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 3 0, 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.

2021 – 2022 TMSCA Middle School Mathematics Test #2

1. 632 + 817 = _____ (nearest ten)
A. 1,400 B. 1,500 C. 1,440 D. 1,450 E. 1,460

2. 305 – 68 = _____
A. 257 B. 317 C. 373 D. 247 E. 237

3. 31×13 = _____
A. 44 B. 403 C. 661 D. 361 E. 363

4. $2{,}056 \div 8$ = _____
A. 267 B. 257 C. 2,048 D. 514 E. 534

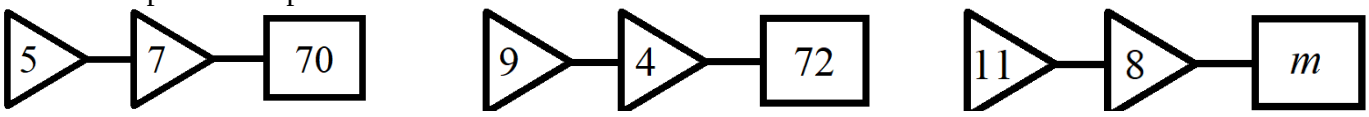
5. A board is 106 cm in length and must be cut so that one piece is 28 cm longer than the other piece. What is the length of the smaller piece of board?
A. 27 cm B. 39 cm C. 66 cm D. 43 cm E. 54 cm

6. What is the additive inverse of the number $8\frac{1}{3}$?
A. $-8\frac{1}{3}$ B. $\frac{25}{3}$ C. $\frac{3}{25}$ D. $-\frac{3}{25}$ E. $\frac{2}{3}$

7. $\Delta ABC \cong \Delta XYZ$. Which of the following is true?
A. $m\angle B = m\angle X$ B. $m\angle A = m\angle Z$ C. $\angle C \cong \angle Z$ D. $\angle A \cong \angle Y$ E. $m\angle C = m\angle Y$

8. $y^2 \cdot y \cdot y \cdot y$ is equivalent to which of the following?
A. $y^2 + 3y$ B. $5y$ C. y^5 D. $2y^2 + 3y$ E. $5y^2$

9. Use the examples in the picture below to find the value of *m*.



A. 176 B. 19 C. 38 D. 152 E. 220

10. What is the GCF of the two numbers 64 and 28?
A. 44 B. 448 C. 8 D. 4 E. 2

11. How many diagonals can be drawn from one vertex of a regular pentagon?
A. 1 B. 2 C. 3 D. 4 E. 5

12. 244 = _____ (Roman numeral)
A. CCXLIV B. CCXDIIII C. CCXLIIII D. MMXLIV E. MMXCIC

13. Which of the following numbers is a rational number, integer, and natural number?
A. 12.5 B. 15 C. -6 D. $\sqrt{5}$ E. ¾

14. Simplify: $32 - 6^2$
A. 20 B. 26 C. 68 D. -4 E. 4

15. What is the positive difference of the mode and median of the set of numbers 23, 45, 12, 44, 97, 23, and 4?
A. 9 B. 11 C. 12 D. 70 E. 0

16. Convert 0.0036 into scientific notation.
A. 0.36×10^{-4} B. 3.6×10^{3} C. 36×10^{-2} D. 36×10^{2} E. 3.6×10^{-3}

17. 35 pennies + 11 nickels + 7 dimes + 1 quarter = _____
A. \$1.85 B. \$1.75 C. \$1.95 D. \$1.65 E. \$1.55

18. Find the value of 24 ♥ 3, if $a \heartsuit b = \frac{1}{2}a - 2b$.
A. 7 B. 18 C. 6 D. $18\frac{1}{2}$ E. 9

19. The ratio of the number of boys to the number of girls in a school's science club is 5 to 6. If there are 42 girls on the school's science team, what is the total number of students in the science club?
A. 35 B. 81 C. 70 D. 84 E. 77

20. 96 ounces = _____ cups
A. 12 B. 24 C. 48 D. 192 E. 36

21. The supplement of an angle measuring 69° is x°. What is the value of $2x - 30$?
A. 12 B. 192 C. 108 D. 222 E. 102

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

A. 4 B. 10 C. 6 D. 8 E. 2

23. $35_{10} =$ _____ (base 7)
A. 55 B. 46 C. 53 D. 51 E. 50

24. If $h(x) = -2x + 11$, then what is the value of $h(-12)$?
A. -13 B. 223 C. 35 D. -37 E. -3

25. 6 is what percent of 120?
A. 20% B. 2% C. 8% D. 5% E. 12%

26. If $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$ and $B = \{3, 6, 9, 12, 15, 18, 21\}$, how many elements are in $A \cap B$?
A. 15 B. 19 C. 21 D. 3 E. 4

