TMSCA MIDDLE SCHOOL MATHEMATICS

TEST#6 ©

DECEMBER 11, 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. $50.03 + 21.99 + 1.6 =$ _____ (nearest integer)
A. 70　　　　　　　　B. 60　　　　　　　　C. 73　　　　　　　　D. 74　　　　　　　　E. 72

2. $14.06 - 8.094 =$ _____
A. 5.12　　　　　　　B. 5.966　　　　　　　C. 6.12　　　　　　　D. 6.966　　　　　　　E. 6.506

3. $46 \times 73 =$ _____
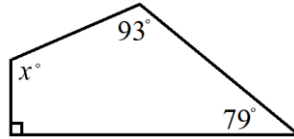A. 3,478　　　　　　B. 3,428　　　　　　　C. 3,358　　　　　　D. 3,328　　　　　　　E. 3,378

4. $72 \div 1.5 =$ _____
A. 48　　　　　　　　B. 44　　　　　　　　C. 144　　　　　　　D. 36　　　　　　　　E. 40

5. What is the additive inverse of $\frac{5}{6}$?
A. $\frac{5}{6}$　　　　　B. $\frac{6}{5}$　　　　　C. $1\frac{1}{5}$　　　　　D. $-\frac{6}{5}$　　　　　E. $-\frac{5}{6}$

6. What is the value of x in the picture below?

A. $108°$　　　　　　B. $106°$　　　　　　C. $98°$　　　　　　D. $124°$　　　　　　E. $104°$

7. Simplify:　　$((7 \cdot 2 - 3 \cdot 3)^2)^2 - 2^4$
A. 609　　　　　　　B. 617　　　　　　　C. 153　　　　　　　D. 12　　　　　　　　E. 587

8. Dylan's puppy ran 32 times around his couch in 4 minutes. At this rate, how many times around the couch did Dylan's puppy run in 1.5 minutes?
A. 8　　　　　　　　B. 16　　　　　　　　C. 10　　　　　　　　D. 9　　　　　　　　E. 12

9. What is the sum of all the data points in the dot plot below?
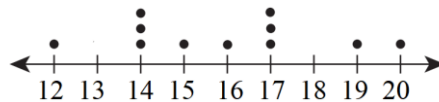
A. 165　　　　　　　B. 160　　　　　　　C. 175　　　　　　　D. 180　　　　　　　E. 170

10. Solve for n:　　$n + 3n + n + n + 2n = 48$
A. $n = 8$　　　　　B. $n = 12$　　　　　C. $n = 4$　　　　　D. $n = 6$　　　　　E. $n = 16$

11. Point A has coordinates $(5, -2)$ and is translated to the left 8 units and up 7 units. What are the new coordinates of A?
A. $(13, 9)$　　　　B. $(13, 5)$　　　　C. $(-3, 9)$　　　　D. $(12, -10)$　　　　E. $(-3, 5)$

12. Classify the polynomial:　　$4x^2 - 7$
A. linear binomial　　B. quadratic binomial　　C. linear monomial　　D. quadratic trinomial　　E. cubic binomial

13. What is the LCM of 35 and 28?
A. 70　　　　　　　　B. 280　　　　　　　C. 140　　　　　　　D. 7　　　　　　　　E. 980

14. Jocelyn bought a computer for $438.00, a wireless mouse for $24.00, and a wireless keyboard for $69.00. Assuming there is no tax and Jocelyn paid with six one-hundred-dollar bills, what was her change?
A. $93   B. $138   C. $38   D. $69   E. $42

15. $\frac{21}{25}$ meters = _____ centimeters
A. 0.84   B. 8.4   C. 84   D. 840   E. 8,400

16. John tells his mom he is thinking of three integers that sum to 84. If John subtracts the same value from each of the three integers, he gets 14, 10, and 39. Which of the following is one of John's original three integers?
A. 23   B. 45   C. 42   D. 21   E. 19

