TMSCA MIDDLE SCHOOL MATHEMATICS

TEST#4 ©

NOVEMBER 13, 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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2021 – 2022 TMSCA Middle School Mathematics Test #4

1. 587 + 688 = _____
A. 1,325 B. 1,350 C. 1,250 D. 1,225 E. 1,275

2. 204 – 76 – 8 = _____
A. 110 B. 114 C. 120 D. 124 E. 122

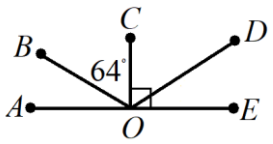
3. 42 × 23 = _____ (nearest hundred)
A. 800 B. 1,000 C. 970 D. 960 E. 900

4. 18 ÷ 0.5 = _____
A. 9 B. 4.5 C. 12 D. 36 E. 6

5. 529 = _____ (Roman numeral)
A. DXXVIIII B. DXXIX C. LXXIX D. MXXVIIII E. MMXIX

6. If $\pi = 3$, what is the circumference of a circle with a diameter of 15.8 cm?
A. 23.7 cm B. 47.4 cm C. 94.8 cm D. 187.23 cm E. 75.68 cm

7. What is the supplement of $\angle BOC$?



A. 126° B. 26° C. 116° D. 86° E. 136°

8. A rope is 65 inches long and must be cut so that one piece is four times as long as the other. What is the length of the larger piece of rope?
A. 48 inches B. 14 inches C. 56 inches D. 46 inches E. 52 inches

9. 12% of 300 is equal to which of the following values?
A. 24 B. 32 C. 38 D. 36 E. 42

10. 300 has how many distinct prime factors?
A. 5 B. 3 C. 6 D. 9 E. 8

11. What is the LCM of the numbers 16 and 30?
A. 2 B. 240 C. 120 D. 90 E. 480

12. Chloe has a bag of 5 yellow markers, 7 green markers, 2 red markers, 4 blue markers, and 2 black markers. If Chloe randomly selects a marker from her bag, what is the probability she does not choose a blue marker?
A. $\frac{9}{10}$ B. $\frac{1}{5}$ C. $\frac{1}{9}$ D. $\frac{3}{4}$ E. $\frac{4}{5}$

13. What is the sum of the integers -87 and 133?
A. 220 B. -220 C. 46 D. 56 E. -56

14. What is the sum of the mean and median of the set of numbers 56, 55, 18, 72, and 14?
A. 110 B. 61 C. 85 D. 98 E. 84

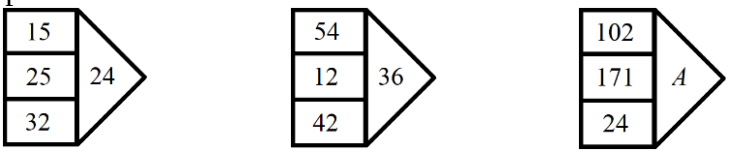
15. 544 millimeters = _____ meters
A. 54,400 B. 5,440 C. 54.4 D. 5.44 E. 0.544

16. Convert 837,000,000,000 into scientific notation.
A. 83.7×10^{10} B. 8.37×10^{-11} C. 8.37×10^{-10} D. 8.37×10^{11} E. 8.37×10^{10}

17. 15 quarters + 24 dimes + 24 nickels + 100 pennies = _____
A. \$10.15 B. \$9.15 C. \$8.15 D. \$8.55 E. \$8.35

18. Find the value of $12 \uparrow 20$, if $m \uparrow n = \frac{5m}{n} - 3$.
A. 7 B. $-\frac{43}{20}$ C. 0 D. $-\frac{8}{3}$ E. -2

19. Use the examples in the picture below to find the value of *A*.



A. 99 B. 108 C. 96 D. 112 E. 117

20. A spinner is divided into 12 equal sections. If Trenton spins the spinner and rolls a number cube, how many total outcomes are possible?
A. 18 B. 12 C. 96 D. 24 E. 72

21. Point *A* has coordinates $(-7, -2)$. What are the coordinates of point *A* after it is reflected across the *y*-axis and then translated down four units and to the right ten units?
A. $(3, 2)$ B. $(3, -6)$ C. $(17, 2)$ D. $(17, -6)$ E. $(-3, 2)$

22. $\frac{7}{8}$ = _____ (decimal)
A. 0.675 B. 0.875 C. 0.825 D. 0.775 E. 0.725

23. Solve: $-3g < 45$
A. $g < 48$ B. $g = 48$ C. $g > -15$ D. $g < -15$ E. $g > 48$

24. What value of *y* makes the proportion $\frac{7}{13} = \frac{y}{78}$ true?
A. 42 B. 54 C. 46 D. 44 E. 52

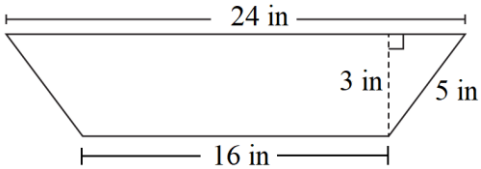
25. What is the perimeter of a right triangle with legs measuring 12 inches and 16 inches?
A. 28 inches B. 36 inches C. 32 inches D. 96 inches E. 48 inches

