



**TMSCA MIDDLE SCHOOL  
MATHEMATICS  
TEST #12 ©  
FEBRUARY 18, 2017**

**GENERAL DIRECTIONS**

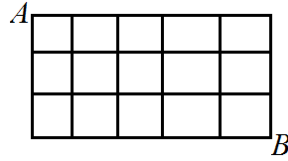
- About this test:
  - You will be given 40 minutes to take this test.
  - There are 50 problems on this test.
- All answers must be written on the answer sheet/Scantron form/Chatsworth card provided. If you are using an answer sheet be sure to use **BLOCK CAPITAL LETTERS**. Clean erasures are necessary 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.



2016 – 2017 TMSCA Middle School Mathematics Test #12

1. Which expression below is not equivalent to the expression  $7,491 - 2,539$ ?  
 A.  $4,423 + 529$       B.  $1368 + 3574$       C.  $619 \cdot 8$       D.  $15,784 - 10,832$       E.  $1238 \times 4$
2. Anya's friend gave her 13 quarters, 17 dimes, 25 nickels and 231 pennies. How much money does Anya have in total?  
 A. \$8.51      B. \$9.01      C. \$8.41      D. \$7.91      E. \$8.01
3. Mel's recipe for cookies calls for  $5\frac{3}{8}$  ounces of flour,  $2\frac{3}{4}$  ounces of butter,  $12\frac{1}{4}$  ounces of chocolate chips and  $\frac{1}{2}$  ounces of vanilla extract. In total, how many ounces of ingredients does Mel need?  
 A.  $19\frac{19}{40}$  ounces      B.  $20\frac{7}{8}$  ounces      C.  $19\frac{7}{8}$  ounces      D.  $20\frac{1}{8}$  ounces      E.  $20\frac{3}{8}$  ounces
4.  $48.2 + 36 + 16.32 + 0.012 =$  \_\_\_\_\_;  
 A. 21.62      B. 64.892      C. 100.582      D. 100.532      E. 99.582
5.  $789.36 \div 0.13 =$  \_\_\_\_\_,  
 A. 617.2      B. 6,172      C. 6,072      D. 607.2      E. 60.72
6. Let  $A$  be equal to the GCF of 36 and 24. Let  $B$  be equal to the LCM of 24 and 36. What is sum of  $A$  and  $B$ ?  
 A. 84      B. 72      C. 60      D. 78      E. 150
7. If  $a = -2$ ,  $b = 3$  and  $c = 4$ , evaluate the expression  $\left(\frac{2a+3b}{c-ab}\right)^0$ .  
 A. 1      B.  $\frac{1}{4}$       C.  $\frac{1}{2}$       D.  $-\frac{1}{2}$       E. 2
8.  $2\frac{1}{3} \times 5\frac{3}{4} =$  \_\_\_\_\_.  
 A.  $10\frac{1}{4}$       B.  $10\frac{1}{3}$       C.  $12\frac{1}{4}$       D.  $13\frac{1}{12}$       E.  $13\frac{5}{12}$
9. Callie watched a movie that was 2.3 hours long and Kelly watched a movie that was 1.9 hours long. How many minutes longer was Callie's movie than Kelly's movie?  
 A. 26 minutes      B. 32 minutes      C. 18 minutes      D. 24 minutes      E. 21 minutes
10.  $234_5 =$  \_\_\_\_\_<sub>10</sub>  
 A. 21      B. 12      C. 56      D. 60      E. 69
11. On a number line,  $X$  and  $Y$  are located at 16 and 40, respectively. If  $Z$  is the midpoint of  $\overline{XY}$ , what is the location of  $Z$ ?  
 A. 56      B. 16      C. 48      D. 18      E. 28
12.  $12.65 \times 0.14 =$  \_\_\_\_\_.  
 A. 1.791      B. 16.91      C. 1.691      D. 1.771      E. 17.71
13.  $-3^2 + 2(-4)^2 + 17 =$  \_\_\_\_\_.  
 A. 58      B. 40      C. 72      D. 36      E. 49
14. A square has an area of  $256 \text{ cm}^2$ . What is the perimeter of the square?  
 A. 16 cm      B. 32 cm      C. 64 cm      D. 123 cm      E. 272 cm

