



**TMSCA MIDDLE SCHOOL
MATHEMATICS
TEST #12 ©
FEBRUARY 22, 2014**

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.

[illegible]

2013-2014 TMSCA Middle School Mathematics Test #12

1. $12.76 - 9.007 =$ _____

- A. 3.19 B. 3.29 C. 3.763 D. 2.953 E. 3.753

2. What is the sum of the digits of the sum of $9,999 + 1,234$?

- A. 8 B. 10 C. 12 D. 46 E. 23

3. $\left(4\frac{1}{8} - 2\frac{1}{2}\right) \div \frac{1}{2} =$ _____

- A. $3\frac{1}{6}$ B. $3\frac{1}{4}$ C. $4\frac{1}{4}$ D. $4\frac{1}{16}$ E. $3\frac{1}{16}$

4. $\left(6 + \frac{3}{2}\right)^2 =$ _____ (decimal, rounded to the nearest tenth)

- A. 56.2 B. 56.25 C. 56.3 D. 56.4 E. 44.4

5. Express the ratio $\frac{1}{4}$ to 2.5 as a common fraction.

- A. 0.1 B. $\frac{2}{5}$ C. $\frac{1}{5}$ D. $\frac{1}{10}$ E. $\frac{1}{2}$

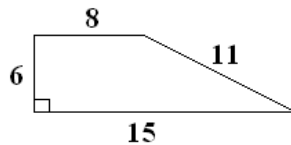
6. It is exactly 8:45 am on a 12-hour clock. What time will it be in exactly 45 hours 20 minutes?

- A. 6:05 am B. 6:15 pm C. 6:15 am D. 5:05 pm E. 7:15 am

7. $70,000,000 \div \frac{1}{4} =$ _____ (scientific notation)

- A. 3.5×10^7 B. 1.4×10^8 C. 1.75×10^7 D. 2.8×10^8 E. 1.75×10^8

8. Find the area of the shape below.



- A. 69 units^2 B. 126.5 units^2 C. 195.5 units^2 D. 52 units^2 E. 40 units^2

9. $41^\circ F =$ _____ $^\circ C$

- A. 10 B. 11 C. 7 D. 5 E. 3

10. 235,000 grams = _____ hectograms

- A. 23,500 B. 2,350 C. 235 D. 23.5 E. 2.35

11. On her birthday, Lindsey and her four friends went to a restaurant. The total bill came out to \$67.36. Because it was her birthday, Lindsey's friends didn't allow her to pay. If each friend added \$2.50 towards the bill as their part of the tip, how much did each friend pay if they split the bill equally?

- A. \$17.09 B. \$16.84 C. \$19.59 D. \$19.34 E. \$17.46

12. $(\{2,3,4,5\} \cup \{4,5,6,7\}) \cup (\{9,8,7,6\} \cap \{4,5,6,7\})$ has _____ elements.

- A. 8 B. 9 C. 7 D. 5 E. 6

13. How many more total diagonals can be drawn in a regular hexagon than a square?

- A. 7 B. 9 C. 6 D. 8 E. 11

14. The supplement to the complement of a 56° angle measures ____°.

- A. 124 B. 132 C. 146 D. 156 E. 134

15. What is the additive inverse to the product of $(-7)(5)(-4)(-2)$?

- A. -190 B. 190 C. 8 D. -280 E. 280

16. If one gross of cookies cost \$36.00, how much does one baker's dozen cost?

- A. \$3.00 B. \$3.25 C. \$3.50 D. \$3.75 E. \$2.75

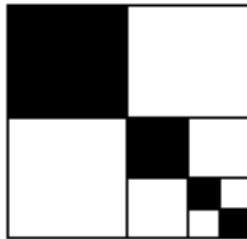
17. 43_5 _____ $_{10}$

- A. 22 B. 23 C. 46 D. 42 E. 37

18. _____ interest is interest calculated on both the amount borrowed and any previous interest.

- A. Exponential B. Variant C. Compound D. Dividend E. Financial

19. What percentage of the square below is shaded?



- A. $\frac{21}{64}$ B. $\frac{11}{32}$ C. $\frac{7}{16}$ D. $\frac{1}{2}$ E. $\frac{5}{8}$

20. Which of the following symbols should replace the question mark to make it true? $\$0.32$? $0.32¢$

- A. < B. = C. π D. > E. \leq

21. Simplify: $|-19 + (-24)| - |-48 - 19|$

- A. -24 B. 14 C. 110 D. 24 E. -14

22. Paul the plumber charges an initial \$75 for a house visit plus \$24 an hour. How many hours did Paul the plumber work if he was paid \$171.00?

