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
R E G I O N A L Q U A L I F I E R ©
M A R C H 8 , 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.

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2013-2014 TMSCA Middle School Mathematics Regional Test

1. 645 – 999 = _____

A. -345 B. -364 C. -354 D. -355 E. 1,644

2. $(-87+92)^2 =$_____

A. 32,041 B. 25 C. -25 D. -5 E. 625

3. $31.025 \times 8.4 =$ _____

A. 26.61 B. 2,600.61 C. 260.61 D. 266.1 E. 206.61

4. $4\frac{4}{5} \div 1\frac{1}{4} + 10\frac{1}{2} =$ _____

A. $14\frac{3}{20}$ B. $16\frac{1}{2}$ C. $16\frac{17}{50}$ D. $14\frac{7}{40}$ E. $14\frac{17}{50}$

5. Evaluate $5a - 4b + 3c - 3d$, if $a = -3$, $b = -2$, $c = -1$ and $d = 5$.

A. -25 B. 5 C. 10 D. -15 E. -20

6. 2 squared feet = _____ squared inches

A. 36 B. 24 C. 144 D. 288 E. 312

7. On a map, 1.5 inches is equal to 200 miles. How many miles does 6 inches represent?

A. 600 B. 700 C. 750 D. 800 E. 850

8. The perimeter of a rectangle is 36 inches. If the length is 4 inches longer than the width, how long is the width of the rectangle?

A. 11 inches B. 7 inches C. 10 inches D. 6 inches E. 8 inches

9. What is the value of twenty-four cubed?

A. 72 B. 144 C. 576 D. 1,152 E. 13,824

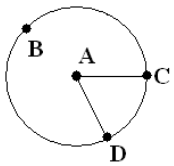
10. Which of the following expressions matches, "four more than twice the sum of two numbers".

A. $4(a + b)$ B. $4(a + b) + 2$ C. $2(a + b) + 4$ D. $2(a + b + 4)$ E. $8a + 8b$

11. $\sqrt{225} - 1 =$ _____

A. $4\sqrt{14}$ B. 14 C. $15\sqrt{14}$ D. 15 E. 16

12. Name a central angle from the picture below.



A. $\angle DAB$ B. $\angle CAB$ C. $\angle CBD$ D. $\angle ADB$ E. $\angle CAD$

13. What value is 42% of 250?

A. 95 B. 105 C. 110 D. 115 E. 100

14. If $A = 43$ and $B = 19$, then $3A - 5B =$ _____ (Roman numeral)

A. 34 B. XXXVI C. 158 D. CLVIII E. XXXIV

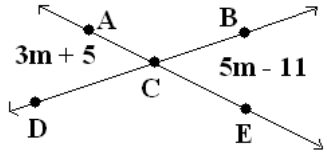
15. Mrs. Bell deposited $10,000 in a simple interest account for her grandson when he was born . If the account has a rate of 2%, how much money will be in his account when he turns 18 years old?

A. $3,800 B. $12,800 C. $15,300 D. $13,600 E. $14,200

16. _____ means tilted at an angle, not vertical nor horizontal.

A. Oblique B. Obsolete C. Incentral D. Orthocentral E. Diagonalism

17. Use the picture below and find the measure of $\angle BCE$.



A. 8° B. 61° C. 35° D. 29° E. 23°

18. Simplify: $\dfrac{3^2+(-4)+11}{2^3}$

A. -1 B. 1 C. 2 D. -2 E. 4

19. Change the quotient of $0.0000049 \div 7$ into scientific notation.

A. 7.7×10^{7} B. 7×10^{9} C. 7×10^{-9} D. 7×10^{-7} E. 7×10^{-8}

20. What is the sum of the supplement and complement of a 71° angle?

A. 128° B. 136° C. 199° D. 119° E. 179°

21. Mark drew all the lines of symmetry in a regular octagon. Susan drew all the lines of symmetry in a regular pentagon. How many more lines did Mark draw than Susan?

