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 # 1 0 ©

F E B R U A R Y 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.

2013-2014 TMSCA Middle School Mathematics Test #10

1. 9,999 + 888 + 77 + 6 = _____

A. 10,780 B. 10,970 C. 11,210 D. 10,460 E. 10,850

2. 765 – 43 – 21 = _____

A. 701 B. 711 C. 691 D. 693 E. 703

3. $452 \div 12$ = _____

A. $37.\overline{6}$ B. 37.7 C. $37.\overline{7}$ D. 37.67 E. $36.\overline{67}$

4. $(4.8)(11.5) - (3)(7)$ = _____

A. 34.3 B. $34.\overline{3}$ C. 33.4 D. 34.2 E. 33.1

5. Let *n* represent the position of a term in the sequence 17, 29, 41, 53, … Which algebraic expression can be used to find the n^{th} term of the sequence?

A. 10*n* – 6 B. 12*n* + 5 C. 12*n* – 7 D. 4*n* + 13 E. 7*n* + 10

6. What is the number of edges of a pentagonal pyramid?

A. 15 B. 12 C. 10 D. 6 E. 7

7. How many times does the digit 3 appear in the numbers between 20 and 45, inclusive?

A. 15 B. 14 C. 11 D. 12 E. 13

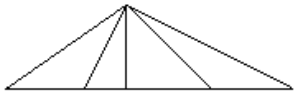
8. What is the sum of the domain values of the relation (3, 5), (2, 5), (8, -9), (-1, 11), (12, -9)?

A. 3 B. 6 C. 12 D. 24 E. 30

9. $\frac{4}{11}$ = _____ (decimal)

A. 0.37 B. 0.36 C. 0.363 D. $0.3\overline{6}$ E. $0.\overline{36}$

10. How many triangles can be found in the picture below?



A. 9 B. 10 C. 4 D. 5 E. 11

11. Solve for *x*: $3x + 2x - 8 - 11 = 131$

A. 35 B. 30 C. 22.4 D. 18.4 E. 40

12. Carrie is 5 feet 4 inches tall, Windy is 5 feet 7 inches tall and Shelby is 6 feet 1 inch tall. What is the average of the three girls' heights?

A. 5 ft 8 in B. 5 ft 6 in C. 5 ft 4 in D. 5 ft 7 in E. 5 ft 5 in

13. How many 9 inch square tiles are needed to cover a square floor that measures 3 feet by 3 feet?

A. 144 B. 72 C. 16 D. 12 E. 24

14. $\_\_\_\_\_^\circ F = 20^\circ C$

A. 64 B. 74 C. 70 D. 66 E. 68

15. _____ lines are lines that have negative reciprocal slopes.

A. Skew B. Parallel C. Perpendicular D. Vertex E. Angular

16. If 40% of a number is 18, and 30% of another number is 24, what is the sum of the two numbers?

A. 42 B. 14.4 C. 144 D. 125 E. 194

17. If $\frac{n+1}{4} = \frac{9}{16}$, find the value of $8n + 7$.

A. 10 B. 17 C. 21 D. 25 E. 30

18. Angles *A* and *B* are complementary and are in a ratio of 2:3, respectively. The supplement of the larger angle measures $\_\_\_\_\_^\circ$.

A. 36 B. 72 C. 144 D. 126 E. 132

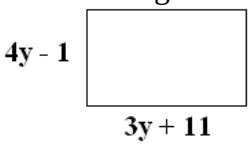
19. What is the degree of the polynomial that is the product of the polynomials $3n - 1$ and $4n^3 - 4n^2 + 7$?

