TMSCA MIDDLE SCHOOL MATHEMATICS

TEST #9 ©

JANUARY 28, 2023

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. $608 + (312 + 998) =$ _____
A. 1,946   B. 1,918   C. 1,606   D. 1,909   E. 1,872

2. $6\frac{2}{5} - 3\frac{3}{4} =$ _____
A. $3\frac{1}{9}$ B. $3\frac{7}{20}$ C. $2\frac{7}{20}$ D. $2\frac{17}{20}$ E. $2\frac{13}{20}$

3. $359 \times 18 =$ _____ (nearest hundred)
A. 6,600   B. 6,500   C. 6,400   D. 6,000   E. 6,470

4. $96 \div 4 \div 1.5 =$ _____
A. 14   B. 24   C. 36   D. 16   E. 27

5. Lakita worked for 14½ hours last week. If Lakita earns $12.40 per hour of work, how much did Lakita earn last week, assuming no taxes were taken out of her pay?
A. $177.60   B. $174.20   C. $179.80   D. $181.70   E. $176.70

6. Sammy is facing west. What direction will Sammy be facing if she makes a ¼ of a revolution clockwise?
A. South   B. East   C. West   D. North   E. Southeast

7. Classify the triangle with angles measuring $21°, 88°$, and $71°$.
A. acute   B. right   C. obtuse   D. equiangular   E. equilateral

8. 1 hour + 3 minutes = _____ seconds
A. 3,640   B. 3,780   C. 3,840   D. 3,920   E. 3,880

9. What is the value of x in the picture below?
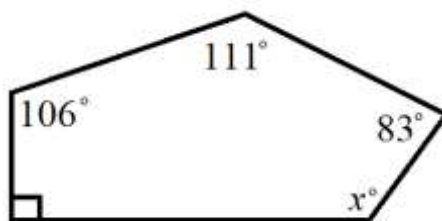
A. 117   B. 130   C. 142   D. 150   E. 149

10. 65 kilometers = _____ decimeters
A. 65,000   B. 650,000   C. 6,500,000   D. 65,000,000   E. 650,000,000

11. 11 quarters + 11 dimes + 11 nickels + 11 pennies = 12 quarters + _____ dimes + 8 nickels + 21 pennies
A. 5   B. 7   C. 6   D. 8   E. 9

12. What is the remainder when the number 87,223 is divided by 8?
A. 5   B. 6   C. 7   D. 4   E. 3

13. A nonagon has x total degrees and a hexagon has y total degrees. What is the value of $x - y$?
A. 720   B. 540   C. 360   D. 900   E. 180

14. If a dozen donuts cost $8.64, how much do five donuts cost?
A. $3.60   B. $4.32   C. $3.72   D. $4.04   E. $3.24

15. A new picture frame is priced $34.60 and is on a stand with a sign reading "45% off TODAY ONLY!".
How much will be saved when buying the picture frame on sale?
A. $15.23   B. $15.57   C. $15.69   D. $15.17   E. $15.43

16. Which expression can produce the next term in the sequence? $-4, -1, 2, 5, 8, ...$
A. $x - 4$ B. $x + 12$ C. $x - 5$ D. $3x - 7$ E. $4x - 8$
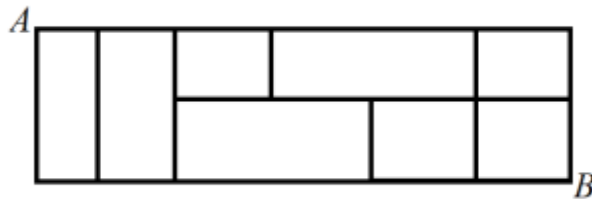
17. $22^2 = $ _____ (Roman numeral)
A. CDLXXIV   B. CCCCLXXXIV   C. XLIV   D. LXXXIV   E. CDLXXXIV

18. Let the LCM of 16 and 24 equal A. What is the value of the LCM of A and 72?
A. 216   B. 432   C. 144   D. 384   E. 192