A. 7 B. 4 C. 5 D. 6 E. 3

22. $3 + 5 + 7 + \ldots + 21 + 23 = A$ and $B = 24$. $A + B =$ _____

A. 167 B. 168 C. 181 D. 171 E. 163

23. What is the probability of rolling a pair of dice and getting a sum greater than 5 facing up?

A. $\frac{7}{9}$ B. $\frac{2}{3}$ C. $\frac{13}{18}$ D. $\frac{5}{6}$ E. $\frac{7}{12}$

24. What is the arithmetic mean of the numbers 42, 56, 84 and 178?

A. 82 B. 76 C. 86 D. 90 E. 92

25. How many three-digit lock combinations can be formed using the digits 2 through 8, inclusive, when the digits can be repeated?

A. 128 B. 256 C. 343 D. 125 E. 210

26. Simplify: $-5(2x-7)+4(4x-5)-(-3x)-7$

A. $28x + 8$ B. $9x - 62$ C. $28x - 62$ D. $13x + 48$ E. $9x + 8$

27. A monster truck has tires that each have a circumference of 15 feet. How many revolutions will the tires take until they reach a distance of one mile?

A. 75 B. 352 C. 1,056 D. 528 E. 288

28. $104^\circ F = \_\_\_\_\_^\circ C$

A. 40 B. 45 C. 35 D. 50 E. 55

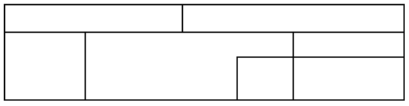
29. Let *m* equal the number of regions in a plane that are determined by 11 lines, no two are parallel and no three are concurrent. Let *n* equal the number of regions in a plane that are determined by six lines, no two are parallel and only three are concurrent. Find the value of $2m - 3n$.

A. 70 B. 71 C. 66 D. 65 E. 75

30. If the graph of the quadratic equation $y = x^2 - 2x + 5$ is translated to the right 3 units, what is the equation of the new axis-of-symmetry?

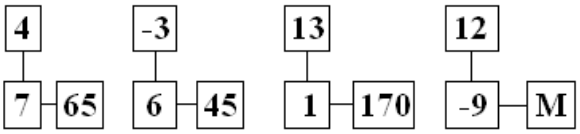
A. $x = 1$ B. $x = -2$ C. $x = 3$ D. $x = -1$ E. $x = 4$

31. How many rectangles are in the picture below?



A. 7 B. 6 C. 10 D. 14 E. 16

32. Use the picture below to find a pattern and then find the value of **M**.



A. 63 B. 201 C. 225 D. -108 E. 216

33. The long leg of a 30-60-90 triangle is $12\sqrt{3}$ inches. What is the perimeter of the triangle?

A. $24+12\sqrt{3}$ inches B. $12+12\sqrt{3}$ inches C. $48\sqrt{3}$ inches D. $36+12\sqrt{3}$ inches E. $36\sqrt{3}$ inches

34. How many positive integers less than 48, and greater than 24, are relatively prime to 48?

A. 6 B. 7 C. 8 D. 9 E. 10

35. Find *d* in the sequence *a*, *b*, *c*, *d*, if $a = 1{,}400{,}000$, $b = 350{,}000$, and $c = 87{,}500$.

A. 21,875 B. 21,850 C. 21,825 D. 21,800 E. 21,675

36. Simplify completely: $2\sqrt{24}\left(\sqrt{32}\right)$

A. $4\sqrt{6}+4\sqrt{2}$ B. $16\sqrt{12}$ C. $32\sqrt{3}$ D. $48\sqrt{3}$ E. $16\sqrt{6}$

37. If $f(x)=11x-1$ and $g(x)=x^2+1$, find the value of $f(g(-3))$.

A. 1,157 B. -56 C. 109 D. -89 E. 111

38. Solve for *x*: $4^{x+5} = 16^{2x}$

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

39. How many times does the digit 8 appear in the answer to $987{,}654{,}321\times 9-1$?

A. 10 B. 11 C. 8 D. 9 E. 7

40. Find *W*, if $32_5 \times 41_7 = W_9$.

A. 493 B. 503 C. 717 D. 727 E. 607

41. Simplify: $(4i^2 - i)(2i - 1)$

A. $-i$ B. i C. $6 + 7i$ D. $-6 - 7i$ E. $6 - 7i$

42. What is the growth rate in the exponential growth function $y = 23 \cdot (2.7)^x$?

A. 270% B. 170% C. 70% D. 23.27% E. 130%

43. What is the area of a triangle with vertices located at (6, 0), (0, -10) and (0, 8)?

A. 48 units^2 B. 36 units^2 C. 84 units^2 D. 54 units^2 E. 120 units^2

44. How many ordered pairs on the line segment with endpoints (0, 0) and (16, 8) have both integer coordinates, with the endpoints included?