A. 5 B. 1 C. 2 D. 3 E. 4

20. How many diagonals can be drawn from one vertex of a 21 sided polygon?

A. 21 B. 42 C. 189 D. 18 E. 7

21. If y = 3, what would be the perimeter of the rectangle below after doubling each side length?



A. 158 units B. 62 units C. 66 units D. 186 units E. 124 units

22. Find the sum of the coordinates of the midpoint between the points (12, -9) and (-23, 14).

A. -3 B. 6 C. -6 D. 20 E. 29

23. What is the parent function for all linear functions?

A. $f(x) = x^2$ B. $Ax - By = C$ C. $y = mx + b$ D. $f(x) = x$ E. $f(x) = f(y)$

24. If $f(x) = 3x - 12$, find $f\left(\frac{2}{3}\right)$.

A. -10 B. -7.5 C. 14 D. -5 E. -14

25. Simplify: $2y^3 \cdot y \cdot y \cdot y^2 \cdot 3y^3$

A. $6y^{11}$ B. $216y^{11}$ C. $216y^{18}$ D. $6y^{18}$ E. $5y^8$

26. How many subsets can be created using the set {a, b, c, d, e, f}?

A. 32 B. 64 C. 63 D. 128 E. 31

27. $7{,}654{,}321 \times 9 - 1 =$ _____

A. 78,888,888 B. 58,888,888 C. 88,888,888 D. 68,888,888 E. 8,888,888

28. An acute triangle has sides measuring 4, 7 and *n* units. What is the largest integral value of *n*?

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

29. How many positive integers less than 24 are relatively prime to 24?

A. 12 B. 11 C. 9 D. 8 E. 6

30. ¼ of 98,000,000,000 would be _____ in scientific notation.

A. 24,500,000,000 B. 2.45×10^{-8} C. 2.45×10^{-10} D. 2.45×10^{8} E. 2.45×10^{10}

31. Two prime numbers have a LCM of 39. What is the sum of these two prime numbers?

A. 12 B. 16 C. 10 D. 18 E. 20

32. Shiela has two yards of rope, Riahanna has 120 inches of rope and Pooja has one and one-third yards of rope. If all three girls combined there rope, how many feet long would it be?

A. 20 ft B. 148 ft C. 147 ft D. 46 ft E. 30 ft

33. Simplify: $\frac{30}{8} \cdot \frac{4}{9} \cdot \frac{2}{6} \cdot \frac{54}{15}$

A. 1 B. 15 C. 2 D. 12 E. 4

34. How many regions in a plane are determined by six lines, no two are parallel and only three are concurrent?

A. 18 B. 19 C. 20 D. 21 E. 22

35. 3,240 + 10,549 + 11 = _____ (Roman numeral)

A. $\overline{XIIIDC}$ B. $\overline{XIII}DC$ C. $\overline{X}IIIDC$ D. $\overline{MMMXIII}DC$ E. $\overline{IIIXXDC}$

36. 1110011010_2 = _____$_8$

A. 1572 B. 1632 C. 1623 D. 1624 E. 1552

37. What is the growth factor in the exponential growth function $y = 43 \cdot 1.46^x$?

A. 43 B. 1.46 C. 46 D. 4.6 E. 43.1046

38. How much money would be in Jeff's bank account if he deposited $1,200 and acquired simple interest at 3% for 6 years?

A. $1,416.00 B. $1,412.50 C. $216.00 D. $984.00 E. $1,418.50

39. How many combinations can be made of 6 items taken 5 at a time?

A. 30 B. 60 C. 120 D. 6 E. 12

40. What is the geometric mean of the numbers 8 and 50?

A. 20 B. 29 C. 24.5 D. 22 E. 2

41. How many solutions are there to the system of equations $y = x^2 - 3$ and $x = 3$?
A. 0 B. 1 C. 2 D. 3 E. 6

42. 5! – 6! = _____
A. 720 B. 840 C. -840 D. -6 E. -600

43. Find the area of a quadrilateral with vertices located at (1, 3), (-2, 2), (-1, -5) and (6, -2).
A. 18 units^2 B. 24 units^2 C. 36 units^2 D. 64 units^2 E. 72 units^2

44. *Old Fashioned Steam Boats* chartered a trip for a group of people. The boat traveled a total of 210 miles down river and back. The trip down river lasted ten hours, while the return trip took seventy hours. How much faster was the speed of the boat than the speed of the current?
A. 1 mi/hr B. 2 mi/hr C. 3 mi/hr D. 4 mi/hr E. 5 mi/hr

