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 E S T # 7 ©

J A N U A R Y 1 5, 2 0 2 2

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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2021 – 2022 TMSCA Middle School Mathematics Test #7

1. $16\frac{7}{8} + 5\frac{3}{4}$ = _____

A. $21\frac{5}{8}$ B. $21\frac{5}{6}$ C. $22\frac{5}{8}$ D. $22\frac{5}{16}$ E. $23\frac{1}{4}$

2. 1,007 – 432.8 = _____

A. 332.2 B. 632.1 C. 564.2 D. 574.2 E. 574.1

3. 44.6×2.05 = _____

A. 91.83 B. 92.63 C. 91.43 D. 88.65 E. 89.53

4. $984 \div 1.5$ = _____

A. 656 B. 646.5 C. 596 D. 626.5 E. 676

5. To get to his grandma's house, Peter traveled at an average speed of 55 mph for 1.5 hours and then traveled at an average speed of 65 mph for 4.5 hours. What was the total distance Peter traveled?

A. 250 miles B. 725 miles C. 375 miles D. 325 miles E. 275 miles

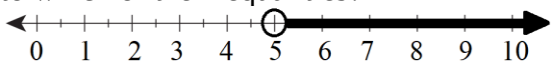
6. Oliver is making an ornament for each of his 13 cousins and each of his 18 friends. For each ornament, the cost of materials is $0.65. What is the total cost of materials Oliver will need to make the ornaments?

A. $18.65 B. $20.15 C. $26.45 D. $24.70 E. $22.35

7. What is the perimeter of a square that has an area of 196 units^2?

A. 56 units B. 49 units C. 98 units D. 64 units E. 72 units

8. The graph below is the solution to which of the inequalities?



A. $n + 8 < 13$ B. $n - 8 < -13$ C. $n + (-6) > 11$ D. $n + (-7) > -2$ E. $n + 14 = -9$

9. If $2n = 34$, what is the value of $n^2 + 17$?

A. 310 B. 308 C. 306 D. 304 E. 302

10. What is the value of 96 divided by ¾?

A. 48 B. 72 C. 128 D. 256 E. 120

11. 1,017 – 538 = _____ (Roman numeral)

A. XCLXXVII B. XCLXVIII C. XDLXXIX D. CDXXCIX E. CDLXXIX

12. Melanie and Stephanie both started a movie at 5:40 pm. Melanie finished the movie in 2 hours 12 minutes. Stephanie finished the movie 1 hour 45 minutes after Melanie. At what time did Stephanie finish the movie?

A. 9:23 pm B. 9:42 pm C. 9:47 pm D. 9:37 pm E. 9:41 pm

13. $\frac{13}{20}$ meters = _____ millimeters

A. 6,500 B. 650 C. 65 D. 6.5 E. 65,000

14. What value is 32% of 1,800?

A. 576 B. 612 C. 540 D. 558 E. 564

15. What is the sum of the mode and median of the set of numbers 8, 8, 3, 5, 2, 7, 9, 6, 4, and 1?
A. 13.5 B. 12.5 C. 10.5 D. 16 E. 14.5

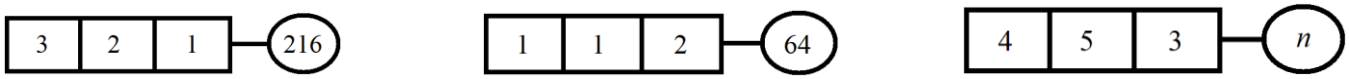
16. 75 quarters + 75 dimes + 75 nickels + 75 pennies = _____
A. $30.50 B. $30.25 C. $29.75 D. $30.75 E. $31.25

17. Simplify: $\frac{3}{4}(28x - 12y) + 6y - 10x$.
A. 15x – 9*y* B. 18*x* – 6*y* C. 11*x* – 3*y* D. 11*x* – 9*y* E. 15*x* – 19*y*