19. Moving only right and/or down, how many paths exist from point A to point B?

A. 10   B. 9   C. 13   D. 11   E. 12

20. If $-\frac{4}{3}m = 56$, what is the value of $17 - m$?
A. -25 B. -39 C. 59   D. 89   E. 73

21. If you roll a pair of dice, what is the probability of rolling a sum of 3, 5, or 11, in ratio form?
A. 1:9   B. 1:6   C. 1:3   D. 2:3   E. 2:9

22. Simplify: $\frac{1}{2}(8n - 12) + \frac{2}{3}(9n - 15) + 6 - (-2n)$
A. $8n + 8$ B. $12n - 10$ C. $8n - 8$ D. $4n - 10$ E. $4n - 21$

23. Given the set of numbers $\{12, 19, 21, 36, 12\}$, $A = $ mode, $B = $ median, $C = $ mean, and $D = $ range. What is
the value of $D + C - B - A$?
A. 6   B. 13   C. 9   D. 16   E. 3

24. Calculate the percent of increase when the quantity 12 increases to 84.
A. 720% increase   B. 700% increase   C. 750% increase   D. 650% increase   E. 600% increase

25. If 3 zebras are equal to 7 lions, and 4 lions are equal to 9 rhinos, how many rhinos are equal to 12 zebras?
A. 45   B. 54   C. 63   D. 72   D. 81

26. The set $\{4, 6, 8, 10\}$ has how many improper subsets?
A. 0   B. 1   C. 2   D. 3   E. 4

27. $102_5 =$ _____ (base 4)
A. 113   B. 121   C. 122   D. 123   E. 133

28. $\angle A$ and $\angle B$ are complementary angles and $\angle C$ and $\angle D$ are complementary angles. If $m\angle D = 63°$, and $m\angle A + \angle D = 101°$, what is the measure of $\angle B$?
A. $79°$ B. $27°$ C. $48°$ D. $52°$ E. $46°$

29. 154 *ft/sec* = _____ *mi/hr*
A. 105   B. 95   C. 110   D. 115   E. 120

30. Two cubes have edge lengths of 6 cm and 10 cm. What is the ratio of the surface area of the smaller cube to the surface area of the larger cube?
A. $\frac{9}{25}$ B. $\frac{3}{5}$ C. $\frac{4}{25}$ D. $\frac{4}{9}$ E. $\frac{2}{5}$

31. $5 \times 10^4 + 7.6 \times 10^5 =$ _____ (scientific notation)
A. 12.6×10^9 B. 1.26×10^9 C. 8.1×10^9 D. 8.1×10^{20} E. 8.1×10^5

32. If $\pi = 3$, what is the volume of the cylinder below?
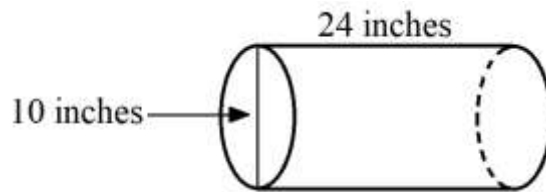
A. 7,200 in^3 B. 1,440 in^3 C. 1,800 in^3 D. 870 in^2 E. 3,600 in^3

33. A direct variation passes through the points (12, 15) and (x, 65). Find the value of x.
A. 48   B. 62   C. 52   D. 82   E. 46

34. What is the domain of the function $f(x) = \frac{7}{2}x + 3$, when the range is $\{-11, -4, 17\}$?
A. $\left\{-\frac{1}{7}, \frac{13}{7}, \frac{55}{7}\right\}$ B. $\left\{-\frac{77}{2}, -14, \frac{119}{2}\right\}$ C. $\{-2.5, -1.5, 2\}$ D. $\{-4, -2, 4\}$ E. $\{-35.5, -11, 62.5\}$

35. In a 30-60-90 special right triangle, if the measure of the long leg is $15\sqrt{3}$ cm, how long is the hypotenuse?
A. $30\sqrt{3}$ cm   B. 30 cm   C. 45 cm   D. $30\sqrt{6}$ cm   E. $15\sqrt{6}$ cm

36. A widget increased by 25% is a gidget. A gidget decreased by 50% is a pidget. A pidget increased by 80% is a cridget. If a widget is equal to 24, what is the value of a cridget?
A. 24   B. 30   C. 15   D. 27   E. 36