26. Bethany has four coins in her pocket that consists of nickels, dimes, and/or quarters. If coins can repeat, for example all four coins could be quarters, how many different total values can Bethany possibly have?
A. 12 B. 15 C. 14 D. 16 E. 18

27. $101_2 =$ _____ (base 4)
A. 31 B. 21 C. 12 D. 11 E. 10

28. If $g(x) = 22x - 17$, then find the value of $g(-9)$.
A. -215 B. -4 C. 30 D. 181 E. -181

29. What is the area of the trapezoid below?



A. 60 in^2 B. 24 in^2 C. 72 in^2 D. 300 in^2 E. 150 in^2

30. Line *a* passes through the points (2, 22.5) and (7, 31.25). What is the slope of line *a*?
A. $\frac{3}{4}$ B. $\frac{5}{4}$ C. $\frac{3}{2}$ D. $-\frac{2}{3}$ E. $\frac{7}{4}$

31. The complement of a set *A* is symbolized by A' and it is the set of all elements in the universal set that are not in set *A*. Let *U* be the universal set $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ and *A* be a subset of *U*, $A = \{2, 4, 6\}$. Find the set A'.
A. {1, 2, 3, 4, 5, 6, 7, 8, 9} B. {7, 8, 9} C. {1, 3, 7, 8, 9} D. {1, 3, 5, 7, 8, 9} E. {2, 4, 6}

32. The angles in a triangle are in a ratio of 7:8:21. If the smallest angle measure is equal to x°, what is the value of twice *x*?
A. 80 B. 210 C. 70 D. 90 E. 50

33. Simplify: $\frac{24m^6n^{11}}{4m^6n^5}$
A. $6mn^6$ B. $6n^6$ C. $20mn^6$ D. $20n^6$ E. $6m^{12}n^{17}$

34. If the exterior angle measure of a regular polygon is 60°, how many sides does the polygon have?
A. 8 B. 12 C. 10 D. 4 E. 6

35. The sum of 2,021 positive integers is 2,022. What is the value of the largest one of these integers?
A. 2 B. 1,011 C. 2,021 D. 674 E. 6

36. What is the equation of the horizontal line passing through the point $(-7, 5)$?
A. $x = -7$ B. $x = 7$ C. $y = -5$ D. $y = 5$ E. $y = 5x$

37. What is the volume of a rectangular solid whose faces have areas of 96 cm^2, 60 cm^2, and 40 cm^2?
A. 480 cm^3 B. 392 cm^3 C. 784 cm^3 D. 98 cm^3 E. 196 cm^3

38. If $(2x - 1)(3x - 1) = 6x^2 + Mx + 1$, then M^2 is equal to which of the following?
A. 25 B. 16 C. 36 D. -36 E. 49

39. $\frac{4\frac{1}{3}-\frac{3}{5}}{2\frac{2}{9}}$ = _____(decimal)
A. 1.54 B. 1.88 C. 1.46 D. 1.66 E. 1.68

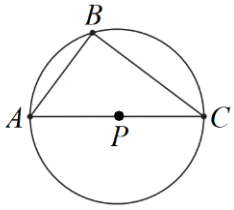
40. $\overline{AB}$ has endpoints $A(-3, 19)$ and $B(2, 7)$. Find the measure of *AB*.
A. 21 units B. 20 units C. 25 units D. 17 units E. 13 units

41. Samantha wants to mix salt and pepper together to get a mixture of 60 ounces worth \$1.80 per ounce. If salt costs \$1.50 per ounce and pepper costs \$2.00 per ounce, how many ounces of salt does Samantha need?
A. 28 ounces B. 24 ounces C. 36 ounces D. 18 ounces E. 32 ounces

42. What is the value of the discriminant of the quadratic equation $5x^2 - 14 = -8x$?
A. -36 B. 476 C. 344 D. 288 E. 296

43. Find the value of *z*, if $\frac{3}{16} = \frac{x}{48} = \frac{x+y}{80} = \frac{y+z}{192}$.
A. 40 B. 42 C. 36 D. 30 E. 32

44. In the picture below, what is the value of *x*, if $m\angle ABC = (3x + 12)^\circ$?



A. 90 B. 26 C. 34 D. 18 E. 28

45. i^3 = _____
A. i B. $-i$ C. 1 D. -1 E. $\sqrt{-1}$

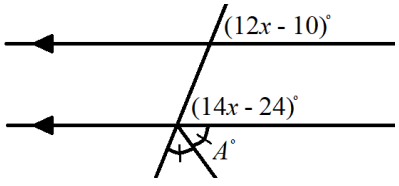
46. A right triangle has three sides, two of which are 6 units and 8 units. What is the least possible length of the triangle's third side?
A. 10 units B. $2\sqrt{5}$ units C. $4\sqrt{2}$ units D. $\sqrt{2}$ units E. $2\sqrt{7}$ units

