TMSCA MIDDLE SCHOOL

MATHEMATICS

REGIONAL TEST ©

MARCH 5, 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.

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1. Missy is buying a shirt that costs $54.86, a pair of pants for $76.24 and a pair of shoes for $87.29. What is Missy's subtotal, before taxes?

A. $216.49   B. $218.39   C. $221.89   D. $207.29   E. $217.19

2. 72.04 – 28 ¾ = _____ (nearest tenth)

A. 44.4   B. 43.3   C. 43.2   D. 40   E. 43

3. $(68 - 128) \div (-5) =$ _____

A. 12   B. -39.2   C. -141.6   D. -60   E. 20

4. Calculate the product of 47 and the additive inverse of 23.

A. 1,504   B. 1,161   C. -1,161   D. -1,081   E. -1,021

5. What is 12 ½% of 480?

A. 80   B. 60   C. 40   D. 65   E. 75

6. 7.6 kilometers + 6,000 centimeters + 2,000 decimeters = _____ meters

A. 786   B. 78.6   C. 78,600   D. 7,860   E. 786,000

7. How many vertices does a regular pentagonal prism have?

A. 5   B. 12   C. 10   D. 15   E. 7

8. What is the area of the non-shaded region in the picture below?
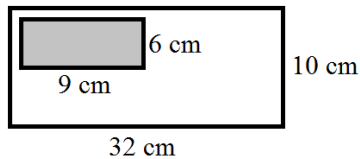
A. 266 cm^2 B. 374 cm^2 C. 290 cm^2 D. 54 cm^2 E. 114 cm^2

9. Simplify: $5n - (8n - 7) + 6(2n - 1)$

A. $9n - 13$ B. $15n - 1$ C. $9n + 1$ D. $9n - 1$ E. $15n + 7$

10. If $a = 5$ and the side length of an equilateral triangle is $7a - 1$, what is the triangle's perimeter?

A. 68 units   B. 98 units   C. 84 units   D. 105 units   E. 102 units

11. The sum of the supplement and complement of a $48°$ angle is equal to ____°.

A. 174   B. 132   C. 196   D. 156   E. 154

12. What is the unit rate of spending $100.80 for two-gross apples?

A. $0.24   B. $0.28   C. $0.25   D. $0.35   E. $0.55

13. 1 cubic yard = _____ cubic feet

A. 36   B. 1,296   C. 27   D. 54   E. 24

14. What number is two-fifths less than the multiplicative inverse of $3\frac{1}{8}$?

A. $-\frac{2}{25}$ B. $\frac{17}{40}$ C. $-\frac{3}{40}$ D. $\frac{18}{25}$ E. $-\frac{18}{25}$

15. What is the probability of rolling a pair of dice and getting a sum divisible by 6?

A. $\frac{1}{3}$ B. $\frac{2}{5}$ C. $\frac{1}{8}$ D. $\frac{2}{9}$ E. $\frac{1}{6}$

16. Of the twenty-four non-overlapping regions created by the nine diagonals in a regular hexagon, how many are not triangles?
A. 18   B. 12   C. 8   D. 6   E. 4

17. Find the value of $2016^2 - 2015^2$.
A. 4,131   B. 4,656   C. 4,625   D. 4,031   E. 4,321

18. Let A equal the set of numbers {12, 14, 9, 17, 18} and B equal the set of numbers {4, 8, 9, 20, 3}. Find the value of the positive difference of the medians of A and B.
A. 0   B. 14   C. 8   D. 6   E. 4

19. Moving only to the left or down, how many paths are there from W to X?

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

20. Solve for n: $\frac{n+2}{5} = \frac{n-1}{4}$
A. 12   B. 13   C. 15   D. 18   E. 23

21. $45_7 = $ _____$_9 + 14_{10}$
A. 33   B. 18   C. 21   D. 19   E. 23

22. Use the examples below to find the value of A.

8	-5		10	3		20	4		16	-7
3	18		9	66		-11	39		14	A

A. 72   B. 69   C. 57   D. 73   E. 61

23. If you add all the lengths of the edges of a cube, the sum is 48 inches. What is the volume of this cube?
A. 64 in^3 B. 512 in^3 C. 216 in^3 D. 54 in^3 E. 96 in^3

24. A fourth of a half of m equals a third of w. If $m = 48$, what is the value of w?
A. 18   B. 6   C. 12   D. 24   E. 3

