

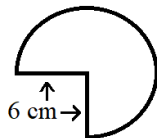
**TMSCA MIDDLE SCHOOL  
MATHEMATICS  
TEST #10 ©  
FEBRUARY 8, 2020**

**GENERAL DIRECTIONS**

- About this test:
  - You will be given 40 minutes to take this test.
  - There are 50 problems on this test.
- 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.
- If you are using a Chatsworth or Scantron card, please follow the specific instructions given at your particular meet.
- You may write anywhere on the test itself. You must write only answers on the answer sheet.
- You may use additional scratch paper provided by the contest director.
- All problems have **ONE** and **ONLY ONE** correct [BEST] answer. There is a penalty for all incorrect answers.
- Calculators **MAY NOT** be used on this test.
- 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.
- In case of ties, percent accuracy will be used as a tie breaker.



1.  $16\frac{1}{4} + 25\frac{3}{8} =$  \_\_\_\_\_  
 A.  $\frac{435}{8}$                       B.  $\frac{333}{8}$                       C.  $\frac{433}{8}$                       D.  $\frac{343}{8}$                       E.  $\frac{335}{8}$
2.  $81.002 - 8.7 =$  \_\_\_\_\_  
 A. 73.132                      B. 73.312                      C. 72.324                      D. 72.302                      E. 73.124
3.  $124\frac{1}{2} \times \frac{4}{5} =$  \_\_\_\_\_  
 A. 100.8                      B. 99.6                      C. 98.2                      D. 101.8                      E. 102.4
4.  $\frac{44}{5} \div 36 =$  \_\_\_\_\_  
 A.  $0.2\bar{4}$                       B.  $0.2\bar{14}$                       C.  $0.\bar{16}$                       D.  $0.\bar{4}$                       E.  $0.\bar{64}$
5.  $\$11.56 = 36$  quarters + 20 dimes + \_\_\_\_\_ nickels + 1 penny  
 A. 15                      B. 9                      C. 12                      D. 13                      E. 11
6. Let  $M$  equal the sum of the numbers 852, 658 and 735. What percentage of the digits of  $M$  are prime?  
 A. 0%                      B. 25%                      C. 50%                      D. 75%                      E. 100%
7. What is the perimeter of a regular undecagon if each of its sides measures 13.34 cm?  
 A. 146.74 cm                      B. 160.08 cm                      C. 133.4 cm                      D. 309.06 cm                      E. 123.42
8. If the following pattern continues, what is the sum of the numbers in Row 6?  
 Row 1: 2  
 Row 2: 4, 6  
 Row 3: 8, 10, 12  
 Row 4: 14, 16, 18, 20
- A. 222                      B. 234                      C. 266                      D. 180                      E. 280
9. What is the lower-quartile for the set of numbers 102, 101, 75, 83, 112, 97, and 92?  
 A. 37                      B. 97                      C. 83                      D. 101                      E. 103
10. If  $\pi = 3$ , what is the perimeter of the shape below?



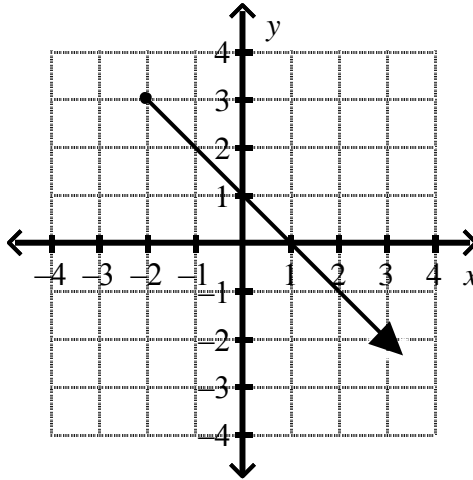
- A. 36 cm                      B. 28 cm                      C. 27 cm                      D. 81 cm                      E. 39 cm
11. 2.5 yards + 4.5 feet = \_\_\_\_\_ inches  
 A. 84                      B. 144                      C. 72                      D. 168                      E. 96
12. A circle has an area of  $484\pi$  units<sup>2</sup>. What is the measure of the diameter of the circle?  
 A. 242 units                      B. 11 units                      C. 22 units                      D. 121 units                      E. 44 units
13. 3.5 quarts = \_\_\_\_\_ pints  
 A. 28                      B. 7                      C. 14                      D. 1.75                      E. 21
14. What is the sum of the number of edges of a square pyramid and a rectangular prism?  
 A. 28                      B. 24                      C. 20                      D. 16                      E. 13

