TMSCA MIDDLE SCHOOL MATHEMATICS TEST #4 ©

NOVEMBER 9, 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.

2019 – 2020 TMSCA Middle School Mathematics Test #4

1. 8.438 + 11.387 = _____
A. 20.125 B. 19.825 C. 19.625 D. 20.105 E. 19.225

2. 156 – 289 = _____
A. -103 B. 445 C. -445 D. -167 E. -133

3. $12\frac{1}{3} \times 6\frac{2}{3}$ = _____
A. $80\frac{2}{9}$ B. $74\frac{2}{9}$ C. $76\frac{2}{9}$ D. $78\frac{2}{9}$ E. $82\frac{2}{9}$

4. 170.4 ÷ 0.6 = _____ (nearest ten)
A. 280 B. 30 C. 300 D. 290 E. 284.1

5. What is the multiplicative inverse of the number $\frac{5}{8}$?
A. $1\frac{3}{8}$ B. $1\frac{5}{8}$ C. $-\frac{5}{8}$ D. 0.625 E. $\frac{8}{5}$

6. Let *S* be the sum of the numbers 349 and 3,896. What percentage of the digits of *S* are prime?
A. 0% B. 25% C. 50% D. 75% E. 100%

7. What are the total interior degrees of a heptagon?
A. $1{,}080^\circ$ B. 900° C. 720° D. $1{,}260^\circ$ E. $1{,}180^\circ$

8. What is the sum of the distinct prime factors of the number 156?
A. 20 B. 18 C. 16 D. 15 E. 19

9. Simplify: $\frac{2}{3}(18+6) - \frac{5}{4}(15-3) + 11$
A. 12 B. 14 C. 24 D. 4 E. 22

10. The table below shows the number of laps Nikhil swam each day for a week. What is the positive difference between the mode and mean of the data from the table?

Number of Laps Swam Each Day

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
# of Laps	16	18	16	4	12	24	8

A. 14 B. 4 C. 1 D. 5 E. 2

11. What is the LCM of the numbers 24 and 138?
A. 382 B. 342 C. 592 D. 552 E. 482

12. 2,119 = _____ (Roman numeral)
A. MMXIX B. MMCXIX C. MMCXVIIII D. MMCXXIX E. MMXCIX

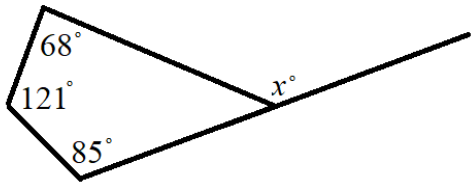
13. 45% = _____ (fraction)
A. $\frac{1}{2}$ B. $\frac{9}{40}$ C. $\frac{9}{20}$ D. $\frac{9}{16}$ E. $\frac{3}{8}$

14. Marcel bought a chicken sandwich for \$9.95, some French-fries for \$4.74, a drink for \$3.75 and a dessert for \$5.19. If there is no tax, how much change did Marcel get back after he paid with one twenty-dollar bill and one ten-dollar bill?
A. \$6.37 B. \$1.31 C. \$4.29 D. \$7.15 E. \$5.33

15. 1,520,000 centigrams = _____ dekagrams
A. 1.52 B. 15.2 C. 152 D. 1,520 E. 15,200

16. The area of a circle is 256π cm^2. What is the circumference of the circle?
A. 16π cm B. 64π cm C. 128π cm D. 8π cm E. 32π cm

17. What is the value of *x* in the picture below?



A. 86 B. 76 C. 116 D. 114 E. 94

18. Which sequence is represented by the expression $4n - 7$, where *n* represents the position of the term in the sequence?
A. $-3, 1, 5, \ldots$ B. $-7, -28, -112, \ldots$ C. $4, -7, -18, \ldots$ D. $3, -1, -5, \ldots$ E. 11, 16, 19, 23