18. 12^3 = _____
A. 144 B. 432 C. 1,278 D. 1,728 E. 1,496

19. Trent drew a rectangle that measured 12 cm by 7 cm. Mike drew a rectangle that measured 18 cm by 9 cm. How much longer is the perimeter of Mike's rectangle than Trent's rectangle?
A. 24 cm B. 16 cm C. 78 cm D. 38 cm E. 18 cm

20. Use the examples in the picture below to find the value of *n*.



A. 1,728 B. 36 C. 1,296 D. 576 E. 1,152

21. What value is 40% of the median of the set of numbers 44, 62, 74, and 18?
A. 21.2 B. 27.2 C. 24.2 D. 54.4 E. 49.4

22. Write the product of 6 and 3.5×10^8 in scientific notation.
A. 2.1×10^{-8} B. 2.1×10^{9} C. 2.1×10^{10} D. 2.1×10^{8} E. 2.1×10^{-9}

23. How many positive integral divisors does the number 560 have?
A. 24 B. 18 C. 16 D. 20 E. 28

24. If two dozen gel pens costs $54.96, how much do eight gel pens cost?
A. $36.64 B. $27.48 C. $13.74 D. $20.61 E. $18.32

25. The measure of an angle is 12 less than twice its complement. What is the measure of the supplement of the smaller angle?
A. 144° B. 158° C. 146° D. 126° E. 134°

26. What is the LCM of $16n^3$ and $24n^2$?
A. $8n^3$ B. $8n^2$ C. $48n^2$ D. $48n^5$ E. $48n^3$

27. $105_6 =$ _____ (base 8)
A. 51 B. 53 C. 52 D. 55 E. 54

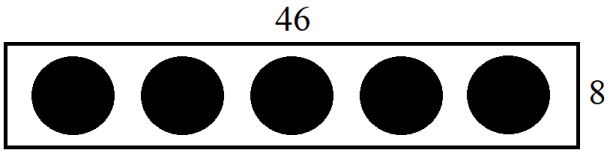
28. The volume of a cylinder with a diameter of 8 cm is 112π cm^3. What is the height of the cylinder?
A. 12 cm B. 28 cm C. 14 cm D. 7 cm E. 6 cm

29. Let U be a universal set and A and B be subsets of U defined as shown. How many elements are in $A' \cup B'$?
$U = \{all\ positive\ integers\ less\ than\ 20\}$ $A = \{multiples\ of\ 5\}$ $B = \{multiples\ of\ 3\}$
A. 18 B. 17 C. 16 D. 15 E. 9

30. What is the value of the mean absolute deviation of the set of numbers 56, 37, 51, and 28?
A. 10.5 B. 8.5 C. 12 D. 11.5 E. 14

31. At an anniversary party, one-third of the people drank only tea, one-half drank only water, fifteen people drank neither water nor tea, and no one drank both. How many people attended the anniversary party?
A. 120 B. 90 C. 150 D. 100 E. 115

32. Five circles each have a diameter of 6 units are drawn in a rectangle, as shown below. If $\pi = 3$, what is the area of the white region inside the rectangle?



A. 233 units^2 B. 369 units^2 C. 503 units^2 D. 163 units^2 E. 313 units^2

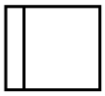
33. What is the slope of a line passing through the points $(4a, a+1)$ and $(2a, 4-a)$?
A. $\frac{a-3}{a}$ B. $\frac{2a-3}{2a}$ C. $\frac{a}{a-1}$ D. $\frac{a-1}{2a}$ E. $\frac{1}{2a-3}$

34. 1,155 in^3 = _____ gallons
A. 2 B. 3 C. 4 D. 5 E. 6

35. How many equilateral triangles of side length 1 cm are needed to completely cover the interior of an equilateral triangle of side length 6 cm?
A. 12 B. 18 C. 36 D. 72 E. 144

36. What is the probability of drawing a prime number from a standard deck of cards?
A. $\frac{5}{13}$ B. $\frac{3}{13}$ C. $\frac{6}{13}$ D. $\frac{2}{13}$ E. $\frac{4}{13}$

