T M S C A M I D D L E S C H O O L
M A T H E M A T I C S

T E S T # 5 ©

D E C E M B E R 4, 2 0 2 1

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 #5

1. 44 + 144 + 244 = _____

A. 432 B. 412 C. 424 D. 448 E. 422

2. 170 – 18.3 = _____

A. 152.7 B. 151.7 C. 13 D. 142.7 E. 158.7

3. 214×21 = _____ (nearest ten)

A. 4,480 B. 4,490 C. 4,500 D. 4,510 E. 4,520

4. $123.2 \div 2.2$ = _____

A. 66 B. 68 C. 44 D. 46 E. 56

5. What is the GCF of the numbers 64 and 120?

A. 8 B. 24 C. 4 D. 12 E. 2

6. $219 is to be divided among three restaurant servers. Andy made $35 more than Bill. Shawn, who went home sick, made $38 less than Bill. How much money did Andy receive?

A. $111 B. $109 C. $74 D. $113 E. $93

7. 1,372 = _____ (Roman numeral)

A. MCCCXLII B. DCCCXLII C. DCCLXXII D. KCCCCXXII E. MCCCLXXII

8. Which inequality is true if $y = 4.6$?

A. $3y < 9.77$ B. $14.8 \geq 4y$ C. $9.7 \leq 2y$ D. $5y > 24.1$ E. $29.2 > 6y$

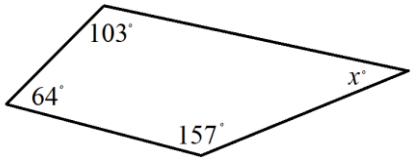
9. What is the sum of the number of sides of a regular octagon and a regular hexagon?

A. 8 B. 18 C. 14 D. 12 E. 11

10. What is the perimeter of a rhombus with a side length of 24 inches?

A. 96 inches B. 120 inches C. 48 inches D. 576 inches E. 6 inches

11. What is the value of *x* in the quadrilateral below?



A. 72 B. 36 C. 24 D. 48 E. 52

12. Melissa has a bracelet that is 8.5 cm shorter than Nancy's necklace. If Nancy's necklace measures 18 cm, what is the measure of Melissa's necklace in millimeters?

A. 95 mm B. 9.5 mm C. 26.5 mm D. 171.5 mm E. 53 mm

13. Jaylen's mother bought her a small personal cake for her birthday that had 12 slices. She ate ⅔ of the cake at dinner and 25% of the remaining cake for a late-night snack. What fraction of the cake has Jaylen not eaten?

A. $\frac{1}{2}$ B. $\frac{1}{8}$ C. $\frac{1}{3}$ D. $\frac{1}{4}$ E. $\frac{11}{12}$

14. 5,280 yards = _____ miles
A. 1 B. 2 C. 3 D. 4 E. 5

15. Simplify: $(3 + 4 \cdot 2)^2 - 3^3$
A. 169 B. 187 C. 112 D. 19 E. 94

16. 28 is 7% of what number?
A. 280 B. 360 C. 400 D. 420 E. 490

17. Which equation produces the table of values below?

x	-2	0	8	11
y	1	5	21	27

A. $y = x + 3$ B. $y = 2x + 5$ C. $y = x - 5$ D. $y = ½x + 17$ E. $y = 3x - 6$

18. Which of the following is equivalent to 7.8×10^{-9}?
A. 0.00000078 B. 0.000000078 C. 0.00000000078 D. 0.0000000078 E. 0.000000000078

19. \$7.42 = 18 quarters + _____ dimes + 16 nickels + 42 pennies
A. 17 B. 21 C. 19 D. 18 E. 16

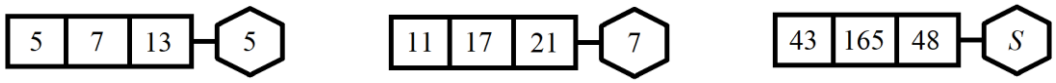
20. What is the positive difference of the largest two positive integral divisors of the number 54?
A. 18 B. 27 C. 9 D. 45 E. 3

21. How many different ways can four different colored books be arranged on a shelf?
A. 16 B. 24 C. 12 D. 4 E. 8

22. What is the value of *x* if 4(*x* – 9) = 12?
A. 12 B. 6 C. -8 D. $\frac{21}{4}$ E. $-5\frac{1}{4}$

23. What is the sum of the reciprocals of the numbers 5 and 6?
A. 11 B. -11 C. 30 D. $\frac{11}{30}$ E. $-\frac{11}{30}$

24. Use the examples in the picture below to find the value of *S*.



A. 24 B. 18 C. 14 D. 22 E. 16

25. 10111_2 = _____ (base 8)
A. 26 B. 27 C. 34 D. 33 E. 32

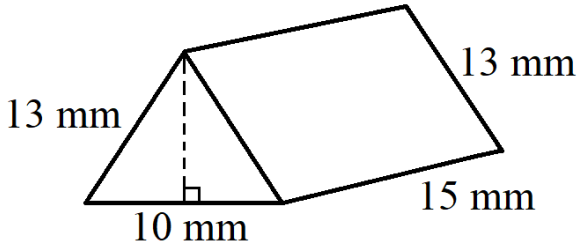
26. If $h(x) = 3x^2 - 18$, then what is the value of $h(-2)$?
A. 18 B. -54 C. 30 D. -30 E. -6

27. How many permutations can be made using the letters of the word POP?
A. 3 B. 6 C. 9 D. 12 E. 27

28. Let U be the universal set $U = \{5, 10, 15, 20, 25\}$ and A be a subset of U, $A = \{10, 15, 20\}$. What is the sum of all the elements of A'?

