



**TMSCA MIDDLE SCHOOL  
MATHEMATICS  
CHAMPIONSHIP MEET ©  
APRIL 5, 2014**

**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.

[illegible]

2013-2014 TMSCA Middle School Mathematics State Championship Test

1.  $65 - 901 =$  \_\_\_\_\_  
 A. -816                      B. -826                      C. -836                      D. -806                      E. 846
2.  $999 + 999 + 101 =$  \_\_\_\_\_  
 A. 2,089                      B. 1,990                      C. 2,199                      D. 1,999                      E. 2,099
3.  $12.6 \times 3.12 =$  \_\_\_\_\_ (nearest hundredth)  
 A. 39.30                      B. 39.312                      C. 39.3                      D. 39.31                      E. 36.3
4.  $14\frac{4}{5} \div 3\frac{1}{5} =$  \_\_\_\_\_ (decimal)  
 A. 4.655                      B. 4.625                      C. 4.675                      D. 4.65                      E. 4.615
5. A bag with a dozen oranges costs \$4.92. What is the unit rate per orange?  
 A. \$0.31                      B. \$0.36                      C. \$0.40                      D. \$0.41                      E. \$0.43
6. 6 pints = \_\_\_\_\_ ounces  
 A. 128                      B. 96                      C. 84                      D. 72                      E. 64
7. Let  $A$  = number of vertices of a dodecagonal prism. Let  $B$  = number of edges of a rectangular prism. Find the value of  $A - 2B$ .  
 A. 0                      B. 12                      C. 10                      D. 24                      E. 6
8. What is the remainder when 17,273 is divided by 11?  
 A. 2                      B. 3                      C. 4                      D. 8                      E. 9
9.  $\sqrt{256} + 1 =$  \_\_\_\_\_  
 A. 16                      B. 17                      C. 18                      D. 19                      E. 129
10. How many digits would be needed to change *MMMDCCLXXXVIII* into an Arabic number?  
 A. 3,888                      B. 6                      C. 3,898                      D. 4                      E. 5
11. When three or more lines meet at a certain point, they are said to be \_\_\_\_\_.  
 A. Perpendicular                      B. Concurrent                      C. Parallel                      D. Circumcenter                      E. Medians
12. What is the sum of all distinct prime factors of 300?  
 A. 17                      B. 15                      C. 14                      D. 10                      E. 8
13. If  $f(x) = 2x$ ,  $g(x) = x^2$  and  $h(x) = 6 - x$ , find the value of  $f(-3) + g(-2) + h(11)$ .  
 A. -7                      B. -11                      C. 5                      D. -15                      E. -5
14. 72 is 30% of what number?  
 A. 180                      B. 200                      C. 220                      D. 240                      E. 260
15. Change the difference of  $12,000,000,000,000 - 9,000,000,000,000$  into scientific notation.  
 A.  $1.1991 \times 10^{13}$                       B.  $-1.1991 \times 10^{13}$                       C.  $-3 \times 10^{12}$                       D.  $3 \times 10^9$                       E.  $3 \times 10^{12}$

16. The sum of the complement and supplement of a  $82.63^\circ$  is equal to \_\_\_\_\_  $^\circ$ .

- A. 97.37                      B. 7.37                      C. 177.37                      D. 97.74                      E. 104.74

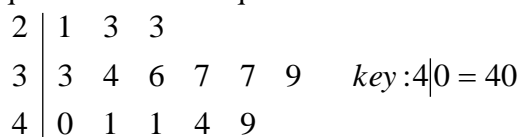
17.  $A$  = total number of diagonals that can be drawn in a regular octagon.  $B$  = total number of lines of symmetry that can be drawn in a regular decagon. Find the value of  $A - B$ .

- A. 40                      B. 30                      C. 20                      D. 10                      E. 5

18. A box has dimensions 30 ft by 12 ft by 6 ft. If it is half full with sand, how much sand is in the box?

- A.  $1,080 \text{ ft}^3$                       B.  $2,280 \text{ ft}^3$                       C.  $1,160 \text{ ft}^3$                       D.  $1,050 \text{ ft}^3$                       E.  $1,860 \text{ ft}^3$

19. What is the sum of the upper quartile and lower quartile of the data in the stem-and-leaf plot below?

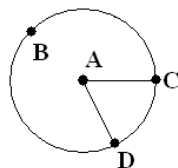


- A. 8                      B. 72                      C. 41                      D. 74                      E. 83

20. If the point  $(-4, -13)$  is reflected across the  $y$ -axis, what is the sum of the new coordinates of the point?

- A. 9                      B. 23                      C. -17                      D. -9                      E. 18

21. From the picture below,  $\angle CAD$  is a central angle with a measure of  $42^\circ$ . What is the measure of  $\angle CBD$ ?



