TMSCA MIDDLE SCHOOL MATHEMATICS

TEST #10©

FEBRUARY 5, 2022

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. $16\frac{3}{5} + 13\frac{4}{5}$ = _____

A. $30\frac{1}{5}$ B. $29\frac{1}{5}$ C. $29\frac{2}{5}$ D. $30\frac{2}{5}$ E. $31\frac{1}{5}$

2. 64 – 92 = _____

A. 28 B. 156 C. -32 D. -38 E. -28

3. $\frac{5}{12} \times 5\frac{9}{10}$ = _____

A. $2\frac{11}{24}$ B. $2\frac{7}{30}$ C. $2\frac{1}{6}$ D. $2\frac{13}{48}$ E. $2\frac{7}{15}$

4. $65.6 \div 0.25$ = _____ (nearest whole number)

A. 254 B. 262 C. 282 D. 274 E. 272

5. $5(12-8)^2 + 4$ = _____ (Roman numeral)

A. LXXVI B. XLVIII C. LXXXIV D. LXXVIII E. LXIX

6. Jacinda paid for four pallets of flower plants. If each pallet cost $78.45, and Jacinda paid $125.00 for delivery, what was the total amount Jacinda paid?

A. $313.80 B. $517.25 C. $438.80 D. $360.35 E. $360.80

7. If Maya paid $26.10 for 6 tickets to a show, how much was each ticket?

A. $5.25 B. $4.15 C. $5.05 D. $4.45 E. $4.35

8. Every 2 days, Augusto spends 1.5 hours dog-walking and 2.25 hours working out. At this rate, how many total hours will Augusto spend dog-walking and working out in 6 days?

A. 11.25 hrs B. 7.5 hrs C. 15 hrs D. 18.75 hrs E. 22.5 hrs

9. Which formula can be used to calculate the lateral surface area of a cylinder?

A. $L = 2\pi r^2 h$ B. $L = 2\pi rh$ C. $L = \pi rh$ D. $L = 2\pi r^2$ E. $L = 2w + 2l$

10. How many rectangles can be found in the picture below?

A. 3 B. 4 C. 5 D. 6 E. 9

11. The area of the base of a triangular prism is 16 cm^2 and its height is 12 cm. What is the volume of the triangular prism?

A. 60 cm^3 B. 192 cm^3 C. 576 cm^3 D. 384 cm^3 E. 288 cm^3

12. 76,000 millimeters = _____ decimeters

A. 7,600 B. 760 C. 760,000 D. 76 E. 7.6

13. $m\angle A = (3x)^\circ$ and $m\angle B = (5x-6)^\circ$. If $\angle A$ and $\angle B$ are complementary angles, what is the value of *x*?

A. 16 B. 14 C. 18 D. 15 E. 12

14. 12^3 = _____

A. 36 B. 2,112 C. 1,788 D. 1,878 E. 1,728

15. If $3x - 26 = 79$, then what is the value of $2x + 26$?

A. 70 B. 131 C. 53 D. 96 E. 44

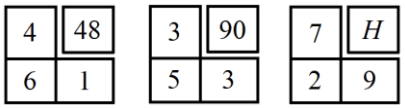
16. What is the GCF of $120a^6b^4c^2$ and $150b^2c$?

A. $30b^2c$ B. $600b^2c$ C. $30a^4b^2c$ D. $30a^4b^4c^2$ E. $600a^4b^4c^2$

17. The legs of a right triangle measure 3 ft and 4ft. What is the length of the third side of the triangle?

A. 3.5 ft B. 4.5 ft C. 5.5 ft D. 5 ft E. 6 ft

18. Use the examples in the picture below to find the value of *H*.



A. 324 B. 189 C. 252 D. 315 E. 378

19. 34 quarters + 87 dimes + 25 nickels + 33 pennies = _____ quarters + 131 dimes + 56 nickels + 88 pennies

