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 # 2 ©

O C T O B E R 2 4 , 2 0 2 0

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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2020 – 2021 TMSCA Middle School Mathematics Test #2

1. 4.5 + 19.8 = _____
A. 24.3 B. 23.3 C. 64.8 D. 6.6 E. 25.3

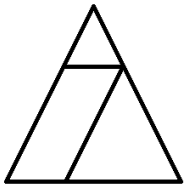
2. 27.1 – 6.6 = _____
A. 21.5 B. 22.5 C. 21.7 D. 20.7 E. 20.5

3. 1.9×84 = _____
A. 1,596 B. 195.6 C. 153.6 D. 156.6 E. 159.6

4. $51.2 \div 3.2$ = _____
A. 18 B. 22 C. 16 D. 24 E. 14

5. XLIX = _____ (Arabic number)
A. 49 B. 61 C. 69 D. 59 E. 54

6. How many triangles can be found in the picture below?



A. 2 B. 6 C. 4 D. 3 E. 5

7. What is the range of the set of numbers 76, 11, 32, 47, 143, 34, 77, 78, 56, 16, 16, 16, 96, and 67?
A. 16 B. 80 C. 132 D. 154 E. 77.5

8. 16 is 32% of what number?
A. 60 B. 48 C. 40 D. 54 E. 50

9. $\frac{1}{2}(8a - 10b)$ is equivalent to which of the following?
A. $4a - 10b$ B. $4a - 5b$ C. $8a - 5b$ D. $4a5b$ E. $-ab$

10. What is the area of a square that has a perimeter of 52 inches?
A. 104 in^2 B. 208 in^2 C. 169 in^2 D. 2,704 in^2 E. 676 in^2

11. The Yellowjackets won 16 out of 18 softball games played. What is the ratio of losses to wins?
A. 8:9 B. 1:8 C. 1:4 D. 1:9 E. 2:3

12. What is the unit rate if Nanuck spent $49.40 on four tickets to go to the movies?
A. $24.70 B. $16.45 C. $13.65 D. $11.95 E. $12.35

13. How many positive whole numbers divide the number 220?
A. 14 B. 26 C. 12 D. 8 E. 18

14. What percent of the digits in the number 25,788 are prime?
A. 40% B. 60% C. 20% D. 80% E. 25%

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15. Evaluate $n^2 + |-3n|$ for $n = -16$.
A. -208 B. 324 C. 304 D. 208 E. 80

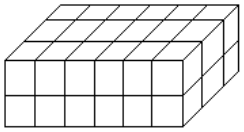
16. 2.2 hours = _____ minutes
A. 220 B. 180 C. 182 D. 144 E. 132

17. 87,000,000,000 = _____ (scientific notation)
A. 87×10^9 B. 0.87×10^{11} C. 87×10^{-9} D. 8.7×10^{-10} E. 8.7×10^{10}

18. Which of the following is not a rational number?
A. $\sqrt{13}$ B. $-\frac{8}{5}$ C. $7.\overline{4}$ D. $\sqrt{64}$ E. 25

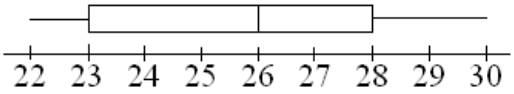
19. What is the sum of the edges and faces of a triangular prism?
A. 14 B. 27 C. 20 D. 6 E. 22

20. The figure below is made of centimeter cubes. If the figure were painted blue, how many cubes would have only two of their faces painted blue?



A. 36 B. 28 C. 20 D. 16 E. 24

21. What is the sum of the lower quartile and upper quartile of the box-and-whisker plot?



A. 52 B. 51 C. 54 D. 58 E. 55

22. Which of the following is the solution of $6 - 2n > 20$?
A. $n > 16$ B. $n < 16$ C. $n < -13$ D. $n < -7$ E. $n > -7$

23. The 6th grade enrollment at Parker Middle School last year was 480 students. This year, the enrollment has decreased by 24 students. What is the percent decrease in the number of 6th graders?
A. 95% B. 5% C. 10% D. 6% E. 2.5%

24. If $a \otimes b = \frac{a-b}{2}$, then what is the value of $-22 \otimes 46$?
A. 12 B. 24 C. -34 D. -12 E. -68

25. 1 + 2 + 3 + … + 18 + 19 + 20 = _____
A. 210 B. 244 C. 202 D. 224 E. 220

26. 104_{10} = _____ (base 8)
A. 124 B. 132 C. 150 D. 162 E. 164

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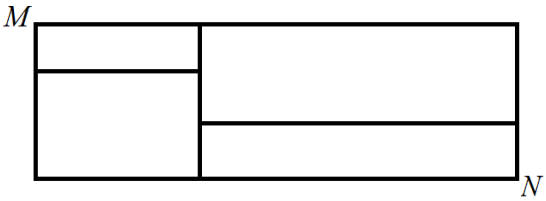
27. $\{3, 6, 9, 12\} \cup \{1, 3, 5, 7, 9\}$ = _____
A. $\{1, 3, 5, 6, 7, 9, 12\}$ B. $\{3, 9\}$ C. $\{2, 4, 6, 8, 10\}$ D. $\{1, 12\}$ E. $\{1, 3, 3, 5, 6, 7, 9, 12\}$