27. A regular nonagon has a side length of 16 inches. What is the perimeter of the nonagon?
A. 144 inches B. 112 inches C. 128 inches D. 256 inches E. 160 inches

28. What is the sum of the next three terms in the sequence 104, 123, 142, 161, …?
A. 597 B. 530 C. 654 D. 710 E. 635

29. Simplify: $4(13n-2)-(n-3)+5(6+3n)$

A. $27n + 31$ B. $66n + 25$ C. $54n + 1$ D. $68n + 19$ E. $36n - 35$

30. Autumn has five gorilla stuffed animals. Becky has four unicorn stuffed animals. How many more ways can Autumn line up her gorillas on her dresser than Becky can line up her unicorns on her dresser?

A. 96 B. 72 C. 64 D. 16 E. 32

31. What is the slope of the line that passes through the points (8, 15) and (11, 8)?

A. $\frac{3}{7}$ B. $-\frac{3}{7}$ C. $\frac{7}{3}$ D. $-\frac{7}{3}$ E. $\frac{18}{19}$

32. What is the mean of the set of data in the stem-and-leaf plot?

stem	leaf
1	3 4 8
2	5
3	1 1

key: 1 | 3 = 13

A. 25 B. 22 C. 24.5 D. 18 E. 31

33. Let F equal the sum of five consecutive odd integers, and let L equal the sum of the next five consecutive odd integers. What is the value of $L - F$?

A. 100 B. 125 C. 25 D. 50 E. 75

34. What is the y-intercept of the graph of the linear equation $6x - 9y = -36$?

A. -6 B. 6 C. ⅔ D. -4 E. 4

35. The price of a shirt was reduced from \$20 to \$16. By what percentage was the price of the shirt reduced?

A. 25% B. 30% C. 4% D. 5% E. 20%

36. What is the volume of a rectangular solid whose faces have areas of 8 in^2, 14 in^2, and 28 in^2?

A. 48 in^3 B. 100 in^3 C. 56 in^3 D. 64 in^3 E. 72 in^3

37. There are nine players on Clint's basketball team. Each player can play any position. If only five players can be on the court at once, how many ways can the five players be selected.

A. 120 B. 324 C. 225 D. 126 E. 15,120

38. Find x, if the product of $(5n-4)$ and x is equal to $15n^2 - 47n + 28$.

A. $10n + 32$ B. $10n - 24$ C. $3n - 7$ D. $3n + 7$ E. $3n + 32$

39. Two sides of a triangle measure 21 mm and 24 mm. What is the largest possible integral length of the third side?

A. 44 mm B. 45 mm C. 46 mm D. 33 mm E. 34 cm

40. What is the value of the reciprocal of $\frac{3+\frac{1}{3}}{3-\frac{1}{3}}$?

A. ⅕ B. ⅖ C. ⅗ D. ⅘ E. ⅝

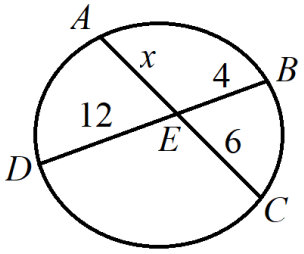
41. What are the coordinates of the center of the circle with an equation of $(x-5)^2+(y+8)^2=100$?

A. $(-5,8)$ B. $(5,-8)$ C. (0, 18) D. (5, 18) E. $(8,-5)$

42. Solve for *y*: $-3x+6y=-24$

A. $y=\frac{1}{2}x-4$ B. $y=-\frac{1}{2}x-4$ C. $y=\frac{1}{2}x+4$ D. $y=-\frac{1}{2}x+4$ E. $y=-2x-4$

43. Using the picture below, find *AC*.

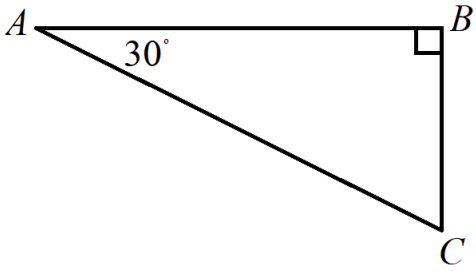


A. 8 units B. 10 units C. 14 units D. 12 units E. 18 units

44. Two numbers sum to 65 and their difference is 39. What is the product of the two numbers?

A. 756 B. 1,014 C. 507 D. 266 E. 676

45. In ΔABC, $m\angle A=30^\circ$, $m\angle B=90^\circ$ and *BC* = 27 inches. Find *AB*.



A. 54 inches B. 13.5 inches C. $13.5\sqrt{3}$ inches D. $27\sqrt{3}$ inches E. $27\sqrt{2}$ inches

46. What is the value of the discriminant of the quadratic equation $10=2x^2-x-1$?

A. 87 B. 89 C. ¼ D. 9 E. -71

47. What is the *y*-intercept of the graph of the function $f(x)=4(1.2)^x$?

A. 4 B. 1.2 C. 0 D. 4.8 E. 5.2

48. $\log_2 16=4$ can be rewritten as which of the following?