A. 12 B. 10 C. 8 D. 16 E. 14

20. What is the sum of the digits of the sum of 763 + 1,080 + 327 + 514?

A. 18 B. 20 C. 17 D. 19 E. 16

21. What is the prime factorization of the number 3,248?

A. $2^3 \cdot 7^2 \cdot 23$ B. $2^3 \cdot 3^2 \cdot 13 \cdot 17$ C. $2^3 \cdot 11 \cdot 31$ D. $2 \cdot 11^2 \cdot 19$ E. $2^4 \cdot 7 \cdot 29$

22. What is the remainder when the number 667,238 is divided by 9?

A. 1 B. 2 C. 3 D. 4 E. 5

23. What is the 19th term of the sequence $-26, -23, -20, -17, ...$?

A. 28 B. 24 C. 30 D. 21 E. 18

24. What is the percent decrease if 40 gidgets is reduced to 18 gidgets?

A. 65% B. 45% C. 70% D. 55% E. 60%

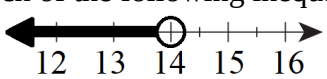
25. Max writes down numbers from least to greatest as 9, 11, *x*, 14, and 24. Max finds the mean of the smallest three numbers to be 11. What is the mean of the largest three numbers of Max's list?

A. 16 B. 17 C. 18 D. 15.5 E. 14.5

26. If $g(x) = 8x + 13$ and $h(x) = -13x$, then what is the value of $g(5) - h(4)$?

A. -7 B. -20 C. 97 D. 110 E. 105

27. The graph represents the solution to which of the following inequalities?



A. $n - 14 = 0$ B. $n - 7 < -21$ C. $-2n < -28$ D. $-6 + n < -8$ E. $-8 - n > -22$

28. Let *U* be a universal set and *A*, *B*, and *C* be subsets of *U* defined as shown. Find $(A \cap B) \cup (B \cap C)$.

$U = \{all\ positive\ integers \leq 20\}$ $A = \{1, 3, 5, 7, 9\}$ $B = \{3, 6, 9, 12, 15\}$ $C = \{5, 10, 15, 20\}$

A. {6, 9} B. {2, 4, 8, 11, 14} C. {3, 9, 12, 15} D. {3, 9, 15} E. {3, 6, 9}

29. Line *a* passes through the points $(-19, 7)$ and $(-7, -1)$. Line *b* is parallel to line *a*. What is the slope of line *b*?

A. $\frac{2}{3}$ B. $-\frac{3}{2}$ C. $-\frac{2}{3}$ D. $\frac{3}{2}$ E. $-\frac{1}{3}$

30. What is the product of 6×10^{-3}, 5×10^{4}, and 5.5×10^{2} in scientific notation?

A. 1.65×10^{3} B. 1.65×10^{-14} C. 1.65×10^{2} D. 1.65×10^{5} E. 1.65×10^{-10}

31. $74_8 - 27_8 =$ _____ (base 10)

A. 33 B. 37 C. 41 D. 43 E. 39

32. What is the probability of rolling a pair of dice and getting a sum of a number greater than 6?

A. $\frac{7}{12}$ B. $\frac{13}{18}$ C. $\frac{5}{12}$ D. $\frac{5}{18}$ E. $\frac{5}{7}$

33. What is the value of the mean absolute deviation of the set of numbers 8, 6, 9, 11, and 1?

A. 4.2 B. 1.6 C. 1.8 D. 2.8 E. 2.6

34. If *a* = 1, *b* = 2, *c* = 3, …, *y* = 25, and *z* = 26, what is the sum of the letters of the word *winner*?

A. 77 B. 69 C. 80 D. 78 E. 83

35. Lincoln is buying a shirt that costs $32.00. If the tax rate is 8.5%, what will Lincoln's total bill be?

A. $34.22 B. $35.02 C. $34.72 D. $34.82 E. $35.12

36. How many permutations can be formed from 6 objects taken 4 at a time?

A. 24 B. 15 C. 144 D. 360 E. 720

37. A shirt originally priced at $56.00 is now priced at $42.00. What is the percent of change of the price drop?

A. 25% B. 40% C. 30% D. 35% E. 75%

38. A group of children are holding hands while standing in a circle. A teacher walks around the circle and gives each child in order a number, 1, 2, 3, 4, … If number 3 is standing across number 15, how many children are there in the circle?

