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 # 8 ©

J A N U A R Y 2 4 , 2 0 1 5

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.
3. If using a scantron answer form be sure to correctly denote the number of problems not attempted.
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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2014-2015 TMSCA Middle School Mathematics Test #8

1. 987 + 345 + 678 = _____

A. 2,110 B. 2,010 C. 2,020 D. 2,120 D. 2,210

2. 3,002 – 1,968 – 289 = _____

A. 767 B. 765 C. 745 D. 2,145 E. 635

3. $4\frac{2}{5} \cdot 6\frac{1}{2}$ = _____

A. 24.6 B. 24.2 C. 28.2 D. 26.4 E. 28.6

4. $12.4 \div 3.2$ = _____

A. $4\frac{5}{8}$ B. $4\frac{7}{8}$ C. $3\frac{7}{8}$ D. $3\frac{1}{5}$ E. $3\frac{3}{8}$

5. \$34.52 = _____ quarters + 265 dimes + 45 nickels + 2 pennies

A. 23 B. 42 C. 34 D. 27 E. 31

6. 124 meters = _____ decimeters

A. 12.4 B. 1.24 C. 0.124 D. 1,240 E. 12,400

7. How many diagonals can be drawn from one vertex of a regular 15-sided polygon?

A. 18 B. 12 C. 90 D. 180 E. 30

8. If $A = 1$, $B = 2$, $C = 3$, …, $Y = 25$ and $Z = 26$, what is the sum of the letters of the word *MULTIPLY?*

A. 128 B. 132 C. 119 D. 112 E. 124

9. Simplify: $|65 - 81| - 4^2$

A. 0 B. -24 C. -8 D. 8 E. 32

10. $\sqrt{421}$ lies between which two integers?

A. 19 & 20 B. 20 & 21 C. 21 & 22 D. 18 & 19 E. 23 & 24

11. What is the radius of a circular micro-organism with a diameter of 0.00000043 inches, written in scientific notation?

A. 4.3×10^{-7} B. 4.3×10^{-8} C. 2.15×10^{-8} D. 2.15×10^{-7} E. 2.15×10^{7}

12. The diameter of a circle is 18 cm. The area of the circle, in terms of π, is equal to _____ cm^2.

A. 324π B. 36π C. 81π D. 162π E. 72π

13. Melissa has 15% of the amount of marshmallows as Jim has. If Jim has ten more marshmallows as Juan has and Juan has 110 marshmallows, how many marshmallows does Melissa have?

A. 120 B. 18 C. 36 D. 130 E. 8

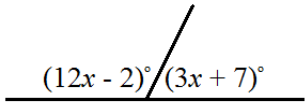
14. If $f(x) = \frac{1}{2} x^2 + 2$, then find $f(-6)$.

A. 74 B. 20 C. -16 D. 11 E. 8

15. What is the remainder when 872 is divided by 13?

A. 1 B. 2 C. 6 D. 7 E. 11

16. Find the value of *x* using the picture below.



A. $10\frac{1}{3}$ B. $10\frac{2}{3}$ C. 11 D. $11\frac{1}{3}$ E. $11\frac{2}{3}$

17. If a chicken cock-a-doodle-do's five time in twenty minutes, how many cock-a-doodle-do's will the chicken do in three hours?

A. 60 B. 30 C. 45 D. 15 E. 90

18. $7(3m + 2) – 5(2m + 3) =$ _____

A. $11m – 1$ B. $11m + 29$ C. $3m + 29$ D. $3m + 17$ E. $11m + 17$

19. Let $W = \{2, 4, 6, 8, 10\} \cup \{1, 2, 3, 4, 5\}$. What is the sum of the elements of *W*?

A. 36 B. 39 C. 45 D. 46 E. 42

20. 3 ft^2 = _____ in^2

A. 288 B. 1,444 C. 432 D. 36 E. 360

21. What is the prime factorization of the number 540?

A. $2^3 \cdot 3^3 \cdot 5^2$ B. $2^2 \cdot 3^2 \cdot 5^3$ C. $2^3 \cdot 3^2 \cdot 5$ D. $2^2 \cdot 3^3 \cdot 5$ E. $2^2 \cdot 3^3 \cdot 5^0$

22. $32 \cdot 19 =$ _____(Roman numeral)

