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 7 , 2 0 1 5

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.

2014-2015 TMSCA Middle School Mathematics Regional Test

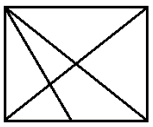
1. 875 + 1,247 + 917 = _____ (nearest hundred)
A. 2,900 B. 2,800 C. 3,000 D. 3,100 E. 3,200

2. $16\frac{2}{5} - 7\frac{3}{4}$ = _____
A. $8\frac{13}{20}$ B. $9\frac{7}{20}$ C. $8\frac{7}{9}$ D. $9\frac{3}{20}$ E. $8\frac{3}{20}$

3. $14.87 \cdot 16.03 =$ _____(nearest hundredth)
A. 238.366 B. 283.16 C. 238.37 D. 283.36 E. 283.166

4. $1{,}478.96 \div 40 =$ _____(nearest ten)
A. 37 B. 36.9 C. 38 D. 30 E. 40

5. In the rectangle below, how many triangles can be found?



A. 10 B. 12 C. 13 D. 14 E. 11

6. If a recipe calls for 2½ cups of water, 4¼ cups of milk and ¾ cup of vegetable oil, how many ounces of liquid does the recipe call for?
A. 30 B. 60 C. 90 D. 120 E. 100

7. 80 is what percent of 500?
A. 16% B. 14% C. 18% D. 15% E. 13.5%

8. Find the positive difference of the GCF of 84 and 56 and the LCM of 32 and 50?
A. 772 B. 828 C. 224 D. 58 E. 282

9. What are the odds of rolling a pair of dice and getting an even sum facing up?
A. 1:1 B. 1:2 C. 1:4 D. 1:3 E. 1:6

10. Solve for *n*: $3n - 7 = 2(n - 9)$
A. $n = -25$ B. $n = -11$ C. $n = 3.6$ D. $n = -3.6$ E. $n = -7$

11. Find $(AB)^2$, if $3{,}960 = 2^A \cdot 3^B \cdot 5 \cdot 11$.
A. 25 B. 36 C. 49 D. 64 E. 81

12. Find the next term in the sequence: 3, 4, 5, 12, 21, 38, 71, …
A. 121 B. 130 C. 142 D. 147 E. 133

13. $54{,}000{,}000{,}000 \div 6{,}000 =$ _____ (scientific notation)
A. 9×10^{10} B. 9×10^{11} C. 9×10^{6} D. 9×10^{-10} E. 9×10^{8}

14. $89 \cdot 12 =$ _____ (Roman numeral)
A. *MXLVIII* B. *CMLXVII* C. *MXLIIX* D. *MLXVIII* E. *MCLXV*

15. When divided by 9, the sum of 456 and 9,564 has a remainder of which of the following?
A. 6 B. 5 C. 7 D. 4 E. 3

16. Simplify: $-5(3n - 9) + 6(4n + 12) - (4n - 11)$
A. $15n + 16$ B. $-9n - 64$ C. $15n + 83$ D. $5n + 128$ E. $5n + 106$

17. How many ways can the letters in the word *SMART* be arranged?
A. 5 B. 120 C. 20 D. 125 E. 75

18. What is the volume of a cylinder that has a radius of 4 inches and a height 13 inches, letting $\pi = 3$?
A. 624 in^3 B. 2,028 in^3 C. 156 in^3 D. 780 in^3 E. 736 in^3

19. Yolanda is buying a shirt for $24.50, a pair of pants for $15.00 and some socks for $8.50. If tax is 8%, what will Yolanda's total bill come out to be?
A. $48.62 B. $48.84 C. $50.76 D. $51.72 E. $51.84

20. If $-7w - 8 = 76$, then $9w + 8$ is equal to which of the following?
A. 84 B. -64 C. -100 D. -108 E. -116

21. $\{A, B, C, D, E, F, G, H, I\} \cap \{A, E, I, O, U\}$ has how many subsets?
A. 4 B. 6 C. 8 D. 12 E. 1,024

22. What is the area of a square with a diagonal of 2.5 cm?
A. 4.125 cm^2 B. 3.125 cm^2 C. 5.25 cm^2 D. 5.75 cm^2 E. 6.25 cm^2

23. $\angle A$ and $\angle B$ are alternate exterior angles. The measure of the complement of $\angle B$ is _____$^\circ$, if the measure of $\angle A = 76.3^\circ$.
A. 13.7 B. 103.7 C. 61.3 D. 73.7 E. 14.7

24. What is the sum of the abscissa of the point (-3, 8) and the ordinate of the point (11, 73)?
A. 5 B. 84 C. -8 D. 81 E. 70

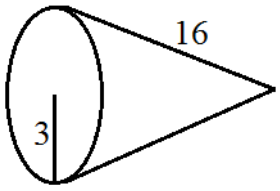
25. What is the simple interest of depositing $3,120 at 5% for 30 months?
A. $390.00 B. $46.80 C. $468.00 D. $540.00 E. $460.00

