TMSCA MIDDLE SCHOOL MATHEMATICS TEST #6 ©

DECEMBER 7, 2019

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. $-911 + 2{,}652$ = _____ (nearest ten)

A. 3,560 B. 3,563.0 C. 1,750 D. 1,740 E. 1,700

2. $53\frac{1}{5} - 15\frac{4}{5}$ = _____

A. $38\frac{1}{5}$ B. $38\frac{4}{5}$ C. $37\frac{1}{5}$ D. $37\frac{2}{5}$ E. $37\frac{3}{5}$

3. $4.2 \times 0.7 \times 0.3$ = _____ (nearest hundredth)

A. 0.9 B. 0.91 C. 0.88 D. 0.89 E. 0.87

4. $82\frac{2}{3} \div 4$ = _____

A. $20\frac{2}{3}$ B. $20\frac{1}{3}$ C. $21\frac{2}{3}$ D. $21\frac{1}{3}$ E. $20\frac{1}{6}$

5. If $x = 12$, then what is the value of $\frac{1}{2}x + \frac{1}{3}x + \frac{1}{4}x$?

A. $1\frac{1}{12}$ B. 6 C. 9 D. $\frac{1}{6}$ E. 13

6. What is the prime factorization of the number 3,564?

A. $2^3 \cdot 3^4 \cdot 13$ B. $2^3 \cdot 3^2 \cdot 5 \cdot 13$ C. $2^2 \cdot 3^4 \cdot 11$ D. $2^4 \cdot 3^2 \cdot 7 \cdot 11$ E. $2^3 \cdot 3^4 \cdot 6 \cdot 7$

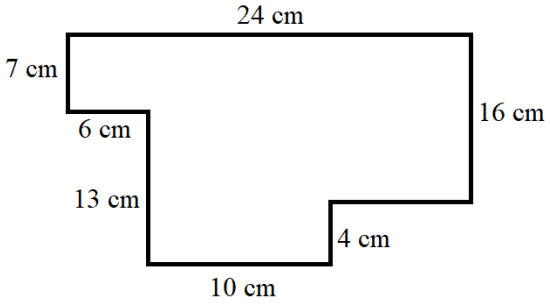
7. What value is 15% of 720?

A. 108 B. 86.5 C. 96 D. 94.5 E. 102.5

8. What is the multiplicative inverse of the number $16\frac{2}{5}$?

A. $-16\frac{2}{5}$ B. $\frac{5}{82}$ C. $-\frac{5}{82}$ D. $\frac{82}{5}$ E. $\frac{1}{41}$

9. What is the perimeter of the shape below?



A. 80 cm B. 84 cm C. 88 cm D. 92 cm E. 86 cm

10. 56 ounces = _____ pounds

A. 2.5 B. 4.5 C. 3.25 D. 4.25 E. 3.5

11. 1,008 – 642 = _____ (Roman numeral)

A. CCCLVI B. CDXLVI C. CDLXVII D. CCCLXVI E. CCCLVI

12. What is the LCM of the numbers 21, 48 and 30?

A. 860 B. 1,830 C. 1,680 D. 1,840 E. 1,760

13. What is the sum of the number of edges and faces of a hexagonal prism?

A. 26 B. 24 C. 36 D. 32 E. 38

14. *Nola's Bakery* orders new piping tips every month. In each order, 5 out of every dozen are defective. If *Nola's Bakery* orders 276 new piping tips in their next order, how many will be defective?
A. 161 B. 115 C. 146 D. 135 E. 107

15. 12 + 22 + 32 + … + 102 + 112 = _____
A. 684 B. 682 C. 686 D. 688 E. 692

16. Which of the following are prime numbers?
I. 61 II. 73 III. 47 IV. 59
A. I and II only B. II and III only C. I, II, III only D. II and IV only E. all are prime

17. What is the area of a triangle with sides measuring 50 inches, 14 inches, and 48 inches?
A. 224 in^2 B. 342 in^2 C. 112 in^2 D. 1,200 in^2 E. 336 in^2

