TMSCA MIDDLE SCHOOL MATHEMATICS TEST #12 ©

FEBRUARY 20, 2016

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.

2015 – 2016 TMSCA Middle School Mathematics Test #12

1. $34\frac{1}{5} - 12\frac{7}{10} =$ _____

A. 21 ¼ B. 21 ¾ C. 22 ½ D. 21 ½ E. 22 ⅛

2. $14^2 + 328 =$ _____

A. 356 B. 425 C. 524 D. 556 E. 518

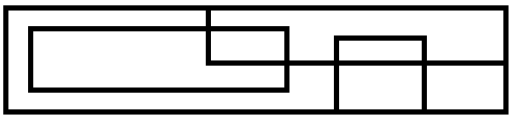
3. Maria and six of her friends each have eighteen medals from gymnastics. How many medals does the entire group have all together?

A. 126 B. 108 C. 96 D. 25 E. 144

4. $75.24 \div \frac{3}{4} =$ _____

A. 124.36 B. 301.32 C. 156.43 D. 112.86 E. 100.32

5. How many rectangles can be found in the picture below?



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

6. ¾ % = _____ (decimal)

A. 0.75 B. 7.5 C. 0.075 D. 0.0075 E. 75

7. 2.4 hours = _____ minutes

A. 144 B. 124 C. 160 D. 190 E. 132

8. What is the sum of the distinct prime factors of the number 336?

A. 12 B. 9 C. 10 D. 18 E. 5

9. The perimeter of a square is 28 cm. Find the area of this square.

A. 14 cm^2 B. 56 cm^2 C. 784 cm^2 D. 49 cm^2 E. 196 cm^2

10. Let *A* equal the set of numbers {4, 5, 6, 7, 8} and *B* equal the set of numbers {13, 12, 11, 8, 1}. Calculate the positive difference of the sums of the elements of set *A* and the sum of the elements in set *B*.

A. 21 B. 18 C. 15 D. 12 E. 9

11. What number is one-half of one-half of one-fourth of 8?

A. -1 B. 1 C. ¼ D. ½ E. ¾

12. Evan bought a snow-cone and his subtotal was $3.50. If he wants to leave a 12% tip, how much money will Evan hand the snow-cone cashier?

A. $3.42 B. $3.92 C. $3.72 D. $4.02 E. $4.42

13. If $m\angle A = 58^\circ$, what is the sum of the degree measures of the complement and supplement of $\angle A$?

A. 32° B. 122° C. 154° D. 148° E. 134°

14. A triangular prism has six vertices and nine edges. How many faces does the prism have?

A. 6 B. 5 C. 4 D. 8 E. 9

15. What is the sum of the digits of 84^2?

A. 11 B. 12 C. 14 D. 16 E. 18

16. $\frac{7}{12}$ = _____

A. 0.58 B. 0.53 C. 0.583 D. $0.5\overline{83}$ E. $0.58\overline{3}$

17. What is the probability of rolling a pair of dice and getting a sum divisible by 5?

A. $\frac{1}{5}$ B. $\frac{5}{36}$ C. $\frac{3}{20}$ D. $\frac{5}{12}$ E. $\frac{7}{36}$

18. Use the examples below to find the value of *n*.

4	6	3	5	2	10	7	9
-2	16	4	24	-5	14	-1	*n*

A. 34 B. 30 C. 28 D. 26 E. 42

19. $52{,}000 \cdot 6.5 =$ _____ (scientific notation)

A. 33.8×10^5 B. 3.38×10^5 C. 33.8×10^6 D. 3.38×10^6 E. 3.38×10^4

20. If ¾ x – 9 = 33, find the value of 5x – 11.

A. 269 B. 56 C. 291 D. 146.5 E. 168.5

21. What is the surface area of a cube with an inner diagonal of 10 meters?

A. 50 m^2 B. 180 m^2 C. 160 m^2 D. 240 m^2 E. 200 m^2

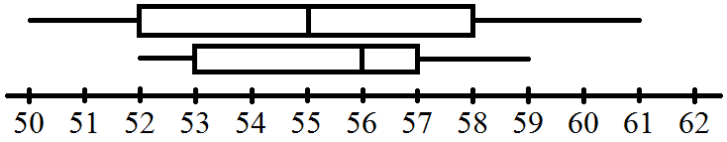
22. In her closet, Lindsey must choose from five different pairs of socks, three different skirts and twelve different shirts. If she must choose one of each, how many combinations of clothes can Lindsey choose from?