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

23. What is the units digit of 3^{14} ?

- A. 1 B. 3 C. 6 D. 7 E. 9

24. What is the sum of all the palindromes between 100 and 150?

- A. 505 B. 604 C. 504 D. 756 E. 605

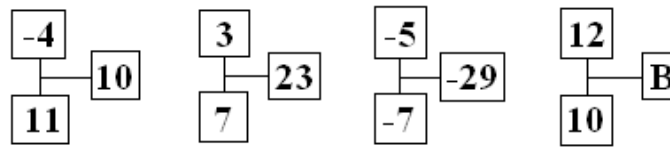
25. If the domain of the function $f(x) = 3x - 4$ is $\{-2, 4, 5\}$, what is the sum of all the range values?

- A. 9 B. 10 C. $\{2, 8, 11\}$ D. $\{-10, 8, 11\}$ E. 21

26. An obtuse triangle has sides measuring 8, 11 and n units. What is the smallest integral value of n ?

- A. 19 units B. 18 units C. 4 units D. 5 units E. 8 units

27. Use the picture below and find a pattern, then find the value of **B**.



- A. 220 B. 122 C. 124 D. 56 E. 64

28. What is the 41st term in the sequence 4, 11, 18, 25, ...?

- A. 291 B. 284 C. 277 D. 298 E. 270

29. How much money will be in Shayna's account if she deposited \$450 in a simple interest account at 5% after 3.5 years?

- A. \$78.50 B. \$528.50 C. \$1,653.75 D. \$472.50 E. \$528.75

30. Simplify: $5\sqrt{24} + 2\sqrt{54} - \sqrt{6}$

- A. $6\sqrt{66}$ B. $7\sqrt{66}$ C. $15\sqrt{6}$ D. $5\sqrt{6}$ E. $16\sqrt{6}$

31. What is the sum of all integers that satisfy $-3 \leq x \leq 4$?

- A. 16 B. 15 C. 4 D. 5 E. 10

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

- A. 32 B. 34 C. 36 D. 38 E. 40

33. 1,000,000 = _____ (Roman numeral)

- A. \overline{C} B. \overline{M} C. \overline{MC} D. \overline{DM} E. \overline{X}

34. How many permutations can be made from 7 items taken 4 at a time?

- A. 840 B. 35 C. 70 D. 920 E. 105

35. Change the linear equation $y = -\frac{2}{3}x - 7$ into standard form.

- A. $2x - 3y = -7$ B. $2x + 3y = -21$ C. $2x + 3y = -7$ D. $2x - 3y = -21$ E. $2x + 3y = 21$

36. The area of an octagon can be found using the formula $A = 2s^2(\sqrt{2} + 1)$. What is the area of an octagon with a side length of $2\sqrt{2}$ cm?

- A. $8 + 8\sqrt{2}$ cm² B. $16 + 16\sqrt{2}$ cm² C. $4 + 4\sqrt{2}$ cm² D. $32 + 32\sqrt{2}$ cm² E. $24 + 24\sqrt{2}$ cm²

37. $23_4 + 52_6 = \text{_____}_8$

- A. 53 B. 75 C. 67 D. 45 E. 66

38. How many positive integers less than 30 are relatively prime to 30?

- A. 8 B. 10 C. 12 D. 14 E. 16

39. Kerry draws a quadrilateral on a sheet of graph paper that has vertices located at (2, 10), (-6, -2), (0, -10) and (4, 8). If Kerry colors half of the quadrilateral's area blue and the other half red, what is the area of the blue colored area?

- A. 84 units² B. 90 units² C. 42 units² D. 60 units² E. 45 units²

40. What is the constant of variation of the direct variation equation $x - 4y = 0$?

- A. -4 B. 4 C. $-\frac{1}{4}$ D. $\frac{1}{4}$ E. $\frac{1}{2}$

41. The points (6, -4) and (-8, -11) lie on the same line. Which of the following points also lies on the same line?

- A. (10, -2) B. (14, -1) C. (2, 6) D. (8, 8) E. (-3, 8)

42. Simplify: $\left(\frac{4ab^2}{5x^3y^2}\right) \cdot \left(\frac{2a^3b^2}{3x^5y}\right) \cdot \left(\frac{8a^4b^4}{15x^8y^3}\right)^{-1}$

- A. -1 B. 0 C. 1 D. $\frac{64a^8b^8}{225x^{16}y^6}$ E. $\frac{14a^8b^8}{23x^{16}y^6}$

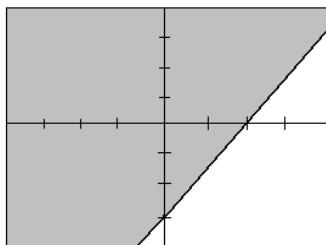
43. What is the rate of decay in the exponential decay function $y = 4 \cdot \left(\frac{3}{5}\right)^x$?

