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

T U N E - U P T E S T ©

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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.

2020 – 2021 TMSCA Middle School Mathematics Tune-Up Test

1. $(0.003) - (-0.92) - 1.2$ = _____ (nearest hundredth)

A. -0.26 B. -0.27 C. -0.28 D. -0.3 E. -0.29

2. $64\frac{1}{2} + 12\frac{3}{4} + 6\frac{5}{8}$ = _____

A. 83.875 B. 83.225 C. 83.125 D. 83.625 E. 83.725

3. $76 \div 0.8 \div 1.5$ = _____

A. $65.\overline{6}$ B. $62.\overline{3}$ C. $64.\overline{6}$ D. $66.\overline{6}$ E. $63.\overline{3}$

4. 996×987 = _____

A. 983,152 B. 983,182 C. 983,052 D. 983,072 E. 983,162

5. 528 is 120% of what number?

A. 440 B. 504 C. 510 D. 480 E. 484

6. Simplify: $\frac{1}{2}(6x - 10y) - (x - y) - 2(-3x - 4y)$

A. $4x + 8y$ B. $4x - 8y$ C. $-4x - 8y$ D. $-8x - 4y$ E. $8x + 4y$

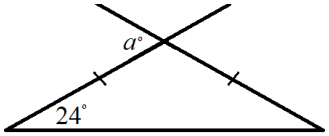
7. MCDXCIX – DCCVIII – DXLVI = _____ (Arabic number)

A. 265 B. 245 C. 285 D. 225 E. 215

8. $\sqrt{3400}$ lies between which two integers?

A. 58 and 59 B. 59 and 60 C. 60 and 61 D. 61 and 62 E. 62 and 63

9. What is the value of *a* below?



A. 24 B. 66 C. 132 D. 48 E. 56

10. 8 ⅔ hours = _____ minutes

A. 560 B. 510 C. 580 D. 540 E. 520

11. What is the number of 15¢ candies Aliyah can buy with $12.50?

A. 123 B. 95 C. 89 D. 83 E. 84

12. What number when divided by 7 gives a quotient of 126 with a remainder of 6?

A. 888 B. 882 C. 876 D. 894 E. 892

13. Evaluate $\left|\frac{3}{2}m\right| - \left|\frac{1}{4}n\right| + mn^2$ for $m = -6$ and $n = \frac{1}{3}$.

A. 8¼ B. 8½ C. 8⅔ D. 8⅞ E. 8⅚

14. What is the sum of all two-digit multiples of 13?

A. 377 B. 403 C. 351 D. 364 E. 338

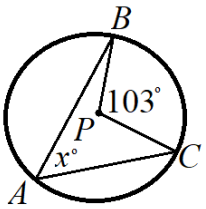
15. The sum of numbers *a* and *b* is 14 and their product is 48. What value is twice the sum of the reciprocals of the numbers a and *b*?

A. $\frac{7}{24}$ B. $\frac{7}{48}$ C. $1\frac{7}{12}$ D. $1\frac{1}{6}$ E. $\frac{7}{12}$

16. 320 ounces = _____ quarts
A. 12 B. 10 C. 8.5 D. 10.5 E. 12.5

17. Every day, a school cafeteria offers popcorn chicken, teriyaki bowl, pizza, baked potato, or salad as lunch entrees. An entree comes with a choice of white milk, chocolate milk, or juice to drink and a chocolate cookie or ice-cream sandwich for dessert. If a student must choose one entree, one drink and one dessert each day, how many days does it take to try every different combination?
A. 10 days B. 24 days C. 30 days D. 35 days E. 25 days

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



A. 51.5 B. 34.3 C. 206 D. 25.75 E. 50.5

19. What is the next number in the sequence $5, 6, 11, 17, 28, 45, \ldots$?
A. 71 B. 73 C. 81 D. 91 E. 87

20. What is the product of all the domain values of the function $\{(3,-2),(9,-3),(-4,8),(-7,2),(-5,-4)\}$?
A. 1,080 B. -384 C. -4 D. $-3{,}780$ E. $-4{,}530$