18. Simplify: $\left(\frac{3}{4}\right)^2 + \left(\frac{1}{2}\right)^2 + 1\frac{3}{16}$
A. 0 B. 1 C. 2 D. 3 E. -1

19. $2012_3 =$ _____$_9$
A. 73 B. 72 C. 65 D. 67 E. 61

20. Saketh started watching a movie at 6:11 pm. He paused the movie after ¾ of an hour had passed to get some snacks. It took him 12 minutes to get snacks and then resumed the movie. If the movie lasted 1½ hours after Saketh got snacks, at what time did the movie end?
A. 8:42 pm B. 8:38 pm C. 8:04 pm D. 8:26 pm E. 8:44 pm

21. What value is 10 more than the sum of the median and mode of the set of numbers 19, 78, 32, 54, 44, 72, 43, 32, 56, and 84?
A. 81 B. 78 C. 93 D. 91 E. 92

22. If one angle in a rhombus measures 96.2°, what is the measure of one of the adjacent angles?
A. 83.8° B. 6.8° C. 6.2° D. 73.8° E. 93.8°

23. $\frac{13}{9}$ = _____ (decimal)
A. $1.\overline{4}$ B. 1.4 C. $1.\overline{43}$ D. 1.45 E. $1.1\overline{4}$

24. What is the 10th term of the sequence 4, 7, 11, 18, 29, 47, …?
A. 319 B. 321 C. 322 D. 320 E. 323

25. Julia has a dog that had a litter of 7 puppies. Sarah's friend Hira is going to adopt 2 of the puppies. In how many ways can Hira choose 2 out of the 7 puppies?
A. 14 B. 4 C. 28 D. 21 E. 42

26. What is the slope of the line with the equation $2y = 8x - 15$?
A. $\frac{-15}{2}$ B. 8 C. 4 D. $\frac{1}{4}$ E. $\frac{-15}{8}$

27. How many ways can you make 25¢ using quarters, dimes, nickels, and pennies?
A. 9 B. 13 C. 17 D. 11 E. 15

28. ½ of 0.00058 = _____ (scientific notation)
A. 2.9×10^{-3} B. 1.16×10^{-3} C. 2.9×10^{-5} D. 2.9×10^{-4} E. 1.16×10^{-2}

29. Which of the following relations does not represent a function?
I. {(9, 8), (12, 12), (3, 4)} II. {(4, 5), (4, 8), (4, 1)} III. {(3, 1), (4, 1), (5, 1)} IV. {(0, 0), (3, 3), (7, 7)}
A. II only B. III and IV C. I only D. II and III E. I, III and IV

30. Gasoline costs $2.25 per gallon and your car has a 24-gallon gas tank. If your gas tank is only ¼ full, how much will it take to fill the tank?
A. $13.50 B. $42.50 C. $38.50 D. $36.50 E. $40.50

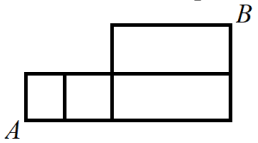
31. The number 9 can be written as the sum of 9 consecutive integers. What is the product of the positive integers?
A. 362,880 B. 120 C. 720 D. 0 E. 15

32. If $f(x) = 15 + 2x$ and $g(x) = \frac{8}{x}$, then what is the value of $f(g(0.4))$?
A. 20 B. 1.975 C. 415 D. 55 E. 36.6

33. Simplify: $12\sqrt{45a^{11}b^{12}}$
A. $3a^5b^6\sqrt{5ab}$ B. $3a^5b^6\sqrt{5a}$ C. $36a^5b^6\sqrt{5ab}$ D. $36a^5b^6\sqrt{5a}$ E. $36a^5b^6\sqrt{5a^6b^6}$

34. What is the growth rate of the exponential growth function $f(x) = 45.2(2.19)^x$?
A. 219% B. 452% C. 119% D. 19% E. 319%

35. Moving only up or to the right, how many paths are there from point *A* to point *B*?



A. 7 B. 6 C. 8 D. 10 E. 9

36. Point *C* is the midpoint of $\overline{AB}$, and point *D* is the midpoint of $\overline{CB}$. What are the coordinates of point *D*, given the coordinates of point *A* are (16, 38) and the coordinates of point *B* are (24, 18)?
A. (20, 27) B. (14, 15) C. (20, 25) D. (18, 21) E. (22, 23)