- A. 400% B. 60% C. 46% D. 40% E. 0.6%

44. If $\frac{1}{2} \begin{bmatrix} -46 & 64 \\ 38 & 20 \end{bmatrix} + \frac{3}{4} \begin{bmatrix} 80 & 24 \\ 44 & -16 \end{bmatrix} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, find the value of $a + b - c - d$.

- A. 37 B. 33 C. 13.875 D. 126 E. 11

45. Which linear inequality matches the graph below.



- A. $3x + 2y \leq 6$ B. $x - 2y \geq 6$ C. $3x + 2y \geq 6$ D. $3x - 2y \leq 6$ E. $3x - 2y \geq 6$

46. Simplify: $5i^2(3i - 4i^3) - 2i^{15}$

- A. $-7i$ B. $20i$ C. $17i$ D. $-33i$ E. $-4i$

47. If the solution to the system $\begin{cases} x - (-y) = 30 \\ 4x - 3y - 36 = 0 \end{cases}$ is (x, y) , then find the value of $x^2 - y^2$.

- A. 216 B. -6 C. 30 D. 180 E. 60

48. The center of the circle with the equation $(x - 3)^2 + (y + 4)^2 = 144$ has which set of coordinates?

- A. (3, -4) B. (12, -4) C. (3, 12) D. (4, -3) E. (-3, 4)

49. Which equation below is the inverse of the equation $y = 2x$?

- A. $y = 2x$ B. $y = 4x$ C. $y = 0.2x$ D. $y = \frac{1}{2}x$ E. $y = x$

50. A primitive Pythagorean triple is a Pythagorean triple in which a , b and c are relatively prime, for example, (3, 4, 5). How many primitive Pythagorean triples are there with $c \leq 50$?

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

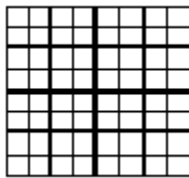
2013-2014 TMSCA Middle School Mathematics Test #12 Answer Key

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

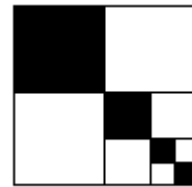
2013-2014 TMSCA Middle School Mathematics Test #12 Selected Solutions

16. One gross = 144 items, so one gross cookies = 144 cookies. First find the amount of one cookie, $\frac{\$36.00}{144} = \0.25 . One baker's dozen cookies = 13 cookies. To find the amount one baker's dozen costs, multiply: $13(0.25) = \$3.25$.

19. Recreate the original square to see how many small squares lie within the original.



From this, we now look at the given square,



We can now see that 22 out of 64 squares are shaded, so $\frac{22}{64} = \frac{11}{32}$.

20. $0.32\text{¢} = \$0.0032$. Thus, $\$0.32 > \0.0032 .

41. The line that passes through the points (6, -4) and (-8, -11) must be found first. The slope is equal to $\frac{-4 - (-11)}{6 - (-8)} = \frac{7}{14} = \frac{1}{2}$ and using one of the points, $y + 4 = \frac{1}{2}(x - 6) \rightarrow y = \frac{1}{2}x - 7$. Now substitute in the value and find which one makes the equation true. The answer is (10, -2) because $-2 = \frac{1}{2}(10) - 7$.

46. Remember, $i = i$, $i^2 = -1$, $i^3 = -i$ and $i^4 = 1$. So, now simplify:
 $5i^2(3i - 4i^3) - 2i^{15} = 5(-1)(3i - 4(-i)) - 2(-i) = -5(3i + 4i) + 2i = -5(7i) + 2i = -35i + 2i = -33i$.

50. There are 7 primitive Pythagorean Theorem triples with $c \leq 100$. They are as follows: (3, 4, 5), (5, 12, 13), (8, 15, 17), (7, 24, 25), (20, 21, 29), (12, 35, 37), and (9, 40, 41).