no tax, how much change will Shelby receive if she pays with a $20 bill?
A. $9.25 B. $10.05 C. $10.15 D. $9.15 E. $9.05

19. What is the value of *x* below?



A. 49 B. 21 C. 31 D. 39 E. 29

20. If $m \odot n = -123 - mn$, then what is the value of $-6 \odot 14$?
A. -78 B. -207 C. -39 D. -123 E. -131

21. Eric has $14.72. Eric's friend gives him 7 nickels, 5 quarters, 3 dimes and 6 pennies. How much money does Eric have after his friend gives him the change?
A. $15.88 B. $16.42 C. $16.68 D. $17.24 E. $15.98

22. A right triangle has its hypotenuse measuring 13 inches and its short leg measuring 5 inches. If a square has a side length as long as the longest leg of the right triangle, what is the perimeter of the square?
A. 48 inches B. 144 inches C. 96 inches D. 60 inches E. 52 inches

23. 252 inches = _____ feet
A. 7 B. 63 C. 14 D. 21 E. 28

24. 54_7 = _____ (base 10)
A. 47 B. 59 C. 63 D. 39 E. 41

25. How many zeros are there in the solution to $8^3 \times (2 + 3)^6$?
A. 9 B. 8 C. 7 D. 6 E. 5

26. $m\angle A = 37.34^\circ$. What is the supplement of $\angle A$?
A. 52.66° B. 62.66° C. 152.66° D. 142.66° E. 112.66°

27. The Dolphin's Swim Team currently has 16 members. The coach informs the members that 4 additional swimmers will be joining the team. What is the percent increase in the size of the swim team?

A. 25% B. 50% C. 75% D. 125% E. 150%

28. If a graphed line extends through the third and first quadrant, it has a _____ slope.

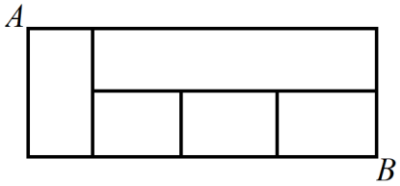
A. undefined B. zero C. negative D. curved E. positive

29. A lock combination must have 5 characters consisting of two letters that can repeat and three single-digit numbers 0 – 9, that can also repeat. If the first two characters must be the letters followed by the three single-digits, how many possible combinations are possible if the first character is an *E* and the last character is a 7?

$E\ \_\_\ \_\_\ \_\_\ 7$

A. 2,340 B. 2,520 C. 2,600 D. 3,200 E. 676,000

30. If one can only move to the right or down, how many paths are there from point *A* to point *B*?



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

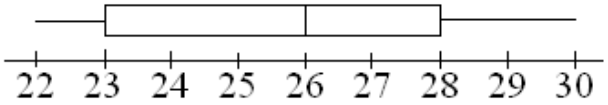
31. Suzanne drew a line segment from the point (14, 28) to the point $(-10, 12)$. What is the midpoint of Suzanne's segment?

A. (2, 20) B. $(-2, 3)$ C. $(-2, 20)$ D. $(-12, 20)$ E. (12, 8)

32. What is the volume of a cube that has a side length of 11 inches?

A. 33 inches^3 B. 1,452 inches^3 C. 198 inches^3 D. 726 inches^3 E. 1,331 inches^3

33. What value is 12 more than the median of the box-and-whisker plot?



A. 34 B. 38 C. 40 D. 17 E. 20

34. If $f(x) = 13 - 2x^2$, then what is the value of $f(-8 + 2)$?

A. -110 B. -115 C. 21 D. 141 E. -59

35. The probability of it raining in Seattle on any given day is 30%. After how many days would it be expected to have rained on 24 days?

A. 64 B. 80 C. 84 D. 72 E. 78

36. Which of the following is equivalent to i?

A. i^0 B. i^6 C. i^7 D. i^5 E. i^2

37. $(x-7)(x+8)$ = _____
A. $2x+1$ B. x^2-56 C. x^2+1 D. x^2+x-56 E. x^2+x-15

38. Which equation below has no solution?
A. $3x+14=4+2x$ B. $\frac{1}{2}(8-6x)=3x+1$ C. $2x=0$ D. $5x=\frac{1}{2}(3+10x)$ E. $-x=-2x$

39. *A* is an integer and $0<A<24$. How many integers of *A* are relatively prime to 24?
A. 8 B. 4 C. 12 D. 2 E. 6

40. 52_6+14_6 = _____ (base 6)
A. 120 B. 110 C. 104 D. 111 E. 66

41. $\sqrt{8}(4\sqrt{2}+4\sqrt{18})$ = _____
A. 52 B. 36 C. 64 D. 48 E. 42

42. How much simple interest will accumulate after depositing $1,200 at 7% for 6 months?
A. $52 B. $504 C. $54 D. $72 E. $42

43. What is the measure of an exterior angle of a regular octagon?
A. 60° B. 45° C. 30° D. 135° E. 120°

44. What are the coordinates of the center of a circle with an equation of $(x-23)^2+y^2=225$?
A. (23, 0) B. $(-23,0)$ C. (23, 15) D. $(-23,15)$ E. $(-23,-1)$

45. The equation $-4|5x-10|=-96$ has two solutions, *A* and *B*. What is the value of *A* + *B*?
A. 8 B. 4 C. 18 D. 16 E. -2

46. What is the equation of the axis of symmetry of the graph of the quadratic function $y=-2x^2-28$?
A. $x=-14$ B. $x=-\frac{1}{14}$ C. $x=-7$ D. $x=-\frac{1}{7}$ E. $x=0$

