TMSCA MIDDLE SCHOOL MATHEMATICS TEST #1©

OCTOBER 26, 2013

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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1. $678 + 985 =$ _____
A. 1,653   B. 1,663   C. 1,753   D. 1,453   E. 1,853

2. $1,021 - 956 =$ _____
A. 56   B. 67   C. 76   D. 65   E. 75

3. $12.4 \times 1.02 =$ _____
A. 12.648   B. 13.446   C. 13.468   D. 12.868   E. 14.88

4. $16\frac{1}{2} \div 5\frac{1}{2} =$ _____
A. 2.5   B. 3   C. 3.5   D. 4   E. 3.75

5. $99 =$ _____ (Roman numeral)
A. LXXXXIX   B. XCXI   C. XCIX   D. XLIX   E. IXIX

6. Evaluate $ab \div bc$, if $a = -2$, $b = 3$, $c = 4$ and $d = -12$.
A. -8 B. 0.125   C. 2   D. 2.125   E. -16

7. How many distinct prime factors does the number 424 have?
A. 4   B. 3   C. 2   D. 5   E. 6

8. Stephen bought 6 movie tickets for $75.00. What was the unit price per ticket?
A. $15.50   B. $12.50   C. $11.75   D. $10.75   E. $13.25

9. _____ _____ is a way to write all real numbers in the form $a \cdot 10^b$, where $1 \le a < 10$ and b is an integer.
A. Scientific notation   B. Function notation   C. Exponential notation   D. Science script   E. Case identity

10. A rectangle has a length of 8 cm and a width of 6 cm. If each side of the rectangle is doubled, what is the perimeter of the new rectangle?
A. 28 cm   B. 48 cm   C. 192 cm   D. 56 cm   E. 84 cm

11. How many lines of symmetry does an isosceles right triangle have?
A. 0   B. 1   C. 2   D. 3   E. 4

12. If $\angle A = 43°$, what is the measure of the complement of $\angle A$?
A. $137°$ B. $147°$ C. $47°$ D. $57°$ E. $117°$

13. Solve for n: $3n - 8 = -26$
A. $n = -11.\overline{3}$ B. $11.\overline{3}$ C. $0.\overline{6}$ D. -6   E. 6

14. If $f(x) = 3x + 4$, then find $f(-6)$.
A. 1   B. -22   C. -14   D. 7   E. -7

15. $5x + 4$ is an example of a _____ binomial.
A. quadratic   B. cubic   C. tetric   D. pentic   E. linear

16. If $\pi = 3$, find the measure of the circumference of the circle below.

9 cm
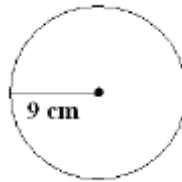
A. 243 cm   B. 243 cm^2 C. 54 cm   D. 27 cm   E. 63 cm^2

17. $\dfrac{3}{16} = $ _____ (decimal)

A. 0.1875   B. 0.1825   C. 0.185   D. 0.1675   E. 0.1625

18. What is 45% of 90?
A. 37.5   B. 38.5   C. 39.5   D. 40.5   E. 41.5

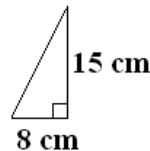19. Evaluate $|ab| - c$, if a = -5, b = 7 and c = -9.
A. 26   B. 35   C. 44   D. -7   E. -26

20. Find the area of a triangle that has a base of 14 inches and a height of 23 inches.
A. 322 in^2 B. 161 in^2 C. 80.5 in^2 D. 322 in^2 E. 37 in^2

21. Which figure will be in the 44th position of the pattern ♫, π, ▲, ☼, ☺, ♫, π, ▲, ☼, ☺, ♫, π, ▲, ☼, ☺…?
A. ♫   B. π   C. ▲   D. ☼   E. ☺

22. Find the length of the hypotenuse of the triangle below, to the nearest integral value.

15 cm

8 cm

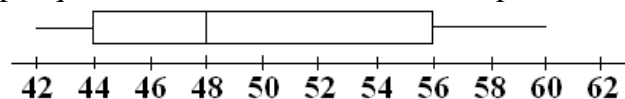A. $\sqrt{274}$ cm   B. 16.5   C. 16.6   D. 17   E. 17.1

23. Find the least common multiple of the numbers 12 and 54.
A. 168   B. 112   C. 108   D. 6   E. 12

24. What is the value of the upper quartile from the box-and-whisker plot below?

42 44 46 48 50 52 54 56 58 60 62

A. 42   B. 44   C. 48   D. 56   E. 60

25. 76 mm + 1 m = _____ cm
A. 1,007.6   B. 17.6   C. 176   D. 10,076   E. 107.6

26. $102_5 = $ _____$_{10}$
A. 127   B. 27   C. 7   D. 11   E. 35

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27. Which equation below is written in slope-intercept form?
A. $3x - 5y = 1$ B. $y - 3 = 2(x + 1)$ C. $y + 3 = 3x$ D. $y = x - 1$ E. $x = \frac{1}{2} y + 3$

28. $\{A, B, C, D, E\} \cup \{C, D, E, F, G\} \cap \{A, B, D, E, H, I, J, K\}$ contains a set with _____ elements.
A. 7   B. 11   C. 0   D. 4   E. 3

29. Each letter of the word *MATHMANIA* is written on a tile and placed inside of a bag. What is the probability you reach into the bag and choose a vowel? (Answers given in the form of a ratio.)
A. 4:5   B. 5:9   C. 3:8   D. 1:3   E. 4:9

30. What is the value of the product of the median and mode of the set of numbers 11, 23, 23, 42, 7 and 4?
A. 551.5   B. 556.5   C. 391   D. 253   E. 714