- A.  $58^\circ$                       B.  $138^\circ$                       C.  $36^\circ$                       D.  $21^\circ$                       E.  $18^\circ$

22. Simplify:  $\frac{3^3 + (-2)}{5^2 + 5^2}$

- A.  $\frac{1}{4}$                       B.  $-\frac{1}{4}$                       C. 2                      D.  $-\frac{1}{2}$                       E.  $\frac{1}{2}$

23. What are the odds of rolling a pair of dice and getting a sum less than or equal to 9 facing up?

- A. 5:6                      B. 5:1                      C. 13:18                      D. 13:5                      E. 6:1

24. What is the degree of the monomial?  $(x^7 y^3 z^2)^3$

- A. 378                      B. 36                      C. 50                      D. 38                      E. 1,728

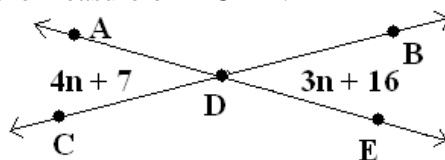
25. Find the next term in the sequence: 2, 10, 30, 68, 130, ...

- A. 222                      B. 216                      C. 188                      D. 242                      E. 236

26. How much money would be in a bank account after depositing \$3,500 into a simple interest account for 36 months at a rate of 6%?

- A. \$3,630                      B. \$3,960                      C. \$4,130                      D. \$4,240                      E. \$5,030

27. Use the picture below and find the measure of  $\angle CDE$ .



- A.  $43^\circ$                       B.  $9^\circ$                       C.  $137^\circ$                       D.  $157^\circ$                       E.  $149^\circ$

28. The angles in a pentagon are in a ratio of 2:7:7:9:11. What is the measure of the largest angle?

- A.  $145^\circ$                       B.  $155^\circ$                       C.  $135^\circ$                       D.  $165^\circ$                       E.  $185^\circ$

29. Which of the following answer choices is a solution for  $x$  in the equation below?

$$\frac{8x^{3/2}}{4x} + x^{0.5} + 6\sqrt{x} = 36$$

- A. 2                      B. 4                      C. 8                      D. 16                      E. 32

30.  $\text{_____}^\circ F = 80^\circ C$

- A. 168                      B. 164                      C. 170                      D. 176                      E. 182

31. The sides of an obtuse triangle measure 10, 13 and  $n$  units. What is the smallest integral value of  $n$ ?

- A. 4 units                      B. 6 units                      C. 22 units                      D. 9 units                      E. 7 units

32. If  $(3a + 5b)^2 = Da^2 + Oab + Gb^2$ , then what is the value of  $D + O + G$ ?

- A. 32                      B. 49                      C. 48                      D. 52                      E. 64

33. What is the equation for the axis of symmetry for the graph of the quadratic equation  $y = x^2 - 18x$ ?

- A.  $x = 9$                       B.  $x = -18$                       C.  $x = \frac{1}{18}$                       D.  $x = 2$                       E.  $x = -\frac{1}{18}$

34. Calculate the midpoint between the points (11.75, 13.4) and (-7.25, 8.6).

- A. (4.25, 10.75)                      B. (2.25, 22)                      C. (9.5, 11)                      D. (9.25, 10.75)                      E. (2.25, 11)

35. Find  $M$  if  $87,654,321 \times 9 - 1 = M88,888,888$ .

- A. 6                      B. 7                      C. 8                      D. 9                      E. 5

36. What is the product of the digits of  $J$ , if  $45_6 \times 23_7 = J_8$ ?

- A. 125                      B. 17                      C. 175                      D. 755                      E. 225

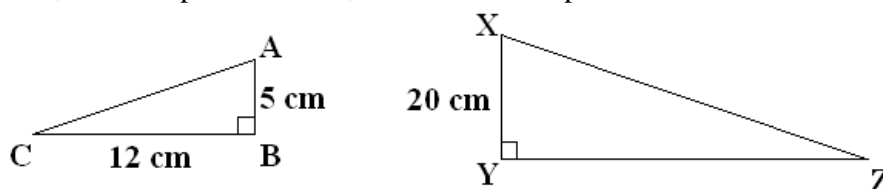
37. Let  $m$  equal the number of regions in a plane that are determined by 10 lines, no two are parallel and no three are concurrent. Let  $n$  equal the number of regions in a plane that are determined by eleven lines, no two are parallel and only three are concurrent. Find the value of  $132 - (\frac{1}{2}n + \frac{1}{4}m)$ .

