TMSCA MIDDLE SCHOOL MATHEMATICS TEST #2 ©

OCTOBER 28, 2017

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 on Scantrons and Chatsworth cards.
3. If you are using a Chatsworth or Scantron card, please follow the specific instructions given at your particular meet.
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.

2017 – 2018 TMSCA Middle School Mathematics Test #2

1. 329 + 478 = _____

A. 787 B. 817 C. 797 D. 807 E. 777

2. 306 – 167 = _____

A. 139 B. 141 C. 131 D. 149 E. 143

3. 147×34 = _____

A. 4,828 B. 4,998 C. 4,768 D. 4,528 E. 4,868

4. $2{,}574 \div 78$ = _____

A. 38 B. 33 C. 43 D. 48 E. 36

5. Calculate the range of the set of numbers {342, 564, 871, 399, 287, 119}.

A. 752 B. 370.5 C. $430.\overline{3}$ D. 990 E. 584

6. Maria's dog had a puppy that weighed 1.4 lbs at birth. At the end of 9 months, Maria's puppy weighed 25½ times its birth weight. How heavy was Maria's puppy at the end of 9 months.

A. 31.5 lbs B. 34.3 lbs C. 36.3 lbs D. 35.7 lbs E. 34.7 lbs

7. What is the perimeter of a regular pentagon with a side length of 17.4 cm?

A. 70 cm B. 87 cm C. 95 cm D. 104.4 cm E. 69.6 cm

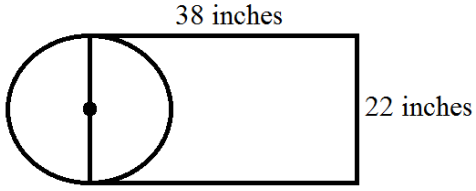
8. Melissa's cat weighs 176 ounces. How many pounds does Melissa's cat weigh?

A. 11 pounds B. 12 pounds C. 9 pounds D. 10 pounds E. 9.8 pounds

9. On a trivia test, Michaela had to answer 20 questions. She received 5 points for each correct answer. Which equation can be used to find *S*, the total score Michaela earned for answering *Q* questions correctly?

A. $S = Q(20 - 4)$ B. $S = 20(Q - 4)$ C. $S = 5Q$ D. $S = 20Q$ E. $S = 4(20Q)$

10. If $\pi = 3$, what is the area of the circle in the figure below?



A. 836 in^2 B. 1,452 in^2 C. 363 in^2 D. 120 in^2 E. 132 in^2

11. Solve for *m*: $\frac{12}{m} = \frac{9}{10}$

A. $10\frac{4}{5}$ B. $13\frac{1}{3}$ C. $13\frac{2}{3}$ D. $13\frac{4}{5}$ E. $10\frac{3}{10}$

12. 18 is 45% of what number?

A. 52 B. 48 C. 43 D. 40 E. 54

13. Simplify: $6^2 - (2^3 - 10)^2$

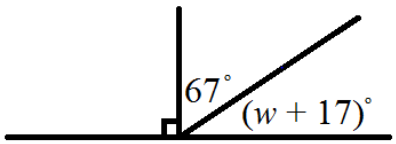
A. 36 B. 32 C. 40 D. 128 E -4

14. If $1 < a < b < c < 7$, and *a*, *b* and *c* are integers with the product of *a* and *c* equaling an odd integer, what is the value of $2b + 5$?

A. 11 B. 13 C. 14 D. 12 E. 18

15. 4.9 tons = _____ pounds
A. 9,760 B. 9,450 C. 9,920 D. 9,800 E. 9,600

16. Find the value of *w* below.



A. 16 B. 13 C. 6 D. 9 E. 8

17. $2{,}000^2$ = _____ (scientific notation)
A. 2×10^{-6} B. 4×10^{-6} C. 4×10^{6} D. 20×10^{6} E. 40×10^{6}

18. 223 dimes + 123 nickels – 37 quarters – 256 pennies = _____
A. \$16.64 B. \$16.46 C. \$21.76 D. \$22.84 E. \$18.78