A. 36 B. 18 C. 15 D. 21 E. 24

39. Jamil is drawing a triangle on a coordinate grid with vertices located at $(16, 4)$, $(6, -9)$, and $(-17, 2)$. If Jamil colors half of the triangle red, how many square units of the triangle are red?

A. 204.5 units^2 B. 120.5 units^2 C. 102.25 units^2 D. 88.25 units^2 E. 96.25 units^2

40. For $a > 0$, which of the following is equivalent to $a^{-\frac{5}{4}}$?

A. $\frac{1}{\left(\sqrt[5]{a}\right)^4}$ B. $\frac{1}{\left(\sqrt[4]{a}\right)^5}$ C. $-\frac{1}{\left(\sqrt[5]{a}\right)^4}$ D. $-\frac{1}{\left(\sqrt[4]{a}\right)^5}$ E. $-\left(\sqrt[5]{a}\right)^4$

41. If $58x + 58y = 59(x + y)$, and $xy \neq 0$, what is the value of $\frac{x}{y}$?

A. 1 B. -1 C. 0 D. ½ E. –½

42. Which of the following sequences below is a geometric sequence?

A. 24, 12, 6, 3, … B. 3, 6, 9, 12, … C. 33, 29, 25, 21, … D. ¼, ½, ¾, 1, … E. 1, 2, 3, 4, …

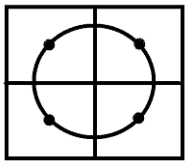
43. If the line $x - y = 17$ intersects the line $y = -x - 11$ at the point (a, b), what is the product of a and b?

A. -27 B. -56 C. 48 D. -42 E. 36

44. What is $2 + \frac{2}{2+\frac{1}{2}}$ expressed as a decimal?

A. 2.2 B. 1.6 C. 2.8 D. 2.24 E. 2.18

45. A square has an area of 144 units^2 and is divided into four smaller squares. In terms of π, what is the area of the circle that passes through the centers of the four smaller squares, as shown?

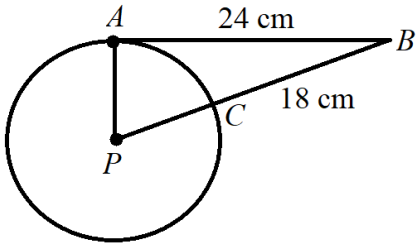


A. 36π units^2 B. 18π units^2 C. 9π units^2 D. 27π units^2 E. 24π units^2

46. Which of the following is the solution set for $3^{-1} = 3^{x^2+2x}$?

A. $\{1\}$ B. $\{-1\}$ C. $\{\pm 1\}$ D. $\{2\}$ E. $\{\pm 2\}$

47. In the picture, $\overline{AB}$ is tangent to $\odot P$ at point A, AB = 24 cm, and BC = 18 cm. What is the measure of the radius of the circle?



A. 11 cm B. 7 cm C. 9 cm D. 12 cm E. 8 cm

48. What is the inverse function of $f(x) = \frac{x-4}{2}$?

A. $f^{-1}(x) = \frac{x+4}{2}$ B. $f^{-1}(x) = \frac{1}{2}x - 2$ C. $f^{-1}(x) = 2x + \frac{1}{2}$ D. $f^{-1}(x) = 2x + 4$ E. $f^{-1}(x) = \frac{x-2}{4}$

49. $(6 + 2i)(4 - 8i) =$ _____

A. $40 - 40i$ B. $40 + 40i$ C. $10 - 6i$ D. $80i$ E. $-80i$

50. Which of the following is the solution to the inequality $-3(n - 4) + 2 \leq -2n - 7$?

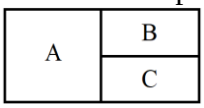
A. $[21, \infty)$ B. $[21, \infty]$ C. $(-\infty, 21)$ D. $(-\infty, 21)$ E. $\{21\}$

2021 – 2022 TMSCA Middle School Mathematics Test #10 Answer Key

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

2021 – 2022 TMSCA Middle School Mathematics Test #10 Selected Answers

10. Label the picture as shown: There are 3 rectangles with 1 letter; A, B, and C. There is 1 rectangle with 2 letters; BC. There is 1 rectangle with all 3 letters; ABC. Therefore, there are a total of 3 + 1 + 1 = 5 rectangles that can be found in the picture.