45. Simplify: $3i^2(2i^2 + 3i^3)$
A. $-6 - 9i$ B. $-3i$ C. $3i$ D. $6 + 9i$ E. $15i^{10}$

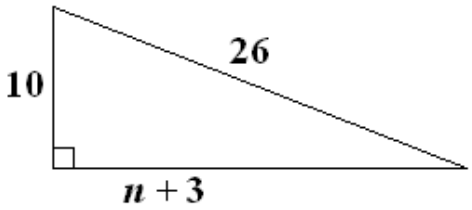
46. If $\begin{bmatrix} a & b \\ c & d \end{bmatrix} \cdot \begin{bmatrix} e & f \\ g & h \end{bmatrix} = \begin{bmatrix} ae+bg & af+bh \\ ce+dg & cf+dh \end{bmatrix}$, find $\begin{bmatrix} 1 & 5 \\ 2 & 3 \end{bmatrix} \cdot \begin{bmatrix} 4 & -3 \\ 6 & 2 \end{bmatrix}$.
A. $\begin{bmatrix} 34 & 7 \\ 26 & 0 \end{bmatrix}$ B. $\begin{bmatrix} 5 & 2 \\ 8 & 5 \end{bmatrix}$ C. $\begin{bmatrix} 16 & 5 \\ 15 & 4 \end{bmatrix}$ D. $\begin{bmatrix} 31 & 45 \\ 16 & 10 \end{bmatrix}$ E. $\begin{bmatrix} 26 & 4 \\ 12 & 0 \end{bmatrix}$

47. In the equation $|x - 7| = 32$, what is the sum of all possible solutions of x?
A. 4 B. 39 C. 14 D. 17 E. 25

48. Simplify by rationalizing the denominator: $\dfrac{3}{3+\sqrt{5}}$
A. $\dfrac{9-3\sqrt{5}}{4}$ B. $\dfrac{9-3\sqrt{5}}{14}$ C. $\dfrac{9-\sqrt{5}}{14}$ D. $\dfrac{6-3\sqrt{5}}{4}$ E. $\dfrac{6-\sqrt{5}}{4}$

49. The areas of three distinct faces of a rectangular prism are 6, 16 and 24 inches^2. What is the volume of this rectangular prism?
A. 92 in^3 B. 48 in^3 C. 96 in^3 D. 44 in^3 E. 32 in^3

50. What is the value of n in the picture below?



A. 24 B. 27 C. 21 D. 28 E. 18

2013-2014 TMSCA Middle School Mathematics Test #10 Answer Key

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

2013-2014 TMSCA Middle School Mathematics Test #10 Selected Solutions

22. The sum of the coordinates of the midpoint between the points (12, -9) and (-23, 14) is equal to $\left(\frac{12+(-23)}{2}, \frac{-9+14}{2}\right) = \left(\frac{-11}{2}, \frac{5}{2}\right) = (-5.5, 2.5)$. Now we must add the coordinates, -5.5 + 2.5 = -3.

33. Instead of multiplying all the numbers in the numerators and denominators, use cross reducing to simplify the problem. $\frac{30}{8} \cdot \frac{4}{9} \cdot \frac{2}{6} \cdot \frac{54}{15} = \frac{30}{8} \cdot \frac{\cancel{4}}{\cancel{9}} \cdot \frac{\cancel{2}}{\cancel{6}} \cdot \frac{\cancel{54}}{15} = \frac{30}{15} = 2$.

47. To solve the equation $|x-7| = 32$, you must set $x - 7$ equal to 32 and -32. So, $x - 7 = 32$; $x = 39$ and $x - 7 = -32$; $x = -25$. The sum of 39 and -25 is equal to 14.

48. We must simplify by rationalizing the denominator of $\frac{3}{3+\sqrt{5}}$. To rationalize the denominator, we want to get rid of the radical in the denominator. To do so, we must multiply by 1 in the form of $\frac{3-\sqrt{5}}{3-\sqrt{5}}$. Thus, $\frac{3}{3+\sqrt{5}} \cdot \frac{3-\sqrt{5}}{3-\sqrt{5}} = \frac{9-3\sqrt{5}}{9-3\sqrt{5}+3\sqrt{5}-5} = \frac{9-3\sqrt{5}}{4}$.

50. In our picture, we see it is a right triangle. So, we can use the Pythagorean Theorem to find the missing side length and we must also solve a quadratic equation:

$a^2 + b^2 = c^2 \rightarrow 10^2 + (n+3)^2 = 26^2 \rightarrow 100 + (n+3)^2 = 676 \rightarrow$

$(n+3)^2 = 576 \rightarrow n^2 + 6n + 9 = 576 \rightarrow n^2 + 6n - 567 = 0 \rightarrow (n+27)(n-21) = 0$

$n + 27 = 0; n = -27 \; and \; n - 21 = 0; n = 21$

From our solutions, we see *n* could be -27 or 21, but if we substitute -27 into our picture, our side length would be -27 + 3 = -24, but we cannot have a negative length for a side. Therefore, we must substitute 21 in and we get 21 + 3 = 24, and $10^2 + 24^2 = 26^2$, so $n = 21$.