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 # 9 ©

J A N U A R Y 2 6 , 2 0 1 9

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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2018 – 2019 TMSCA Middle School Mathematics Test #9

1. $85\frac{1}{5} - 16\frac{3}{4}$ = _____

A. $69\frac{2}{9}$ B. $68\frac{2}{9}$ C. $68\frac{9}{20}$ D. $69\frac{9}{20}$ E. $68\frac{7}{9}$

2. 45.65 + 19.008 + 117.107 = _____ (nearest tenth)

A. 181.77 B. 180.765 C. 181.7 D. 180.77 E. 181.8

3. 4.14×7.4 = _____

A. 30.736 B. 30.636 C. 30.536 D. 30.436 E. 29.836

4. $\frac{11}{4} \div \frac{3}{5} \div \frac{1}{2}$ = _____

A. $9\frac{5}{6}$ B. $9\frac{1}{6}$ C. $9\frac{1}{3}$ D. $8\frac{2}{3}$ E. $8\frac{5}{6}$

5. What is the sum of the GCF and LCM of the numbers 54 and 52?

A. 1,404 B. 1,406 C. 2,810 D. 2,806 E. 1,604

6. Simplify: $6^0 + 5^0(14 - 22) - (-8)^1$

A. -1 B. $-½$ C. ½ D. 1 E. 6

7. $\frac{11}{16}$ = _____%

A. 68.25 B. 68.5 C. 68.75 D. 67.25 E. 67.75

8. If eight figurines cost $130.24, how much will eleven figurines cost?

A. $179.08 B. $168.08 C. $177.08 D. $178.18 E. $178.28

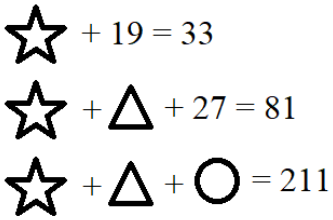
9. 2 square feet = _____ square inches

A. 288 B. 72 C. 144 D. 1,296 E. 216

10. The number 1,200 has how many positive integral factors?

A. 24 B. 30 C. 36 D. 8 E. 16

11. What is the value of the circle below?



A. 143 B. 139 C. 157 D. 161 E. 155

12. Abbey, Becky, Candice, Dianne and Emily each have different amounts of bows. Abbey and Becky have more than Emily. Neither Abbey nor Dianne has as many bows as Candice. Dianne has more than Emily, but less than Abbey. Who has the least amount of bows?

A. Abbey B. Becky C. Candice D. Dianne E. Emily

13. What is the positive difference of the median and upper quartile of the set of numbers 33, 34, 38, 39, 41, 45, 53, 104?

A. 12 B. 8 C. 11 D. 9 E. 10

14. 12,900,000 mm = _____ km

A. 12.9 B. 129 C. 1.29 D. 1,290 E. 0.129

15. 0.0000056 = _____ (scientific notation)
A. 5.6×10^{-5} B. 5.6×10^{-6} C. 5.6×10^{5} D. 5.6×10^{6} E. 56×10^{-5}

16. Solve: $-\frac{w}{7} \geq -14$
A. $w \geq -2$ B. $w \geq 2$ C. $w \leq 2$ D. $w \geq 98$ E. $w \leq 98$

17. $175\% \neq$ _____
A. 1.75 B. $\frac{14}{8}$ C. $1\frac{3}{4}$ D. 17.5 E. $\frac{7}{4}$

18. What is the value of the 8th term of the sequence 4, 7, 11, 18, 29, …?
A. 76 B. 123 C. 156 D. 199 E. 119

19. If $a \♫ b = 4ab - a - b$, what is the value of ½ ♫ ¾?
A. ⅜ B. ⅝ C. ¼ D. −½ E. −⅛

20. The product of two consecutive positive odd integers is 1,023. What is the sum of the two integers?
A. 60 B. 62 C. 68 D. 66 E. 64

21. Thirty percent of the registered cyclists did not finish the race due to bicycle malfunctions. If 308 registered cyclists finished the race, how many registered cyclists were there?
A. 460 B. 420 C. 480 D. 440 E. 500

22. The sum of three consecutive positive integers is 66. What is the product of the largest and smallest of the integers?
A. 484 B. 529 C. 506 D. 483 E. 462

