

**TMSCA MIDDLE SCHOOL  
MATHEMATICS  
TEST #11 ©  
FEBRUARY 11, 2017**

**GENERAL DIRECTIONS**

- About this test:
  - You will be given 40 minutes to take this test.
  - There are 50 problems on this test.
- 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.
- If you are using a Chatsworth or Scantron card, please follow the specific instructions given at your particular meet.
- You may write anywhere on the test itself. You must write only answers on the answer sheet.
- You may use additional scratch paper provided by the contest director.
- All problems have **ONE** and **ONLY ONE** correct [BEST] answer. There is a penalty for all incorrect answers.
- Calculators **MAY NOT** be used on this test.
- 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.
- In case of ties, percent accuracy will be used as a tie breaker.



1. Which of the following expressions is not equal to  $-76$ ?

- I.  $85 - 163 + 2$       II.  $519 - 594$       III.  $27 - 59 - 43$       IV.  $-119 + 43$   
 A. II only      B. I only      C. III only      D. I and IV      E. II and III

2. Logan bought a mystery box at a fundraiser. Inside the box were a dozen smaller boxes, each contained ten packs of beef jerky. If each pack of jerky contained eight ounces of jerky, how many ounces of jerky does Logan have total?

- A. 120 ounces      B. 1,520 ounces      C. 1,920 ounces      D. 960 ounces      E. 1,240 ounces

3. What is the value of  $m$ , if  $846 \div 0.4 = 45m$ ?

- A. 47      B. 14.5      C. 45.8      D. 51      E. 73

4. The area of a rectangle is  $53.48 \text{ cm}^2$ . If the length of the rectangle is 1.4 cm, what is the width of the rectangle?

- A. 36.4 cm      B. 38.2 cm      C. 36.7 cm      D. 38.7 cm      E. 36.2 cm

5. Two pages that face each other in a book have 575 as the sum of their page numbers. What is the product of these page numbers?

- A. 82,080      B. 82,656      C. 82,369      D. 82,944      E. 82,648

6. Rounded to the nearest thousand, what is the product of the LCM of 22 and 46 and the LCM of 48 and 52?

- A. 315,000      B. 315,700      C. 316,000      D. 300,000      E. 320,000

7. Calculate the total cost of buying a pair of jeans for \$38.00 with a 9.5% tax.

- A. \$41.21      B. \$40.71      C. \$40.11      D. \$41.61      E. \$41.91

8. The number 24 is divisible by its unit digit 4. How many whole numbers between 12 and 40 are also divisible by their unit's digit?

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

9. Which polynomial below does not have a degree of 7?

- A.  $9x^3y^4$       B.  $5x^5 + x^2 + 4$       C.  $2xy^6 + 3x^2y^3$       D.  $x^5y^2 - y$       E.  $5 + y^2 - 2y^7$

10. If  $a = -2$ ,  $b = 3$  and  $c = 4$ , evaluate the expression  $\left(\left(\frac{1}{2}a + \frac{2}{3}b\right)\left(-\frac{1}{4}c\right)\right)^2$ .

- A. 16      B. 0      C. 1      D. 4      E. 9

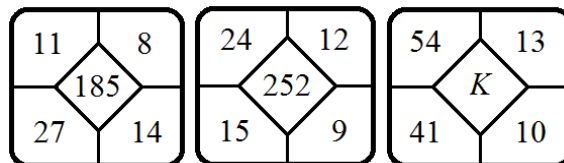
11.  $(419 - 467)^2 =$  \_\_\_\_\_ (Roman numeral)

- A. MCMCCVI      B. MMCCVI      C. MMCCCIV      D. MMCCCVI      E. CCDIV

12.  $(1.8 \times 10^7)(7.5 \times 10^{-3}) =$  \_\_\_\_\_ (scientific notation)

- A.  $13.5 \times 10^4$       B.  $1.35 \times 10^4$       C.  $1.35 \times 10^{-10}$       D.  $1.35 \times 10^{-21}$       E.  $1.35 \times 10^5$