21. Point *A* has coordinates $(21, 20)$. What are the coordinates of point *A* if it is rotated clockwise about the origin by 180°?
A. $(-20,-21)$ B. (20, 21) C. $(-21,-20)$ D. $(-21, 20)$ E. $(21,-20)$

22. $1-\frac{3^2-2^2+1^2}{1+2+3}$ = _____
A. 0 B. ⅓ C. ⅔ D. ⅙ E. ⅚

23. Two positive integers have a sum of 58 and are in a ratio of 11:18. What is the value of twice the larger integer?
A. 72 B. 76 C. 44 D. 48 E. 54

24. 31^2 = _____
A. 959 B. 969 C. 961 D. 951 E. 1,001

25. What is the positive difference between a 5% sales tax and a 7.5% sales tax on an item costing $60?
A. $2.25 B. $2.50 C. $2.75 D. $1.50 E. $4.50

26. 200_{12} = _____ (base 13)
A. 184 B. 188 C 192 D. 196 E. 186

27. What is the positive difference if the 17th triangular number is subtracted from the 25th triangular number?
A. 145 B. 163 C. 172 D. 181 E. 167

28. If $x \boxdot y = \frac{2x}{y} + \frac{y}{2x}$, then what is the value of $3 \boxdot 4$?
A. $2\frac{1}{6}$ B. $2\frac{1}{2}$ C. $2\frac{1}{3}$ D. $2\frac{2}{3}$ E. $2\frac{5}{6}$

29. What is the sum of the median and the product of the modes of the stem-and-leaf plot?

1	8 9 9
2	3 4 5 5
3	0
4	2 3 6

key: 1|8 = 18

A. 625 B. 500 C. 505 D. 650 E. 644

30. A triangle and a square have the same perimeters. The side lengths of the triangle are 8.6 inches, 7.6 inches and 7.8 inches. What is the area of the square?
A. 28 in^2 B. 16 in^2 C. 25 in^2 D. 49 in^2 E. 36 in^2

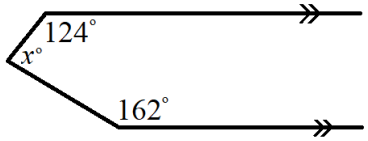
31. The sum of three positive integers, *a*, *b*, and *c*, is 50. If you increase *a* by 4, decrease *b* by two and decrease *c* by seven, all three integers will be equal. What is the value of *c*?
A. 25 B. 16 C. 32 D. 27 E. 22

32. Fisher's Bait House Fishing Supplies marks up merchandise 45% for profit. If a fishing reel costs the store $45, what is the selling price?
A. $65.75 B. $64.75 C. $66.25 D. $66.75 E. $65.25

33. A sports car is traveling at a constant rate of 54 feet in 2×10^{-2} seconds. If the car continues at the same rate, how far will the sports car travel in one hour? Answer in scientific notation.
A. 1.62×10^6 feet B. 3.88×10^4 feet C. 7.26×10^8 feet D. 7.26×10^6 feet E. 9.72×10^6 feet

34. Which integer must replace *x* in the set {29, 36, 111, *x*} in order for the set of numbers to have a mean of 66?
A. 96 B. 112 C. 92 D. 88 E. 74

35. In the picture below, what is the value of *x*?



A. 82 B. 56 C. 74 D. 86 E. 68

36. Solve for *m*: $5m - 3n = 9n - m + 24$
A. $m = 3n + 6$ B. $m = \frac{3}{2}n + 6$ C. $m = \frac{3}{2}n + 4$ D. $m = 2n + 4$ E. $m = 2n + 6$

37. What is the area of a quadrilateral with its vertices located at $(2, -1), (-4, -3), (-5, 2)$, and $(3, 4)$?
A. 32.5 $units^2$ B. 36.5 $units^2$ C. 38.5 $units^2$ D. 35 $units^2$ E. 37 $units^2$

38. Line *A* passes through the points (4, −6) and (−2, −2). Line *B* passes through the points (3, 7) and (*x*, 1). Line *C* passes through the points (14, 12) and (2, *y*). If lines *A*, *B* and *C* are parallel, what is the value of *x* + *y*?
A. 24 B. 32 C. 48 D. 44 E. 36