A. *DCVIII* B. *CCCCMIIX* C. *LCVIII* D. *DCIIX* E. *CDVIII*

23. Which of the following formulas can be used to find the area of a rhombus?

A. $A = d_1 \cdot d_2$ B. $A = 2(d_1 \cdot d_2)$ C. $A = 2d_1 + 2d_2$ D. $A = ½(d_1 \cdot d_2)$ E. $A = 2d_1 \cdot 2d_2$

24. The odds of it raining today are 3:4. What is the probability of it raining today, in ratio form?

A. 3:4 B. 1:4 C. 4:7 D. 3:7 E. 1:12

25. If Clint is 4 feet tall and casts a 5 foot shadow, how long is the shadow of a 14 foot tree?

A. 17.5 ft B. 16.25 ft C. 17 ft D. 18.25 ft E. 18.5 ft

26. What is the sum of all positive integral divisors of the number 72?

A. 200 B. 201 C. 195 D. 191 E. 122

27. $123_4 + 33_4 + 21_4 =$ _____$_4$

A. 303 B. 332 C. 333 D. 1313 E. 213

28. How many squares, each having a perimeter of 20 inches, can be cut from one large square having a perimeter of 80 inches?

A. 12 B. 16 C. 4 D. 24 E. 20

29. Which equation below is equivalent to the equation $4(x - 3) = 2x - 17$?

A. $2x = -14$ B. $2x = -29$ C. $6x = -29$ D. $2x = -10$ E. $2x = -5$

30. Lucia drove her car at 64 mph for 8 hours. How many total miles did Lucia travel?

A. 504 miles B. 512 miles C. 8 miles D. 400 miles E. 556 miles

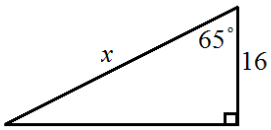
31. What is the LCM of the two monomials $14a^2b^6$ and $22a^3b^2$?

A. $2a^2b^2$ B. $154a^5b^8$ C. $154a^2b^2$ D. $154a^3b^6$ E. $2a^3b^6$

32. What is the unit's digit of 4^{16}?

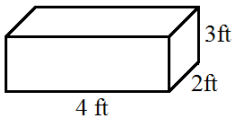
A. 2 B. 4 C. 6 D. 8 E. 0

33. Using the picture below, which trig function can be used to find the length of x?



A. $\sin(65) = \frac{x}{16}$ B. $\cos(65) = \frac{x}{16}$ C. $\tan(65) = \frac{16}{x}$ D. $\tan(65) = \frac{x}{16}$ E. $\cos(65) = \frac{16}{x}$

34. Michelle wants to fill her aquarium below half full with water. How many cubic feet of water will Michelle need?



A. 8 ft^3 B. 16 ft^3 C. 24 ft^3 D. 15 ft^3 E. 12 ft^3

35. What is the simple interest of depositing \$400 at 3% for 2½ years?

A. \$45.00 B. \$40.00 C. \$35.00 D. \$30.00 E. \$25.00

36. Simplify: $12\sqrt{108} + \sqrt{12}$

A. $72\sqrt{3}$ B. $74\sqrt{3}$ C. $76\sqrt{3}$ D. $84\sqrt{3}$ E. $86\sqrt{3}$

37. What is the percent of increase if a \$40.00 shirt is marked up to \$64.00?

A. 40% B. 114% C. 54% D. 52% E. 60%

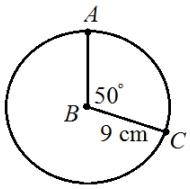
38. The sum of three positive even integers is 120. What is the value of ten more than the largest of these integers?