A. 144 B. 75 C. 180 D. 240 E. 150

23. A twenty inch candle burns at a rate of ¾ inch per hour. How tall will the candle be after 15 hours of burning?

A. 15.75 inches B. 8.75 inches C. 12.25 inches D. 10.5 inches E. 9.25 inches

24. What is the positive difference of the inter-quartile ranges of the two box plots below?



A. 2 B. 4 C. 6 D. 8 E. 10

25. What is the units digit of 3^{10}?

A. 0 B. 1 C. 3 D. 7 E. 9

26. What is the largest unattainable sum of the numbers 14 and 11?

A. 111 B. 129 C. 141 D. 137 E. 159

27. *MDCLXIX – DCCCXCIX* = _____

A. *DCCLXX* B. *CDXLVII* C. *XL* D. *DXXLVV* E. *DCCXX*

28. {12, 24, 36, 48}∪{5, 10, 15, 20} contains how many elements divisible by 3?
A. 8 B. 7 C. 6 D. 5 E. 4

29. Find the range of the function $f(x) = -x^2 + 2x$, when the domain is {-3, 1, 7}.
A. {-15, -1, 35} B. {15, 1, -35} C. {-15, 1, -35} D. {-3, 3, 63} E. {-3, 3, -35}

30. If $(3n + 11)(n - 7) = 3n^2 + Bn - 77$, find the value of $-5B + 1$.
A. -154 B. -156 C. 51 D. 50 E. -54

31. If y varies directly as x, and $y = 6$ when $x = 2$, find the value of x when y is 24.
A. 20 B. 8 C. 4 D. 12 E. 72

32. The measure of an exterior angle of a regular dodecagon is equal to ____°.
A. 45 B. 60 C. 36 D. 30 E. 24

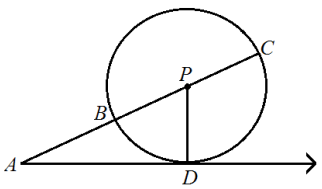
33. When $\frac{a^3b^{-5}c^6}{ab^{-8}c^{-1}}$ is written in simplified form, what is the sum of the exponents?
A. -1 B. 0 C. 7 D. 13 E. 12

34. 101111_2 = _____$_8$
A. 57 B. 37 C. 23 D. 63 E. 53

35. In a quadrilateral with angles measuring a, b, c, and d degrees, the mean of b, c, and d is a. Find the value of a?
A. 30 B. 60 C. 90 D. 36 E. 64

36. Let A equal the value of the growth factor in the exponential growth function $y = 98(2.7)^x$. Find the value of $\frac{1}{3}(10A)$.
A. 9 B. 27 C. 18 D. $5.\overline{6}$ E. 90

37. In the picture below, $m\angle A = 38^\circ$, $\overrightarrow{AD}$ is tangent at D and secant $\overline{ABC}$ passes through the center of $\odot P$. The measure of $\angle BPD =$ ____°.



A. 76 B. 38 C. 54 D. 48 E. 52

38. Convert $\frac{8\pi}{9}$ radians into a degree measure.
A. 210° B. 190° C. 170° D. 160° E. 200°

39. Find the value of 6^x, if $6^{x+2} = 144$?
A. 108 B. 6 C. 1.5 D. 4 E. 36

40. A circle with the equation $(x + 4)^2 + (y - 3)^2 = 144$ is dilated by a scale factor of 3. What is the length of the new circle's diameter?
A. 12 units B. 36 units C. 72 units D. 48 units E. 96 units

41. If $f(x) = 2x^3 + 3$, what is the value of x for which $f(x) = 57$?
A. 3 B. 5 C. 4 D. 4.5 E. 6

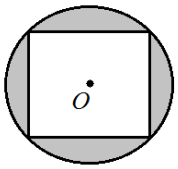
42. Which of the following is equivalent to $\log_2 32 - \log_3 27 - \log_5 25$?
A. 0 B. 1 C. -1 D. 2 E. -2

43. Faith is writing the exponential decay function for the following, "The fish population of a lake is decreasing at a rate of 4% each year. The original population was 62,000. The parks and wildlife department will try and find out how many fish there will be after eight years." What will be the decay factor of Faith's equation?
A. 4 B. 0.04 C. 0.96 D. 0.92 E. 1.04

44. $\frac{1}{4}\begin{bmatrix} 12 & -8 \\ -48 & 0 \end{bmatrix} - \frac{1}{3}\begin{bmatrix} -9 & 0 \\ 33 & -36 \end{bmatrix} =$