28. Point *H* has coordinate $(3, -4)$. If *H* is rotated 90° counterclockwise, what are the new coordinates of *H*?
A. $(-3, -4)$ B. $(-3, 4)$ C. $(3, 4)$ D. $(4, 3)$ E. $(4, -3)$

29. Moving only to the right or down, how many different pathways are there from *M* to *N*?

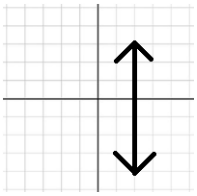


A. 5 B. 6 C. 7 D. 8 E. 4

30. What is the GCF of $16a^2b$ and $48b^2c$?
A. $48abc$ B. $48a^2b^3c$ C. $16a^2b^2c$ D. $16abc$ E. $16b$

31. If $\pi = 3$, what is the area of a circle with a diameter of 16 inches?
A. 192 in^2 B. 48 in^2 C. 768 in^2 D. 144 in^2 E. 576 in^2

32. What kind of slope does the graphed line below have?



A. positive slope B. undefined slope C. zero slope D. negative slope E. curved slope

33. If the letters in the word TOILET were individual tiles and placed into a box, what would be the probability of drawing an O, and then without replacement drawing a T?
A. $\frac{1}{18}$ B. $\frac{17}{30}$ C. $\frac{1}{2}$ D. $\frac{1}{15}$ E. $\frac{3}{7}$

34. Simplify: $(6x - 3y) + (5y - 2x) - (2x + y)$
A. $2x - y$ B. $9x - 6y$ C. $2x + y$ D. $9x - 4y$ E. $6x + 3y$

35. What is the 10th term of the sequence 120, 230, 340, 450, …?
A. 1,110 B. 1,000 C. 960 D. 890 E. 1,220

36. The points (12, 2) and (*x*, 5) lie on the same line of a direct variation. What is the value of *x*?
A. $0.8\overline{3}$ B. 15 C. 30 D. 24 E. 4.8

37. $8 + \sqrt{16} + \sqrt[3]{8}$ = _____
A. $14 + \sqrt[3]{2}$ B. $12 + 2\sqrt[3]{2}$ C. $8 + 4\sqrt{2} + 2\sqrt[3]{2}$ D. $8 + \sqrt[4]{24}$ E. 14

38. Which of the following is equivalent to $-i$?
A. i^2 B. i^3 C. i^0 D. i^4 E. i^1

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39. $21_4 - 13_4$ = _____ (base 4)
A. 2 B. 1 C. 0 D. 3 E. 8

40. Sheeha is buying apples, but first is comparing the prices from five different stores. Which choice is the better buy?
A. 8 lbs for \$26.00 B. 6 lbs for \$19.68 C. 7 lbs for \$22.54 D. 4 lbs for \$14.72 E. 3 lbs for \$10.05

41. Which expression is not equivalent to m^3m^5?
A. $\frac{m^{-3}}{m^{-11}}$ B. $\frac{m^9}{m}$ C. m^6m^2 D. m^8m^{-1} E. $(m^4)^2$

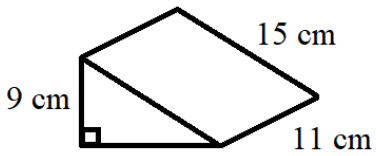
42. Which of the following numbers could be added to the set {16, 34} to create a Pythagorean triple?
A. 26 B. 30 C. 50 D. 38 E. 28

43. Charlene has \$3.10 in quarters and nickels. If Charlene has 26 coins total, how many more nickels does she have than quarters?
A. 9 B. 7 C. 8 D. 10 E. 11

44. Find the sum of the following matrices: $\begin{bmatrix}12 & 7\\ -1 & -8\end{bmatrix} + \begin{bmatrix}-13 & -6\\ 3 & 11\end{bmatrix}$ = _____
A. $\begin{bmatrix}-15 & 13\\ -4 & -19\end{bmatrix}$ B. $\begin{bmatrix}-156 & -42\\ -3 & -88\end{bmatrix}$ C. $\begin{bmatrix}-1 & 1\\ 2 & -3\end{bmatrix}$ D. $\begin{bmatrix}1 & -1\\ -2 & -3\end{bmatrix}$ E. $\begin{bmatrix}-1 & 1\\ 2 & 3\end{bmatrix}$