23. What is $0.6\overline{54}$ expressed as a fraction?
A. $\frac{23}{44}$ B. $\frac{19}{37}$ C. $\frac{42}{73}$ D. $\frac{36}{55}$ E. $\frac{101}{211}$

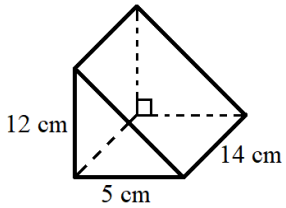
24. Which formula gives the n^{th} term of the sequence? 4, 10, 18, 28, …
A. $n^3 + 3$ B. $n^2 + 3n$ C. $2n^2 + 2$ D. $2 - n^2$ E. $4n - 5$

25. $(2n^3)^2(3n^4)^2$ = _____
A. $36n^{14}$ B. $24n^{14}$ C. $24n^{25}$ D. $36n^{25}$ E. $144n^{10}$

26. If the first term of an arithmetic sequence is 19 and the common difference is 17, what is the value of the 8th term of the arithmetic sequence?
A. 97 B. 155 C. 138 D. 121 E. 114

27. At the local clothing store, a specific shirt is priced at $24.00. The next week, the store owner puts the shirt on sale for 25% off. A week afterwards, the store owner notices the shirt still has not sold so she marks the shirt for one-half off the already reduced price. What is the final price of the shirt?
A. $18.00 B. $12.00 C. $16.00 D. $9.00 E. $6.00

28. What is the lateral surface area of the triangular prism?



A. 60 cm^2 B. 120 cm^2 C. 456 cm^2 D. 420 cm^2 E. 480 cm^2

29. A rectangle has a length of 14 cm and a width of 32 cm. A square has a perimeter of 72 cm. How many square centimeters larger is the area of the rectangle than the area of the square?
A. 148 cm^2 B. 20 cm^2 C. 96 cm^2 D. 112 cm^2 E. 124 cm^2

30. $12_5 \times 21_5 =$ _____$_5$
A. 1221 B. 302 C. 212 D. 142 E. 232

31. If $h(x) = \frac{x^2-5}{x}$, which of the following is true?
A. $h(-10) = 9.5$ B. $h(-5) = -4$ C. $h(-1) = -4$ D. $h(5) = -4$ E. $h(6) = 34$

32. How many zeros does the product of 24^2 and 15^3 end with?
A. 3 B. 4 C. 5 D. 6 E. 2

33. What is the growth rate of the exponential growth function $y = \left(\frac{2}{3}\right)\left(\frac{13}{5}\right)^x$?
A. 360% B. 160% C. 260% D. $66.\bar{6}\%$ E. $166.\bar{6}\%$

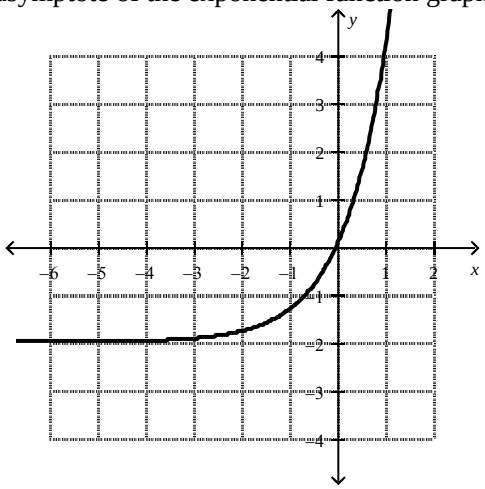
34. What is the value of the mean absolute deviation of the numbers 112, 135, 101 and 96?
A. 110.5 B. 8.75 C. 10.5 D. 9.5 E. 12.5

35. Paul built a rectangular fence 60 yards long by 20 yards wide for his pumpkin patch. To make the pumpkin patch larger, while using the same fence, Paul changed the shape to a square. By how many square yards is the pumpkin patch enlarged?
A. 0 $yards^2$ B. 250 $yards^2$ C. 300 $yards^2$ D. 400 $yards^2$ E. 500 $yards^2$

36. Which of the following is a linear factor of the quadratic equation $0 = 6x^2 + x - 35$?
A. $2x - 7$ B. $3x + 5$ C. $3x + 7$ D. $2x - 5$ E. $3x - 7$