15. What is the positive difference between the complement of a  $22^\circ$  angle and the supplement of a  $127^\circ$ ?  
A.  $105^\circ$                       B.  $35^\circ$                       C.  $31^\circ$                       D.  $15^\circ$                       E.  $25^\circ$
16. A tree casts a shadow 48 feet long. At the same time, a yardstick casts a shadow of 8 feet, how tall is the tree?  
A. 18 feet                      B. 24 feet                      C. 16 feet                      D. 21 feet                      E. 32 feet
17.  $6^{-1} + 6^0 + 6^1 =$  \_\_\_\_\_  
A. 0                      B. 1                      C. 6                      D.  $6\frac{1}{6}$                       E.  $7\frac{1}{6}$
18. What will be the total cost of an item priced at \$180.00, if the tax rate is  $8\frac{1}{4}\%$ ?  
A. \$194.85                      B. \$148.50                      C. \$188.25                      D. \$328.50                      E. \$194.94
19. The arithmetic mean of  $A$ ,  $B$  and  $C$  is 23. If  $C = 33$ , what is the arithmetic mean of  $A$  and  $B$ ?  
A. 26                      B. 18                      C. 16                      D. 24                      E. 20
20.  $2.56 \times 10^5$  centimeters = \_\_\_\_\_ kilometers  
A. 25.6                      B. 256                      C. 0.256                      D. 2.56                      E. 0.0256
21. The prime factorization of 560 is  $2^a \cdot 5^b \cdot 7^c$ . What is the value of  $a^b + b^c + a^c + b^a + c^a - c^b$ ?  
A. 12                      B. 4                      C. 16                      D. 8                      E. 10
22. For the holiday season, Maggie works at the local department store. Maggie makes \$5.50 per hour plus \$1.75 for each gift she wraps. If Maggie earns \$75.00 for working 6 hours, how many gifts did she wrap?  
A. 18                      B. 28                      C. 24                      D. 20                      E. 32
23. What is the probability of rolling a pair of dice and getting a sum of 6, 7 or 8?  
A.  $\frac{2}{3}$                       B.  $\frac{1}{2}$                       C.  $\frac{11}{36}$                       D.  $\frac{4}{9}$                       E.  $\frac{5}{18}$
24. If  $x \neq 0$ ,  $4wx = 5y$ ,  $xz = y$ , and  $z = 6$ , what is the value of  $w$ ?  
A. 7.5                      B.  $0.\overline{13}$                       C. 1.25                      D. 2.75                      E. 3.5
25. 210 miles/hour = \_\_\_\_\_ feet/second  
A. 298                      B. 318                      C. 292                      D. 316                      E. 308
26.  $CCCXXXVI \div XXIV =$  \_\_\_\_\_ (Arabic number)  
A. 24                      B. 14                      C. 22                      D. 18                      E. 12
27.  $101_2 + 1101_2 - 111_2 =$  \_\_\_\_\_<sub>8</sub>  
A. 11                      B. 121                      C. 15                      D. 13                      E. 27
28. Line  $A$  passes through the points  $(\frac{3}{2}, \frac{1}{4})$  and  $(-\frac{1}{2}, \frac{5}{4})$ . What is the slope of any line parallel to line  $A$ ?  
A.  $-\frac{1}{4}$                       B. 4                      C.  $-\frac{1}{2}$                       D.  $\frac{3}{4}$                       E.  $-\frac{3}{4}$
29. The sum of two prime numbers is 55. What is their product?  
A. 667                      B. 899                      C. 391                      D. 143                      E. 106
30. How many numbers less than 10 are relatively prime to 10?  
A. 4                      B. 3                      C. 2                      D. 5                      E. 1

31. Jamal went to the store and saw a fishing pole for sale for \$24.00. He went back to the store a week later and saw the same fishing pole costing \$32.00. What was the percent of increase in the prices of the fishing pole?