A. $16^4=2$ B. $16^2=4$ C. $4^{16}=2$ D. $2^{16}=4$ E. $2^4=16$

49. What are all real values of $x>1$ for which $\frac{4}{x}$ is an integer?

A. {1, 2, 3} B. {1, 2} C. $\left\{\frac{4}{3},\frac{4}{2}\right\}$ D. $\left\{\frac{4}{3},\frac{4}{2},\frac{4}{1}\right\}$ E. {0, 1, 2}

50. Which of the following is the inverse function of the function $f(x)=\frac{x}{9}$?

A. $f^{-1}(x)=\frac{9}{x}$ B. $f^{-1}(x)=-\frac{x}{9}$ C. $f^{-1}(x)=9x$ D. $f^{-1}(x)=-9x$ E. $f^{-1}(x)=\frac{x}{9}$

2021 – 2022 TMSCA Middle School Mathematics Test #2 Answer Key

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

2021 – 2022 TMSCA Middle School Mathematics Test #2 Selected Answers

6. The additive inverse is the same as the opposite of a number. Therefore, the additive inverse of $8\frac{1}{3}$ is $-8\frac{1}{3}$.

20. There are 8 ounces in 1 cup. Therefore, 96 ounces = $96 \div 8 = 12$ cups.

27. A regular nonagon is a polygon with 9 sides. If a regular nonagon has a side length of 16 inches, the perimeter is 9(16) = 144 inches.

28. The sequence 104, 123, 142, 161, … is an arithmetic sequence with a common difference of 19. The next three terms are then 180, 199, and 218. Their sum is 180 + 199 + 218 = 597.

29. To simplify $4(13n-2)-(n-3)+5(6+3n)$, first distribute to get $4(13n-2)-(n-3)+5(6+3n) = 52n-8-n+3+30+15n$. Now, combine like terms to get 66*n* + 25.

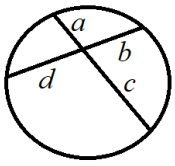
34. Standard form of a linear equation is $Ax+By=C$. Once in standard form, the *y*-intercept can be found by $\frac{C}{B}$. Therefore, the *y*-intercept of the graph of the linear equation $6x-9y=-36$ is $\frac{-36}{-9}=4$.

40. $\frac{3+\frac{1}{3}}{3-\frac{1}{3}} = \frac{\frac{9}{3}+\frac{1}{3}}{\frac{9}{3}-\frac{1}{3}} = \frac{\frac{10}{3}}{\frac{8}{3}} = \frac{10}{3} \div \frac{8}{3} = \frac{10}{3} \cdot \frac{3}{8} = \frac{30}{24} = \frac{5}{4}$. The reciprocal of $\frac{5}{4}$ is $\frac{4}{5}$.

41. The center-radius form of a circle equation is $(x-h)^2+(y-k)^2=r^2$, where the center is located at (h,k). Therefore, the center of the circle with equation $(x-5)^2+(y+8)^2=100$ is located at $(5,-8)$.

42. To solve for *y* in the equation $-3x+6y=-24$, first, add 3*x* to both sides of the equation to get the new equation $6y=3x-24$. Now, divide 6 from both sides of the equation to get the equation $\frac{6y}{6}=\frac{3x}{6}-\frac{24}{6}$. Simplify, and our answer is then $y=\frac{1}{2}x-4$.

43. According to the Chord-Chord Product Theorem, if two chords intersect inside a circle, then the products of the lengths of the segments of the chords are equal. From the picture to the left, *ac* = *bd*. From the picture given in the problem, we know 6*x* = 4(12), so 6*x* = 48. Dividing both sides of the equation by 6 and we get *x* = 8. To find *AC*, add 6 and 8 to get *AC* = 14 units.



47. In an exponential function in the form $y=a\cdot b^x$, *a* is the initial amount, or *y*-intercept if *x* = 0. Therefore, the *y*-intercept of the graph of the function $f(x)=4(1.2)^x$ is 4, when *x* = 0.

50. $f(x)$ can be replaced with *y*, so $f(x)=\frac{x}{9}$ can be rewritten as $y=\frac{x}{9}$. To find the inverse function of a function, switch the *y* and *x* variables and solve for *y*. So, switching the variables gives us $x=\frac{y}{9}$. To solve for *y*, multiply both sides of the equation by 9, to get 9*x* = *y*. So, the inverse function of $f(x)=\frac{x}{9}$ is therefore, $f^{-1}(x)=9x$.