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 ©

F E B R U A R Y 1 , 2 0 1 4

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.

2013-2014 TMSCA Middle School Mathematics Test #9

1. 98 – 187 = _____
A. -65 B. 65 C. 91 D. -91 E. -89

2. 96 – (-51) + (-87) = _____
A. 60 B. 234 C. -42 D. 132 E. 81

3. $150\frac{3}{8} - 75\frac{3}{4}$ = _____ (decimal)
A. 75.65 B. 75.125 C. 74.625 D. 74.675 E. 74.125

4. $0.143 \div 0.0022$ = _____
A. 45 B. 50 C. 55 D. 60 E. 65

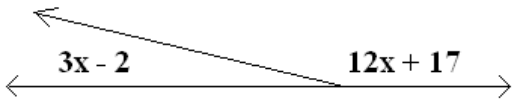
5. $59^\circ F$ = _____$^\circ C$
A. 12 B. 15 C. 11 D. 19 E. 18

6. What is the sum of the distinct prime factors of the number 196?
A. 16 B. 18 C. 6 D. 11 E. 9

7. If $a \oplus b = (a+b)^2 \cdot (a-b)$, find the value of $3 \oplus -4$.
A. -1 B. 1 C. 49 D. 7 E. 14

8. What is the sum of the GCF of 14 and 42 and the LCM of 42 and 63?
A. 14 B. 126 C. 120 D. 140 E. 63

9. Find the value of *x* from the picture below.



A. 15 B. 11 C. 17 D. 9 E. 18.3

10. 1 squared foot = _____ squared inches
A. 24 B. 144 C. 288 D. 48 E. 64

11. If tax is 6.5%, how much will you pay in tax on a shirt that costs $18.50, to the nearest cent?
A. $1.20 B. $1.21 C. $1.19 D. $1.18 E. $1.17

12. The exterior angle measure of a regular dodecagon is equal to _____ degrees.
A. 30 B. 45 C. 60 D. 36 E. 24

13. 2,897 – 1,670 – 599 + 1 = _____
A. DCXXIX B. DCXXXVI C. DCXXIXVI D. DCXXVIIII E. DCLXXIX

14. _____ circles are circles that share a common center.
A. Inscribed B. Incenter C. Equidistant D. Codiameter E. Concentric

15. If a point with coordinates (-5, 6) is translated up nine units and to the left twelve units, then what are the coordinates of its new location?

A. (14, 18) B. (4, 18) C. (-4, -6) D. (4, -6) E. (7, 3)

16. ½ of 9,876,000 in scientific notation is equal to _____.

A. 9.876×10^{6} B. 1.9752×10^{7} C. 4.638×10^{5} D. 4.938×10^{6} E. 9.438×10^{6}

17. What is the value of taking the largest prime number less than 70 and then tripling it?

A. 183 B. 213 C. 201 D. 219 E. 189

18. Today, the high temperature in Houston was 91°. Also today, the high temperature in Antarctica was -12°. The difference in temperature, Houston minus Antarctica, is equal to _____ $^{\circ}$.

A. 103 B. 79 C. 82 D. 92 E. 101

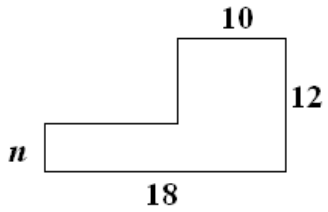
19. What is the probability of rolling a pair of dice and getting a sum of 8 facing up?