37. James weighs 120 pounds and is sitting on a seesaw 9 feet from the middle. Walter weighs 150 pounds and is sitting on the opposite side of the seesaw as James. How far from the middle of the seesaw must Walter sit to balance the seesaw?
A. 6.8 feet B. 9.6 feet C. 8.4 feet D. 7.2 feet E. 8.6 feet

38. What is the equation of the horizontal asymptote of the exponential function graphed below?



A. $y = -2$ B. $x = 1$ C. $x = -2$ D. $y = 0$ E. $y = 1$

39. What is the product of the solutions to the equation $\sqrt{9y} = y$?
A. 0 B. 9 C. 81 D. 18 E. 3

40. The vertex form quadratic equation $y = \frac{1}{2}(6x - 4)^2 + 1$ is written as $y = 18x^2 - 24x + C$ in standard form. What is the value of *C*?

A. 17 B. -15 C. 9 D. -3 E. 5

41. Square *ABCD* has vertices located at $(-8, 3), (-1, 3), (-1, -4)$, and $(-8, -4)$. What is the measure of one of the diagonals of square *ABCD*?

A. 7 units B. $7\sqrt{3}$ units C. 14 units D. $14\sqrt{3}$ units E. $7\sqrt{2}$ units

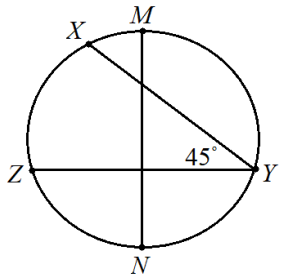
42. Harden correctly changes the circle with a general form equation of $x^2 + y^2 + 6x - 4y = 51$ into its center-radius form. Which equation does Harden write down?

A. $(x + 3)^2 + (y - 2)^2 = 64$ B. $(x + 3)^2 + (y - 2)^2 = 49$ C. $(x + 6)^2 + (y - 4)^2 = 64$
D. $(x - 3)^2 + (y + 2)^2 = 25$ E. $(x - 3)^2 + (y + 2)^2 = 49$

43. Which of the following is equivalent to $\log_5(\sqrt{7})$?

A. $2\log_5 7$ B. $\frac{\log_5 7}{\log_5 2}$ C. $\frac{\log_5 7}{2}$ D. $\log_5\left(\frac{7}{2}\right)$ E. $\log_5\left(\frac{2}{7}\right)$

44. In the circle below, *MN* = 16 cm and $m\angle XYZ = 45^\circ$. If *XY* = *YZ*, what is the length of minor arc *XZ*, in terms of π?



A. 4π cm B. 8π cm C. 2π cm D. 32π cm E. 6π cm

45. Simplify: $\frac{n^2-4}{n-2}$

A. $n - 2$ B. $2n$ C. $n + 2$ D. $2n - 2$ E. $2n - 1$

46. What is the side length of a square with a diagonal of 12 mm?

A. 3 mm B. 6 mm C. $12\sqrt{2}$ mm D. $6\sqrt{2}$ mm E. $3\sqrt{2}$ mm

47. The points $(-11, 21), (-5, 12)$ and $(19, y)$ are collinear. What is the value of *y*?

A. -18 B. -24 C. -6 D. 2 E. -32

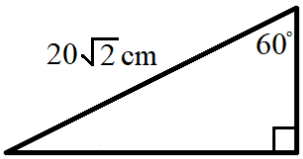
48. If $4x + 5y = 2$ and $10 = 2y - 3x$, what is the value of $17x + 17y$?

A. 0 B. 68 C. -34 D. 34 E. 128

49. What is the units digit of 8^{10}?

A. 8 B. 0 C. 2 D. 6 E. 4

50. What is the area of the triangle?



A. $120\sqrt{3}$ cm^2 B. $50\sqrt{6}$ cm^2 C. $30\sqrt{2} + 10\sqrt{6}$ cm^2 D. $200\sqrt{2}$ cm^2 E. $100\sqrt{3}$ cm^2

2018 – 2019 TMSCA Middle School Mathematics Test #9 Answer Key

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

2018-2019 TMSCA Middle School Mathematics Test #9 Selected Answers

9. If 1 square foot = 144 square inches, 2 square feet = 2(144) = 288 square inches.

19. If $a \♫ b = 4ab - a - b$, then ½ ♫ ¾ = 4(½)(¾) – ½ – ¾ = $\frac{3}{2} - \frac{1}{2} - \frac{3}{4} = \frac{2}{2} - \frac{3}{4} = \frac{4}{4} - \frac{3}{4} = \frac{1}{4}$.