13. Use the examples below to find the value of  $K$ .

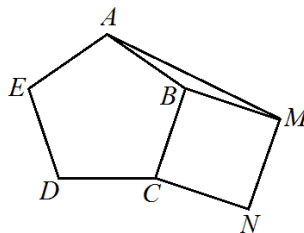


- A. 2,084      B. 918      C. 292      D. -7      E. 710

14. What is the sum of all the two-digit multiples of the number 19?

- A. 190      B. 285      C. 266      D. 304      E. 247

15. Lindsey's monthly salary is \$2,250 plus 5% commission on her sales for the month. If Lindsey was paid \$8,650 for the month of December, how much in sales did Lindsey sell?  
 A. \$146,000      B. \$132,000      C. \$128,000      D. \$136,000      E. \$124,000
16. On a map,  $\frac{1}{4}$  inch = 13 miles. If the distance between two cities on a map is 5.2 inches, what is the actual distance between the two cities, in miles?  
 A. 67.6 miles      B. 270.4 miles      C. 67.4 miles      D. 338.2 miles      E. 250.6 miles
17. Eleanor went to the local grocery store and is buying specialty candy. The specialty candy costs \$4.80 per one-half pound. To the nearest penny, how much will Eleanor pay before taxes for the 30 ounces of specialty candy she is buying?  
 A. \$9.00      B. \$9.75      C. \$12.50      D. \$18.00      E. \$20.50
18. Calculate the mean of the means of the four sets of numbers below.  
 $\{6, 8, 10, 80\}$        $\{17, 18, 45, 56\}$        $\{1, 3, 75, 105\}$        $\{4, 16, 28, 88\}$   
 A. 32      B. 45      C. 36      D. 41      E. 35
19. A right triangle has legs measuring 16 inches and 30 inches. What is the perimeter of the triangle after a dilation by a scale factor of 2?  
 A. 180 inches      B. 100 inches      C. 160 inches      D. 240 inches      E. 172 inches
20.  $12!$  ends in how many zeroes?  
 A. 2      B. 4      C. 3      D. 5      E. 6
21. Banita rolls a pair of dice and adds the sum of the faces facing up. What is the probability Banita's sum is not eight?  
 A.  $\frac{1}{3}$       B.  $\frac{31}{36}$       C.  $\frac{5}{36}$       D.  $\frac{5}{18}$       E.  $\frac{13}{18}$
22.  $\angle X$  and  $\angle Y$  are complementary angles and  $m\angle X = (3x + 7)^\circ$  and  $m\angle Y = (2x + 13)^\circ$ . What is the measure of the supplement of  $\angle Y$ ?  
 A.  $41^\circ$       B.  $49^\circ$       C.  $139^\circ$       D.  $141^\circ$       E.  $119^\circ$
23. If  $m\sqrt{n} = \frac{m}{4} - \frac{n}{5} + \frac{m+n}{2}$ , then find the value of  $(10\sqrt{8})$ .  
 A. 40.9      B. 9.9      C. 0.9      D. 4.95      E. 18.9
24.  $400_{10} - 245_9 = 111_6 + \text{_____}_{10}$   
 A. 44      B. 51      C. 112      D. 197      E. 154
25. You are given a list of numbers  $\{a, b, c, d, e, f, g\}$ . The average of the first four numbers is 6 and the average of the last four numbers is 16. 11 is the average of all seven numbers. Which of the following is the number that is common to both sets of four numbers?  
 A. 11      B. 7      C. 13      D. 9      E. 8
26. Regular pentagon  $ABCDE$  and square  $BMNC$  share a common side, as below. What is the measure of  $\angle BAM$ ?



- A.  $6^\circ$       B.  $11^\circ$       C.  $18^\circ$       D.  $9^\circ$       E.  $7^\circ$

27. Find the value of  $\frac{1}{2}A + \frac{3}{8}B$ , if  $-5(3x + 6y) - 3(4y - 8x) = Ax + By$ .

- A.  $20\frac{1}{4}$                       B.  $19\frac{3}{4}$                       C.  $-13\frac{5}{8}$                       D.  $-11\frac{1}{4}$                       E.  $6\frac{7}{8}$

28. A rectangular garden measures 10.5 feet by 4.5 feet. 6 pounds of mulch come in one single bag and can cover 3 square feet. One bag of mulch costs \$2.80. How much will it cost to cover the entire garden if you must buy whole bags?