26. If Yeshi can walk thirty feet in eight seconds, how long would it take Yeshi to walk one mile?
A. $23\frac{7}{15}$ minutes B. 1,408 minutes C. $23\frac{8}{15}$ minutes D. $14\frac{2}{15}$ minutes E. $14\frac{13}{15}$ minutes

27. If the point (3, -11) is reflected over the *x*-axis and then rotated 90° counter-clockwise about the origin, what are its new coordinates?
A. (11, 3) B. (-11, -3) C. (-11, 3) D. (3, 11) E. (-3, -11)

28. $131_4 \times 22_5 + 15_7 =$ _____$_{10}$
A. 2,897 B. 348 C. 360 D. 2,662 E. 285

29. What is the lateral surface area of the cone below, letting $\pi = 3$?



A. 288 $units^2$ B. 48 $units^2$ C. 144 $units^2$ D. 432 $units^2$ E. 72 $units^2$

30. How many positive integral divisors does the number 3,150 have?
A. 24 B. 36 C. 28 D. 32 E. 48

31. Which point could be added to the relation {(3, -5), (9, 10), (1, -1)} to not make it a function?
A. (3, 0) B. (4, -1) C. (11, 10) D. (0, 0) E. (-3, 5)

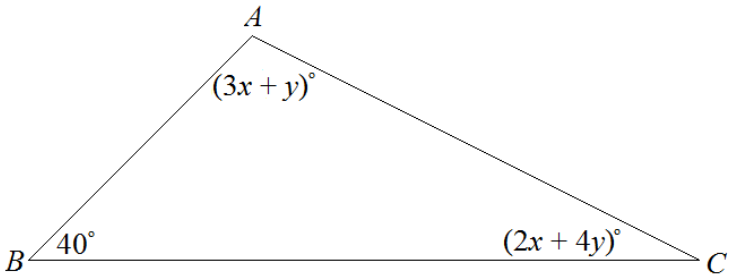
32. Stevie made 70 out of 125 free throws last basketball season. If Stevie maintains his free throw percentage this season, how many free throws must he make if he attempts 200 free throws?
A. 145 B. 56 C. 115 D. 112 E. 120

33. If a regular polygon has 24 sides, the measure of an exterior angle is _____°.
A. 15 B. 30 C. 12 D. 18 E. 24

34. If a box-and-whisker plot were to be made using the data {34, 34, 56, 57, 62, 63, 76, 78, 90}, a number would be considered an outlier if it passed an upper limit. Which of the following is the upper limit?
A. 48 B. 90 C. 125 D. 140 E. 175

35. $\left(\sqrt{3}\right)^6 =$ _____
A. 3 B. ⅓ C. 27 D. 9 E. 81

36. Using the picture below, find the value of $x + y$.



A. 70 B. 140 C. 36 D. 28 E. 32

37. Let z equal the growth factor of the exponential function $y = 3(7.3)^x$. Find the value of $4z + 19$.
A. 44.2 B. 48.2 C. 30.3 D. 142.7 E. 52.2

38. To the nearest whole number, what is the mean absolute deviation to the data set 110, 111, 131, 176 and 172?
A. 27 B. 28 C. 26 D. 29 E. 31

39. What is the area of a hexagon with its vertices located at (-4, -1), (-2, 1), (2, 3), (4, 2), (4, -1), and (2, -3)?
A. 27 units^2 B. 81 units^2 C. 33 units^2 D. 29 units^2 E. 35 units^2

40. $3\sqrt{7}\left(2\sqrt{7} + 3\right) =$ _____
A. $42 + 9\sqrt{7}$ B. $42 + 3\sqrt{7}$ C. $13 + 3\sqrt{7}$ D. $25 + 9\sqrt{7}$ E. $13 + 9\sqrt{7}$

41. B bisects $\overline{AC}$ and C bisects $\overline{AD}$. Find the measure of $\overline{BC}$ if $\overline{AB} = 10x - 1$ and $\overline{CD} = 10x + 18$.
A. 38 units B. 2 units C. 19 units D. 16 units E. 10 units

42. Solve: $-4|2x - 6| = -48$
A. {-3, 6} B. {all real numbers} C. {-3, 18} D. {no solution} E. {-3, 9}

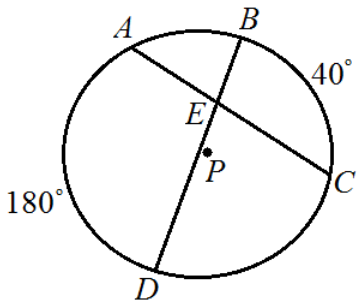
43. The solution to the system $\begin{cases} 5x = 2y + 2 \\ -7x + y = -19 \end{cases}$ is (x, y). Find the value of $x^3 - 7y$.