32. $24 = 2^3 \cdot 3$, so $24^2 = (2^3 \cdot 3)^2 = 2^6 \cdot 3^2$. $15 = 3 \cdot 5$, so $15^3 = (3 \cdot 5)^3 = 3^3 \cdot 5^3$. Thus, $24^2 \cdot 15^3 = 2^6 \cdot 3^2 \cdot 3^3 \cdot 5^3 = 2^6 \cdot 3^5 \cdot 5^3$. Since the product has 3 pairs of $2 \cdot 5$, the product will end with 3 zeros.

35. If Paul has a rectangular fence 60 yards by 20 yards, then he has 160 yards of fence. To make this a square, 160 divided by 4 is 40 yards. Since 60 yards by 20 yards gives a field with an area of 1,200 yards^2 and a 40 yards by 40 yards field gives an area of 1,600 yards^2, the newly formed pumpkin patch is enlarged by 1,600 – 1,200 = 400 yards^2.

39. First square both sides of $\sqrt{9y} = y$ to get $\left(\sqrt{9y}\right)^2 = y^2 \rightarrow 9y = y^2$. Subtract 9*y* from both sides to get $y^2 - 9y = 0$. Factor to get *y*(*y* – 9) = 0. Set each factor equal to 0 and solve, which gives us *y* = 0 and *y* – 9 = 0, so *y* = 0 and 9. The product of 0 and 9 is then 9(0) = 0.

40. First square the parentheses, so $y = \frac{1}{2}(6x - 4)^2 + 1$ becomes $y = \frac{1}{2}(36x^2 - 48x + 16) + 1$. Now distribute to get $y = 18x^2 - 24x + 8 + 1$. Finally, simplify to get $y = 18x^2 - 24x + 9$. Therefore, if $y = \frac{1}{2}(6x - 4)^2 + 1$ becomes $y = 18x^2 - 24x + C$, then *C* = 9.

42. Rewrite $x^2 + y^2 + 6x - 4y = 51$ as $x^2 + 6x + y^2 - 4y = 51$. Complete the square with each variable as $x^2 + 6x + \_\_\_\_ + y^2 - 4y + \_\_\_\_ = 51$. When completing the square, this equation becomes $x^2 + 6x + 9 + y^2 - 4y + 4 = 51 + 9 + 4$, and then simplify to get $(x + 3)^2 + (y - 2)^2 = 64$.

43. $\log_5\left(\sqrt{7}\right)$ can be rewritten as $\log_5\left(7^{\frac{1}{2}}\right)$. Since $\log_a(b^x) = x \cdot \log_a b$, $\log_5\left(7^{\frac{1}{2}}\right) = \frac{1}{2}\log_5 7$ and $\frac{1}{2}\log_5 7$ can be rewritten as $\frac{1}{2}\log_5 7 = \frac{\log_5 7}{2}$.

44. Let *O* be the center of the circle. If $m\angle XYZ = 45^\circ$, then measure of arc XY $= 90^\circ$. The central angle equals the measure of its arc, so $m\angle XOZ = 90^\circ$. Since we are given *MN* = 16 cm, then the circumference of the circle is $C = \pi d = 16\pi$. Therefore, the length of minor arc *XZ* = ¼(16π) = 4π cm.

45. First, factor the numerator. $\frac{n^2-4}{n-2} = \frac{(n+2)(n-2)}{n-2}$. Simplify and we are left with $\frac{(n+2)\cancel{(n-2)}}{\cancel{n-2}} = n + 2$.

47. If points are collinear, they lie on the same line. If points line on the same line, the slope between any two points on that line will be the same. We are given then points $(-11, 21), (-5, 12)$ and $(19, y)$. The slope between the first pair of points is $\frac{21-12}{-11+5} = -\frac{3}{2}$. Now, use either of the first pair of points and the last point to write an equation and solve. $\frac{y-12}{19+5} = -\frac{3}{2} \rightarrow \frac{y-12}{24} = -\frac{3}{2}$. Cross multiply to get $-72 = 2y - 24$. Add 24 to both sides to get $-48 = 2y$. Divide by sides by 2 and $y = \frac{-48}{2} = -24$.