- A.  $66\frac{1}{3}\%$       B.  $66\frac{2}{3}\%$       C.  $33\frac{2}{3}\%$       D.  $33\frac{1}{3}\%$       E.  $30\frac{2}{3}\%$

32. What is the range of the graph below?



- A.  $y \geq -2$       B. all real numbers      C.  $-2 \leq y \leq 3$       D.  $y \leq 3$       E.  $-2.2 \leq y \leq 3$

33. What is the equation  $(a + b)^2 - n = p$  solved for  $b$ ?

- A.  $b = \sqrt{p + n - a}$       B.  $b = \sqrt{p + n} - a$       C.  $b = \sqrt{p} + n - a$       D.  $b = (p + n)^2 - a$       E.  $b = (p + n - a)^2$

34. If  $f(x) = 2x^2$ ,  $g(x) = x \div 0.2$  and  $h(x) = 17 - 3x$ , then what is the value of  $g(h(f(-3)))$ ?

- A. -185      B. -253      C. 33,800      D. -163      E. -455

35. Which regular polygon has an interior angle measure of  $140^\circ$ ?

- A. octagon      B. nonagon      C. decagon      D. undecagon      E. dodecagon

36. There are 350 squirrels in the local park. If the squirrel population is decreasing at a rate of 40% each year because of construction, what will be the squirrel population after two years?

- A. 126      B. 290      C. 104      D. 118      E. 124

37. Eight friends consisting of four girls and four boys go to *Bounce for Life* trampoline park. Boys and girls alternate in lining up in a straight line to buy their tickets. What is the probability the eight friends line up in a boy-girl arrangement?

- A.  $\frac{1}{70}$       B.  $\frac{1}{7}$       C.  $\frac{1}{4}$       D.  $\frac{1}{16}$       E.  $\frac{1}{35}$

38. What is the product of the roots of the quadratic equation  $6x^2 - 24 = 8x$ ?

- A. -3      B.  $-\frac{2}{3}$       C.  $-\frac{3}{4}$       D. -4      E. -6

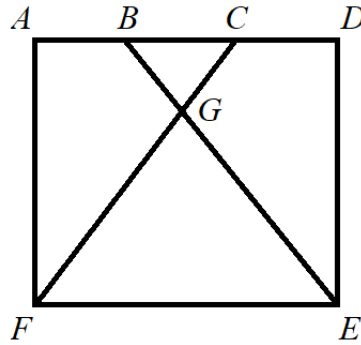
39.  $(2x - 1)(x^2 + 3) =$  \_\_\_\_\_

- A.  $2x^3 - x^2 + 6x - 3$       B.  $2x^3 - 2x^2 + x - 3$       C.  $2x^3 + x - 6x - 3$       D.  $2x^3 + x^2 + 7x - 3$       E.  $2x^3 + x + 6x + 3$

40. If  $A = 6\sqrt{\frac{9}{2}}$  and  $B = 7\sqrt{\frac{4}{6}}$ , what is the product of  $AB$ ?

- A.  $13\sqrt{6}$       B.  $13\sqrt{3}$       C.  $46\sqrt{3}$       D.  $42\sqrt{\frac{13}{12}}$       E.  $42\sqrt{3}$

41. Square  $ADEF$  has a perimeter of 32 inches. If  $FG + GC = 10$  inches and  $BG + GE = 10$  inches, find  $BC$ .



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

42. A scientist has a 4% acid solution and a 40% acid solution. The scientist wants to make 72 mL of a 20% acid solution. How many milliliters of the 4% acid solution does the scientist need?