45. Factor completely: $2x^2 + 9x - 35$
A. $(2x+5)(x-7)$ B. $(2x+7)(x-5)$ C. $(2x-7)(x+5)$ D. $(2x-5)(x+7)$ E. $(2x-7)(x-5)$

46. What is the volume of the prism below?



A. 742.5 cm^3 B. 396 cm^3 C. 495.5 cm^3 D. 504 cm^3 E. 594 cm^3

47. Rationalize the denominator: $\frac{9}{\sqrt{24}}$
A. $\frac{3}{\sqrt{8}}$ B. $\frac{3}{2\sqrt{2}}$ C. $\frac{9}{2\sqrt{6}}$ D. $\frac{3\sqrt{6}}{4}$ E. $\frac{\sqrt{6}}{3}$

48. What is the sum of the coordinates of the vertex of the graph of the function $y = 4x^2 + 16x$?
A. -18 B. 32 C. 124 D. -24 E. -10

49. What is the positive geometric mean of the numbers 1 and 256?
A. 16 B. 32 C. 128.5 D. 64.25 E. 128

50. What is the product of the solutions of the equation $-3|2n - 3| = -15$?
A. -12 B. 5 C. -4 D. -3 E. -16

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2020 – 2021 TMSCA Middle School Mathematics Test #2 Answer Key

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

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2020 – 2021 TMSCA Middle School Mathematics Test #2 Selected Answers

10. If a square has a perimeter of 52 inches, then is has a side length of $52 \div 4 = 13$ inches. Therefore, the area of the square is $13^2 = 169$ inches^2.

17. 87,000,000,000 = 8.7×10^{10}.

24. If $a \otimes b = \frac{a-b}{2}$, then the value of $-22 \otimes 46$ is equal to $\frac{-22-46}{2} = \frac{-68}{2} = -34$.

25. To find the sum of a set of consecutive integers, use the formula $\frac{N(F+L)}{2}$, where *N* is equal to the number of integers being added, *F* is equal to the first term, and *L* is equal to the last term. We are asked to find the sum of 1 + 2 + 3 + … + 18 + 19 + 20, so *N* = 20, *F* = 1, and *L* = 20. Substituting into our formula and we get the sum to be equal to $\frac{20(1+20)}{2} = \frac{20(21)}{2} = 10(21) = 210$.

27. ∪ is the symbol for union, which means one of every element, with no repeating elements. So, $\{3, 6, 9, 12\} \cup \{1, 3, 5, 7, 9\} = \{1, 3, 5, 6, 7, 9, 12\}$.

32. The slope of any vertical line will always be undefined.

34. $(6x - 3y) + (5y - 2x) - (2x + y) = 6x - 3y + 5y - 2x - 2x - y = 2x + y$.

36. A direct variation is in the form $y = kx$, where *k* is the constant of variation. *k* can be found by dividing both side of the equation by *x* and getting $k = \frac{y}{x}$. We are given the point (12, 2), so the constant of variation is $\frac{2}{12} = \frac{1}{6}$. Now, given the point (*x*, 5), we must make the equation $\frac{1}{6} = \frac{5}{x}$. Cross multiplying and we get 30 = *x*.

37. $8 + \sqrt{16} + \sqrt[3]{8} = 8 + 4 + 2 = 14$.

38. The imaginary numbers are $i = \sqrt{-1}$, $i^2 = -1$, $i^3 = -i$, and $i^4 = 1$. So, $-i = i^2 \cdot i = i^3$.

41. Using the exponent rule $a^m \cdot a^n = a^{m+n}$, $m^3 m^5 = m^{3+5} = m^8$. Therefore, m^8 is not equivalent to $m^8 m^{-1}$, because $m^8 m^{-1} = m^{8+(-1)} = m^7$.

49. The geometric mean of two numbers, *a* and *b*, is found by $\sqrt{ab}$. So, the geometric mean of 1 and 256 is equal to $\sqrt{1 \cdot 256} = \sqrt{256} = 16$.

50. First, we must solve the equation $-3|2n - 3| = -15$ by dividing both sides of the equation by -3. This gives us $\frac{-3|2n-3|}{-3} = \frac{-15}{-3}$, which becomes $|2n - 3| = 5$. To solve an absolute value equation, we must set what is inside the absolute symbol equal to ± 5. These equations are then $2n - 3 = 5$ and $2n - 3 = -5$. Solving each of the equations and our solutions are 4 and -1. The product of these solutions is then $(4)(-1) = -4$.

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