19. $\{a, b, c, d, e\} \cup \{a, e, i, o, u\}$ = _____
A. $\{a, e\}$ B. $\{\emptyset\}$ C. $\{a, a, b, c, d, e, e, i, o, u\}$ D. $\{a, b, c, d, e, i, o, u\}$ E. $\{b, c, d, i, o, u\}$

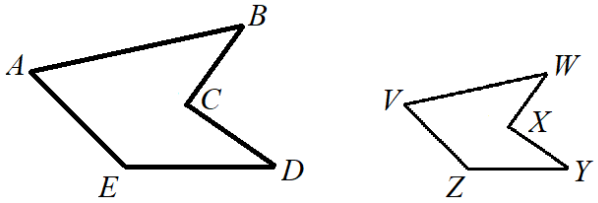
20. $1101101_2 =$ _____$_4$
A. 1223 B. 1212 C. 1032 D. 1232 E. 1231

21. The probability of Rasheed making a free throw is 3:8. What are the odds of Rasheed not making a free throw?
A. 5:8 B. 3:5 C. 8:3 D. 5:3 E. 8:5

22. $17^{\frac{1}{2}}$ is equivalent to which of the following?
A. $\sqrt{17^2}$ B. $\sqrt{17}$ C. 8.5 D. 144.5 E. $\frac{1}{17^2}$

23. Alice is going to a snow-cone stand. They have three different sizes of cups, 15 different flavors, and then you must decide if you want a narrow or wide straw. How many total options can Alice choose from to order her snow-cone?
A. 120 B. 180 C. 90 C. 60 E. 45

24. If Pentagon *ABCDE* is similar to pentagon *VWXYZ*, which of the following must be true?



A. $\frac{AB}{VW} = \frac{XW}{CB}$ B. $\frac{AE}{VZ} = \frac{CD}{XY}$ C. $\frac{ED}{CB} = \frac{XW}{YZ}$ D. $\frac{AE}{ED} = \frac{VY}{XZ}$ E. $\frac{ZY}{CD} = \frac{AB}{VX}$

25. If $f(x) = 12x^2 - 31$, then what is the value of $f(-5)$?
A. 3,569 B. -91 C. 89 D. -331 E. 269

26. Kartik can rake four yards in one hour. How many yards can he rake in 4.5 hours?
A. 16 B. 18 C. 22 D. 20 E. 21

27. What is the slope of the line that passes through the point (26, 31) and is parallel to the *y*-axis?

A. zero-slope B. $x = 26$ C. undefined slope D. $y = 31$ E. $\frac{31}{26}$

28. The local pizza shop offers 6 different appetizers. A group of friends go eat at the pizza shop and order three appetizers. How many different combinations of appetizers are there?

A. 20 B. 18 C. 2 D. 120 E. 36

29. What is the *y*-intercept of the line with the equation $6x = 4y - 48$?

A. -8 B. 8 C. -12 D. 12 E. ⅔

30. $\frac{1}{7}$ = _____ (decimal)

A. $0.\overline{148257}$ B. $0.\overline{142857}$ C. $0.\overline{142587}$ D. $0.\overline{145827}$ E. $0.\overline{124857}$

31. What is the range of the function $y = \frac{x}{3} - 7$ when the domain is $\{-6, -3, 0, 12\}$?

A. $\{-9, -8, -7, -3\}$ B. $\{-9, -6, -3, 0\}$ C. {−½, −1, 0, 4} D. $\{12, 0, -3, -6\}$ E. {⅓, ½, 0, 1}

32. Simplify: $4n - [p + (p + 5n) - (3n - 4p)] - 2n$

A. $-4n + 6p$ B. $-6n + 4p$ C. $4n + 6p$ D. $4n$ E. $-6p$

33. $3\sqrt{18} + 6\sqrt{72}$ = _____

A. $45\sqrt{2}$ B. $36\sqrt{3}$ C. $54\sqrt{10}$ D. $36\sqrt{6}$ E. $18\sqrt{2}$

34. What is the growth factor of the exponential growth function $f(x) = 76(3.6)^x$?

A. 273.6 B. 76 C. 2.6 D. 260 E. 3.6

35. Neal gave 3 pieces of candy to each of his friends. He would have needed 30 more pieces of candy to give his friends 5 pieces each. How many friends did Neal give candy to?