37. Eva's bedroom floor is the shape of a square that has a perimeter of 48 feet. How many 2 ft × 3 ft rectangular tiles does Eva need to completely cover her bedroom floor?
A. 36 tiles   B. 48 tiles   C. 18 tiles   D. 24 tiles   E. 32 tiles

38. How many permutations can be made of 7 items taken 4 at a time?
A. 840   B. 35   C. 420   D. 70   E. 110

39. What is the name of the regular polygon with an exterior angle of $40°$?
A. heptagon   B. nonagon   C. septagon   D. undecagon   E. dodecagon

40. If $x^2 < 144$, what is the sum of all positive integers, x, that satisfy the inequality?
A. 506   B. 78   C. 72   D. 253   E. 66

41. What is the value of the mean absolute deviation of the set of numbers 9, 30, 12, 17, 23, and 23?
A. 6⅔   B. 6½   C. 6⅓   D. 6¼   E. 6¾

42. $\left(\sqrt{6} + \sqrt{8}\right)\left(\sqrt{6} - \sqrt{8}\right) = $ _____
A. -2 B. 2   C. $\sqrt{2}$ D. $-\sqrt{2}$ E. $-2\sqrt{2}$

43. In three dimensions, what are the coordinates of the center of the sphere that has the equation
$(x - 2)^2 + (y + 4)^2 + (z - 3)^2 = 225$?
A. $(-2, 4, 3)$ B. $(2, -4, 3)$ C. $(13, 19, 12)$ D. $(17, 11, 18)$ E. $(-2, -4, -3)$

44. Line M has a slope of $-\frac{11}{9}$ and passes through the point $(-9, 15)$ and $(45, y)$. What is the value of y?
A. 69   B. -17 C. 51   D. -51 E. -69

45. What is the value of the y-coordinate of the solution to the system of equations $\begin{cases} x + 2y = -33 \\ 2x - y = 49 \end{cases}$?
A. -18 B. -17 C. -23 D. -27 E. -39

46. Using the picture below, which trig function can be used to find the length of x?
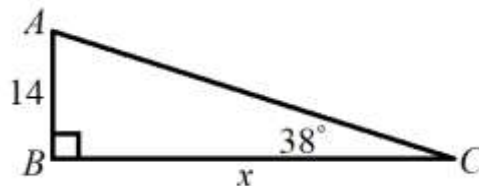
A. $\tan(38) = \frac{14}{x}$ B. $\tan(38) = \frac{x}{14}$ C. $\sin(38) = \frac{14}{x}$ D. $\cos(38) = \frac{x}{14}$ E. $\sin(38) = \frac{x}{14}$

47. What is the maximum point of the graph of the quadratic equation $y = -5x^2 + 20x - 13$?
A. $(-4, -3)$ B. $(2, 7)$ C. $(-1, 5)$ D. $(-3, 8)$ E. $(2, -3)$

48. Solve the compound inequality and express the solution in interval notation. $-11 \leq x - 9 \leq 17$
A. $[2, 26]$ B. $(-2, 26]$ C. $[-2, 26)$ D. $(-2, 26)$ E. $[-2, 26]$

49. $\left(\left(\frac{a^4 b^{-2}}{a^8 b^{-5}}\right)^3\right)^{-1} = $ _____

A. $\frac{a^{12}}{b^9}$ B. $\frac{1}{a^{12} b^9}$ C. $a^{12} b^9$ D. $\frac{b^9}{a^{12}}$ E. $\frac{b^{27}}{a^{36}}$

50. What is the area of a triangle with side lengths measuring 8 cm, 7 cm, and 3 cm?
A. $6\sqrt{42}$ cm^2 B. $8\sqrt{2}$ cm^2 C. $6\sqrt{3}$ cm^2 D. $6\sqrt{6}$ cm^2 E. $30\sqrt{33}$ cm^2

2022 – 2023 TMSCA Middle School Mathematics Test #9 Answer Key

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

8. 1 hour = 60 minutes, so 1 hour + 3 minutes = 1(60) + 3 = 63 minutes. 1 minute = 60 seconds, so 63 minutes = 63(60) = 3,780 seconds.

10. 1 kilometer = 10,000 decimeters, so 65 kilometers = 65(10,000) = 650,000 decimeters.