A. 48 B. 50 C. 52 D. 54 E. 46

39. Calculate the mean absolute deviation for the data set 57, 63, 49 and 69.

A. 2.5 B. 3.5 C.10.5 D. 9.5 E. 6.5

40. Using the picture below, what is the measure of the length of minor arc AC (in terms of π)?



A. 2.5π cm B. 9π cm C. 18π cm D. 4.5π cm E. 1.25π cm

41. Identify which of the following is the rate of decay in the exponential decay function $y = 7.22(0.22)^x$.

A. 0.22% B. 22% C. 722% D. 78% E. 88%

42. Letting $\pi = 3$, what is the area of the circle with the equation $(x-4)^2 + (y+5)^2 = 576$?

A. 72 units^2 B. 216 units^2 C. 1,944 units^2 D. 1,728 units^2 E. 1,648 units^2

43. Find the area of a quadrilateral with its vertices located at (-6, 4), (-2, -5), (2, -5) and (4, 2).

A. 41 units^2 B. 55 units^2 C. 16 units^2 D. 32 units^2 E. 69 units^2

44. What is the value of the discriminant of the quadratic equation $2x^2 - 5x = 12$?

A. 96 B. 71 C. 121 D. -71 E. 169

45. An exterior angle of a regular dodecagon is equal to _____°.

A. 45 B. 60 C. 150 D. 30 E. 135

46. If $\frac{x}{y} = \frac{4}{7}$, then $\frac{2y}{3x}$ is equal to which of the following?

A. $\frac{8}{21}$ B. $\frac{3}{2}$ C. $\frac{7}{4}$ D. $\frac{7}{8}$ E. $\frac{7}{6}$

47. Using interval notation, $-5 < x < 12$ can be written as which of the following?

A. (-5, 12) B. [-5, 12] C. (-5, 12] D. [-5, 12) E. [5, -12]

48. Factor completely: $3m^2 - 12$

A. $m(3m - 12)$ B. $3(m^2 - 4)$ C. $3(m - 4)$ D. $3(m - 2)(m + 2)$ E. $3(m - 2)^2$

49. Simplify: $\left(\frac{a^3b^{-3}c^4}{ab^2c^{-1}}\right)^2$

A. $\frac{a^2c^5}{b^5}$ B. $\frac{a^4c^7}{b^7}$ C. $\frac{a^4c^{10}}{b^{10}}$ D. $\frac{a^6c^{10}}{b^2}$ E. $\frac{a^4c^6}{b^{10}}$

50. Solution *A* is 70% acid and solution *B* is 20% acid. How many more liters of solution *A* are needed than solution *B* to make 100 liters of a 65% acid solution?

A. 80 liters B. 60 liters C. 85 liters D. 75 liters E. 70 liters

2014-2015 TMSCA Middle School Mathematics Test #8 Answer Key

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

2014-2015 TMSCA Middle School Mathematics Test #8 Selected Answers

16. The two angles given in the picture are supplementary, so we must add them and set their sum equal to 180 degrees. $(12x - 2) + (3x + 7) = 180$. Now, we must combine like terms and then solve the equation. $(12x - 2) + (3x + 7) = 180 \rightarrow 12x - 2 + 3x + 7 \rightarrow 15x + 5 = 180$. Subtract 5 and then divide by 15, $15x + 5 - 5 = 180 - 5 \rightarrow 15x = 175 \rightarrow \frac{15x}{15} = \frac{175}{15} \rightarrow x = \frac{35}{3}$. Now change $\frac{35}{3}$ into a mixed number and we have $x = \frac{35}{3} = 11\frac{2}{3}$.

24. The odds of it raining today are 3:4. Remember, odds are *what we want* : *what we don't want*. Therefore, the probability of it raining would be *what we want* : *total outcomes*. Thus, the probability of it raining today are 3:7.

36. $12\sqrt{108} + \sqrt{12} = 12\sqrt{36 \cdot 3} + \sqrt{4 \cdot 3} = 12 \cdot 6\sqrt{3} + 2\sqrt{3} = 72\sqrt{3} + 2\sqrt{3} = 74\sqrt{3}$.

46. If $\frac{x}{y} = \frac{4}{7}$, then $7x = 4y$ and $x = \frac{4y}{7}$. We must find the value of $\frac{2y}{3x}$, so substitute. If $x = \frac{4y}{7}$, then $\frac{2y}{3x} = \frac{2y}{3\left(\frac{4y}{7}\right)} = \frac{2y}{\frac{12y}{7}} = 2y \div \frac{12y}{7} = 2y \cdot \frac{7}{12y} = \frac{14y}{12y} = \frac{7}{6}$.

49. $\left(\frac{a^3b^{-3}c^4}{ab^2c^{-1}}\right)^2 = \left(\frac{a^2c^5}{b^5}\right)^2 = \frac{a^4c^{10}}{b^{10}}$

50. Create a system, $\begin{cases} A + B = 100 \\ 0.7A + 0.2B = 100(0.65) \end{cases} \rightarrow \begin{cases} A + B = 100 \\ 0.7A + 0.2B = 65 \end{cases}$. Multiply the top equation by -0.2 and then add the two equations together: $\begin{cases} A + B = 100 \\ 0.7A + 0.2B = 65 \end{cases} \rightarrow$ $\begin{cases} -0.2A - 0.2B = -20 \\ 0.7A + 0.2B = 65 \end{cases} \rightarrow 0.5A = 45$. Divide by 0.5 and $A = 90$. If $A = 90$, then $B = 10$. Therefore, 90 – 10 = 80 mL.