A. 12 B. 18 C. 16 D. 15 E. 13

36. If $(7x - 3)(3x - 5) = Ax^2 + Bx + C$, what is the value of $B - 2C + A$?

A. 124 B. 17 C. -53 D. -7 E. -35

37. If the area of the square is 144 unit^2, what is the area of the circle, in terms of π?

A. 6π units^2 B. 12π units^2 C. 24π units^2 D. 36π units^2 E. 48π units^2

38. What is the value of *C* that will make the polynomial $x^2 + 22x + C$ a perfect square trinomial?

A. 121 B. 484 C. 44 D. 242 E. 88

39. What is the domain of the graph of the quadratic equation $2x^2 + 7 = -12x + y$?

A. $x \leq 7$ B. all real numbers C. $x \geq 7$ D. $x < 7$ E. $x > 7$

40. Which of the following represents a direct variation?

I. $4x = 10y$ II. $y = 0.75x$ III. $y = 3x + 2$ IV. $y = 2x^2$

A. I and II B. I, II, and III C. III and IV D. II and III E. all of them

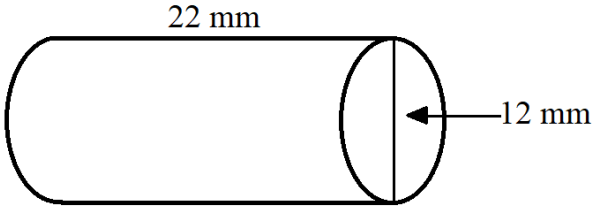
41. If $2^{x+4} = 40$, then 2^x is equal to which of the following?
A. 2.5 B. 5 C. 22.5 D. 2.25 E. 5.2

42. A circle has an equation of $(x-4)^2 + (y+2)^2 = 225$. If $\pi = 3$, what is the area of the circle?
A. 90 units^2 B. 180 units^2 C. 625 units^2 D. 337.5 units^2 E. 675 units^2

43. What is the length of the median of an isosceles trapezoid with bases measuring 34 inches and 52 inches, and has a height of 12 inches?
A. 49 inches B. 45 inches C. 43 inches D. 42 inches E. 46 inches

44. What is the equation of the axis of symmetry of the graph of the quadratic equation $10x^2 + 5x - 20 = y$?
A. $x = -½$ B. $x = -2$ C. $x = -4$ D. $x = -¼$ E. $x = ½$

45. If $\pi = 3$, what is the volume of the prism?



A. 9,504 mm^3 B. 2,746 mm^3 C. 9,124 mm^3 D. 2,436 mm^3 E. 2,376 mm^3

46. $\frac{a^{-3}b^{-2}c}{(a^2b^{-2})^3} \cdot \frac{ab^{-2}c^2}{a^{-1}b^{-1}c} =$ _____

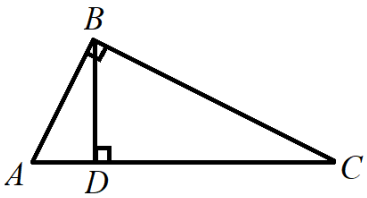
A. $\frac{b^4c^2}{a^9}$ B. $\frac{c^2}{a^{13}b}$ C. $\frac{c^2}{a^{15}b}$ D. $\frac{b^4c^2}{a^{13}}$ E. $\frac{b^3c^2}{a^7}$

47. What are the coordinates of the vertex of the graph of the quadratic equation $2x^2 - 16x - 8 = y$?
A. $(4, -40)$ B. $(-8, -8)$ C. $(-4, 88)$ D. $(8, -8)$ E. $(-4, -8)$