A. $\frac{5}{12}$ B. $\frac{1}{4}$ C. $\frac{1}{3}$ D. $\frac{7}{36}$ E. $\frac{5}{36}$

20. The angles in a triangle are in a ratio of 2:3:5. What is the measure of the second largest angle?

A. 18° B. 36° C. 48° D. 54° E. 62°

21. If the area of the shape below is 152 units^2, what is the value of *n*?



A. 3 units B. 4 units C. 5 units D. 104 units E. 112 units

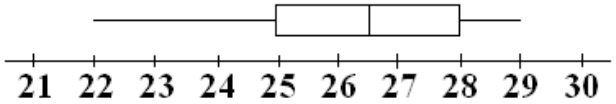
22. Simplify: $4(3x-8)-3(2x+1)-3x+4$

A. $3x-31$ B. $9x-39$ C. $3x-3$ D. $3x-27$ E. $6x-39$

23. What is the area of a triangle with vertices located at (3, 6), (2, 8) and (0, 4)?

A. 8 units^2 B. 4 units^2 C. 6 units^2 D. 5 units^2 E. 7 units^2

24. From the box-and-whisker plot below, what is the value of the inter-quartile range?



A. 7 B. 26.5 C. 3 D. 9 E. 53

25. $\overline{XXIV}$ = _____ (Arabic number)

A. 24 B. 240 C. 2,400 D. 24,000 E. 240,000

26. 210122_3 = _____$_9$

A. 718 B. 729 C. 730 D. 688 E. 728

27. What is the value of the sum of the mean and median for the set of numbers 7, 7, 8, 9, 10 and 1?
A. 7 B. 7.5 C. 13.5 D. 14.5 E. 15

28. Using the letters of the word *CENTROID*, if each letter were written on a tile and placed inside a bag, what are the odds of you reaching in the bag and grabbing a vowel? (Answers in ratio form.)
A. 5:8 B. 1:2 C. 3:8 D. 1:4 E. 3:5

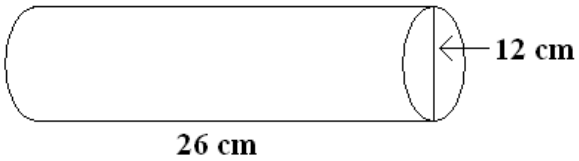
29. Find the slope of the line that passes through the points (-10, 8) and (-16, -5).
A. $\frac{6}{13}$ B. $2\frac{1}{3}$ C. $\frac{13}{6}$ D. $3\frac{1}{2}$ E. $\frac{7}{3}$

30. In a 30-60-90 triangle, what is the length of the short leg if the long leg measures 12 inches?
A. $4\sqrt{3}$ inches B. $12\sqrt{3}$ inches C. $6\sqrt{3}$ inches D. 24 inches E. 6 inches

31. How many regions in a plane are determined by eight lines, no two are parallel and no three are concurrent?
A. 40 B. 39 C. 38 D. 37 E. 36

32. How many positive integers less than 20 are relatively prime to 20?
A. 8 B. 14 C. 6 D. 10 E. 12

33. Calculate the total surface area of the cylinder below, assume $\pi = 3$.



A. 1,152 cm^2 B. 528 cm^2 C. 1,056 cm^2 D. 1,320 cm^2 E. 792 cm^2

34. Solve the proportion: $\frac{n+3}{5} = \frac{7}{2}$
A. -1 B. 14.5 C. 16 D. 7.5 E. -6.5

35. 1.8 + 2.8 + 3.8 + … + 7.8 + 8.8 = _____
A. 40.8 B. 40.8 C. 42.4 D. 46.4 E. 46.8

36. 120 mi/hr = _____ ft/ sec
A. 167 B. 156 C. 166 D. 176 E. 184

37. Calculate the area of an isosceles triangle with a height of 3 cm.
A. $3\sqrt{3}$ cm^2 B. $6\sqrt{3}$ cm^2 C. $9\sqrt{3}$ cm^2 D. $6\sqrt{2}$ cm^2 E. $\sqrt{3}$ cm^2

38. What is the product of the roots of the quadratic equation $0 = 3x^2 - 16x + 42$?
A. $-5.\overline{3}$ B. -0.1875 C. 14 D. $5.\overline{3}$ E. $2.\overline{6}$

39. Factor completely: $3x^4 - 12x^2$
A. $3x(x^3 - 4x)$ B. $(3x^2 - 6x^2)(x + 2)$ C. $(x - 2)(3x^2 + 6x^2)$ D. $3x^2(x - 2)(x + 2)$ E. $3x^2(x - 2)^2$

40. On a number line, the distance from point *A* to point *B* is 23 units. *A* has coordinate -8. What is the sum of all possible values for *B*?

