# TMSCA MIDDLE SCHOOL MATHEMATICS

# TEST #1 ©

# OCTOBER 19, 2019

## 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. $286 + 93 =$ _____
A. 359      B. 397      C. 379      D. 193      E. 386

2. $517 - 83 =$ _____
A. 454      B. 600      C. 344      D. 434      E. 414

3. $56 \times 72 =$ _____
A. 4,182      B. 4,032      C. 4,162      D. 4,202      E. 4,112

4. $85 \div 17 =$ _____
A. 5      B. 6      C. 5.5      D. 6.5      E. 7

5. If $x = 8$, then what is the value of $3x - 4x + 5x$?
A. $-8$      B. 64      C. $-16$      D. 32      E. 12

6. Which set of numbers below has the greatest sum?
A. $\left(\frac{5}{4}, \frac{1}{2}, 4\right)$      B. $\left(\frac{1}{2}, \frac{1}{3}, 3\right)$      C. $\left(\frac{5}{2}, 1, 2\right)$      D. $\left(\frac{2}{3}, \frac{3}{4}, 3\right)$      E. $(1, 1, 2)$

7. Which of the following numbers is/are irrational?
     I. $\pi$      II. $\sqrt{64}$      III. $\frac{48}{4}$      IV. $\sqrt{5}$
A. I and II      B. I only      C. II and III      D. I and IV      E. II and IV

8. What number when divided by 7, gives a quotient of 24 with a remainder of 4?
A. 146      B. 74      C. 172      D. 181      E. 184

9. The interior angles of a regular _____ sum to $1,080°$.
A. octagon      B. hexagon      C. heptagon      D. nonagon      E. decagon

10. $-8^2 + 7 =$ _____
A. 71      B. $-57$      C. $-9$      D. $-23$      E. 23

11. What is the value of the median of the set of numbers 23, 54, 37, 35, 36, 29, 36 and 24?
A. 34.375      B. 36      C. 35.5      D. 36.5      E. 31

12. What is the GCF of the numbers 84 and 140?
A. 420      B. 224      C. 6      D. 42      E. 28

13. What is the area of the trapezoid below?

14 inches

4 inches      5 inches

20 inches
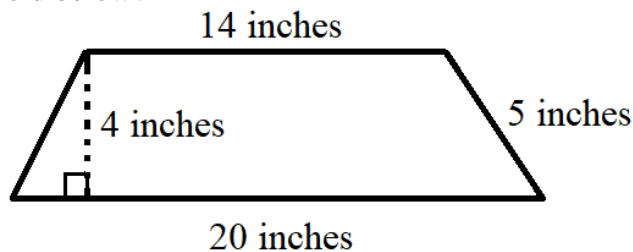
A. 68 in$^2$      B. 85 in$^2$      C. 44 in$^2$      D. 43 in$^2$      E. 56 in$^2$

14. The radius of a circular clock is 23 cm.  In terms of $\pi$, what is the circumference of the clock?
A. 138 cm          B. 144.44 cm          C. $138\pi$ cm          D. $46\pi$ cm          E. $23\pi$ cm

15. If today is Saturday, what day of the week will it be in two weeks from yesterday?
A. Monday          B. Tuesday          C. Friday          D. Saturday          E. Sunday

16. At the *Science Mania Contest*, there will be 136 students and 34 coaches.  If each person must have a name badge and name badges cost $1.85 each, how much will *Science Mania* make from name badge sales?
A. $257.40          B. $314.50          C. $251.60          D. $398.90          E. $262.80

17. 4,501,000,000,000 = _____ (scientific notation)
A. $4.501 \times 10^{11}$          B. $4.5 \times 10^{12}$          C. $4.501 \times 10^{12}$          D. $4.5 \times 10^{-12}$          E. $4.501 \times 10^{-11}$

18. What is the sum of the next two numbers in the pattern 4, 5, 9, 14, 23, 37, …?
A. 157          B. 254          C. 97          D. 134          E. 127