48. What is the sum of the two linear factors of $x^2 - 81$?
A. 18*x* B. -18 C. 9*x* D. 2*x* E. 18

49. 105 people attended a school basketball game where adult tickets cost \$2 and student tickets cost \$1. If total sales of the tickets were \$185, how many more adults attended the basketball game than students?
A. 45 B. 85 C. 55 D. 30 E. 25

50. Given the triangle below, if *AD* = 10 cm and *DC* = 20 cm, what is *BD*.



A. $4\sqrt{5}$ cm B. $10\sqrt{2}$ cm C. 15 cm D. $12\sqrt{2}$ cm E. 12 cm

2019 – 2020 TMSCA Middle School Mathematics Test #4 Answer Key

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

2019 – 2020 TMSCA Middle School Mathematics Test #4 Selected Answers

8. The prime factorization of 156 is $2^2 \cdot 3 \cdot 13$. Therefore, the sum of the distinct prime factors of the number 156 is 2 + 3 + 13 = 18.

22. If $n^{\frac{a}{b}} = \sqrt[b]{n^a}$, then $17^{\frac{1}{2}} = \sqrt[2]{17^1}$, or $\sqrt{17}$.

27. The *y*-axis is a vertical line. Every vertical line has an undefined slope. Therefore, any line that is parallel to the *y*-axis will also have an undefined slope.

30. $\frac{1}{7} = 0.142857142857142857 \ldots = 0.\overline{142857}$.

35. You can make an equation for this problem. He gave each friend 3 pieces and needed 30 more to give each friend a total of 5 pieces of candy each. So, the equation is $\frac{3x+30}{x} = 5$. First, multiply each side by *x* and get $3x + 30 = 5x$. Subtract 3*x* from both sides and get 30 = 2*x*. Dividing each side by 2 and we get *x* = 2. Neal gave candy to 15 friends.

37. The area of the square is 144 unit^2, so the side length of the square is 12 units. This means the radius of the circle is ½(12) = 6 units. The formula for the area of a circle is $A = \pi r^2$. Therefore, in terms of π, the area of the circle is $6^2 \cdot \pi = 36\pi$ units^2.

40. A direct variation is a linear function in the form *y* = *kx*. Simplify $4x = 10y$ by dividing both sides by 10 and get $y = \frac{2}{5}x$. Therefore, the only choices that represent direct variations are choices I and II.

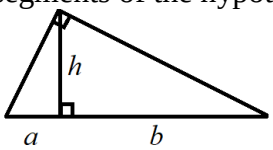
41. $2^{x+4} = 2^x \cdot 2^4 = 2^x \cdot 16$. So, if $2^{x+4} = 40$, then $2^x \cdot 16 = 40$, and dividing by sides by 16 gives $2^x = 2.5$.

43. The measure of a median of a trapezoid is equal to one-half the sum of the two bases of the trapezoid. Therefore, the measure of the median of a trapezoid with bases measuring 34 inches and 52 inches is then $\frac{34+52}{2} = \frac{86}{2} = 43$ inches.

44. The formula to find the axis of symmetry of a quadratic equation in standard form, $Ax^2 + Bx + C = 0$, is $x = \frac{-B}{2A}$. We are given the equation $10x^2 + 5x - 20 = 0$, so its axis of symmetry is $x = \frac{-5}{2(10)} = \frac{-5}{20} = -\frac{1}{4}$.

48. The linear factors of $x^2 - 81$ are (*x* + 9) an (*x* – 9). Therefore, the sum of the two factors of $x^2 - 81$, is then $x + 9 + x - 9 = 2x$.

50. The length of the altitude to the hypotenuse of a right triangle is the geometric mean of the lengths of the segments of the hypotenuse. Looking at the picture below, we now know that $h = \sqrt{ab}$.



In the problem, *a* = 10 and *b* = 20. Therefore, *BD* = $\sqrt{10 \cdot 20} = \sqrt{200} = 10\sqrt{2}$ cm.