A. 48 B. -3 C. 127 D. 1 E. 75

44. When factored completely, $6x^3 - 6 = 6(x^2 + x + 1)(\ ?\ )$. Which expression should replace the question mark?

A. $x + 1$ B. $6x$ C. $x - 1$ D. $2x + 1$ E. $x - 6$

45. In the picture below, arc BC $= 40^\circ$ and arc AD $= 180^\circ$. What is the measure of $\angle BEC$? Circle not drawn to scale.



A. 220° B. 120° C. 140° D. 80° E. 110°

46. The hypotenuse of a right triangle is $\sqrt{185}$ inches and legs are 8 and 11 inches. Which equation below could be used to find the angle measure of the angle opposite the shortest leg?

A. $cos^{-1}\left(\frac{8}{11}\right)$ B. $sin^{-1}\left(\frac{8}{11}\right)$ C. $tan^{-1}\left(\frac{\sqrt{185}}{11}\right)$ D. $cos^{-1}\left(\frac{11}{\sqrt{185}}\right)$ E. $tan^{-1}\left(\frac{11}{\sqrt{185}}\right)$

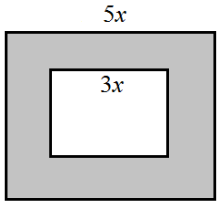
47. When solving the following quadratic equation by completing the square, what would you add to both sides of the equal sign? $x^2 + 6x +$ _____ $= 14 +$ _____

A. 36 B. 12 C. 9 D. 3 E. 25

48. Simplify: $\frac{x^2-16}{x-3} \cdot \left(\frac{x^2-9}{x+4}\right)^1$

A. $\frac{x^2-x+12}{x-3}$ B. $x^2 - x - 12$ C. $\frac{x^2-9}{x-3}$ D. $x^2 - 8x + 16$ E. $\frac{x+4}{x^2-9}$

49. In the picture below, the larger square has a side length of $5x$ units and the smaller square inside the larger has a side length of $3x$ units. If this picture were that of a dartboard, what would be the probability of throwing a dart and it landing in the shaded area?



A. $\frac{9x^2}{25}$ B. $\frac{9}{25x^2}$ C. $\frac{1}{4}$ D. $\frac{9}{25}$ E. $\frac{16}{25}$

50. Simplify: $1 - \frac{1}{1-\frac{1}{x}}$

A. $\frac{x}{x-1}$ B. $\frac{x+1}{x}$ C. $\frac{-1}{x-1}$ D. $\frac{1}{x+1}$ E. $\frac{1}{x-1}$

2014-2015 TMSCA Middle School Mathematics Regional Test Answer Key

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

2014-2015 TMSCA Middle School Mathematics Regional Test Selected Answers

24. (x, y) → (*abscissa*, *ordinate*). We are given the points (-3, 8) and (11, 73). We are asked to find the sum of the abscissa of the first point with the ordinate of the second point, so -3 + 73 = 70.

32. Set up a proportion and solve. $\frac{70}{125} = \frac{x}{200} \rightarrow \frac{14}{25} = \frac{x}{200} \rightarrow 2{,}800 = 25x \rightarrow x = 112.$
Therefore, Stevie must make 112 free throws to maintain his percentage.

33. The formula to find the exterior angle of a regular polygon is $\frac{360}{n}$, where n equals the number of sides of the polygon. If a polygon has 24 sides, then $\frac{360}{24} = 15$. The measure of an exterior angle of a polygon with 24 sides is equal to 15°.

38. To find the mean absolute deviation, first find the mean of the set of numbers, and then find the absolute value of the mean of the difference of each number from the mean.

Numbers given	Absolute value of difference from mean
110	110 – 140 = -30 = 30
111	111 – 140 = -29 = 29
131	131 – 140 = -9 = 9
176	176 – 140 = 36 = 36
172	172 – 140 = 32 = 32
mean: (110 + 111 + 131 + 176 + 172)/5 = 140	Mean abs. dev.: (30 + 29 + 9 + 36 + 32)/5 = 27.2

Therefore the mean absolute deviation is 27.2, which is equal to 27 when rounded to the nearest whole number.

40. $3\sqrt{7}\left(2\sqrt{7}+3\right) = 3\sqrt{7}\cdot 2\sqrt{7} + 3\sqrt{7}\cdot 3 = 6\cdot 7 + 9\sqrt{7} = 42 + 9\sqrt{7}.$

50. $1 - \frac{1}{1-\frac{1}{x}} = 1 - \frac{1}{\frac{x}{x}-\frac{1}{x}} = 1 - \frac{1}{\frac{x-1}{x}} = 1 - 1 \div \frac{x-1}{x} = 1 - \frac{x}{x-1} = \frac{x-1}{x-1} - \frac{x}{x-1} = \frac{x-1-x}{x-1} = \frac{-1}{x-1}.$