39. If $\pi = 3$, what is the volume of a sphere with a diameter of 26 inches?
A. 70,304 in^3 B. 4,943.25 in^3 C. 1,098.5 in^3 D. 8,112 in^3 E. 8,788 in^3

40. If $1 + \frac{1}{1+\frac{1}{3}} = \frac{a}{b}$, what is the value of $4a \div 2b$?
A. 2.5 B. 3.5 C. 4.5 D. 5.5 E. 6.5

41. Which of the following is equivalent to $4\log_6 3 - \log_6 7$?

A. $\log_6\left(\frac{3^4}{7}\right)$ B. $\log_6\left(\frac{4^3}{7}\right)$ C. $\log_6(3^4 - 7)$ D. $\log_6(4^3 - 7)$ E. $\log_6\left(\frac{3}{7}\right)^4$

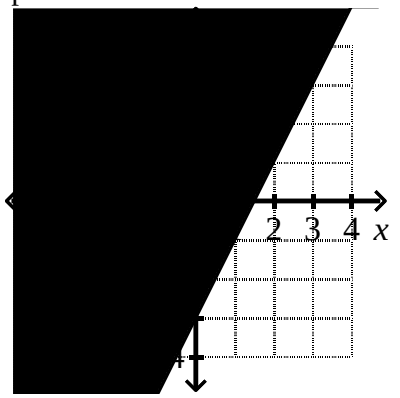
42. If $A = \begin{bmatrix} -1 & 2 \\ 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -2 \\ 3 & 1 \end{bmatrix}$, then find $AB + BA$.

A. $\begin{bmatrix} 0 & 8 \\ 0 & 4 \end{bmatrix}$ B. $\begin{bmatrix} 4 & 4 \\ 2 & -2 \end{bmatrix}$ C. $\begin{bmatrix} -4 & 4 \\ -2 & 6 \end{bmatrix}$ D. $\begin{bmatrix} -24 & 40 \\ -4 & -4 \end{bmatrix}$ E. $\begin{bmatrix} -4 & -8 \\ 6 & 0 \end{bmatrix}$

43. $\sqrt[4]{16} + \sqrt[3]{64} + \sqrt{676}$ = _____

A. 28 B. 44 C. 32 D. 36 E. 46

44. Which linear inequality matches the graph?



A. $2x + y \leq -3$ B. $2x - y \leq 3$ C. $x - 2y \geq -3$ D. $x + 2y \geq -3$ E. $2x - y \geq -3$

45. $\left(\frac{8m^3n^{-2}}{15mn^{-6}}\right) \cdot \left(\frac{20m^{-1}n^4}{10m^3n}\right)^2 \cdot \left(\frac{5m^{-4}n^{-3}}{m^{-3}n^{-4}}\right)$ = _____

A. $\frac{32n^{10}}{3m^7}$ B. $\frac{3n^{11}}{32m^6}$ C. $\frac{32m^7}{3n^{11}}$ D. $\frac{32n^{11}}{3m^7}$ E. $\frac{3m^7}{32n^{10}}$

46. $200_8 \div 40_8$ = _____ (base 10)

A. 6 B. 8 C. 4 D. 2 E. 5

47. Stuart has 27 coins consisting of quarters and nickels. If the total value of Stuart's coins is \$3.75, how many more nickels does Stuart have than quarters?

A. 3 B. 5 C. 1 D. 7 E. 9

48. What is the distance between the points $(-6, 15)$ and $(-2, -1)$?

A. $8\sqrt{15}$ units B. $4\sqrt{17}$ units C. $6\sqrt{19}$ units D. $6\sqrt{15}$ units E. $2\sqrt{11}$ units

49. If $f(0) = 7, f(1) = 9, f(2) = 16$, and $f(3) = 28$, find $f(6)$.

A. 77 B. 56 C. 66 D. 88 E. 94

50. What is the mean absolute deviation of the set of numbers 18, 11, 35, and 28?

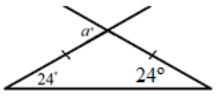
A. 2.5 B. 6.5 C. 8.5 D. 10.5 E. 14.5

2020 – 2021 TMSCA Middle School Mathematics Tune-Up Test Answer Key

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

2020 – 2021 TMSCA Middle School Mathematics Tune-Up Test Selected Answers

9. From the picture given, we have an isosceles triangle with a base angle of 24°. This means the second base angle is also 24°. The Exterior Angle Theorem states that an exterior angle of a triangle is equal to the sum of the two remote interior angles of the triangle. Therefore, $a = 24 + 24 = 48$.