A. 30 B. 45 C. 15 D. 25 E. 75

29. What is the volume of the triangular prism?



A. 900 mm^3 B. 975 mm^3 C. 1,170 mm^3 D. 1,260 mm^3 E. 1,950 mm^3

30. What is the value of the mean absolute deviation of the set of numbers 28, 22, 15, and 19?

A. 7 B. 3.5 C. 4.5 D. 4 E. 6.5

31. Valerie deposits \$840.00 into a simple interest account at 2.5%. If Valerie does not withdraw or deposit any more money into her account, how much money will be in her account after 4 years?

A. \$884.00 B. \$896.00 C. \$924.00 D. \$932.00 E. \$984.00

32. Let a non-standard deck of cards be a standard deck of cards plus two jokers. If you randomly choose a card, what is the probability the card chosen is not a king?

A. $\frac{25}{27}$ B. $\frac{12}{13}$ C. $\frac{2}{27}$ D. $\frac{1}{12}$ E. $\frac{25}{26}$

33. If 4 mm's = 7 bb's, and 14 bb's = 29 yy's, how many yy's are there in 16 mm's?

A. 116 B. 87 C. 58 D. 145 E. 14.5

34. Line b passes through the points $(-7, -4)$ and $(11, y)$, and has a slope of $-\frac{2}{9}$. What is the value of y?

A. -6 B. -5 C. 3 D. -2 E. -8

35. The math club of Willis Intermediate School went to the park. At the park, one-half of the math club ate only vanilla ice-cream, three-tenths ate only chocolate ice-cream, sixteen ate neither vanilla nor chocolate ice-cream, and no one ate both. How many members were in the math club?

A. 90 B. 80 C. 60 D. 120 E. 100

36. What is the rate of decay of the exponential decay function $y = 2.28(0.73)^x$?

A. 228% B. 28% C. 73% D. 27% E. 37%

37. $(6n - 5)^2$ = _____

A. $36n^2 - 11n + 25$ B. $36n^2 - 25$ C. $36n^2 + 25$ D. $36n^2 - 60n - 25$ E. $36n^2 - 60n + 25$

38. N is the midpoint of $\overline{MP}$. What are the coordinates of point P, if the coordinates of M are $(-3, 17)$ and the coordinates of N are $(8, -6)$?

A. $(19, -29)$ B. $(2.5, 5.5)$ C. $(-5.5, -11.5)$ D. $(5, 11)$ E. $(14, 2)$

39. Brett wants to buy some new sandals that cost $23.25. What will Brett's total cost be if there is an 8% tax?
A. $23.33 B. $25.27 C. $24.57 D. $25.11 E. $24.93

40. $\dfrac{\frac{6}{10}\cdot\frac{7}{14}\cdot\frac{15}{18}\cdot\frac{12}{9}}{3\frac{1}{3}\div 2}$ = _____
A. ⅔ B. ⅝ C. ⅕ D. ⅓ E. ¾

41. What is the area of a triangle with vertices located at $(-2,-4)$, (6, 4), and $(-9,3)$?
A. 49 units^2 B. 56 units^2 C. 64 units^2 D. 27 units^2 E. 38 units^2

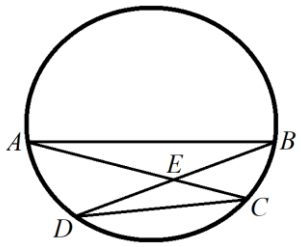
42. What is the circumference of the graph of a circle with an equation of $(x+7)^2+(y-13)^2=256$?
A. 64π units B. 16π units C. 32π units D. 256π units E. 128π units

43. 80 people sat in a theater to view a new movie. The total money collected from all ticket sales was $570.00. If adult tickets cost $9.00 and children tickets cost $6.00, how many more children were in the theater than adults?
A. 35 B. 30 C. 40 D. 20 E. 25

44. If $6^n+6^n+6^n+6^n+6^n+6^n=6^4$, then what is the value of 6 – 3*n*?
A. 6 B. -6 C. 3 D. -3 E. -21

45. $7i(-i)=$ _____
A. 7 B. -7 C. $\frac{1}{7}$ D. $-\frac{1}{7}$ E. $-7i$

46. In the picture below, $\angle CAB = 30^\circ$ and the measure of minor arc $AD = 20^\circ$. What is the measure of $\angle DEC$?