25. What is the units digit of 4^{11}?
A. 8   B. 4   C. 2   D. 1   E. 0

26. Calculate the sum of the range and mean of the set of numbers 14, 26, 17, 28, 20, 12, 16.
A. 47   B. 56   C. 35   D. 41   E. 38

27. What is the positive difference in the total number of diagonals of a pentagon and the total number of diagonals of an octagon?
A. 18   B. 14   C. 17   D. 16   E. 15

28. A box measuring 12 cm × 10 cm × 7 cm is filled half-way with packing peanuts. What is the volume of the amount of packing peanuts inside the box?
A. 420 cm^3 B. 640 cm^3 C. 840 cm^3 D. 210 cm^3 E. 274 cm^3

29. If x varies directly as y, and $x = 4$ when $y = 48$, find the value of x when $y = 120$.
A. 40   B. 24   C. 10   D. 20   E. 36

30. What is the sum of all the positive integral divisors of the number 120?
A. 360   B. 240   C. 239   D. 480   E. 280

31. Which linear equation below has a slope of ⅔ and passes through the point (12, -9)?
A. $2x + 3y = -9$ B. $2x - 3y = 51$ C. $2x - 3y = -9$ D. $3x - 2y = 51$ E. $3x + 2y = -51$

32. What is the distance of the line segment with endpoints located at (-7, 3) and (5, -2)?
A. 13 units   B. 15 units   C. 9 units   D. 12 units   E. 10 units

33. Choose the linear inequality that matches the graph below.
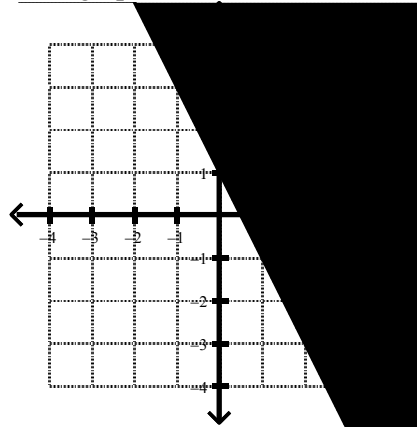
A. $y > 2x + 1$ B. $y \geq -2x + 1$ C. $y \geq \frac{1}{2}x + \frac{1}{2}$ D. $y \leq -\frac{1}{2}x + 1$ E. $y \leq -x + 1$

34. Find the midpoint between the points A and B, if A has coordinates $(3n, 5n)$ and B has coordinates $(n, -2n)$ and $n = 7$.
A. (21, 35)   B. (7, -14)   C. (14, 10.5)   D. (21, 10.5)   E. (14, -14)

35. Convert $\frac{41\pi}{36}$ radians into a degree measure.
A. 205° B. 210° C. 235° D. 224° E. 216°

36. A town population is decreasing at a rate of 70% each year. If the population is 30,000, what will be the population after two years?
A. 86,700   B. 8,670   C. 2,700   D. 14,700   E. 6,030

37. Find the value of $\log_4 64 + \log_3 27 - \log_3 9$.
A. 0   B. 2   C. 4   D. 6   E. 8

38. $48 \begin{bmatrix} \frac{2}{3} & -\frac{3}{4} \\ \frac{1}{4} & \frac{3}{8} \end{bmatrix} =$

A. $\begin{bmatrix} 16 & -18 \\ 6 & 9 \end{bmatrix}$ B. $\begin{bmatrix} 32 & 36 \\ 12 & 18 \end{bmatrix}$ C. $\begin{bmatrix} 64 & 72 \\ 24 & 36 \end{bmatrix}$ D. $\begin{bmatrix} 72 & -36 \\ 12 & 18 \end{bmatrix}$ E. $\begin{bmatrix} 32 & -36 \\ 12 & 18 \end{bmatrix}$

39. Which of the following linear equations are perpendicular?
            I. $4x - y = 10$ II. $y = -¼ x - 3$ III. $y = -4x + 11$ IV. $y = ½ x - 7$
A. I and II   B. II and III   C. I and III   D. II and IV   E. II and IV

40. Find the value of 5^x, if $5^{x+3} = 250$.
A. 125   B. 2   C. 47   D. 3   E. 5

41. The sum of four consecutive positive odd integers is 208. What is the value of seven more than the largest of these integers?
A. 56   B. 58   C. 59   D. 60   E. 62

42. What is the length of the diagonal of a rectangle with side lengths of 4 cm and 6 cm?
A. $4\sqrt{13}$ cm   B. $2\sqrt{6}$ cm   C. $6\sqrt{2}$ cm   D. $13\sqrt{6}$ cm   E. $2\sqrt{13}$ cm