47. What is the altitude of an equilateral triangle with a side length of 32 cm?
A. 16 cm B. $16\sqrt{2}$ cm C. $8\sqrt{3}$ cm D. $8\sqrt{2}$ cm E. $16\sqrt{3}$ cm

48. Find the sum of the following matrices: $\begin{bmatrix}8&-5\\-7&19\end{bmatrix}+\begin{bmatrix}-3&9\\-12&-1\end{bmatrix}$ = _____
A. $\begin{bmatrix}5&-4\\-19&19\end{bmatrix}$ B. $\begin{bmatrix}-24&-45\\84&-19\end{bmatrix}$ C. $\begin{bmatrix}5&4\\-19&18\end{bmatrix}$ D. $\begin{bmatrix}-24&-14\\-19&18\end{bmatrix}$ E. $\begin{bmatrix}-11&-14\\-19&-20\end{bmatrix}$

49. Wat is the value of *y* – *x*, if the solution to the system of equations $\begin{cases}4x-y=24\\y-2x=16\end{cases}$ is (*x*, *y*)?
A. 24 B. 52 C. 44 D. 48 E. 36

50. $\frac{a^3b^2}{ab^7}\cdot\frac{a^9b^{-2}}{(ab^2)^0}\cdot\frac{a^4}{b^{-10}}$ = _____
A. $a^{15}b^7$ B. $\frac{a^{15}}{b^{17}}$ C. $\frac{a^{15}}{b^7}$ D. $a^{15}b^3$ E. $a^{16}b^{10}$

2020 – 2021 TMSCA Middle School Mathematics Test #1 Answer Key

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

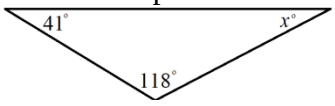
2020 – 2021 TMSCA Middle School Mathematics Test #1 Selected Answers

5. The distributive property is $a(b+c) = ab + ac$. Therefore, $3(m+n) = 3m + 3n$.

13. A palindromic number is a number that remains the same when its digits are reversed. Therefore, the largest palindrome number less than 732 is 727.

15. $714 = 2 \cdot 357 = 2 \cdot 3 \cdot 119 = 2 \cdot 3 \cdot 7 \cdot 17$.

19. Use the picture to see the two given angle measures.



A triangle has 180°, so to find the missing angle we subtract the two given angles from 180. Therefore, $180 - 41 - 118 = 21$, so $x = 21$.

23. 12 inches = 1 foot, so 252 inches is equal to $252 \div 12 = 21$ feet.

32. The formula for volume of a cube is $V = s^3$. We are asked to find the volume of a cube with a side length of 11 inches. Therefore, the volume is $V = 11^3 = 11 \cdot 11 \cdot 11 = 1{,}331$ in^3.

34. $-8 + 2 = -6$, so $f(-8+2) = f(-6)$. Therefore, $f(-6) = 13 - 2x^2 = 13 - 2(-6)^2 = 13 - 2(36) = 13 - 72 = -59$.

37. $(x-7)(x+8) = x(x) + 8(x) - 7(x) + 8(-7) = x^2 + 8x - 7x - 56 = x^2 + x - 56$.

41. $\sqrt{8}(4\sqrt{2} + 4\sqrt{18}) = 2\sqrt{2}\left(4\sqrt{2} + 12\sqrt{2}\right) = 2\sqrt{2}\left(16\sqrt{2}\right) = 2 \cdot 16 \cdot \sqrt{2 \cdot 2} = 32 \cdot 2 = 64$.

46. The standard form of a quadratic equation is $y = Ax^2 + Bx + C$. To find the equation for the axis of symmetry, use $x = \frac{-B}{2A}$. We are given the equation $y = -2x^2 - 28$, so $A = -2$, $B = 0$ and $C = -28$. Substituting our values in for *A* and *B*, the axis of symmetry for the graph of the equation $y = -2x^2 - 28$ is $x = \frac{-0}{2(-2)} = 0$.

48. To find the sum of a 2×2 matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and another 2×2 matrix $\begin{bmatrix} e & f \\ g & h \end{bmatrix}$, then we do the following $\begin{bmatrix} a & b \\ c & d \end{bmatrix} + \begin{bmatrix} e & f \\ g & h \end{bmatrix} = \begin{bmatrix} a+e & b+f \\ c+g & d+h \end{bmatrix}$. So, $\begin{bmatrix} 8 & -5 \\ -7 & 19 \end{bmatrix} + \begin{bmatrix} -3 & 9 \\ -12 & -1 \end{bmatrix} = \begin{bmatrix} 8+(-3) & -5+9 \\ -7+(-12) & 19+(-1) \end{bmatrix} = \begin{bmatrix} -5 & 4 \\ -19 & 18 \end{bmatrix}$.

50. Using the exponent rules $a^{-n} = \frac{1}{a^n}$, $a^m \cdot a^n = a^{m+n}$, $\frac{a^m}{a^n} = a^{m-n}$, and $(a^m)^n = a^{m \cdot n}$,
$\frac{a^3b^2}{ab^7} \cdot \frac{a^9b^{-2}}{(ab^2)^0} \cdot \frac{a^4}{b^{-10}} = \frac{a^2}{b^5} \cdot \frac{a^9}{b^2} \cdot \frac{a^4b^{10}}{1} = \frac{a^{2+9+4}b^{10}}{b^{5+2}} = \frac{a^{15}b^{10}}{b^7} = a^{15}b^3$.