15. Moving only to the right or down, how many paths are there from  $A$  to  $B$ ?



- A. 32                      B. 56                      C. 62                      D. 48                      E. 54

16. Find the complement of an angle whose supplement is  $110^\circ$ .

- A.  $20^\circ$                       B.  $70^\circ$                       C.  $10^\circ$                       D.  $40^\circ$                       E.  $60^\circ$

17. Martel swam 15 laps on Monday, 12 on Tuesday, 18 on Wednesday and 12 on Thursday. How many laps must Martel swim on Friday to have an average of 16 laps swam for the five days?

- A. 18                      B. 24                      C. 21                      D. 25                      E. 23

18. The probability of it raining on Monday is  $\frac{4}{5}$ . The probability of it raining on Tuesday drops to  $\frac{4}{7}$ . What is the probability of it not raining on Monday?

- A.  $\frac{4}{5}$                       B.  $\frac{4}{7}$                       C.  $\frac{3}{7}$                       D.  $\frac{1}{5}$                       E.  $\frac{16}{35}$

19. What is the sum of the first 6 perfect square numbers?

- A. 55                      B. 70                      C. 91                      D. 121                      E. 81

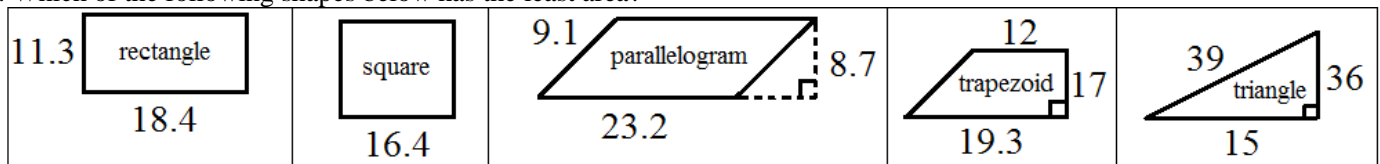
20. What is the positive difference between 140% of 2,000 and 80% of 1,600?

- A. 1,640                      B. 1,280                      C. 4,080                      D. 1,460                      E. 1,520

21. A new rectangular granite countertop measuring four feet by eight feet is being installed in a new house. A rectangle measuring 1.25 ft by 2.5 ft is being cut out of the granite countertop in order for a sink to be installed. What is the area of the remaining granite countertop?

- A.  $27.875 \text{ ft}^2$                       B.  $28.875 \text{ ft}^2$                       C.  $29.25 \text{ ft}^2$                       D.  $35.125 \text{ ft}^2$                       E.  $30.125 \text{ ft}^2$

22. Which of the following shapes below has the least area?



- A. rectangle                      B. triangle                      C. trapezoid                      D. parallelogram                      E. square

23. Simplify:  $\left(\frac{14a^{-3}b^3c}{7a^2bc^4}\right)$

- A.  $\frac{2b^2}{a^5c^3}$                       B.  $\frac{2}{a^4b^2c^6}$                       C.  $\frac{2a^6}{bc^4}$                       D.  $\frac{2b}{c^6}$                       E.  $\frac{2c^6}{a^4b^2}$

24. What is the lateral surface area of a cylinder with a diameter of 28 cm and a height of 18 cm ( $\pi = 3$ )?

- A.  $1,512 \text{ cm}^2$                       B.  $1,890 \text{ cm}^2$                       C.  $3,024 \text{ cm}^2$                       D.  $1,008 \text{ cm}^2$                       E.  $2,688 \text{ cm}^2$

25. If  $m\angle A = (16x - 7)^\circ$ ,  $m\angle B = (12x + 3)^\circ$  and  $\angle A \cong \angle B$ , then find the measure of  $\angle C$  if  $m\angle C = \frac{2}{3}m\angle A$ .