- A. \$36.40                      B. \$42.60                      C. \$43.20                      D. \$48.40                      E. \$44.80

29. The angle ratio in a triangle is 2:5:8. How much larger is the largest angle than the smallest angle?

- A.  $64^\circ$                       B.  $72^\circ$                       C.  $60^\circ$                       D.  $74^\circ$                       E.  $62^\circ$

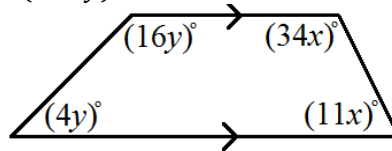
30. The product of 135 and  $276$  is  $2V,160$ . What is the value of  $2(T+V)$ ?

- A. 18                      B. 20                      C. 16                      D. 30                      E. 22

31. A trapezoid has its vertices located at (4, 10), (27, 10), (10, 15) and (6, 15). What is the measure of the median of the trapezoid?

- A. 27 units                      B. 19 units                      C. 27.5 units                      D. 11.5 units                      E. 13.5 units

32. Using the picture below, find the value of  $(x + y)^2$ .



- A. 144                      B. 169                      C. 196                      D. 256                      E. 324

33. Which of the following is not part of the solution set to the inequality?  $10 < 7x + 3 < 24$

- A. 1.5                      B. 2                      C. 2.5                      D. 1.75                      E. 1

34. A rectangular prism has a height that is one more than its width and a length that is two more than its width. What is the volume of six of these boxes?

- A.  $6w^3 + 18w^2 + 12w$     B.  $6w^3 + 12w^2 + 18w$     C.  $3w^3 + 6w^2 + 4w$         D.  $2w^3 + 9w^2 + 12w$     E.  $3w^3 + 9w^2 + 12w$

35. The advertising company *We Sell for You* spends  $x$  dollars on software and  $y$  dollars on paper. *We Sell for You* calculates its profit of each client by the equation  $f(x, y) = 40,000 - 40x - 22y$ . What is the profit of one client if *We Sell for You* spends \$240 on software and \$140 on paper?

- A. \$23,720                      B. \$23,640                      C. \$27,230                      D. \$27,620                      E. \$27,320

36. Find the area of a segment of a circle with a central angle of  $60^\circ$  and a diameter of 24 inches.

- A.  $36\pi - 24\sqrt{3} \text{ in}^2$     B.  $12\pi - 18\sqrt{3} \text{ in}^2$     C.  $24\pi - 36\sqrt{3} \text{ in}^2$     D.  $24\pi - 12\sqrt{3} \text{ in}^2$     E.  $24\pi - 18\sqrt{3} \text{ in}^2$

37. 70% of Mika's friends like vanilla ice-cream and 42% of his friends like both vanilla and chocolate ice-creams. What is the probability that a friend of Mika's who likes vanilla ice-cream also likes chocolate ice-cream?

- A. 80%                      B. 40%                      C. 60%                      D. 28%                      E. 42%

38. A triangle has side lengths of 12, 21 and  $w$  units. What is the sum of all the possible integral lengths of  $w$ ?

- A. 483                      B. 484                      C. 452                      D. 505                      E. 491

39. What is the 7<sup>th</sup> term of the sequence?  $284\frac{4}{9}, 213\frac{1}{3}, 160, 120, 90, \dots$

- A.  $50\frac{5}{8}$                       B.  $67\frac{1}{2}$                       C.  $45\frac{1}{3}$                       D.  $45\frac{5}{9}$                       E.  $48\frac{1}{2}$

40. What is the value of  $W$ , if  $\frac{a^{3/4}b^{2/3}c^{1/2}}{(a^{1/2}b^{1/4}c^{2/3})^2} = \frac{b^{1/6}}{a^{1/4}c^W}$ .