19. Which expression represents "seven more than the product of two numbers"?
A. $7mn$ B. $7m + n$ C. $7n + m$ D. $mn + 7$ E. $\frac{m}{n} + 7$

20. Mrs. Wilson is making bracelets for all the students in band and choir. There are 72 students in band and 45 students in choir. If it costs \$0.45 to make each bracelet, how much will it cost Mrs. Wilson to make each student a bracelet?
A. \$32.40 B. \$20.25 C. \$54.65 D. \$52.25 E. \$52.65

21. Simplify: $4n + 8n - 7n + 3(2n - 6)$
A. $12n - 18$ B. $6n - 18$ C. $30n - 6$ D. $11n - 6$ E. $11n - 18$

22. If $m \blacktriangle n = m^n + 3n$, then find the value of $(-6) \blacktriangle 2$.
A. 42 B. -30 C. -36 D. -6 E. 18

23. Lindsey has 2.5 gallons of lemonade in a container for a family reunion. She pours 64 ounces more lemonade into the container. Lindsey's friend accidentally spills 3 gallons of the lemonade. How much lemonade is still in the container?
A. 64 ounces B. 32 ounces C. 1.5 gallons D. 0 ounces E. 1 gallon

24. What is the sum of the first 24 positive odd numbers?
A. 624 B. 528 C. 576 D. 784 E. 584

25. How many positive integral divisors does the number 520 have?
A. 16 B. 12 C. 20 D. 24 E. 48

26. Simplify: $\frac{15y^{12}}{3y^3}$
A. $12y^{15}$ B. $12y^9$ C. $5y^9$ D. $5y^{15}$ E. $5y^4$

27. What is the value of the median of all prime numbers between 20 and 50?
A. 33 B. 37 C. 41 D. 29 E. 35

28. Find the value of *n*, if $4! + 5! = n^2$.
A. 3 B. 12 C. 14 D. 8 E. 3!

29. _____ angles are not always congruent?
A. vertical B. alternate interior C. alternate exterior D. corresponding E. same-side interior

30. What is the 21st term of the sequence? 11, 17, 23, 39, …
A. 126 B. 131 C. 127 D. 135 E. 137

31. 231_{10} = _____ (base 6)
A. 1021 B. 1022 C. 1023 D. 1121 E. 1123

32. MMDIX + CCCXXXIV = _____ (Roman numeral)
A. MMDCCCXLIII B. MMDCCLXVII C. MMCCCXLIX D. DCCCIX E. MMDCXVII

33. How many subsets can be formed from set *A*, if $A = \{a, b, c, d, e\}$?
A. 32 B. 64 C. 16 D. 1 E. 128

34. How many different ways can Saila arrange her five different toy ponies in a line on her dresser?
A. 15 B. 5 C. 120 D. 100 E. 125

35. Two sides of a triangle measure 15 cm and 18 cm. What is the largest possible integral length of the third side?
A. 33 cm B. 34 cm C. 30 cm D. 32 cm E. 31 cm

36. If $h(x) = 10x - 8x^2$, then find the value of $h\left(\frac{1}{2}\right)$.
A. 1 B. 3 C. -11 D. -6 E. 14

37. Which of the following functions is an example of an exponential decay function?
A. $y = 17(1.001)^x$ B. $y = 0.45(4.11)^x$ C. $y = 0.007(9)^x$ D. $y = 0.8(0.61)^x$ E. $y = 231\left(\frac{5}{4}\right)^x$

38. Which of the following linear equations is in standard form?
A. $3x = 19y$ B. $y = 24x - 7$ C. $y + 4 = 3(x - 1)$ D. $\frac{1}{2}x + \frac{1}{4}y = \frac{3}{4}$ E. $5x - 6y = 2$

39. What is the measure of an exterior angle of a regular decagon?
A. 72° B. 60° C. 36° D. 45° E. 30°

40. What is the slope of the line passing through the points (14, 6) and (24, 2)?
A. $-\frac{5}{2}$ B. $-\frac{2}{5}$ C. $\frac{2}{5}$ D. $\frac{5}{2}$ E. $-\frac{7}{2}$