A. 18 B. 15 C. -16 D. -31 E. -46

41. An exponential function is in the form $y = a \cdot b^x$. If it is an exponential decay function, $b = 1 - r$ where r is the rate of decay, and then an exponential decay function is $y = a \cdot (1-r)^x$. What is the rate of decay in the function $y = 7 \cdot 0.37^x$?

A. 7.037% B. 63% C. 37% D. 3.7% E. 70.37%

42. $32^{2/5}$ = _____

A. 33,554,432 B. 4 C. $\sqrt[2]{32^5}$ D. 8 E. 16

43. Kyle can mow a yard in 2 hours. Michael can mow the same yard in 3 hours. If they work together, how long will it take them both to mow the yard?

A. 2.4 hours B. 84 minutes C. 1.5 hours D. 1.3 hours E. 72 minutes

44. $\frac{24}{\sqrt{6}}$ is equal to _____ when simplified.

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

45. The points (6, 16) and (-4, -14) lie on the same line. Which of the following points also lies on the same line?

A. (-1, -7) B. (2, -8) C. (-1, -5) D. (1, -2) E. (9, 19)

46. If $f(x) = 3x - 7$ and $g(x) = 7 - 2x$, then find the value of $f(g(4))$.

A. -6 B. -10 C. -4 D. -3 E. 4

47. Calculate the value of the determinant of the matrix: $\begin{bmatrix} 6 & 11 \\ -5 & -3 \end{bmatrix}$

A. -73 B. -3 C. 29 D. 37 E. 73

48. *We're Nuts* health food store wants to mix almonds that cost $1.20 per pound with pecans that cost $2.10 per pound to create a 50 pound mixture that costs $1.47 per pound. How many more pound of almonds are needed than pecans?

A. 20 pounds B. 24 pounds C. 32 pounds D. 16 pounds E. 18 pounds

49. Simplify: $2i^2 \cdot 3i \cdot 4i^4 \cdot i^2$

A. $10i$ B. $24i$ C. $-24i$ D. $24i^2$ E. $10i$

50. If $x \neq 0$ and $y \neq 0$, which of the following is a simplified version of the expression below?

$$\frac{x^{17}y^8 + x^8y^5}{x^3y^3}$$

A. x^8y^5 B. $x^{22}y^{10}$ C. $x^{11}y^8 + x^5y^2$ D. $x^6y^3 + xy$ E. $x^{14}y^5 + x^5y^2$

2013-2014 TMSCA Middle School Mathematics Test #9 Answer Key

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

2013-2014 TMSCA Middle School Mathematics Test #9 Selected Solutions

12. T find the exterior angle of a regular polygon, use $\frac{360}{n}$, where n = number of sides of the polygon. Since we are given a dodecagon, we know it has twelve sides. Therefore, the measure of the exterior angle we are looking for is $\frac{360}{12} = 30^\circ$.

14. Concentric circles are circles that share a common center.

25. When a Roman numeral has a bar over the number, it means to multiply what is under the bar by 1,000. So, $\overline{XXIV}$ has the Arabic number 24 under the bar and $24 \cdot 1000 = 24{,}000$.

36. To convert mi/ hr into ft/ sec, multiply by $\frac{22}{15}$. So, $120 \cdot \left(\frac{22}{15}\right) = \frac{2640}{15} = 176$. Therefore, 120 mi/ hr = 176 ft/ sec.

38. The standard form of a quadratic equation is $Ax^2 + Bx + C = 0$. The product of the roots of a quadratic equation is $\frac{C}{A}$. We are given $0 = 3x^2 - 16x + 42$, so our $C = 42$ and our $A = 3$. Thus, $\frac{42}{3} = 14$, which is our product of the roots.

44. To simplify $\frac{24}{\sqrt{6}}$, you must rationalize the denominator. Multiply the fraction by $\frac{\sqrt{6}}{\sqrt{6}}$. So, $\frac{24}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{24\sqrt{6}}{\sqrt{36}} = \frac{24\sqrt{6}}{6} = 4\sqrt{6}$.