17. MMDCXLIV = _____ (Arabic number)
A. 2,644   B. 2,464   C. 2,466   D. 2,664   E. 2,624

18. If $A = 3,500,000$ and $B = 8,500,000$, then $A + B = $ _____ (scientific notation).
A. 1.2×10^7 B. 1.2×10^6 C. 1.2×10^8 D. 1.2×10^5 E. 1.2×10^{-6}
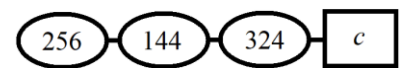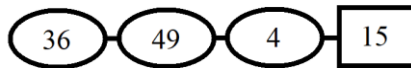
19. What is the supplement of an angle measuring $32°$?
A. $118°$ B. $158°$ C. $58°$ D. $28°$ E. $148°$

20. $421_5 = $ _____ (base 10)
A. 111   B. 132   C. 131   D. 101   E. 121

21. Use the examples in the picture below to find the value of c.

(16)—(9)—(64)—[15]   (36)—(49)—(4)—[15]   (256)—(144)—(324)—[c]

A. 35   B. 15   C. 48   D. 46   E. 32

22. $9.65 = 23$ quarters + 23 dimes + _____ nickels + 10 pennies
A. 24   B. 20   C. 32   D. 36   E. 30

23. Find the value of $m - n$, if $\frac{5}{6} = \frac{n}{42} = \frac{60}{m}$.
A. 28   B. 41   C. 37   D. 102   E. 45

24. What is the value of $f\left(\frac{2}{3}\right)$, if $f(x) = \frac{1}{2}x + 4$?
A. $4\frac{2}{3}$ B. $4\frac{1}{6}$ C. $4\frac{5}{6}$ D. $4\frac{1}{3}$ E. $4\frac{5}{18}$

25. In how many different ways can six people stand in a line?
A. 120   B. 6   C. 12   D. 36   E. 720

26. What is the 31st term of the sequence 948, 944, 940, 936, …?
A. 828   B. 824   C. 832   D. 820   E. 816

27. How many positive integral divisors does the number 1,200 have?
A. 8   B. 30   C. 24   D. 18   E. 22

28. If digits can be repeated, how many three-digit numbers can be formed using prime numbers less than 10?
A. 27   B. 24   C. 64   D. 125   E. 36

29. Let U be a universal set and A and B be subsets of U defined as shown. Find $A' \cap B$.

$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ $A = \{2, 3, 4, 5, 6, 7\}$ $B = \{5, 6, 7, 8, 9, 10\}$

A. $\{1, 8, 9, 10\}$ B. $\{2, 3, 4\}$ C. $\{8, 9, 10\}$ D. $\{5, 6, 7\}$ E. $\{\}$

30. In $\triangle ABC$, the angle measures are $(7x)°$, $(15x - 4)°$ and $(20x - 16)°$, respectively. What would be the classification of $\triangle ABC$?
A. equilateral   B. acute   C. obtuse   D. right   E. equiangular

31. Every student in a class of 24 has on a solid-colored shirt. 25% have on a blue shirt, $\frac{1}{3}$ have on a red shirt and $\frac{1}{12}$ have on a pink shirt. How many students are not wearing a blue, red, or pink shirt?
A. 6   B. 4   C. 2   D. 8   E. 0

32. The arithmetic mean of X, Y, and Z is 57. If $Z = 61$, what is the arithmetic mean of X and Y?
A. 55   B. 52   C. 53.5   D. 54   E. 56

33. In *MathLand*, the currency consists of $5 bills and $9 bills, and the price of every item sold is a whole number of dollars that can be paid exactly, without need for any change to be given using only these two types of bills. What is the largest whole number of dollars which could not be the price of an item sold in *MathLand*?
A. $45.00   B. $90.00   C. $4.00   D. $14.00   E. $31.00

34. What is the value of x if line a passes through the points $(x, 15)$ and $(3, 9)$, and has a slope of $\frac{6}{5}$?
A. -11 B. 8   C. -7 D. 12   E. 10