- A.  $40^\circ$                       B.  $22^\circ$                       C.  $47^\circ$                       D.  $11^\circ$                       E.  $33^\circ$

26. If the pattern continues in the following sequence, what is the 8<sup>th</sup> term of the sequence? 8, 11, 19, 30, 49, ...

- A. 128                      B. 335                      C. 207                      D. 197                      E. 325

27. Alicia opens plastic eggs and finds chocolate delights in 35% of the eggs. If Alicia opens 1,040 eggs, how many does she expect to have chocolate delights in them?

- A. 296                      B. 490                      C. 424                      D. 338                      E. 364

28. What is the greatest prime factor of  $A$ , if  $A = 4^5 - 2^3$ ?

- A. 128                      B. 113                      C. 2                      D. 131                      E. 127

29. The sum of three consecutive odd integers is -231. What value is two-thirds the largest integer?

- A. -52                      B.  $-52\frac{2}{3}$                       C. -50                      D.  $-50\frac{1}{3}$                       E.  $-51\frac{1}{3}$

30. Samantha and Sam are deciding which haunted house to go to. *No Fear Here* charges a \$6.00 entrance fee plus \$0.65 for every trip through the maze. *Scary Mary Extreme* charges an entrance fee of \$10.00 and \$0.40 for every trip through their maze. How many mazes must Samantha and Sam travel through for the cost of each haunted house to be the same?

- A. 18                      B. 24                      C. 20                      D. 14                      E. 16

31. If  $\frac{x+4}{6} = \frac{3x}{8}$ , then what is the value of  $x^2 + 3$ ?

- A. 13.24                      B. 23.28                      C. 16.76                      D. 8.76                      E. 10.24

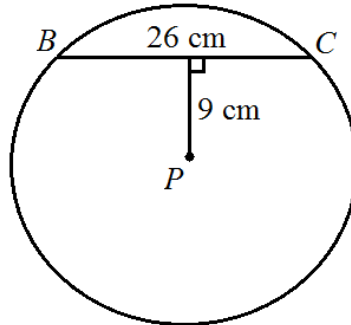
32. Lucas has a triangle whose vertices are located at  $(6, -2)$ ,  $(-6, -4)$  and  $(-2, 6)$ . Lucas is coloring half the triangle red and half blue. What is the area Lucas will color blue?

- A. 32 units<sup>2</sup>                      B. 28 units<sup>2</sup>                      C. 26 units<sup>2</sup>                      D. 30 units<sup>2</sup>                      E. 31 units<sup>2</sup>

33.  $211_5 + \text{---}_9 = 14_{10} + 146_7$

- A. 53                      B. 66                      C. 69                      D. 45                      E. 71

34. Find the length of the diameter of  $\odot P$ , using the picture below.



- A.  $13\sqrt{6}$  cm                      B.  $5\sqrt{10}$  cm                      C.  $\sqrt{757}$  cm                      D.  $9\sqrt{2}$                       E.  $10\sqrt{10}$  cm

35. If  $f(x) = \sqrt{x^2 + 4x + 21}$  and  $g(x) = -2\sqrt{2x^2 - 3x + 1}$ , then find the value of  $f(6) + \frac{2}{3}g(5)$ .

- A. 12                      B. 14                      C. 5                      D. 1                      E. 18

36. Letter tiles spelling the word *STARTERS* are placed in a bag. How many different sequences of letters can be formed using the letters in *STARTERS*?

- A. 5,180                      B. 5,040                      C. 10,080                      D. 2,520                      E. 4,640

37. Find the area of a sector of a circle with an arc length of 60 cm and a radius of 18 cm.

- A. 480 cm<sup>2</sup>                      B. 540 cm<sup>2</sup>                      C. 360 cm<sup>2</sup>                      D. 720 cm<sup>2</sup>                      E. 1,080 cm<sup>2</sup>

38. A trapezoid has bases with lengths of 8 inches and 14 inches. If the bases of the trapezoid are tripled, what is the length of the median of the trapezoid?