37. How many elements are in *A*, if $A = \{a, b, c, d, e, f\} \cup \{a, e, i, o, u\} \cap \{a, d, g, j\}$?
A. 11 B. 4 C. 2 D. 15 E. 3

38. If $(4n - 9)(3n + 12) = Ax^2 + Bx + C$, what is the value of $AB - C$?
A. 39 B. 360 C. 144 D. 252 E. 156

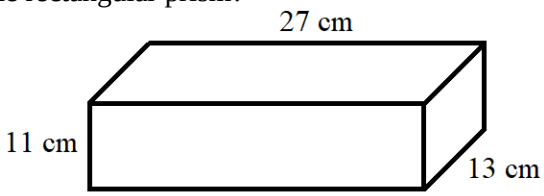
39. A bicycle lock has a combination consisting of a letter of the alphabet first, followed by three digits. The digits can be 0 – 9, inclusive, and may repeat. How many bicycle combinations can be formed?
A. 13,104 B. 17,576 C. 26,000 D. 18,954 E. 75,760

40. Simplify: $6x - 3x + 6((-2)^3 \cdot x - 1.5x)$
A. $-36x$ B. $-48x$ C. $-54x$ D. $-63x$ E. $-24x$

41. What is the measure of the hypotenuse of a right triangle with legs measuring 1.4 cm and 4.8 cm?
A. 5.4 cm B. 5.3 cm C. 6.1 cm D. 6 cm E. 5 cm

42. For a matinee movie, adult tickets cost \$4.50 and child tickets cost \$3.00. A daycare center paid for a total of 66 people to attend a movie. If movie ticket sales totaled \$216, how many adult tickets did the daycare center pay for?
A. 12 B. 20 C. 22 D. 8 E. 14

43. What is the lateral surface area of the rectangular prism?



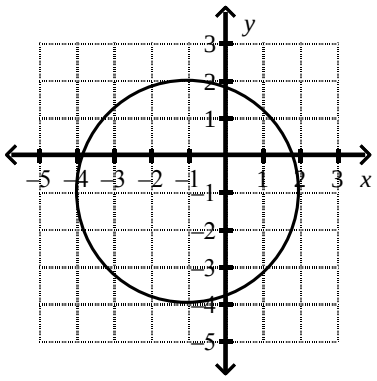
A. 3,861 cm^2 B. 102 cm^2 C. 1,582 cm^2 D. 880 cm^2 E. 1,102 cm^2

44. What is the sum of the digits of 7!?
A. 11 B. 9 C. 13 D. 7 E. 10

45. Solve for *x*: $x^2 = (x + 2020)^2$
A. 404 B. 505 C. no solution D. $-1{,}010$ E. $-2\sqrt{404}$

46. $(mn^2)^3 \cdot (m^{-2}n^2)^2 \cdot m^4 \cdot ((mn^2)^2)^2$ = _____
A. m^9n^{16} B. m^9n^{20} C. m^7n^{18} D. m^7n^{16} E. m^7n^{20}

47. What is the equation of the circle graphed below?

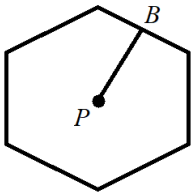


A. $x^2 + y^2 = 6$ B. $x^2 + y^2 = 3$ C. $(x + 1)^2 + (y + 1)^2 = 3$ D. $(x + 1)^2 + (y + 1)^2 = 9$ E. $x^2 + y^2 = 9$

48. What is the area of a triangle with vertices located at $(-3, -1), (6, -2)$, and $(4, 4)$?
A. 24 $units^2$ B. 28 $units^2$ C. 32 $units^2$ D. 26 $units^2$ E. 34 $units^2$

49. Using interval notation, what is the range of the graph of the quadratic function $x^2 + 4x - 1 = 0$?
A. $[-5, \infty)$ B. $[-2, \infty)$ C. $(-\infty, -1]$ D. $[-\infty, -1]$ E. $(-2, -5)$

50. $\overline{PB}$ is an apothem of the regular hexagon below. If $PB = 6\sqrt{3}$ cm, what is the perimeter of the hexagon?