- A.  $\frac{3}{8}$                       B.  $\frac{1}{6}$                       C.  $\frac{1}{36}$                       D.  $\frac{7}{6}$                       E.  $\frac{5}{6}$

41. Chords  $AB$  and  $CD$  intersect in a circle at point  $P$ . If  $\overline{AP}$  has a measure of 2 units,  $\overline{CP}$  has a measure of 6 units and  $\overline{CD}$  has a measure of 14 units, what is the measure of  $\overline{PB}$ ?

- A. 14 units                      B. 18 units                      C. 24 units                      D. 28 units                      E. 42 units

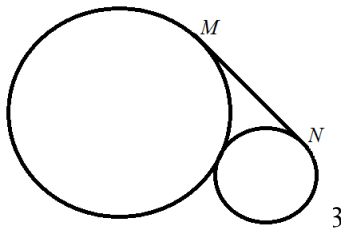
42. Between which two points below is the distance between them exactly 17 units?

- A. (7, 5) & (23, 5)                      B. (-11, 3) & (-8, 20)                      C. (3, 4) & (20, 21)                      D. (5, -3) & (-10, 5)                      E. (32, 24) & (27, 12)

43. Which of the following sets of numbers does not form a Pythagorean triple?

- A. 9, 40, 41                      B. 12, 35, 37                      C. 20, 21, 29                      D. 14, 48, 50                      E. 11, 60, 63

44. Two circles with radii 1 inch and 6 inches are tangent, as in the picture below. The point  $N$  is on the smaller circle,  $M$  is on the larger circle, and  $\overline{MN}$  is tangent to both circles. Find the length of  $\overline{MN}$

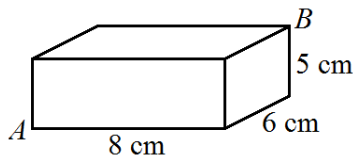


- A.  $2\sqrt{6}$  inches                      B. 5 inches                      C. 7 inches                      D.  $5\sqrt{2}$  inches                      E.  $5\sqrt{6}$  inches

45. If we know that  $x^2 + x + 1 = 0$ , then what is the value of  $x^3$ ?

- A. 1                      B. 0                      C. 2                      D.  $\frac{1}{2}$                       E.  $\frac{1}{4}$

46. In the rectangular prism below, what is the shortest distance from  $A$  to  $B$ ?



- A. 19 cm                      B. 10 cm                      C.  $10\sqrt{5}$  cm                      D.  $5\sqrt{5}$  cm                      E.  $5\sqrt{3}$  cm

47. It takes a boat 8 hours to travel 80 kilometers upstream and 5 hours for the boat to travel the same distance downstream. Find the speed of the boat in still water.

- A. 11 km/hr                      B. 13 km/hr                      C. 3 km/hr                      D. 7 km/hr                      E. 15 km/hr

48. What is the equation of the parabola that passes through the points (9, 12), (-3, 0) and (0, -24)?

- A.  $y = x^2 + 5x + 24$                       B.  $y = x^2 - 4x - 32$                       C.  $y = x^2 + 6x - 24$                       D.  $y = x^2 - 5x - 24$                       E.  $y = x^2 - 5x + 24$

49. A square has a side length of  $5M - 3$ . What is the perimeter of the square if  $M = \frac{6x^2+6x-120}{2x^2+8x-10} \div \frac{3x^2-48}{4x^2+12x-16}$ ?

- A. 52 units                      B. 68 units                      C. 72 units                      D. 82 units                      E. 77 units

50. Last year, there were thirty more girls than boys in the math club. This year the number of math club members has increased by 20%, the number of boys has increased by 40% and the number of girls has increased by 10%. How many members are there in the math club this year?