13. If $m = -6$ and $n = \frac{1}{3}$, then $\left|\frac{3}{2}m\right| - \left|\frac{1}{4}n\right| + mn^2 = \left|\frac{3}{2}(-6)\right| - \left|\frac{1}{4}\left(\frac{1}{3}\right)\right| + (-6)\left(\frac{1}{3}\right)^2 =$ $|-9| - \left|\frac{1}{12}\right| + (-6)\left(\frac{1}{9}\right) = 9 - \frac{1}{12} - \frac{2}{3} = \frac{108}{12} - \frac{1}{12} - \frac{8}{12} = \frac{99}{12} = \frac{33}{4} = 8\frac{1}{4}$.

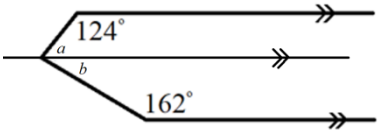
14. The two-digit multiples of 13 are 13, 26, 39, 52, 65, 78, and 91. Therefore, 13 + 26 + 39 + 52 + 65 + 78 + 91 = 364.

19. The given sequence of numbers, $5, 6, 11, 17, 28, 45, \ldots$ follows a Fibonacci pattern of starting with the summing two terms to get the next term. 5 + 6 = 11, 6 + 11 = 17, 11 + 17 = 28, 17 + 28 = 45. So, the next term is equal to the sum of 28 + 45, so 28 + 45 = 73.

23. Create the equation, $11x + 18x = 58$. This simplifies to $29x = 58$. Dividing by 29 to each sides of the equation, then $x = 2$. This means the two integers are 11(2) = 22 and 18(2) = 36. Twice the larger number is then 2(36) = 72.

30. The perimeter of a triangle with side lengths of 8.6 inches, 7.6 inches, and 7.8 inches is equal to 24 inches. Because it states that the perimeters of the triangle and square are equal, the square has a perimeter of 24 inches. Dividing 24 by 4 gives a side length of 6 inches. The area of the square is then $6^2 = 36$ inches^2.

35. Draw a third line parallel to the two given parallel lines. This will create angles a and b. We see two sets of same-side interior angels, which sum to 180°. We can create the equations $a + 124 = 180$ and $b + 162 = 180$. Solving both equations an s we get $a = 180 - 124 = 56$ and $b = 180 - 162 = 18$. Because $x = a + b$, $x = 56 + 18 = 74$.



36. We are asked to solve for m in the equation $5m - 3n = 9n - m + 24$. First, add m to both sides of the equation to get $6m - 3n = 9n + 24$. Next, add $3n$ to both sides of the equation to get $6m = 12n + 24$. Divide both sdies of the equation by 6 to get $m = 2n + 4$.

40. $1 + \frac{1}{1+\frac{1}{3}} = 1 + \frac{1}{\frac{3}{3}+\frac{1}{3}} = 1 + \frac{1}{\frac{4}{3}} = 1 + 1 \div \frac{4}{3} = 1 + 1 \cdot \frac{3}{4} = 1 + \frac{3}{4} = \frac{4}{4} + \frac{3}{4} = \frac{7}{4}$. So, If $\frac{7}{4} = \frac{a}{b}$, then $4a \div 2b = 4(7) \div 2(4) = 28 \div 8 = 3.5$.

49. Create a table and notice the pattern:

x	0	1	2	3	4	5	6
$f(x)$	7	9	16	28	45	67	94

+2 +7 +12 +17 +22 +27

+5 +5 +5 +5 +5

So, $f(6) = 94$.