19. How many different outcomes are possible if you flip a coin four times?
A. 8          B. 6          C. 16          D. 12          E. 24

20. 314 = _____ (Roman numeral)
A. DDDXIV          B. LLLXIIII          C. CCCXIIII          D. CCDXIV          E. CCCXIV

21. If $f(n) = 27 - 5n$, then what is the value of $f(0.4)$?
A. 7          B. 23          C. 21.6          D. 25          E. 8.8

22. $43_7$ = _____$_{10}$
A. 36          B. 33          C. 31          D. 35          E. 29

23. $9.24 = 26 quarters + _____ dimes + 24 nickels + 74 pennies
A. 11          B. 9          C. 8          D. 10          E. 12

24. Which of the following numbers are composite numbers?
                    I. 17          II. 51          III. 73          IV. 67          V. 81
A. I, II and IV          B. II and V          C. I, II and III          D. IV and V          E. V only

25. 36 ounces = _____ cups
A. 4.5          B. 5.5          C. 5          D. 5.25          E. 6

26. What is the slope of the line that passes through the points $(-14, 9)$ and $(-2, -11)$?
A. $-\frac{5}{3}$          B. $\frac{5}{3}$          C. $-\frac{4}{3}$          D. $\frac{3}{5}$          E. $-0.6$

27. Simplify:          $(4a^2 + 3a - 7) + (7a - 8 + 3a^2)$
A. $11a^2 - 5a - 4$          B. $11a^2 - 5a + 4$          C. $a^2 - 4a + 1$          D. $7a^2 + 10a - 15$          E. $7a^2 + 4a - 1$

28. The sum of two consecutive even integers is 134.  What is the product of these integers?
A. 4,624               B. 4,228               C. 4,488               D. 4,896               E. 4,224

29. What is the total surface area of the prism below?



11 in

3 in

5 in
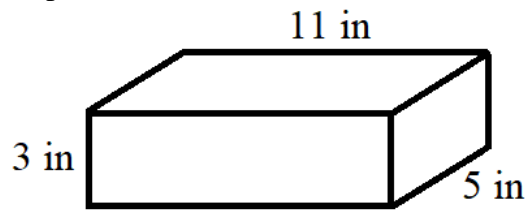
A. 76 in$^2$               B. 152 in$^2$               C. 304 in$^2$               D. 96 in$^2$               E. 206 in$^2$

30. What is the equation $6x = m + f$ solved for $x$?
A. $x = m + f + 6$     B. $x = m + f - 6$     C. $x = 6(m + f)$     D. $x = 6m + f$     E. $x = \frac{m+f}{6}$

31. Which of the following relations does not represent a function?
A. $\{(3, 4), (3, 6), (3, 8)\}$ B. $\{(3, 2), (2, 1), (0, 8)\}$ C. $\{(4, 4), (3, 4), (5, 4)\}$ D. $\{(1, 1), (2, 2), (3, 3)\}$ E. $\{(0, 1), (1, 2), (2, 3)\}$

32. If all the letters of the alphabet were placed in a bag, what is the probability of drawing a vowel or the letter X?
A. $\frac{5}{26}$               B. $\frac{7}{26}$               C. $\frac{5}{13}$               D. $\frac{3}{13}$               E. $\frac{1}{6}$

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



$-10 \quad -9 \quad -8 \quad -7 \quad -6 \quad -5$
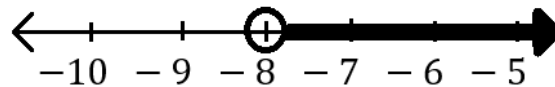
A. $-4n - 6 > 26$     B. $2n - 2 > 14$     C. $-2n - 2 > 14$     D. $6n - 14 > -34$   E. $4n - 12 > -44$

34. In how many ways can six different books be lined up on a shelf?
A. 720               B. 120               C. 49               D. 240               E. 360