A. 140° B. 120° C. 130° D. 125° E. 135°

47. What is the inverse function of the function $f(x)=4x+12$?
A. $f^{-1}(x)=-4x-12$ B. $f^{-1}(x)=\frac{x}{4}-3$ C. $f^{-1}(x)=\frac{1}{4}x-\frac{1}{12}$ D. $f^{-1}(x)=\frac{1}{3}x$ E. $f^{-1}(x)=-3x$

48. If the equation $x^2+Mx-84=0$ has *x* = 14 as one root, what is the value of *M*?
A. 6 B. -6 C. -8 D. 12 E. -4

49. Using interval notation, which of the following is the solution to the inequality $-\frac{x}{3}+5>-12$?
A. $(-\infty,21)$ B. $[-\infty,51)$ C. $(-\infty,51)$ D. $(21,\infty)$ E. $[21,\infty)$

50. 2 cubic feet = _____ cubic inches
A. 1,728 B. 2,368 C. 5,184 D. 7,920 E. 3,456

2021 – 2022 TMSCA Middle School Mathematics Test #5 Answer Key

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

2021 – 2022 TMSCA Middle School Mathematics Test #5 Selected Answers

23. The reciprocal of 5 is $\frac{1}{5}$ and the reciprocal of 6 is $\frac{1}{6}$. Therefore, $\frac{1}{5}+\frac{1}{6}=\frac{6}{30}+\frac{5}{30}=\frac{11}{30}$.

27. There are three permutations that be made using the letters of the POP, they are PPO, OPP, and POP.

28. If U = {5, 10, 15, 20, 25} and A is a subset of U, with A = {10, 15, 20}, then $A' = \{5, 25\}$. Therefore, the sum of the elements of A' is 5 + 25 = 30.

30. The mean absolute deviation of a set of numbers is the average distance between each number and the mean. We are given the set of numbers 28, 22, 15, and 19, so the mean is $\frac{28+22+15+19}{4}=\frac{84}{4}=21$. The positive differences of each number and the mean are $|28-21|=7, |22-21|=1, |15-21|=6$, and $|19-21|=2$. The mean absolute deviation is therefore $\frac{7+1+6+2}{4}=\frac{16}{4}=4$.

35. If $\frac{1}{2}$ ate only vanilla and $\frac{3}{10}$ ate only chocolate, then we know $\frac{1}{2}+\frac{3}{10}=\frac{8}{10}$. This means that $\frac{2}{10}=\frac{1}{5}$ ate neither vanilla nor chocolate, so we have the equation $\frac{1}{5}x=16$, with x representing the number of math club members. Multiply both sides by 5 and get 16(5) = 80. There were 80 members in the math club.

36. An exponential decay function is in the form $y=a\cdot b^x$, where $0<b<1$ and $b=1-r$, which is the rate. We are given the exponential decay function $y=2.28(0.73)^x$, so b = 0.73. Since b = 1 – r, then 0.73 = 1 – r. Subtracting 1 from both sides of the equation gives us $-0.27=-r$. Dividing both sides of the equation gives us r = 0.27 = 27%. The function has a rate of decay of 27%.

37. $(6n-5)^2=(6n-5)(6n-5)=6n(6n)-6n(5)-6n(5)-5(-5)=36n^2-60n+25$.

40. $\frac{\frac{6}{10}\cdot\frac{7}{14}\cdot\frac{15}{18}\cdot\frac{12}{9}}{3\frac{1}{3}\div 2}=\frac{\frac{3}{5}\cdot\frac{1}{2}\cdot\frac{5}{6}\cdot\frac{4}{3}}{\frac{10}{3}\div\frac{2}{1}}=\frac{\frac{60}{180}}{\frac{10}{3}\div\frac{2}{1}}=\frac{\frac{1}{3}}{\frac{10}{3}\cdot\frac{1}{2}}=\frac{\frac{1}{3}}{\frac{10}{6}}=\frac{\frac{1}{3}}{\frac{5}{3}}=\frac{1}{3}\div\frac{5}{3}=\frac{1}{3}\cdot\frac{3}{5}=\frac{3}{15}=\frac{1}{5}$.

42. The center-radius form of a circle is $(x-h)^2+(y-k)^2=r^2$, where (h, k) are the coordinates of the center of the circle and r is the radius. We are given the equation $(x+7)^2+(y-13)^2=256$, so $r^2=256$. Square root both sides of the equation to get r = 16. The formula for the circumference of a circle, when given the radius, is $C=2\pi r$. Therefore, the circumference of the circle with the given equation is $C=2\pi(16)=32\pi$ units.

44. $6^n+6^n+6^n+6^n+6^n+6^n$ can be factored to $6^n(1+1+1+1+1+1)=6^n(6)=6^{n+1}$. Since $6^n+6^n+6^n+6^n+6^n+6^n=6^4$, then $6^{n+1}=6^4$ and n + 1 = 4. Subtract 1 from both sides of the equation to get n = 3. If n = 3, then the value of 6 – 3n is equal to 6 – 3(3) = 6 – 9 = -3.

45. Remember, $i=\sqrt{-1}$, so $i^2=-1$. Therefore, $7i(-i)=-7i^2=-7\cdot(-1)=7$.

50. 1 cubic foot = 1,728 cubic inches, so 2 cubic feet = 2(1,728) = 3,456 cubic inches.