43. Billy can fold one basket of clothes in twelve minutes and Laura can fold the same basket of clothes in eighteen minutes. If they work together, hold long would it take them to fold two baskets of clothes?
A. 12.6 minutes   B. 7.2 minutes   C. 9.4 minutes   D. 14.4 minutes   E. 10.8 minutes

44. If $f(x) = 3x - 7$ and $g(x) = 4x + 3$, find $f(g(a + 1))$.
A. $12a + 14$ C. $12a + 21$ C. $12a - 7$ D. $7a - 3$ E. $7a + 21$

45. In the picture below, $m\angle A = 36°$, $\overrightarrow{AE}$ is tangent at E, and secant $\overline{APD}$ passes through the center of $\odot P$. The measure of $\angle ECD =$ ____°.
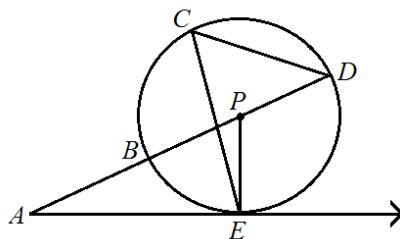
A. 63   B. 54   C. 116   D. 46   E. 58

46. Which expression is equivalent to $\frac{5x}{\sqrt{5}}$?

A. $5x\sqrt{5}$ B. $x\sqrt{5}$ C. $\frac{5}{x}$ D. $\frac{x}{5}$ E. $\frac{x\sqrt{5}}{5}$

47. Find the area of a triangle with its vertices located at (-7, -1), (5, -2) and (2, 6).
A. 38 units^2 B. 38.5 units^2 C. 40 units^2 D. 46 units^2 E. 46.5 units^2

48. Express the inequality below using interval notation.
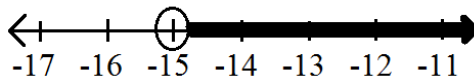
A. $[-15, -\infty]$ B. $(-15, -\infty)$ C. $(-15, \infty)$ D. $(-15, \infty]$ E. $[-15, \infty]$

49. What is the sum of the coordinates of the solution to the system $\begin{cases} 4x + \frac{1}{2}y = -12 \\ 3x + \frac{1}{4}y = -24 \end{cases}$?

A. 138   B. 102   C. 120   D. 92   E. 112

50. If $x + \frac{1}{x} = 4$, what is the value of $x^2 + \frac{1}{x^2}$?
A. 14   B. 16   C. 18   D. 12   E. 20

2015 – 2016 TMSCA Middle School Mathematics Regional Test Answer Key

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

12. We have to remember that one gross = 144 items. So, we must divide $100.80 by $2 \cdot 144$, or 288. $100.8 \div 288 = 0.35$, and we now know that our units rate is $0.35 per apple.

23. A cube has 12 edges, so $48 \div 12 = 4$ inches per edge. The formula for volume of a cube is s^3. So, $4^3 = 64$ and our volume of the cube is 64 in^3.

32. The formula to calculate the distance between two points is $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$. We are given the points (-7, 3) and (5, -2). Substituting our coordinates into our formula and we get $d = \sqrt{(-7 - 5)^2 + (3 - (-2))^2} = \sqrt{(-12)^2 + 5^2} = \sqrt{144 + 25} = \sqrt{169} = 13$. The distance between our given points is equal to 13 units.

36. We must create an exponential function in the form $f(x) = a \cdot b^x$, and since our information says our population is decreasing, it will be an exponential decay function and $0 < b < 1$. To find b, subtract 70% = 0.7 from 1. $b = 1 - 0.7 = 0.3$. Our function is now $f(x) = 30{,}000(0.3)^x$, where x is our amount of years, which gives us $f(2) = 30{,}000(0.3)^2 = 30{,}000(0.09) = 2{,}700$. After two years, our population will be 2,700.

37. We are asked to find $\log_4 64 + \log_3 27 - \log_3 9$. We know that $\log_4 64 = 3$, $\log_3 27 = 3$ and that $\log_3 9 = 2$. So, $\log_4 64 + \log_3 27 - \log_3 9 = 3 + 3 - 2 = 4$.

38. $48 \begin{bmatrix} 2/3 & -3/4 \\ 1/4 & 3/8 \end{bmatrix} = \begin{bmatrix} 48 \cdot 2/3 & 48 \cdot -3/4 \\ 48 \cdot 1/4 & 48 \cdot 3/8 \end{bmatrix} = \begin{bmatrix} 32 & -36 \\ 12 & 18 \end{bmatrix}$.