- A. 24 inches                      B. 44 inches                      C. 33 inches                      D. 42 inches                      E. 64 inches

39. Which of the following represents the solution set to the inequality?  $5 < 1 - 6x < 12$
- A.  $(-1\frac{5}{6}, -\frac{2}{3})$       B.  $(-\frac{2}{3}, -1\frac{5}{6})$       C.  $(\frac{2}{3}, 1\frac{5}{6})$       D.  $[\frac{2}{3}, 1\frac{5}{6}]$       E.  $[-1\frac{5}{6}, \frac{2}{3}]$

40. If  $x > 0$  and  $2^x + 2^{x-2} = 35$ , then  $\sqrt{2^x}$  is equal to which of the following?
- A.  $\frac{\sqrt{35}}{2}$       B.  $2\sqrt{6}$       C.  $\sqrt{70}$       D.  $2\sqrt{35}$       E.  $2\sqrt{7}$

41. If  $m > n$  and  $m$  and  $n$  are the roots of  $4x^2 + 8x - 140 = 0$ , then find the value of  $6m^3 + 3mn^2 - 2m^2n^2$ .
- A. -965      B. -5,033      C. -719      D. -117      E. -560

42. Calculate the mean absolute deviation for the set of number  $\{42, 45, 76, 81\}$ .
- A. 35.5      B. 18.5      C. 30.5      D. 17.5      E. 13.5

43. After great conservation efforts, the mole population in the county of Mole-Ville is increasing at a rate of 20% each year. If 5,000 moles are counted today, how many moles will there be in two years from now?
- A. 7,000      B. 7,200      C. 5,200      D. 7,500      E. 6,500

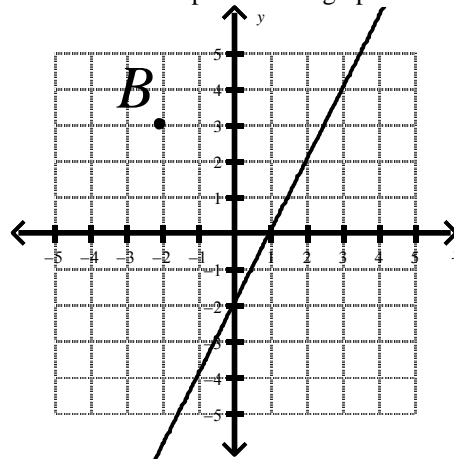
44. If three cows eat an average of 180 pounds of feed each and two calves eat an average of 80 pounds of feed each, then what is the average number of pounds eaten for all five?
- A. 130 lbs of feed      B. 140 lbs of feed      C. 150 lbs of feed      D. 125 lbs of feed      E. 135 lbs of feed

45. Simplify:  $\frac{6x^2+6x-36}{3x-15} \cdot \frac{8x^2+32x+24}{x^2+x-6} \cdot \frac{x^2-25}{x^2+8x+15}$
- A.  $16(x+3)$       B.  $16(x-1)$       C.  $16(x-5)$       D.  $16(x+1)$       E.  $16(x-3)$

46. If  $196x^2 + 252xy + 81y^2 = (ax + by)^2$ , then find the value of  $a^{\sqrt{b}}$ , if  $b > 1$ .
- A. 2,729      B. 2,974      C. 2,744      D. 2,528      E. 528

47. If  $x + \frac{1}{x} = 9$  and  $x^2 + \frac{1}{x^2} = k$ , then find the value of  $\frac{k+1}{4^2}$ .
- A. 4      B. 5      C. 6      D. 7      E. 8

48. Using the graph below, what is the equation of the line that passes through point  $B$  and is perpendicular to the given line?