47. Find the value of *x*, if $\log_3 81 = x$.
A. 27 B. 9 C. 4 D. 78 E. 18

48. If $2x + y = 13$ and $2x - y = 3$, what is the value of 2^{y-x}?
A. 2 B. 4 C. 8 D. 16 E. 32

49. 1 mile = _____ inches
A. 64,640 B. 64,320 C. 63,360 D. 1,760 E. 5,280

50. What is the value of *A* in the picture below?



A. 47 B. 49 C. 51 D. 53 E. 55

2021 – 2022 TMSCA Middle School Mathematics Test #4 Answer Key

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

2021 – 2022 TMSCA Middle School Mathematics Test #4 Selected Answers

18. If $m \uparrow n = \frac{5m}{n} - 3$, then $12 \uparrow 20 = \frac{5(12)}{20} - 3 = \frac{60}{20} - 3 = 3 - 3 = 0$.

26. Let Q = quarters, D = dimes, and N = nickels. If Bethany has four coins in her pocket that consists of nickels, dimes, and/or quarters, she can have 15 different combinations of coins, which are: (4-Q, 0-D, 0-N), (3-Q, 1-D, 0-N), (3-Q, 0-D, 1-N), (2-Q, 2-D, 0-N), (2-Q, 1-D, 1-N), (2-Q, 0-D, 2-N), (1-Q, 3-D, 0-N), (1-Q, 2-D, 1-N), (1-Q, 1-D, 2-N), (1-Q, 0-D, 3-N), (0-Q, 4-D, 0-N), (0-Q, 3-D, 1-N), (0-Q, 2-D, 2-N), (0-Q, 1-D, 3-N), and (0-Q, 0-D, 4-N). However, the question is asking for how many different values of coins she can have, so the combinations of (1-Q, 0-D, 3-N) and (0-Q, 4-D, 0-N) each have a value of 40¢, you can only count that value once. Therefore, there are 14 different value combinations of coins Bethany can have.

28. If $g(x) = 22x - 17$, then $g(-9) = 22(-9) - 17 = -198 - 17 = -215$.

31. If set U = {1, 2, 3, 4, 5, 6, 7, 8, 9} and A is a subset of U, with A = {2, 4, 6}, then set $A' = \{1, 3, 5, 7, 8, 9\}$.

33. The Quotient of Powers Property of Exponents states $\frac{a^m}{a^n} = a^{m-n}$. Therefore, $\frac{24m^6n^{11}}{4m^6n^5} = \frac{24}{4} \cdot m^{6-6} \cdot n^{11-5} = 6m^0n^6 = 6n^6$.

39. $\frac{4\frac{1}{3} - \frac{3}{5}}{2\frac{2}{9}} = \frac{\frac{13}{3} - \frac{3}{5}}{\frac{20}{9}} = \frac{\frac{65}{15} - \frac{9}{15}}{\frac{20}{9}} = \frac{\frac{56}{15}}{\frac{20}{9}} = \frac{56}{15} \div \frac{20}{9} = \frac{56}{15} \cdot \frac{9}{20} = \frac{42}{25} = 1.68.$

40. Given two points, (x_1, y_1) and (x_2, y_2), the distance formula is $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$. We are given the line segment with endpoints $A(-3, 19)$ and $B(2, 7)$, so $AB = \sqrt{(2 - (-3))^2 + (7 - 19)^2} = \sqrt{5^2 + (-12)^2} = \sqrt{25 + 144} = \sqrt{169} = 13$ units.

42. The discriminant of a quadratic equation, in standard form $y = Ax^2 + Bx + C$, is found using the formula $B^2 - 4AC$. The equation given in the problem, $5x^2 - 14 = -8x$, must first be solved to get the equation equal to 0. So, adding 8x to both sides of the equation gives us $5x^2 + 8x - 14$. Now, we see that A = 5, B = 8, and $C = -14$. Substituting into the formula and we get a discriminant of $8^2 - 4(5)(-14) = 344$.

45. Since $i = \sqrt{-1}$ and $i^2 = -1$, then $i^3 = i \cdot i^2 = i \cdot -1 = -i$.

46. Let 8 units be the length of the hypotenuse of the right triangle. Using the Pythagorean Theorem, $A^2 + B^2 = C^2$, where A and B are the legs and C is the hypotenuse of a right triangle, we get the equation $A^2 + 6^2 = 8^2 \rightarrow A^2 + 36 = 64$. Subtracting 36 from both sides of the equation and we get $A^2 = 28$. Taking the square root of both sides of the equation and we get $\sqrt{A^2} = \sqrt{28} \rightarrow A = \sqrt{28} = \sqrt{4 \cdot 7} = \sqrt{4} \cdot \sqrt{7} = 2\sqrt{7}$. Therefore, the least possible length of the triangle's third side is $2\sqrt{7}$ units.

47. $\log_3 81 = x$ can be rewritten as $3^x = 81$. Therefore, since $3^x = 81 = 3^4$, x = 4.

49. 1 mile = 5,280 feet = 5,280(12) = 63,360 inches.