- A. 60 mL                      B. 40 mL                      C. 25 mL                      D. 50 mL                      E. 20 mL

43. The sum of the two linear factors of  $x^2 + 13x + 36$  is subtracted from the sum of the two linear factors of  $x^2 - 25$ . What is the value of the result?

- A. 61                      B. 14                      C. -11                      D. -12                      E. -13

44. What is the 23<sup>rd</sup> digit to the right of the decimal point in the decimal expansion of  $\frac{2}{13}$ ?

- A. 5                      B. 3                      C. 8                      D. 4                      E. 6

45. Which of the following sets is not a Pythagorean Triple?

- A. {27, 45, 36}                      B. {39, 15, 36}                      C. {17, 8, 15}                      D. {9, 40, 41}                      E. {20, 52, 46}

46.  $\frac{20a^3b^4}{c^2} \cdot \frac{a^4c^3}{b^{-1}} \cdot \frac{2ac^6}{10a^2b^5} =$  \_\_\_\_\_

- A.  $4a^6bc^7$                       B.  $10a^6bc^7$                       C.  $4a^6c^7$                       D.  $\frac{10a^6c^7}{b}$                       E.  $\frac{4a^6c^7}{b^2}$

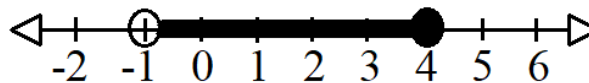
47. A model rocket is launched into the air with an upward velocity of 64 ft/s. Its height  $h$  in feet after  $t$  seconds is given by the function  $h(t) = -16t^2 + 64t + 8$ . What is the maximum height the rocket will reach?

- A. 72 feet                      B. 80 feet                      C. 64 feet                      D. 76 feet                      E. 84 feet

48. What is the decimal representation of  $5 - \frac{1}{1 - \frac{1}{5}}$ ?

- A. 4.25                      B. 3.75                      C. 3.5                      D. 4.5                      E. 3.25

49. How would the graph below be expressed using interval notation?



- A.  $(-1, 4)$                       B.  $[-1, 4]$                       C.  $[-1, 4)$                       D.  $(-1, 4]$                       E.  $(-\infty, \infty)$

50. If  $3x + \sqrt{x} - 2 = 0$ , what is the value of  $\frac{3}{2}x + \frac{2}{3}$ ?

- A.  $2\frac{1}{6}$                       B.  $2\frac{5}{6}$                       C.  $2\frac{1}{3}$                       D.  $1\frac{1}{6}$                       E.  $1\frac{1}{3}$