37. What is the perimeter of a square that is divided into two rectangles whose areas are 25 cm^2 and 144 cm^2?



A. 52 cm B. 169 units C. 119 units D. 84.5 units E. 59.5 units

38. A pentagon has angle measures of $72^\circ, 58^\circ, 97^\circ, 150^\circ$, and x°. What is the sum of the digits of x?
A. 13 B. 10 C. 12 D. 11 E. 9

39. $\frac{\frac{5}{4}-\frac{4}{3}+\frac{3}{2}}{\frac{1}{6}}$ = _____
A. $\frac{15}{2}$ B. $\frac{3}{14}$ C. $\frac{17}{2}$ D. $\frac{4}{15}$ E. $\frac{19}{2}$

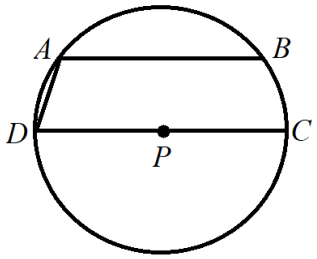
40. Factor completely over the set of real numbers: $4x^2 - 144$
A. $(2x + 12)(2x - 12)$ B. $(2x + 12)^2$ C. $(2x - 12)^2$ D. $4(x^2 - 36)$ E. $4(x + 6)(x - 6)$

41. What is the sum of the roots of the quadratic equation $0 = 2(x - 3)^2 - 5$?
A. -6 B. -1 C. 6.5 D. 6 E. -11

42. To a school musical, adult tickets cost \$12.00 and student tickets cost \$7.00. If 350 people attend the musical for a total of \$3,700.00 in ticket sales, how many adults attended the school musical?
A. 250 B. 200 C. 100 D. 300 E. 150

43. Which of the following is the inverse function of $f(x) = -x + 6$?
A. $f^{-1}(x) = x - 6$ B. $f^{-1}(x) = x - \frac{1}{6}$ C. $f^{-1}(x) = x + \frac{1}{6}$ D. $f^{-1}(x) = -x - \frac{1}{6}$ E. $f^{-1}(x) = -x + 6$

44. In the picture of $\odot P$ below, chord $\overline{AB}$ is parallel to diameter $\overline{DC}$, and $\overline{AD}$ is also a chord. If the measure of minor arc $AD = 35^\circ$, what is the measure of $\angle DAB$?



A. 145° B. 110.5° C. 107.5° D. 72.5° E. 165°

45. Find the value of $x + y$, if $\log_4 64 = x$ and $\log_7 y = 3$.
A. 67 B. 78 C. 340 D. 346 E. 359

46. Which of the following is the solution set for the inequality $-18 < 2x - 4 \leq 44$?
A. $(-7, 24]$ B. $[-7, 24)$ C. $(-11, 24]$ D. $[-11, 24)$ E. $(-\infty, \infty)$

47. Simplify: $\left(\frac{16a^5b^{-2}}{5a^{-2}b^{-3}}\right) \cdot \left(\frac{10a^{-6}b^2}{2ab^{-3}}\right)^2$
A. $\frac{32b^{10}}{a^{11}}$ B. $\frac{80b^{11}}{a^7}$ C. $\frac{32b^{11}}{a^7}$ D. $\frac{80b^{10}}{a^{11}}$ E. $\frac{80b^{11}}{a^{11}}$

48. Find $h\left(\frac{1}{4}\right)$, if $h(x) = x^{-\frac{3}{2}}$.
A. $-\frac{3}{8}$ B. $-\frac{3}{4}$ C. -4 D. 6 E. 8

49. If $(1, 4)$ and $(5, 2)$ are the coordinates of two opposite vertices of a square, what are the coordinates of the other two vertices?
A. $(1, 6)$ & $(5, 4)$ B. $(1, 8)$ & $(9, 2)$ C. $(2, 1)$ & $(4, 5)$ D. $(9, 4)$ & $(5, 6)$ E. $(-2, -1)$ & $(-4, -5)$

50. $-6i(-7i^2)(-i)$ = _____
A. $42i$ B. $-42i$ C. 42 D. -42 E. $13i$

2021 – 2022 TMSCA Middle School Mathematics Test #7 Answer Key

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

2021 – 2022 TMSCA Middle School Mathematics Test #7 Selected Answers

13. 1 meter = 1,000 millimeters, so $\frac{13}{20}$ meters = $\frac{13}{20}(1{,}000) = 650$ millimeters.