- A. 169                      B. 87.5                      C. 85                      D. 81.5                      E. 76

38. The area of an equilateral triangle is  $16\sqrt{3} \text{ m}^2$ . What is the perimeter of the triangle?

- A.  $48\sqrt{3} \text{ m}$                       B. 48 m                      C. 24 m                      D. 12 m                      E. 32 m

39. Calculate the exponential growth rate in the exponential growth function  $y = 127 \cdot \left(2\frac{3}{8}\right)^x$ .
- A. 137.5%      B. 37.5%      C. 237.5%      D. 2.375%      E. 127.1375%
40. What is the area of a hexagon with vertices located at (12, 2), (10, 4), (2, 10), (-6, 0), (-6, -4) and (0, -4)?
- A. 138 units<sup>2</sup>      B. 176 units<sup>2</sup>      C. 276 units<sup>2</sup>      D. 142 units<sup>2</sup>      E. 96 units<sup>2</sup>
41. What is the geometric mean of the numbers 8 and 98?
- A. 53      B. 52.5      C. 46      D. 22      E. 28
42. Find the value of  $x$ , if  $6^{5x-3} = 36^{2x+1}$ .
- A. 5      B. 0.75      C. 0.5      D. 2      E. 7
43. If  $\triangle ABC \sim \triangle XYZ$ , as in the picture below, then what is the perimeter of  $\triangle XYZ$ ?



- A. 68 cm      B. 30 cm      C. 240 cm      D. 120 cm      E. 480 cm
44. Which of the following equations is the inverse to the equation  $y = 3x + 12$ ?
- A.  $y = 3x - 12$       B.  $y = \frac{1}{3}x - 4$       C.  $y = x + 4$       D.  $y = \frac{1}{4}x - 3$       E.  $y = \frac{1}{3}x + 4$
45. Which of the polynomials listed below is relatively prime to the polynomial  $4n^2 + 8$ ?
- A.  $16n - 8$       B.  $3n^2 + 6$       C.  $36n^3 + 8$       D.  $5x + 5$       E.  $8x - 8$
46. One-fourth of Roger's age four years from now plus one-half of his age six years ago is equal to the value of twenty-two. What was Roger's age one year ago?
- A. 31      B. 32      C. 33      D. 41      E. 42
47.  $5i^2(2i^3 + 3i) - 3i(2i^2 + 4i) + (2i + 1)(i - 1)$
- A. 12      B. -2      C. 9      D. -12      E. 17
48. If the long leg of a 30-60-90 triangle measures 12 inches, what is the measure of the hypotenuse?
- A.  $8\sqrt{3}$  in      B.  $6\sqrt{3}$  in      C. 24 in      D.  $24\sqrt{3}$  in      E.  $12\sqrt{3}$  in
49. If  $A = \begin{bmatrix} 0 & 3 \\ 4 & -2 \end{bmatrix}$ ,  $B = \begin{bmatrix} -1 & 2 \\ 1 & -2 \end{bmatrix}$  and  $C = \begin{bmatrix} -3 & 2 \\ 2 & 1 \end{bmatrix}$ , find the value of the determinant of the sum of  $A + B$ .
- A. -2      B. 0      C. -35      D. 216      E. 142
50. Using a coordinate plane, what is the product of the coordinates of the point  $\frac{1}{4}$  of the distance from the origin to the point (12, -8)?
- A. -96      B. -24      C. -60      D. -6      E. -3

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

11. When three or more lines meet at a certain point, they are said to be concurrent.

25. Create a picture where you can see all the differences until we find a constant difference, then continue the pattern until you get the next term.



From our picture, we can see the next term in the sequence is 222.

28. We know there are a total of  $540^\circ$  in a pentagon. So, if the sides are in a ratio of 2:7:7:9:11, we can create the equation  $2x + 7x + 7x + 9x + 11x = 540 \rightarrow 36x = 540$  and  $x = 15$ . The largest angle measure is equal to  $11(15) = 165^\circ$ .

44. To find the inverse of  $y = 3x + 12$ , switch the  $x$  and  $y$  variables and solve for  $y$ .

$$x = 3y + 12 \rightarrow x - 12 = 3y + 12 - 12 \rightarrow x - 12 = 3y \rightarrow \frac{x}{3} - \frac{12}{3} = \frac{3y}{3} \rightarrow y = \frac{1}{3}x - 4.$$

46. Let  $R$  = Roger's age now. One-fourth of Roger's age four years from now creates the expression  $\frac{1}{4}(R + 4)$ . One-half of his age six years ago creates the expression  $\frac{1}{2}(R - 6)$ .

If we add the expressions together, we get  $\frac{1}{4}(R + 4) + \frac{1}{2}(R - 6) = 22$ . Solving the

$$\text{equation, } \frac{1}{4}(R + 4) + \frac{1}{2}(R - 6) = 22 \rightarrow \frac{1}{4}R + 1 + \frac{1}{2}R - 3 = 22 \rightarrow 4\left(\frac{1}{4}R + 1 + \frac{1}{2}R - 3\right) = 4(22) \rightarrow$$

$R + 4 + 2R - 12 = 88 \rightarrow 3R - 8 = 88 \rightarrow 3R = 96 \rightarrow R = 32$ . Roger is currently 32, so we must subtract 1 from 32 to get 31, which was his age one year ago.