35. What is the $y$-intercept of the graph of the exponential function $y = 24(2)^x$?
A. 48               B. 24               C. 2               D. 12               E. 576

36. What is the value of the discriminant of the quadratic equation $x^2 - 7x + 12 = 0$?
A. 49               B. 48               C. 1               D. $-97$               E. 6

37. Simplify:  $13\sqrt{80}$
A. $26\sqrt{20}$               B. $52\sqrt{5}$               C. $104\sqrt{10}$               D. $104\sqrt{5}$               E. $26\sqrt{10}$

38. What is the LCM of $14a^3bc^4$ and $16ab^2$?
A. $2a^3b^2c^4$               B. $24abc^4$               C. $224a^3b^2$               D. $112a^3b^2c^4$               E. $112ab$

39. Kevin saw a baseball hat that cost $16.00. A day later, Kevin saw the same hat on sale for $2 off. What is the percent of change between the two prices of the hat Kevin saw?
A. 87.5%              B. 2.5%                    C. 12.5%                    D. 67.5%                    E. 10.5%

40. What is the range of the function $y = \frac{5}{2}x - 3$, with a domain of $\{-6, 0, 8\}$?
A. $\{-12, 3, 23\}$        B. $\{-15, 0, 20\}$        C. $\{-13, 2, 22\}$        D. $\{-23, -8, 12\}$        E. $\{-18, -3, 17\}$

41. What is the growth factor in the exponential growth function $y = 6(1.4)^x$?
A. 1.4                    B. 140                    C. 6                    D. 40                    E. 14

42. Which of the following is a linear factor of the polynomial $6x^2 + 7x - 20$?
A. $2x - 4$                B. $2x + 5$                C. $3x + 4$                D. $3x - 5$                E. $3x + 2$

43. What is the multiplicative inverse of the product of $4\frac{2}{5}$ and $3\frac{3}{4}$?
A. $\frac{20}{7}$              B. $\frac{7}{20}$              C. $\frac{4}{15}$              D. $\frac{2}{33}$              E. $\frac{3}{20}$

44. The solution to the system $\begin{cases} 9x + 8y = 1 \\ 2x - 4y = -46 \end{cases}$ is $(x, y)$. What is the value of the negative coordinate of the solution?
A. $-9$                    B. 8                    C. $-2$                    D. $-8$                    E. $-7$

45. Solve for $x$.                    $|x| = 32$
A. $\{32\}$                B. $\{-32\}$                C. $\left\{-\frac{1}{32}\right\}$                D. $\left\{\frac{1}{32}\right\}$                E. $\{\pm 32\}$

46. What is the side length of a square with a diagonal measure of 16 inches?
A. $16\sqrt{2}$ inches        B. $16\sqrt{3}$ inches        C. $8\sqrt{2}$ inches        D. 8 inches        E. $8\sqrt{3}$ inches

47. Simplify: $\frac{20a^3 b^{-2} c}{5a^{-1} b^{-4} c^3}$
A. $\frac{a^4 b^2}{4c^2}$              B. $\frac{4a^2 b^2}{c^3}$              C. $\frac{a^2 b^2}{4c^3}$              D. $\frac{4a^4 b^2}{c^2}$              E. $\frac{4a^4}{b^2 c^2}$

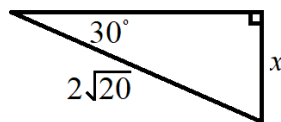48. If $\pi = 3$, what is the circumference of a circle with the equation $(x - 7)^2 + y^2 = 256$?
A. 768 units            B. 384 units            C. 96 units            D. 128 units            E. 64 units

49. If $\frac{4x-1}{2} = \frac{3x+4}{3}$, what is the value of $12x - 7$?
A. 9                    B. 15                    C. 17                    D. 21                    E. 19

50. What is the length of $x$ below?

30°

$2\sqrt{20}$

$x$

A. $2\sqrt{15}$ units            B. $5\sqrt{3}$ units            C. $2\sqrt{5}$ units            D. $5\sqrt{2}$ units            E. $3\sqrt{5}$ units

# 2019 – 2020 TMSCA Middle School Mathematics Test #1 Answer Key

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

10. $-8^2 + 7 = -64 + 7 = -57$.