35. How many triangles can be found in the picture below?

A. 16   B. 8   C. 24   D. 18   E. 12

36. What is the x-coordinate of the intersection point of the graphs of the linear equation $2x + y = -9$ and the linear equation $-10x + y = -15$?
A. ⅓   B. ¾   C. ⅔   D. ¼   E. ½

37. What is the geometric mean of the numbers 96 and 6?
A. 102   B. 51   C. 24   D. 26   E. 45

38. Which of the following is equivalent to $y - 8 = \frac{2}{3}(x - 5)$?
A. $y = \frac{2}{3}x - \frac{34}{3}$ B. $y = \frac{2}{3}x + \frac{14}{3}$ C. $y = \frac{2}{3}x + 7$ D. $y = \frac{2}{3}x - 13$ E. $y = \frac{2}{3}x + 3$

39. $\sqrt{12} + \sqrt{192} + \sqrt{300} =$ _____
A. $6\sqrt{2} + 10\sqrt{3}$ B. $6\sqrt{2} + 74\sqrt{3}$ C. $26\sqrt{2}$ D. $20\sqrt{3}$ E. $22\sqrt{3}$

40. Let A be the reciprocal of $\dfrac{1}{3+\frac{1}{3+\frac{1}{3}}}$. What is the value of A expressed as a decimal?

A. $3.\overline{3}$ B. $3.\overline{6}$ C. 0.33 D. 3.6 E. 3.3

41. What is the negative value of x for which $x(x+1) = 2{,}021(2{,}022)$?
A. $-1{,}011$ B. $-2{,}022$ C. $-2{,}021$ D. $-1{,}012$ E. $-4{,}043$

42. The tire below has a radius of 18 inches. If the tire makes three revolutions to get from point A to point B, what is the distance the tire travels? Let $\pi = 3$.

A. 324 inches   B. 1,944 inches   C. 108 inches   D. 486 inches   E. 216 inches

43. $6i \cdot i(-3i) = $ _____
A. $-18i$ B. $18i$ C. -18 D. 18 E. $\dfrac{1}{18}i$

44. The points $(8, -12)$ and $(-17, -19)$ are the endpoints of a diameter of a circle. What is the sum of the coordinates of the center of the circle?
A. -40 B. -8 C. -20 D. -31 E. -36

45. Find the value of x, if $\log_6 x = 3$.
A. 18   B. 48   C. 216   D. 36   E. 729

46. The graph of the quadratic equation $0 = 2x^2 - 16x + 38$ is translated down six units and to the left eight units. What are the new coordinates of the vertex of the graph after the translation?
A. $(-4, 0)$ B. $(0, 380)$ C. $(-12, 128)$ D. $(-8, 32)$ E. $(-2, -2)$

47. The sum of a number and its reciprocal is $-\dfrac{65}{8}$. What is the sum of all possible value of x?
A. -8 B. $-\dfrac{65}{8}$ C. $-\dfrac{25}{4}$ D. $-\dfrac{27}{4}$ E. $-\dfrac{19}{2}$

48. What is the perimeter of a right triangle with hypotenuse 40 units which can be circumscribed about a circle with radius of 6 units?

A. 52 units   B. 92 units   C. 104 units   D. 88 units   E. 76 units

49. If $2^{x+4} = 1$ and $3^{y-4} = 1$, what is the value of $2^y 3^x$?
A. $\dfrac{8}{27}$ B. $\dfrac{4}{9}$ C. $\dfrac{16}{81}$ D. $\dfrac{8}{81}$ E. $\dfrac{4}{81}$

50. What are the three ordered pairs of numbers (x, y) for which the four vertices of a parallelogram are $(-1, -1)$, $(2, -1)$, $(3, 2)$, and (x, y)?
A. $(0, 2), (-4, -2), (2, 2)$ B. $(0, 2), (-2, -4), (6, 2)$ C. $(2, 0), (2, 4), (6, 2)$ D. $(0, -2), (2, -4), (2, 6)$ E. $(0, -2), (-3, -5), (-6, 4)$

2021 – 2022 TMSCA Middle School Mathematics Test #6 Answer Key

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

6. A four-sided polygon is a quadrilateral. All quadrilaterals have a total of $360°$. Therefore, $x = 360 - 93 - 90 - 79 = 98°$.

