TMSCA MIDDLE SCHOOL MATHEMATICS

TEST#8 ©

JANUARY 23, 2021

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. 731 – 78 – 4.07 = _____ (nearest ten)
A. 648.9 B. 649 C. 650 D. 660 E. 700

2. $\frac{7}{5} - \frac{3}{4}$ = _____
A. 0.75 B. 0.65 C. 0.15 D. 2.15 E. 1.35

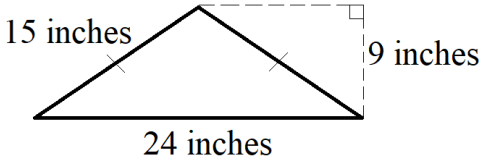
3. $6.5 \times 0.9 \times 0.11$ = _____ (nearest tenth)
A. 0.4 B. 0.5 C. 0.6 D. 0.54 E. 0.7

4. $700 \div 0.25 \div 16$ = _____
A. 225 B. 10.9 C. 155 D. 250 E. 175

5. Simplify: $8x - 3x - 10x$
A. $5x$ B. $-5x$ C. $-7x$ D. $-8x$ E. $7x$

6. What is the multiplicative inverse of $\frac{5}{12}$?
A. $\frac{5}{12}$ B. $-\frac{5}{12}$ C. $-2\frac{2}{5}$ D. $-\frac{11}{5}$ E. $2\frac{2}{5}$

7. What is the area of the triangle below?



A. 180 in^2 B. 67.5 in^2 C. 135 in^2 D. 108 in^2 E. 216 in^2

8. $\frac{1+3+5+7+9}{11+13+15+17+19}$ = _____
A. ½ B. ⅓ C. ⅜ D. ⅖ E. ⅚

9. 288 is what percent of 900?
A. 32% B. 36% C. 44% D. 28% E. 40%

10. If $A = 83$ and $B = 319$, then $A + B$ = _____ (Roman numeral)
A. CDII B. CCXXXVI C. DII D. DCII E. CCXII

11. Simplify: $-8 - 4(16 - 2^3) \div (3 + 1)$
A. -16 B. -8 C. -18 D. 0 E. -3

12. 22 quarters + 210 pennies = _____ nickels + 67 dimes
A. 36 B. 32 C. 18 D. 14 E. 26

13. What is the sum of the distinct prime factors of the number 156?
A. 15 B. 16 C. 21 D. 18 E. 12

14. How many multiples of 4 are between 45 and 219?
A. 42 B. 41 C. 45 D. 44 E. 43

15. Evaluate $\frac{1}{2}a^2 + 4b$ for $a = -10$ and $b = -20$.
A. -12 B. 130 C. -55 D. -105 E. -30

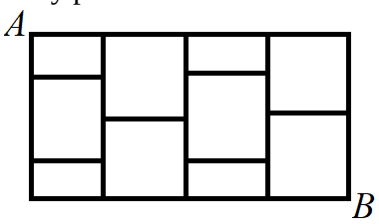
16. A spinner is divided into ten equal sections labeled A – J. What is the probability of spinning the spinner and landing on a vowel and flipping a coin and landing on heads?
A. $\frac{1}{4}$ B. $\frac{1}{5}$ C. $\frac{3}{10}$ D. $\frac{3}{5}$ E. $\frac{3}{20}$

17. What is the supplement to the complement of an angle measuring 73°?
A. 173° B. 163° C. 17° D. 34° E. 107°

18. 2.5 gallons = _____ pints
A. 10 B. 160 C. 5 D. 15 E. 20

19. What is the sum of the first 12 consecutive odd integers?
A. 476 B. 78 C. 156 D. 144 E. 112

20. Moving only to the right or down, how many paths exist from *A* to *B*?



A. 18 B. 16 C. 15 D. 17 E. 20

21. $2 \times 3 \times 5^2 \times 13$ is the prime factorization of which of the following numbers?
A. 1,950 B. 1,620 C. 975 D. 1,350 E. 1,650

22. The area of a rhombus is 42 units^2. If one of the diagonals of the rhombus measures 6 units, what is the measure of the second diagonal of the rhombus?
A. 7 units B. 36 units C. 28 units D. 14 units E. 21 units

23. What is the measure of an exterior angle of a regular decagon?
A. 36° B. 40° C. 45° D. 15° E. 60°

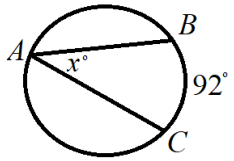
24. If 40% of a number *n* is 32, what is ⅜ of *n*?
A. 40 B. 36 C. 28 D. 24 E. 30

25. Mineral *M* has a mass of 6.4×10^{-2} kilograms and mineral *N* has a mass of 4×10^{-9} kilograms. How many mineral *N*'s have the same mass as one mineral *M*?
A. 1.6×10^{-7} B. 1.6×10^{-11} C. 1.6×10^{18} D. 1.6×10^{11} E. 1.6×10^{7}