41. Simplify: $\sqrt{24} + \sqrt{150}$
A. $87\sqrt{6}$ B. $7\sqrt{6}$ C. $3\sqrt{14}$ D. $14\sqrt{6}$ E. $6\sqrt{5} + 6\sqrt{2}$

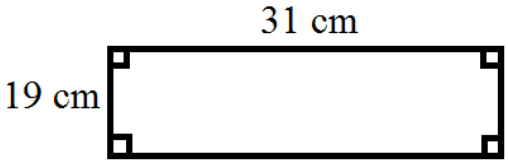
42. Find *x*, if the product of $(6n - 5)$ and *x* is equal to $48n^2 - 10n - 25$.
A. $8n + 5$ B. $8n - 5$ C. $8n - 20$ D. $8n + 20$ E. $8n^2 - 4n + 5$

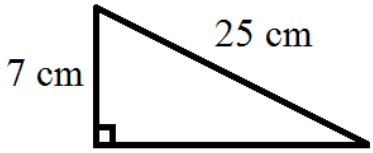
43. What is the sum of the positive integral solutions to the inequality $1 - m > -4$?
A. 15 B. 10 C. 21 D. 16 E. 14

44. How many solutions does the quadratic equation $0 = x^2 - 8 + 10x$ have?

A. 0 B. 1 C. 2 D. infinitely many E. 3

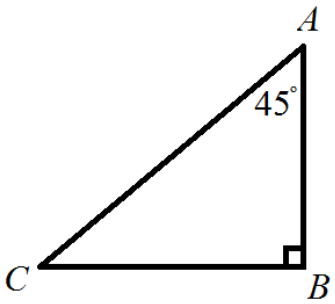
45. What is the combined perimeters of the figures?





A. 156 cm B. 82 cm C. 132 cm D. 175 cm E. 134 cm

46. In ΔABC, $m\angle A = 45^\circ$, $m\angle B = 90^\circ$ and $AB = 26$ inches. Find *AC*.



A. 26 inches B. $13\sqrt{2}$ inches C. $26\sqrt{3}$ inches D. $13\sqrt{3}$ inches E. $26\sqrt{2}$ inches

47. The sum of two numbers is 131 and their difference is 47. What is the value of the larger number?

A. 89 B. 93 C. 87 D. 91 E 77

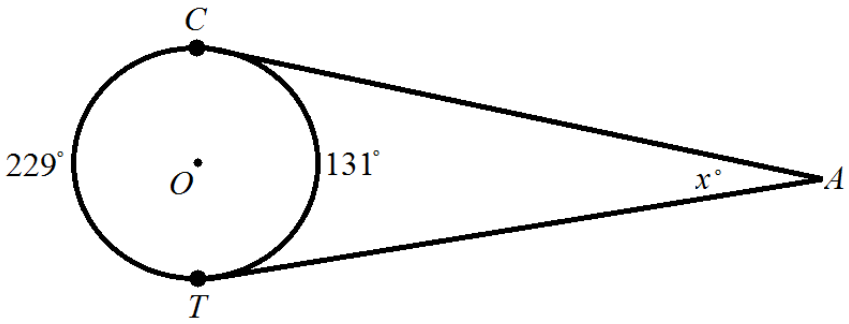
48. A hiker travels 18 kilometers north and then 24 kilometers west. What is the shortest distance the hiker will have to travel to return to his starting point?

A. 28 kilometers B. 32 kilometers C. 36 kilometers D. 34 kilometers E. 30 kilometers

49. Solve for *a*, using the formula $M = \frac{3(a+b)}{d}$

A. $a = 3Md - b$ B. $a = \frac{Md}{3} - b$ C. $a = \frac{Md-b}{3}$ D. $a = \frac{3Md}{b}$ E. $a = \frac{Md}{3b}$

50. $\overline{CA}$ and $\overline{TA}$ are both tangent to $\odot O$. What is the value of *x*?