- A. 92                      B. 98                      C. 108                      D. 112                      E. 104

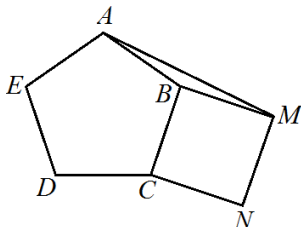
2016 – 2017 TMSCA Middle School Mathematics Test #11 Answer Key

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

14. The two-digit multiples of 19 are 19, 38, 57, 76 and 95. Thus,  $19 + 38 + 57 + 76 + 95 = 285$ .

20.  $12! = 12 \cdot 11 \cdot 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 2^{10} \cdot 3^5 \cdot 5^2 \cdot 7 \cdot 11$ . We want to only look at the  $2^{10} \cdot 5^2$ . Since we can only make two pairs of  $2 \cdot 5$ , that gives us a factor of 100, so  $12!$  will create a number that will end in two zeroes.

26. We are given that Regular pentagon  $ABCDE$  and square  $BMNC$  share a common side as below.



since the two shapes are both regular, we know that  $m\angle ABC = 108^\circ$  and  $m\angle CBM = 90^\circ$ . These total  $108 + 90 = 198^\circ$ . Therefore,  $m\angle ABM = 360 - 198 = 162^\circ$ . We know that  $AB = BM$ , so  $\triangle ABM$  is an isosceles triangle and  $m\angle BAM = m\angle BMA$ .  $180 - 162 = 18$  and  $18 \div 2 = 9$ . Thus,  $m\angle BAM = 9^\circ$ .

33. To solve  $10 < 7x + 3 < 24$ , first subtract 3 from all parts,  $7 < 7x < 21$ . Now, divide by 7 to all parts,  $1 < x < 3$ . All of the numbers given are parts of the solution set except 1. 1 does not make the inequality statement true. 1 is not greater than 1, so 1 is the answer.

45. We are given that  $x^2 + x + 1 = 0$ . Using the multiplication property of equality, multiply both sides by  $x$ .  $x(x^2 + x + 1) = x(0) \rightarrow x^3 + x^2 + x = 0$ . Using the addition property of equality, add 1 to both sides.  $x^3 + x^2 + x + 1 = 1$ . We already know that  $x^2 + x + 1 = 0$ , so we have  $x^3 + 0 = 1$ , and  $x^3 = 1$ .

46. This question is asking us to find the distance from  $A$  to  $B$ , which is the inner diagonal of the rectangular prism. The formula for finding the inner diagonal of a rectangular prism is  $a^2 + b^2 + c^2 = d^2$ , where  $a$ ,  $b$  and  $c$  are the length, width and height of the prism. Therefore,  $d^2 = 8^2 + 6^2 + 5^2 = 125$ . If  $d^2 = 125$ , then square root of both sides gives,  $d = \sqrt{125} = \sqrt{25 \cdot 5} = 5\sqrt{5}$  units.

49.  $\frac{6x^2+6x-120}{2x^2+8x-10} \div \frac{3x^2-48}{4x^2+12x-16} = \frac{6x^2+6x-120}{2x^2+8x-10} \cdot \frac{4x^2+12x-16}{3x^2-48} = \frac{6(x-4)(x+5)}{2(x-1)(x+5)} \cdot \frac{4(x+4)(x-1)}{3(x+4)(x-4)} = 4$ . Because  $M = 4$ ,  $5(4) - 3 = 17$ . The perimeter of the square is  $4(17) = 68$  cm.

50. Let  $B$  = boys and  $G$  = girls. We are given the members increased by 20%, the boys by 40% and the girls by 10%, so we can make the equation  $1.2(B + G) = 1.4B + 1.1(G)$ . Since there are 30 more girls than boys,  $G = B + 30$ . Now we have  $1.2(B + B + 30) = 1.4B + 1.1(B + 30)$ . This equation simplifies to  $2.4B + 36 = 2.5B + 33$ . Now subtract  $2.4B$  from both sides and subtract 33 from both sides and we have  $3 = 0.1B$ . Divide by 0.1 and  $B = 30$ . If  $B = 30$ , then  $G = 60$ . To find the total members of this year,  $1.4(30) + 1.1(60) = 42 + 66 = 108$  math club members.