14. 32% of 1,800 is equal to 0.32(1800) = 576.

27. $105_6 = 1(36) + 0(6) + 5(1) = 41$ (base 10) = 51 (base 8).

31. If ⅓ drank only tea and ½ drank only water then we know ⅓ + ½ = ⅚. This means that ⅙ of the people at the party drank neither water nor tea, so we have the equation ⅙ x = 15, with x representing the amount of people attending the party. Multiply both sides by 6 and get x = 90. There were a total of 90 at the party.

34. Since 231 in^3 = 1 gallon, 1,155 in^3 = $1{,}155 \div 231 = 5$ gallons.

37. If the square is divided into two rectangles with areas of 25 cm^2 and 144 cm^2, then the area of the entire square is 169 cm^2. This means the side length of the square is 13 units. Therefore, the perimeter of the square is 13(4) = 52 cm.

38. A pentagon has a total of 540°. So, if a pentagon has angle measures of $72^\circ, 58^\circ, 97^\circ, 150^\circ$, and x°, then $x = 540 - 72 - 58 - 97 - 150 = 163$. The sum of the digits of x is then 1 + 6 + 3 = 10.

39. $\frac{\frac{5}{4}-\frac{4}{3}+\frac{3}{2}}{\frac{1}{6}} = \frac{\frac{15}{12}-\frac{16}{12}+\frac{18}{12}}{\frac{1}{6}} = \frac{\frac{17}{12}}{\frac{1}{6}} = \frac{17}{12} \div \frac{1}{6} = \frac{17}{12} \cdot \frac{6}{1} = \frac{102}{12} = \frac{17}{2}$.

40. To factor $4x^2 - 144$, first factor out the GCF of the two terms. The GCF is 4, so $4x^2 - 144$ becomes $4(x^2 - 36)$. $x^2 - 36$ is a difference of squares, which can be factored as $a^2 - b^2 = (a + b)(a - b)$, so $x^2 - 36 = (x + 6)(x - 6)$. Therefore, $4x^2 - 144 = 4(x + 6)(x - 6)$ when factored completely.

41. The sum of the roots of a quadratic equation in standard form, $Ax^2 + Bx + C = 0$, can be found using $\frac{-B}{A}$. We are given the equation $0 = 2(x - 3)^2 - 5$, which must be changed into standard form. Square the binomial to get, $2(x - 3)^2 - 5 = 2(x^2 - 6x + 9) - 5$. Distribute to get $2(x^2 - 6x + 9) - 5 = 2x^2 - 12x + 18 - 5$. Now, combine like terms to get $2x^2 - 12x + 13 = 0$. Therefore, the sum of the roots is then $\frac{-(-12)}{2} = \frac{12}{2} = 6$.

48. If $h(x) = x^{-\frac{3}{2}}$, then $h\left(\frac{1}{4}\right) = \left(\frac{1}{4}\right)^{-\frac{3}{2}} = \left(\frac{4}{1}\right)^{\frac{3}{2}} = (4)^{\frac{3}{2}} = \left(\sqrt[2]{4}\right)^3 = 2^3 = 8$.

49. The vertices (1, 4) and (5, 2) lie on one of the squares diagonals that has a slope of $\frac{4-2}{1-5} = \frac{2}{-4} = -\frac{1}{2}$. The slope of the other diagonal is perpendicular to this diagonal, so its slope must be 2. The midpoint of the diagonals lies at the point $\left(\frac{1+5}{2}, \frac{4+2}{2}\right) = (3, 3)$. Using the slope of 2 and midpoint (3, 3), produces the two points (2, 1) and (4, 5) as the two missing vertices of the square.