A. 98 B. 65.5 C. 76.5 D. 49 E. 35

2017 – 2018 TMSCA Middle School Mathematics Test #2 Answer Key

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

2017-2018 TMSCA Middle School Mathematics Test #2 Selected Answers

14. *a*, *b* and *c* are integers with the product of *a* and *c* equaling an odd integer and $1 < a < b < c < 7$. In order for their product to be an odd integer, *a* and *c* must be odd because $even \times even = even, even \times odd = even$ and $odd \times odd = odd$. If $1 < a < b < c < 7$, then *a* = 3 and *c* = 5. Also, *b* must be 4 to satisfy $1 < a < b < c < 7$. If *b* = 4, then 2(4) + 5 = 8 + 5 = 13.

15. If 1 ton = 2,000 pounds, then 2.9 tons is equal to $4.9(2{,}000) = 9{,}800$ pounds.

21. $4n + 8n - 7n + 3(2n - 6) = 4n + 8n - 7n + 3(2n) - 3(6) = 4n + 8n - 7n + 6n - 18 = 11n - 18.$

26. The quotient rule of exponents states that to divide two exponents with the same base, you keep the base and subtract the exponents. Algebraically, the rule is $\frac{a^m}{a^n} = a^{m-n}$. We are given $\frac{15y^{12}}{3y^3}$, so by using the quotient rule, $\frac{15y^{12}}{3y^3} = \frac{15}{3} \cdot \frac{y^{12}}{y^3} = 5 \cdot y^{12-3} = 5y^9$.

28. 4! + 5! = $4 \cdot 3 \cdot 2 \cdot 1 + 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 24 + 120 = 144 = n^2$. Square root both sides and $\sqrt{n^2} = \sqrt{144} = 12 = n$.

30. The sequence given is an arithmetic sequence because it has a common difference of 6. To find the n^{th} term of an arithmetic sequence, use $a_n = a_1 + (n-1)d$, where a_1 is the first term of the sequence, *n* is the term position and *d* is the common difference. Substituting and we get $a_{21} = 11 + (21-1)(6) = 11 + (20)(6) = 11 + 120 = 131$.

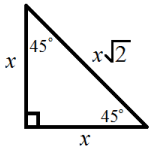
33. To find the number of subsets of a set, use 2^n, where *n* is equal to the number of elements of the set. Set *A* has five elements, so the number of subsets of set *A* is $2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$.

38. Standard form of a linear equation is in the form *Ax* + *By* = *C*, where *A*, *B* and *C* are integers. 5*x* – 6*y* = 2 is the only choice of a linear equation in standard form.

39. The formula to find the measure of an exterior angle of a regular polygon is $\frac{360}{n}$, where *n* is the number of sides of the polygon. A decagon has 10 sides, so *n* = 10. Substituting into the formula and $\frac{360}{n} = \frac{360}{10} = 36^\circ$. The measure of an exterior angle of a regular decagon is 36°.

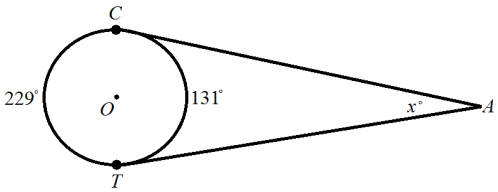
40. The symbol for slope is *m*. The formula to find the slope of a line when given two points is $m = \frac{y_2 - y_1}{x_2 - x_1}$. We are given the points (14, 6) and (24, 2). We will call (14, 6) point 1 , so 14 = $x_1$and $6 = y_1$, and (24, 2) point 2, so $24 = x_2$ and $2 = y_2$. Substituting into the formula and $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2-6}{24-14} = \frac{-4}{10} = -\frac{2}{5}$. The slope of the line is $-\frac{2}{5}$.

46. In a 45-45-90 right triangle, the angles are in the ratio *x*:*x*:$x\sqrt{2}$, respectively.



If given a side length, multiply it by $\sqrt{2}$ to find the hypotenuse. We are given a side length of 26 inches, so $26(\sqrt{2}) = 26\sqrt{2} = AC$.

50. The measure of an angle formed outside of a circle by two tangents is ½ the difference of the intercepted arcs.



From the picture, $m\angle CAT = \frac{1}{2}(229 - 131) = \frac{1}{2}(98) = 49^\circ$. Therefore, the value of *x* is 49.