A. $\begin{bmatrix} -6 & -2 \\ -23 & 12 \end{bmatrix}$ B. $\begin{bmatrix} 6 & -2 \\ -23 & 12 \end{bmatrix}$ C. $\begin{bmatrix} -6 & -2 \\ 23 & 12 \end{bmatrix}$ D. $\begin{bmatrix} 6 & 2 \\ -23 & -12 \end{bmatrix}$ E. $\begin{bmatrix} 6 & -2 \\ -23 & -12 \end{bmatrix}$

45. The circle below has an area of 49π units^2. Find the area of the shaded region.



A. $49\pi - 49$ units^2 B. $49\pi - 14$ units^2 C. $49\pi - 98$ units^2 D. $49\pi - 196$ units^2 E. $49\pi - 28$ units^2

46. Find the area of the triangle with its vertices located at (-4, -1), (3, -4) and (8, 4).
A. 35.5 units^2 B. 25.5 units^2 C. 40.5 units^2 D. 40 units^2 E. 37.5 units^2

47. The sum of four consecutive positive integers is 202. What is the value of three less than the smallest of these integers?
A. 45 B. 47 C. 46 D. 48 E. 44

48. When rationalizing the denominator of $\frac{8}{4-\sqrt{6}}$, what is the numerator of the resulting simplified fraction?

A. $32 + 8\sqrt{6}$ B. $32 - 8\sqrt{6}$ C. $12 - \sqrt{6}$ D. $16 + 4\sqrt{6}$ E. $8\sqrt{6}$

49. The vertex of the quadratic equation $y = x^2 - 2x + 3$ is translated three units to the right. What is the new quadratic equation after the translation, in vertex form?
A. $y = (x + 4)^2 + 2$ B. $y = (x - 4)^2 + 3$ C. $y = (x + 4)^2 + 3$ D. $y = (x - 4)^2 + 2$ E. $y = (x - 4)^2$

50. At a school play, student tickets cost \$4.00 and adult tickets cost \$5.00. If a total of two hundred twenty tickets were sold for a total of \$1,000.00, how many more adults attended the play than students?
A. 40 B. 30 C. 35 D. 20 E. 18

2015 – 2016 TMSCA Middle School Mathematics Test #12 Answer Key

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

2015 – 2016 TMSCA Middle School Mathematics Test #12 Selected Answers

16. $\frac{7}{12} = 7 \div 12 = 0.58333333333\ldots = 0.58\overline{3}$.

32. To find the exterior angle of a regular polygon, use the formula $\frac{360}{n}$, where n is the number of sides of the polygon. Since it is asking for the exterior angle of a regular dodecagon, we know the polygon has 12 sides. Therefore, the exterior angle of a regular dodecagon is $\frac{360}{12} = 30^{\circ}$.

35. In a quadrilateral with angles measuring a, b, c, and d degrees, the mean of b, c, and d is a. We know that $a + b + c + d = 360$. We also know that $\frac{b+c+d}{3} = a$ and then $b + c + d = 3a$. We can substitute and solve our equation. $a + 3a = 360$, $4a = 360$ and $a = 90$.

45. The formula to find the area of a circle is $A = \pi r^2$. If we know the area of a circle to be 49π, then we can find the radius. $49\pi = \pi r^2$, so $r^2 = 49$ after we divide both sides of the equation by π. Now square root 49 and our radius is 7. If the radius is 7, the diagonal of the square is 14. The formula to find the area of a square is $\frac{d^2}{2}$. So, the area of the square is $\frac{14^2}{2} = \frac{196}{2} = 98$. Therefore, the area of the shaded region is the area of the square subtracted from the area of the circle. The area of the shaded region is $49\pi - 98$ units^2.

49. The quadratic equation $y = x^2 - 2x + 3$ has a vertex that can be found by $\left(\frac{-B}{2A}, f\left(\frac{-B}{2A}\right)\right)$. Using the given equation, we find our vertex to be $\left(\frac{-(-2)}{2(1)}, f\left(\frac{-(-2)}{2(1)}\right)\right) = (1,2)$. If it is translated three units to the right, we add three units to the x-coordinate to find our new vertex, which is $(1, 2) \rightarrow (1+3, 2) \rightarrow (4, 2)$. The vertex form of a quadratic equation is $y = a(x - h)^2 + k$, where the vertex is (h, k). The only equation that has the proper substitution of the vertex coordinates is D, $y = (x - 4)^2 + 2$.