A. $72\sqrt{3}$ cm B. 72 cm C. 108 cm D. $96\sqrt{3}$ cm E. $48\sqrt{3}$ cm

2019 – 2020 TMSCA Middle School Mathematics Test #6 Answer Key

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

2019 – 2020 TMSCA Middle School Mathematics Test #6 Selected Answers

15. To add consecutive integers, use the formula $\frac{N(F+L)}{2}$, where N equals the number of terms, F equals the first term, and L equals the last term. We are given $12 + 22 + 32 + \ldots + 102 + 112$, so we know that $N = 11$, $F = 12$, and $L = 112$. Substituting into the formula and we have a sum of $\frac{11(12+112)}{2} = \frac{11(124)}{2} = \frac{1{,}364}{2} = 682$.

26. The slope-intercept form of a linear equation is $y = mx + b$, where m is the slope and b is the y-intercept. We are given the equation $2y = 8x - 15$, so dividing by 2 to the entire equation and we get $y = 4x - 7.5$. The slope of the equation is then 4.

28. ½ of 0.00058 = 0.00029 = 2.9×10^{-4}.

31. The number 9 can be written as the sum of 9 consecutive integers, $(-3) + (-2) + (-1) + 0 + 1 + 2 + 3 + 4 + 5$. The product of the positive integers is $1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 = 120$.

34. An exponential function is in the form $y = a \cdot b^x$, where b is equal to the growth factor. b is equal to $1 + r$, where r equals the growth rate. We are given the equation $f(x) = 45.2(2.19)^x$, so the growth factor is 2.19. Since $b = 2.19$, then $2.19 = 1 + r$. Subtract 1 from both sides and get $1.19 = r$. Therefore, the growth rate is 1.19 = 119%.

37. $\{a, b, c, d, e, f\} \cup \{a, e, i, o, u\} = \{a, b, c, d, e, f, i, o, u\}$ and $\{a, b, c, d, e, f, i, o, u\} \cap \{a, d, g, j\} = \{a, d\}$. Therefore, A has 2 elements.

39. There are 26 letters in the alphabet and 10 digits from 0 – 9, inclusive. If the combination consists of a letter first and then three digits that may repeat, then there are a total of $26 \cdot 10 \cdot 10 \cdot 10 = 26{,}000$ bicycle combinations that can be formed.

40. $6x - 3x + 6((-2)^3 \cdot x - 1.5x) = 6x - 3x + 6(-8x - 1.5x) = 6x - 3x - 48x - 9x = -54x$.

44. $7! = 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 5{,}040$. The sum of the digits of 7! is then 5 + 0 + 4 + 0 = 9.

45. $x^2 = (x + 2020)^2$, so $x^2 = x^2 + 2020x + 2020x + 2020^2$, which gives us $x^2 = x^2 + 4040x + 2020^2$. Subtract x^2 from both sides of the equal sign and we get $0 = 4040x + 2020^2$. Subtract 2020^2 from both sides and we get $4040x = -(2020)^2$. Divide both sides by 4040 and $x = \frac{-(2020)^2}{4040} = \frac{-(2020)(2020)}{4040} = \frac{-(2020)(2020)}{2(2020)} = \frac{-2020}{2} = -1{,}010$.

46. $(mn^2)^3 \cdot (m^{-2}n^2)^2 \cdot m^4 \cdot ((mn^2)^2)^2 = m^3n^{2\cdot3} \cdot m^{-2\cdot2}n^{2\cdot2} \cdot m^4 \cdot m^{2\cdot2}n^{2\cdot2\cdot2} = m^3n^6 \cdot m^{-4}n^4 \cdot m^4 \cdot m^4n^8 = m^{3+(-4)+4+4}n^{6+4+8} = m^7n^{18}$.

47. The equation of a circle is $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the center and r is the radius. The center of the circle on the graph is $(-1, -1)$ and the radius is 3. Therefore, the equation of the graphed circle is $(x - (-1))^2 + (y - (-1))^2 = 3^2$, which simplifies to $(x + 1)^2 + (y + 1)^2 = 9$.