20. 763 + 1,080 + 327 + 514 = 2,684. Therefore, the sum of the digits of the sum is 2 + 6 + 8 + 4 = 20.

21. 3,248 = $2(1{,}624) = 2 \cdot 2(812) = 2 \cdot 2 \cdot 2(406) = 2 \cdot 2 \cdot 2 \cdot 2(203) = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 7 \cdot 29 = 2^4 \cdot 7 \cdot 29$.

30. $(6 \times 10^{-3})(5 \times 10^4)(5.5 \times 10^2) = (6 \cdot 5 \cdot 5.5)(10^{-3+4+2}) = 165 \times 10^3 = 1.65 \times 10^2 \times 10^3 = 1.65 \times 10^{2+3} = 1.65 \times 10^5$.

37. Percent of change is found by $\frac{change\ in\ amount}{original\ amount} \times 100$. So, the percent of change in the shirt price is found by $\frac{42-56}{56} = -\frac{14}{56} = -\frac{1}{4} = -0.25(100) = -25\%$. Therefore, the price drop was 25%.

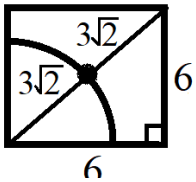
38. If g represents the number of children in the circle, then half will be in-between 3 and 15. So, we will have the equation $3 + \frac{g}{2} = 15$. Subtract 3 from both sides and get $\frac{g}{2} = 12$. Multiply both sides by 2 and get g = 24. Therefore, there are 24 children standing in the circle.

41. If $58x + 58y = 59(x + y)$, then $58x + 58y = 59x + 59y$. Subtracting 58x from both sides of the equation gives us $58y = x + 59y$. Subtracting 59y from both sides of the equation gives us $-y = x$. Therefore, substituting $-y$ for x in $\frac{x}{y}$ gives us $\frac{-y}{y} = -1$.

42. A geometric sequence is a sequence of numbers where each term is found by multiplying the previous one by a common ratio. 24, 12, 6, 3, … is a geometric sequence because each term following the previous term is the previous term multiplied by the common ratio of ½. ½(24) = 12, ½(12) = 6, and ½(6) = 3.

44. $2 + \frac{2}{2+\frac{1}{2}} = 2 + \frac{2}{\frac{4}{2}+\frac{1}{2}} = 2 + \frac{2}{\frac{5}{2}} = 2 + 2 \div \frac{5}{2} = 2 + 2 \cdot \frac{2}{5} = 2 + \frac{4}{5} = 2.8$.

45. If you look at one of the smaller squares,



We can see that we have a 45-45-90 special right triangle and the hypotenuse is therefore $6\sqrt{2}$ units. This means the radius of the circle is ½ of the hypotenuse in the 45-45-90 triangle, which will be $3\sqrt{2}$ units. To find the area of a circle, we use the formula $A = \pi r^2$. So, the area of the circle is therefore, $A = \pi(3\sqrt{2})^2 = 18\pi$ units^2

48. $f(x) = \frac{x-4}{2}$ can be rewritten as $y = \frac{x-4}{2}$. Interchanging the variables x and y gives us $x = \frac{y-4}{2}$. Solving for y, first multiply both sides of the equation by 2, to get $2x = y - 4$. Now, add 4 to both sides of the equation to get $y = 2x + 4$. Therefore, the inverse function of $f(x) = \frac{x-4}{2}$ is $f^{-1}(x) = 2x + 4$.