16. There are a total of $136 + 34 = 170$ people that need a name badge. Since name badges cost $1.85, the total sales are then $1.85 \times 170 = \$314.50$.

25. There are 8 ounces in 1 cup, so 36 ounces $= 36 \div 8 = 4.5$ cups.

26. To find the slope of the line between two points, use the formula $\frac{y_2-y_1}{x_2-x_1}$. We are given the points $(-14, 9)$ and $(-2, -11)$. Substituting into the formula and we get a slope of $\frac{9-(-11)}{-14-(-2)} = \frac{9+11}{-14+2} = \frac{20}{-12} = -\frac{5}{3}$.

32. There are 2 letters in the alphabet, with 5 vowels, A, E, I, O, and U. If X is added to the group of vowels, the group then has 6 letters. 6 out of 26 is then $\frac{6}{26} = \frac{3}{13}$. The probability of getting a vowel or X from drawing a letter is $\frac{3}{13}$.

36. The discriminant of a quadratic equation in standard form, $Ax^2 + Bx + C = 0$, can be found using $B^2 - 4AC$. We are given the equation $x^2 - 7x + 12 = 0$. The discriminant of the equation is then $(-7)^2 - 4(1)(12) = 49 - 48 = 1$.

39. The formula for percent of change is $\frac{change\ in\ amount}{original\ amount}$. The $16 hat changes to $16 - 2 = \$14$. Therefore, the percent of change from 16 to 14 is $\frac{16-14}{16} = \frac{2}{16} = \frac{1}{8} = 0.125 = 12.5\%$.

40. The range is the output of a function and the domain is the input of the function. We are asked to find the range of the function $y = \frac{5}{2}x - 3$, with a domain of $\{-6, 0, 8\}$, so input each value of the domain separately to find its corresponding range value. $\frac{5}{2}(-6) - 3 = -18, \frac{5}{2}(0) - 3 = -3$, and $\frac{5}{2}(8) - 3 = 17$. The range values, given the specified domain values, are then $\{-18, 0, 17\}$.

41. An exponential growth function is in the form $y = a \cdot b^x$, where $a$ is the initial amount and $b$ is the growth factor. In the equation $y = 6(1.4)^x$, the growth factor is then 1.4.

43. The product of $4\frac{2}{5}$ and $3\frac{3}{4}$ is equal to $4\frac{2}{5} \cdot 3\frac{3}{4} = \frac{22}{5} \cdot \frac{15}{4} = \frac{330}{20} = \frac{33}{2}$. The multiplicative inverse is another name for the reciprocal. Therefore, the multiplicative inverse, or reciprocal, of $\frac{33}{2}$ is $\frac{2}{33}$.

47. $\frac{20a^3b^{-2}c}{5a^{-1}b^{-4}c^3} = \frac{4a^{3-(-1)}b^{-2-(-4)}c^{1-3}}{1} = \frac{4a^4b^2c^{-2}}{1} = \frac{4a^4b^2}{c^2}$.

49. To solve the equation $\frac{4x-1}{2} = \frac{3x+4}{3}$, first we need to cross multiply to get $2(3x + 4) = 3(4x - 1)$. Now distribute to get $6x + 8 = 12x - 3$. Next, subtract $6x$ from both sides and get $8 = 6x - 3$. Add three to both sides and get $11 = 6x$. Divide by 6 to both sides and we get $x = \frac{11}{6}$. Now substitute into the expression $12x - 7$, and we get $12\left(\frac{11}{6}\right) - 7 = \frac{132}{6} - 7 = 22 - 7 = 15$.