16. Let the three integers be x, y, and z. We know that $x + y + z = 84$. If the same amount is subtracted from each integer, the new sum is 63. $84 – 63 = 21$. If we divide 21 by 3, we get 7. Adding 7 to 14, 10, and 39 gives the integers 21, 17, and 46. Since $21 + 17 + 46 = 84$, these are our original three integers. Therefore, the only one of these as an answer choice is 21.

18. If $A = 3,500,000$ and $B = 8,500,000$, then $A + B = 12,000,000 = 1.2 \times 10^7$.

24. If $f(x) = \frac{1}{2}x + 4$, then $f\left(\frac{2}{3}\right) = \frac{1}{2}\left(\frac{2}{3}\right) + 4 = \frac{2}{6} + 4 = \frac{1}{3} + \frac{12}{3} = \frac{13}{3} = 4\frac{1}{3}$.

28. There are 4 prime numbers less than 10, which are 2, 3, 5, and 7. If digits can repeat, there are 4 choices for the first digit, 4 choices for the second digit and 4 choices for the third digit. Therefore, there are $4 \cdot 4 \cdot 4 = 64$ three-digit numbers than can be formed using prime numbers less than 10.

32. The arithmetic mean of X, Y, and Z is 57, so we know $\frac{X+Y+Z}{3} = 57$. If $Z = 61$, then we can substitute to get $\frac{X+Y+61}{3} = 57$. Now, multiply both sides of the equation by 3 to get $X + Y + 61 = 57(3) = 171$. Subtracting both sides of the equation by 61 gives us $X + Y = 110$. The arithmetic mean of X and Y is then $\frac{X+Y}{2} = \frac{110}{2} = 55$.

35. Label the drawing as such:
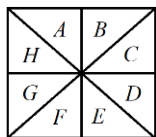
There are 8 triangles labeled with a single letter: $A, B, C, D, E, F, G,$ and H. There are 4 triangles with two letters: AB, CD, EF, GH. There are no triangles using 3 letters. There are 4 triangles using 4 letters, $ABCD, CDEF, EFGH,$ and $GHAB$. There are no more triangles using more than 4 letters. Therefore, there are 16 triangles that can be found in the picture.

40. $\frac{1}{3+\frac{1}{3+\frac{1}{3+\frac{1}{3}}}} = \frac{1}{3+\frac{1}{3+\frac{9}{3}+\frac{1}{3}}} = \frac{1}{3+\frac{1}{3+\frac{1}{10}}} = \frac{1}{3+1\div\frac{10}{3}} = \frac{1}{3+1\cdot\frac{3}{10}} = \frac{1}{3+\frac{3}{10}} = \frac{1}{\frac{30}{10}+\frac{3}{10}} = \frac{1}{\frac{33}{10}} = 1 \div \frac{33}{10} = 1 \cdot \frac{10}{33} = \frac{10}{33}$. The reciprocal of $\frac{10}{33}$ is $\frac{33}{10}$, which is equal to 3.3.

41. We know that $2,021(2,022) = -2,021(-2,022)$. So, if $x(x + 1) = 2,021(2,022)$, we see that we can have $x = 2,021$ or $-2,022$, because $2021(2022) = 2021(2022)$ and $-2,022(-2,021) = 2,021(2,022)$. Therefore, the negative value of x is $-2,022$.

43. $6i \cdot i(-3i) = -18i^3 = -18 \cdot i \cdot i^2 = -18 \cdot i \cdot -1 = 18i$.

48. Label the picture as shown. The sides of the square are 6 units. If the hypotenuse is 40 units, we can label

the segments of the as x and $40 - x$. Since tangents drawn to a circle from the outside point are congruent, two segments have length x units and two have lengths $40 - x$. The perimeter is therefore, $6 + 6 + x + x + 40 - x + 40 - x = 12 + 2x + 80 - 2x = 12 + 80 = 92$ units.