31. Which of the following points is not a solution to the linear inequality graphed below?
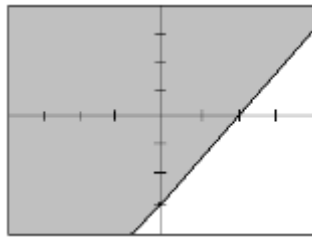
A. (0, 0)   B. (-1, 3)   C. (-4, -3)   D. (3, -1)   E. (0, -3)

32. What is the maximum number of diagonals that can be drawn from one vertex of a regular hexagon?
A. 9   B. 18   C. 6   D. 12   E. 3

33. Maira has a box that measures 5 inches high, 8 inches long and 6 inches wide. She plans to fill it half- full with sand for a school project. How many cubic inches of sand will Maria need?
A. 240 in^3 B. 360 in^3 C. 120 in^3 D. 148 in^3 E. 96 in^3

34. Simplify: $4n + 6m - 3n - (-8m) - 6m - m + (-3n) - 6n$
A. $7m - 8n$ B. $7m - 10n$ C. $-9m - 8n$ D. $-9m - 10n$ E. $8m - 7n$

35. What is the range of the following relation?   [(4, 5), (-1, 0), (-7, 3)]
A. {4, -1, -7}   B. {5, 0, 3}   C. {12, 2}   D. {20, 0, -21}   E. {9, -1, -4}

36. If $\dfrac{1}{1 \cdot 2} + \dfrac{1}{2 \cdot 3} + \dfrac{1}{4a} = \dfrac{3}{4}$, then find the value of a.
A. 5   B. 6   C. 4   D. 2   E. 3

37. The graph of a direct variation equation will always passes through the _____.
A. quadrant   B. origin   C. apex   D. centroid   E. secant

38. In how many different ways can 6 distinct books be arranged on a shelf?
A. 720   B. 1,440   C. 360   D. 30   E. 1,080

39. The geometric mean of three numbers a, b, and c, can be found by $\sqrt[3]{abc}$. What is the geometric mean of the numbers 4, 8 and 16?

A. $9.\overline{3}$ B. 12   C. 14   D. 8   E. $10.\overline{3}$

40. What is the equation of the axis of symmetry for the graph of the quadratic equation $y = 2x^2 - 16x + 1$?

A. $x = 8$ B. $x = -8$ C. $x = 4$ D. $x = 16$ E. $x = -4$

41. Four consecutive positive integers sum to 198. What is the value of the smallest integer?

A. 46   B. 47   C. 48   D. 49   E. 49.5

42. Find the slope of the line that passes through the points (9, -4) and (17, 4)?

A. -1   B. 1   C. -½   D. ½   E. ¼

43. What is the formula to find the area of any regular polygon, if a = apothem, n = side length, p = perimeter, h = height and b = base?

A. $A = \dfrac{bh}{2}$ B. $A = \dfrac{ap}{2}$ C. $A = s^2$ D. $A = ap + bh$ E. $A = \dfrac{anp}{bh}$

44. Simplify: $\sqrt{480}$

A. $4\sqrt{30}$ B. $48\sqrt{10}$ C. $2\sqrt{60}$ D. $10\sqrt{48}$ E. $6\sqrt{80}$

45. Simplify: $64^{\frac{2}{3}}$

A. 4   B. 216   C. 32   D. 8   E. 16

46. Factor: $x^2 + 2x - 15$

A. $(x - 15)(x + 1)$ B. $(x - 5)(x + 3)$ C. $(x + 15)(x - 1)$ D. $(x - 5)(x - 3)$ E. $(x + 5)(x - 3)$

47. If $\begin{bmatrix} 3 & -2 \\ a & 6 \end{bmatrix} - \begin{bmatrix} -4 & -7 \\ 3 & 8 \end{bmatrix} = \begin{bmatrix} 7 & 5 \\ -9 & -2 \end{bmatrix}$, then a is equal to what value?

A. 12   B. -12   C. 6   D. -6   E. 3

48. If $i = \sqrt{-1}$, what is the value of $3i^2$?

A. 3   B. -3   C. $\sqrt{3}$ D. $\sqrt{-3}$ E. $3i$

49. The solution to the system $\begin{cases} 3x + 4y = 10 \\ x - y = 1 \end{cases}$ has coordinates (a, b). What is the value of b^{3a}?

A. 1   B. 64   C. 32   D. 128   E. 4

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

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

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

7. The prime factorization of 242 is $2^3 \cdot 53$. Therefore, 424 has 2 distinct prime factors.

9. Scientific notation is a way to write all real numbers in the form $a \cdot 10^b$, where $1 \le a < 10$ and b is an integer.

26. $102_5 = 1 \cdot 125 + 0 \cdot 5 + 2 \cdot 1 = 27_{10}$

37. The graph of a direct variation equation will always passes through the origin.

38. If you have 6 distinct books and you want to find how many different ways they can be arranged on a shelf, you find 6!, because you would have 6 choices for the first postion, followed by 5 choices, then 4 and so on. $6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 720$ different arrangements.

45. There are two methods to simplifying $64^{\frac{2}{3}}$.

$$\text{Method 1:} \quad 64^{\frac{2}{3}} = \sqrt[3]{64^2} = \sqrt[3]{4{,}096} = 16$$
$$\text{or}$$
$$\text{Method 2:} \quad 64^{\frac{2}{3}} = \left(\sqrt[3]{64}\right)^2 = 4^2 = 16$$

50. To determine the total regions in a plane created by a given number of lines, when no three are concurrent, use the nth triangular number + 1. So, we are given three lines, no two are parallel and no three are concurrent. To find the number of regions, we use the 3rd triangular number + 1. $6 + 1 = 7$, as in the picture below.