A. 12 B. 9 C. 8 D. 6 E. 4

45. *We're Nuts* health food store is selling a 40 gram mixture that costs \$2.59 per gram. In the mixture, peanuts and cashews are combined. If cashews cost \$1.60 per gram and peanuts cost \$3.40 per gram, how many more grams of peanuts were needed to create the mixture than cashews?

A. 3 grams B. 4 grams C. 5 grams D. 6 grams E. 12 grams

46. If $\frac{8a}{b-4} = 6$, then what does $3b$ equal?

A. $8a + 12$ B. $6a + 12$ C. $4a + 24$ D. $8a + 24$ E. $4a + 12$

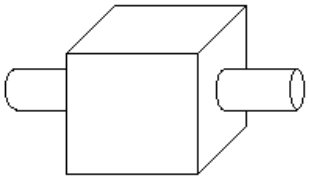
47. If $\begin{bmatrix} 0.5 & 1 \\ 0.25 & 0.75 \end{bmatrix} \cdot \begin{bmatrix} 4 & -16 \\ 8 & 12 \end{bmatrix} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then find the value of $ab - cd$.

A. 6.5 B. 7 C. 8.25 D. 5 E. 2.75

48. Which equation below is the inverse to the equation $y = \frac{1}{4}x$?

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

49. A 24 inch cylinder passes through a cube with a side length of 5 inches, as in the picture below. If $\pi = 3$ and the cylinder has a radius of 3 inches, what is the volume of the cylinder within the cube?



A. 135 in^3 B. 648 in^3 C. 125 in^3 D. 324 in^3 E. 773 in^3

50. Simplify: $\left(\frac{9a^3b^{-2}c}{5ab^5c^2}\right) \cdot \left(\frac{10abc^2}{4.5a^2b^{-3}}\right) \div \left(\frac{a^5b^0c^2}{a^2b^{-3}c}\right)$

A. $\frac{4c^2}{a^3b^2}$ B. $a^3b^4c^2$ C. $\frac{4}{a^2b^6}$ D. $\frac{4a^4c}{b^2}$ E. $\frac{4a^4}{b^6}$

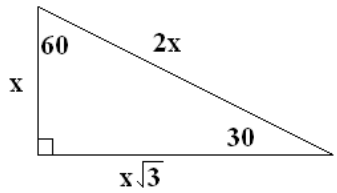
2013-2014 TMSCA Middle School Mathematics Regional Test Answer Key

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

12. A central angle is an angle in a circle with its vertex at the center of the circle and its endpoint on the circle. The central angle in the picture given is $\angle CAD$.

27. Remember that 1 mile = 5,280 feet = 1,760 yards. If the tires have a circumference of 15 ft, that is equal to 5 yards. Now you can divide 1,760 by 5 and get 352 revolutions.

33. The long leg of a 30-60-90 triangle is $12\sqrt{3}$ inches. From our picture below we see the side ratios in a 30-60-90 triangle.



Seeing our ratios, we know our side lengths are 12, $12\sqrt{3}$ and 24. Our perimeter is $12 + 24 + 12\sqrt{3} = 36 + 12\sqrt{3}$.

38. To solve for *x*, first simplify the right side of the equation: $4^{x+5} = 16^2 \rightarrow 4^{x+5} = (4^2)^{2x}$ Now, using exponent rules we know that $4^{x+5} = 4^{4x}$. Now we have the equation $x + 5 = 4x$ to solve. Subtract *x* from both sides and $5 = 3x$, then divide by 3 and $x = \frac{5}{3}$.

46. To answer this question, first multiply both sides of $\frac{8a}{b-4} = 6$ by $b - 4$.

$(b-4)\cdot\frac{8a}{b-4} = 6(b-4) \rightarrow 8a = 6b - 24$. Now add 24 to both sides,

$8a + 24 = 6b - 24 + 24 \rightarrow 6b = 8a + 24$. The question asked us to find what $3b$ is equal to, so now divide both sides by 2, $\frac{6b}{2} = \frac{8a}{2} + \frac{24}{2} \rightarrow 3b = 4a + 12$.