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

49. The graph of  $x^2 + y^2 + 10x - 22y = -110$  is a circle with a center at  $(h, k)$ . Find the value of  $h - k$ .
- A. 6      B. -12      C. -32      D. -16      E. -2

50. The sum of two fractions is  $1\frac{1}{6}$  and the product of the two fractions is  $\frac{5}{18}$ . What is the lesser of the two fractions?
- A.  $\frac{2}{3}$       B.  $\frac{1}{3}$       C.  $\frac{1}{6}$       D.  $\frac{1}{4}$       E.  $\frac{2}{9}$

2016 – 2017 TMSCA Middle School Mathematics Test #12 Answer Key

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

2016-2017 TMSCA Middle School Mathematics Test #12 Selected Answers

20.  $140\%$  of  $2,000 = 2,800$  and  $80\%$  of  $1,600 = 1,280$ . Therefore,  $2,800 - 1,280 = 1,520$ .

28. If  $A = 4^5 - 2^3$ , then  $A = (2^2)^5 - 2^3 = 2^{10} - 2^3$ . Factor out the  $2^3$  and we get  $2^3(2^7 - 1)$ . The prime factorization of  $A$  is then  $2^3 \cdot 127$ . Since  $127$  is prime,  $127$  is our answer.

37. The formula for finding the area of a sector of a circle given the arc length is  $A = \frac{c}{2\pi r} \cdot \pi r^2$ , where  $c$  is the arc length. Substituting what we know and we get  $A = \frac{60}{2\pi 18} \cdot \pi 18^2 = \frac{5}{3\pi} \cdot 324\pi = \frac{5 \cdot 324\pi}{3\pi} = 540 \text{ cm}^2$ .

40. If  $x > 0$  and  $2^x + 2^{x-2} = 35$ , then  $2^x + 2^{x-2} = 2^x + 2^x \cdot 2^{-2} = 2^x + 2^x \cdot \frac{1}{4}$ . If you factor out  $2^x$ , you have  $2^x \left(1 + \frac{1}{4}\right) = 2^x \left(\frac{5}{4}\right) = 35$ . Multiply both sides by  $\frac{4}{5}$  and you get  $2^x = 28$  and  $\sqrt{28} = 2\sqrt{7}$ .

42.  $\frac{42+45+76+81}{4} = 61$ .  $|61 - 42| = 21$ ;  $|61 - 45| = 16$ ;  $|61 - 76| = 15$ ;  $|61 - 81| = 20$ . The mean absolute deviation is then  $\frac{21+16+15+20}{4} = 18$ .

44. Assume the cows eat 180 pounds each and the calves eat 80 pounds each. We then can find our answer by  $\frac{180+180+180+80+80}{3+2} = \frac{700}{5} = 140$  pounds per animal.

46. Since  $196x^2 + 252xy + 81y^2$  follows the pattern of  $x^2 + 2xy + y^2$ , then it is a perfect square trinomial that can be factored to  $(14x + 9y)^2$ . This informs us that  $a = 14$  and  $b = 9$ . Substituting into our expression  $a^{\sqrt{b}}$ , and we have  $14^{\sqrt{9}} = 14^3 = 2,744$ .

50. Change  $1\frac{1}{6}$  to  $\frac{7}{6}$ . Let our two fractions be  $x$  and  $y$ . Our equations are  $x + y = \frac{7}{6}$  and  $xy = \frac{5}{18}$ . In our second equation, solve for  $x$  by dividing both sides by  $y$ ;  $x = \frac{5}{18} \div y = \frac{5}{18y}$ . Now, substitute into the first equation.  $\frac{5}{18y} + y = \frac{7}{6}$ . Get rid of the fractions by multiplying every term on both sides by  $18y$ .  $18y \left(\frac{5}{18y} + y\right) = 18y \left(\frac{7}{6}\right)$ , which becomes  $5 + 18y^2 = 21y$ . Move  $21y$  over to get  $18y^2 - 21y + 5 = 0$ . Factor  $18y^2 - 21y + 5$  to  $(6x - 5)(3x - 1) = 0$ . Setting each equation equal to 0 and  $x = \frac{5}{6}$  and  $\frac{1}{3}$ . Since  $\frac{5}{6}$  is greater than  $\frac{1}{3}$ , the fraction we are looking for is  $\frac{1}{3}$ .