22. $\frac{1}{2}(8n - 12) + \frac{2}{3}(9n - 15) + 6 - (-2n) = 4n - 6 + 6n - 10 + 6 + 2n = 12n - 10$

24. Percent of change is found by $\frac{change\ in\ amount}{original\ amount} \times 100$. Therefore, the percent of increase when the quantity 12 increases to 84 is equal to $\frac{84-12}{12} = \frac{72}{12} = 6 \times 100 = 600\%$ increase.
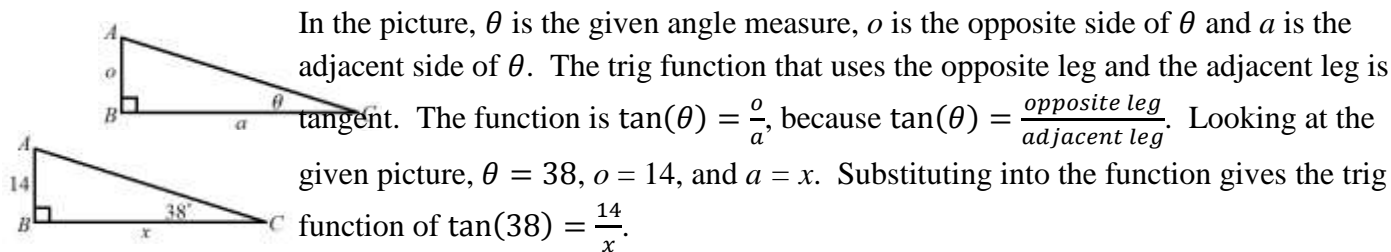
26. The total number of improper subsets of a set of elements is always equal to 1. Therefore, the number of improper subsets of the set {4, 6, 8, 10} is 1.

32. The formula for finding the volume of a cylinder is $V = \pi r^2 h$, where r is the radius of the cylinder and h is the height of the cylinder. In the given cylinder, $r = 10 \div 2 = 5$ in, and the height is 24 in. Therefore, if $\pi = 3$, the volume of the cylinder is equal to $V = (3)(5)^2(24) = 3(25)(24) = 1,800$ in^3.

38. The formula for finding the number of permutations of n items taken r at a time is $\frac{n!}{(n-r)!}$. In the given problem, $n = 7$ and $r = 4$. Therefore, the number of permutations made of 7 items taken 4 at a time is equal to $\frac{7!}{(7-4)!} = \frac{7!}{3!} = 7 \times 6 \times 5 \times 4 = 840$.

39. The formula for finding the exterior angle of a regular polygon is $\frac{360}{n}$, where n is equal to the number of sides of the polygon. We are given an exterior angle of 40°, so we can make the equation $\frac{360}{n} = 40$. Multiply both sides of the equation by n gives $360 = 40n$. Divide both sides of the equation by 40 and get $\frac{360}{40} = 9 = n$. Therefore, the polygon with an exterior angle of 40° has 9 sides, which is called a nonagon.

46. Label the right triangle as shown.

In the picture, θ is the given angle measure, o is the opposite side of θ and a is the adjacent side of θ. The trig function that uses the opposite leg and the adjacent leg is tangent. The function is $\tan(\theta) = \frac{o}{a}$, because $\tan(\theta) = \frac{opposite\ leg}{adjacent\ leg}$. Looking at the given picture, $\theta = 38$, $o = 14$, and $a = x$. Substituting into the function gives the trig function of $\tan(38) = \frac{14}{x}$.

50. The given triangle is a scalene triangle, a triangle with all three side lengths of different measure. The formula to find the area of a scalene triangle is $A = \sqrt{s(s-a)(s-b)(s-c)}$, where the triangle's side lengths are a, b, and c, and s is equal to the semi-perimeter of the triangle. The semi-perimeter of the triangle with side lengths measuring 8 cm, 7 cm, and 3 cm is equal to $\frac{8+7+3}{2} = \frac{18}{2} = 9$. Substituting into the formula gives the triangles area of $A = \sqrt{9(9-8)(9-7)(9-3)} = \sqrt{9(1)(2)(6)} = \sqrt{108} = \sqrt{36 \cdot 3} = 6\sqrt{3}$ cm^2.