2019 – 2020 TMSCA Middle School Mathematics Test #10 Answer Key

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

7. An undecagon has 11 sides. If the side length of a regular undecagon is 13.34 cm, the perimeter of the undecagon is  $11(13.34) = 146.74$  cm.
8. The numbers in row 8 will be 32, 34, 36, 38, 40, and 42. Their sum is  $32 + 34 + 36 + 38 + 40 + 42 = 222$ .
21. The prime factorization of 560 is  $2^4 \cdot 5^1 \cdot 7^1$ , so  $560 = 2^a \cdot 5^b \cdot 7^c$  and  $a = 4$ ,  $b = 1$ , and  $c = 1$ . So, substituting into the expression  $a^b + b^c + a^c + b^a + c^a - c^b$ , we get  $4^1 + 1^1 + 4^1 + 1^4 + 1^4 - 1^1$ , which simplifies to  $4 + 1 + 4 + 1 + 1 - 1 = 10$ .
24. If  $x \neq 0$ ,  $4wx = 5y$ ,  $xz = y$ , and  $z = 6$ , then  $6x = y$ . Substitute, and  $4wx = 5y$  becomes  $4wx = 5(6x)$ . This simplifies to  $4wx = 30x$ . Divide both sides by  $x$  and  $4w = 30$ . Divide 30 by 4 and  $w = 7.5$ .
26.  $CCCXXXVI \div XXIV = 336 \div 24 = 14$ .
30. To find how many numbers less than 10 are relatively prim to 10, first find the prime factorization of 10.  $10 = 2^1 \cdot 5^1$ . Subtract 1 from each exponent and multiply the remaining parts,  $2^{1-1} \cdot 5^{1-1} = 1 \cdot 1$ . Next, subtract 1 from each base,  $2 - 1 = 1$  and  $5 - 1 = 4$ . Finally, multiply out all the parts,  $1 \cdot 1 \cdot 1 \cdot 4 = 4$ . There are 4 numbers less than 10 that are relatively prime to 10.
38. Rewrite the equation into standard form,  $Ax^2 + Bx + C = 0$ , and  $6x^2 - 24 = 8x$  becomes the equation  $6x^2 - 8x - 24 = 0$ . To find the product of the roots, use  $\frac{C}{A}$ . So, since  $C = -24$  and  $A = 6$ , the product of the roots of the given equation is  $\frac{-24}{6} = -4$ .
39.  $(2x - 1)(x^2 + 3) = 2x(x^2) + 3(2x) - 1(x^2) - 1(3) = 2x^3 + 6x - x^2 - 3 = 2x^3 - x^2 + 6x - 3$ .
40. If  $A = 6\sqrt{\frac{9}{2}}$  and  $B = 7\sqrt{\frac{4}{6}}$ , then  $AB = 6\sqrt{\frac{9}{2}} \cdot 7\sqrt{\frac{4}{6}} = \frac{6\sqrt{9}}{\sqrt{2}} \cdot \frac{7\sqrt{4}}{\sqrt{6}} = \frac{42\sqrt{36}}{\sqrt{12}} = 42\sqrt{\frac{36}{12}} = 42\sqrt{3}$ .
41. If the perimeter of square  $ADEF$  is 32 inches, then each side length is  $32 \div 4 = 8$  inches. If  $FC = 10$  inches,  $AF = 8$  inches and  $\angle FAC$  is a right angle, then we can use the Pythagorean Theorem to find  $AC$  to be 6 inches. If  $AD = 8$  inches and  $AC = 6$  inches, then  $CD = 2$  inches. We can use the same proof to find  $AB = 2$  inches. Since  $CD = 2$  inches and  $AB = 2$  inches, then  $BC = AD - AB - CD = 4$  inches.
49. In interval notation,  $<$  corresponds to  $($ ,  $>$  corresponds to  $)$ ,  $\leq$  corresponds to  $[$ , and  $\geq$  corresponds to  $]$ . Using the graph given, we see the domain is  $-1 < x \leq 4$ . Therefore, using interval notation, the domain of the graph is  $(-1, 4]$ .
50. Let  $\sqrt{x} = a$ . So, if  $3x + \sqrt{x} - 2 = 0$ , we can substitute to get  $3a^2 + a - 2 = 0$ . This factors out to be  $(a + 1)(3a - 2) = 0$ . Solving each factor and  $a = -1$  or  $\frac{2}{3}$ . Since  $a = \sqrt{x}$ , we can write two equations  $\sqrt{x} = -1$  and  $\sqrt{x} = \frac{2}{3}$ . Since  $\sqrt{x}$  cannot be a negative number,  $\sqrt{x}$  is only equal to  $\frac{2}{3}$ . Solve  $\sqrt{x} = \frac{2}{3}$  by squaring both sides to get  $x = \frac{4}{9}$ . So, if  $x = \frac{4}{9}$ , then  $\frac{3}{2}x + \frac{2}{3} = \frac{3}{2}\left(\frac{4}{9}\right) + \frac{2}{3} = \frac{2}{3} + \frac{2}{3} = \frac{4}{3} = 1\frac{1}{3}$ .