26. What is the sum of all two-digit multiples of 14?
A. 378 B. 392 C. 406 D. 420 E. 418

27. Find the value of $(1 \blacksquare 2) \blacksquare (3 \blacksquare 4)$, if $a \blacksquare b = 5b - a^2 - ab$.
A. -709 B. -35 C. -127 D. -47 E. -261

28. What is the value of *x* in the circle if the measure of minor arc $BC = 92^\circ$?



A. 46 B. 88 C. 44 D. 92 E. 28

29. 225_{10} = _____ (base 12)

A. 173 B. 171 C. 169 D. 165 E. 175

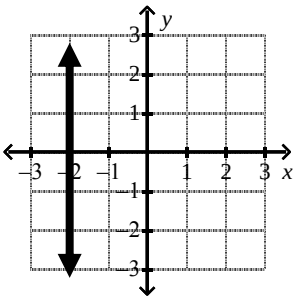
30. What is the LCM of the two monomials $28a^5b^4c$ and $21a^2b^2c^3$?

A. $7abc$ B. $7a^2b^2c$ C. $84abc$ D. $84a^2b^2c$ E. $84a^5b^4c^3$

31. Calculate the mean absolute deviation for the data set 24, 33, 18, and 41?

A. 2.9 B. 8 C. 9 D. 6.5 E. 6

32. What is the equation of the line graphed below?



A. $y = -2x$ B. $y = 2x$ C. $y = -2$ D. $x = -2y$ E. $x = -2$

33. A manager's salary at Burgers Plus increased from \$48,000 to \$55,200. What is the rate of increase for the salary?

A. 15% B. 10% C. 18% D. 20% E. 12%

34. What is the slope of any line perpendicular to the line with the equation $-2x + 8y = -32$?

A. 16 B. -4 C. $\frac{1}{4}$ D. $\frac{1}{16}$ E. -16

35. How many combinations can be made of 20 items taken 2 at a time?

A. 120 B. 150 C. 380 D. 190 E. 170

36. What is the value of the discriminant of the quadratic equation $4 = -x^2 + 3 - 2x$?

A. -2 B. -5 C. 0 D. 3 E. 1

37. The areas of three distinct faces of a rectangular prism are 12, 14, and 42 units^2. What is the volume of this rectangular prism?

A. 84 units^3 B. 68 units^3 C. 136 units^3 D. 168 units^3 E. 124 units^3

38. Simplify: $(-2n^5)(4n^{-2})$

A. $-128n^{-10}$ B. $8n^7$ C. $\frac{-8}{n^{10}}$ D. $-8n^3$ E. $\frac{-8}{n^3}$

39. What is the value of $-3x^2 - 1$, if x is the smallest root of $x^2 + 4x - 77 = 0$?
A. -148 B. -364 C. 15 D. 195 E. -195

40. $101_8 \times 12_8$ = _____ (base 8)
A. 1124 B. 1212 C. 1224 D. 2142 E. 1422

41. If $\frac{4}{n-3} = \frac{5}{2n+3}$, then what is the value of $-2n^2$?
A. -36 B. -324 C. 121 D. -162 E. 324

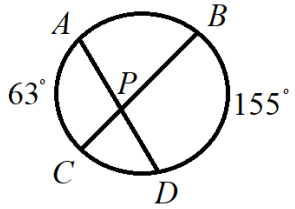
42. Destiny deposits \$1,400.00 into a simple interest account at a rate of 3.2%. If Destiny doesn't withdraw or deposit any additional money from her account for 54 months, how much money will be in her account?
A. \$1,601.60 B. \$1,600.60 C. \$200.60 D. \$201.60 E. \$1,641.60

43. What is the growth rate in the exponential growth function $y = 2.4(3.2)^x$?
A. 240% B. 140% C. 320% D. 220% E. 120%

44. If the domain of the function $f(x) = 3x - 4$ is $\{-2 \le x \le 3\}$, which of the following integers is not in the range of the function?
A. -7 B. -4 C. 8 D. 5 E. -10

45. The solutions to the equation $|2x - 3| = 15$ are a and b. What is the value of $\frac{ba}{3}$?
A. -1 B. -3 C. -15 D. -12 E. -18

46. What is the measure of $\angle APC$ if minor arc $AC = 63^\circ$ and minor arc $BD = 155^\circ$?



A. 92° B. 117° C. 109° D. 46° E. 142°

47. If $M = \begin{bmatrix} 6 & -7 \\ 5 & -4 \end{bmatrix}$ and $N = \begin{bmatrix} 10 & -11 \\ -12 & 13 \end{bmatrix}$, then what is the value of NM?
A. $\begin{bmatrix} 5 & -26 \\ -7 & 32 \end{bmatrix}$ B. $\begin{bmatrix} 60 & 77 \\ -60 & -52 \end{bmatrix}$ C. $\begin{bmatrix} 144 & -157 \\ 98 & -107 \end{bmatrix}$ D. $\begin{bmatrix} 144 & 157 \\ 98 & 107 \end{bmatrix}$ E. $\begin{bmatrix} 16 & -18 \\ -7 & 9 \end{bmatrix}$

48. What is the area of a triangle with its vertices located at $(-9, -2)$, $(-6, 5)$ and $(-5, -5)$?
A. 16.5 units^2 B. 18.5 units^2 C. 20.5 units^2 D. 22.5 units^2 E. 21.5 units^2

49. The legs of a right triangle measure 8 units and $8\sqrt{3}$ units. What is the measure of the hypotenuse of the triangle?
A. 18 units B. $18\sqrt{3}$ units C. 16 units D. $16\sqrt{3}$ units E. 20 units

50. The sum of two positive integers is 52. If one integer is 10 more than half of the other integer, what is the value of the larger integer?
A. 32 B. 26 C. 24 D. 28 E. 30

2020 – 2021 TMSCA Middle School Mathematics Test #8 Answer Key

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

2020 – 2021 TMSCA Middle School Mathematics Test #8 Selected Answers

6. The multiplicative inverse is another name for the reciprocal of a fraction. So, the multiplicative inverse of $\frac{5}{12}$ is $\frac{12}{5} = 2\frac{2}{5}$.

11. $-8 - 4(16 - 2^3) \div (3 + 1) = -8 - 4(16 - 8) \div (3 + 1) = -8 - 4(8) \div (3 + 1) = -8 - 4(8) \div 4 = -8 - 32 \div 4 = -8 - 8 = -16.$

19. The sum of the first *n* consecutive odd integers is equal to n^2. Therefore, the sum of the first 12 consecutive odd integers is $12^2 = 144$.

23. The formula to find the exterior angle of a regular polygon is $\frac{360}{n}$, with *n* equal to the number of sides of the polygon. Since a decagon has 10 sides, the exterior angle measure of a decagon is $\frac{360}{10} = 36^\circ$.

28. $\angle BAC$ is an inscribed angle. An inscribed angle measure is one-half of the intercepted arc. Therefore, $m\angle BAC = \frac{1}{2}(92^\circ) = 46^\circ$, and therefore, the value of *x* is 46.

33. The rate of increase is found by $\frac{change\ in\ amount}{original\ amount} \times 100$. So, the rate of change for this problem is therefore, $\frac{55200-48000}{48000} = \frac{7200}{48000} = \frac{3}{20} \times 100 = 15\%$.

41. Use cross multiplication to solve $\frac{4}{n-3} = \frac{5}{2n+3}$. So, $5(n - 3) = 4(2n + 3)$. Next, distribute to get $5n - 15 = 8n + 12$. Subtract 5*n* from both sides of the equation to get $-15 = 3n + 12$. Subtract 12 from both sides of the equation to get $-27 = 3n$. Divide by 3 to both sides of the equation to get $n = -9$.

44. If the domain of the function $f(x) = 3x - 4$ is $\{-2 \le x \le 3\}$, then substitute -2 in place of *x* to get $f(-2) = 3(-2) - 4 = -10$, and substitute 3 in place of *x* to get $f(3) = 3(3) - 4 = 5$. This means if the domain of the function $f(x) = 3x - 4$ is $\{-2 \le x \le 3\}$, then the range is $\{-10 \le y \le 5\}$. Therefore, 8 is the answer choice that is not within the range of the function.

45. To solve the equation $|2x - 3| = 15$, make two new equations, $2x - 3 = 15$ and $2x - 3 = -15$. Solve each equation by adding 3 to both sides of the equation to get $2x = 18$ and $2x = -12$. Divide by 2 to both sides of each equation to get $x = -6$ and 9. Therefore, substitute in for *a* and *b* to get $\frac{(-6)(9)}{3} = \frac{-54}{3} = -18$.

50. Create the system $\begin{cases} x + y = 52 \\ x = \frac{1}{2}y + 10 \end{cases}$. Solve this system using substitution. Substitute $\frac{1}{2}y + 10$ in place of *x* in the first equation to get $\frac{1}{2}y + 10 + y = 52$. This simplifies to $\frac{3}{2}y + 10 = 52$. Subtract 10 from both sides of the equation to get $\frac{3}{2}y = 42$. Multiply both sides of the equation by $\frac{2}{3}$ to get $y = \frac{2}{3}(42) = 28$. If *y* = 28, then *x* is equal to 52 – 28 = 24. Therefore, the value of the larger integer is 28.