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

T U N E - U P T E S T ©

2 0 1 9

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.

2018 – 2019 TMSCA Middle School Mathematics Tune-Up Test

1. $34 - 106 - 81$ = _____

A. 9 B. -9 C. -81 D. -173 E. -153

2. $11\frac{3}{4} + 8\frac{1}{2} + \frac{5}{2}$ = _____

A. 22¾ B. 19½ C. 19¾ D. 21½ E. 21¾

3. $68 \div 1.8$ = _____ (nearest tenth)

A. 38 B. 37.7 C. 38.7 D. 37.8 E. 37

4. $80 \times 4\frac{1}{2} = 36 \times$ _____

A. 10 B. 12 C. 14 D. 9 E. 11

5. 14 quarters + 12 dimes – 16 nickels + 29 pennies = _____

A. $5.79 B. $5.29 C. $4.59 D. $4.19 E. $4.39

6. Simplify: $((1^3 + 3^2)^2)^2 \div 2$

A. 10,000 B. 100 C. 5,000 D. 500 E. 50,000

7. The sum of two numbers is 98. One of the numbers is 48. What is the product of the two numbers?

A. 2,500 B. 2,400 C. 4,900 D. 2,450 E. 2,550

8. What value is 75% more than the sum of 312 and 96?

A. 510 B. 612 C. 546 D. 742 E. 714

9. If *A* is equal to the LCM of 76 and 8 and *B* is equal to the GCF of 1,024 and 550, what is the value of *A* – *B*?

A. 175 B. 260 C. 86 D. 150 E. 872

10. 0.8125 = _____(fraction)

A. $\frac{11}{14}$ B. $\frac{13}{17}$ C. $\frac{13}{16}$ D. $\frac{21}{26}$ E. $\frac{11}{13}$

11. What is the value of *A* – *B* – *C*, if $\frac{5}{7} = \frac{35}{A} = \frac{60}{B} = \frac{C}{98}$?

A. -123 B. -114 C. -105 D. -97 E. -121

12. Solve: $8 - n \leq 24$

A. $n \geq -16$ B. $n \geq 16$ C. $n \leq -16$ D. $n \leq 16$ E. no solution

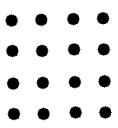
13. 3.5 gallons = _____ pints

A. 24 B. 26 C. 28 D. 32 E. 34

14. What is the sum of all the positive integral divisors greater than 62 but less than 200, of the number 420?

A. 399 B. 539 C. 319 D. 426 E. 424

15. How many different sized squares can be drawn on the 4×4 grid below?

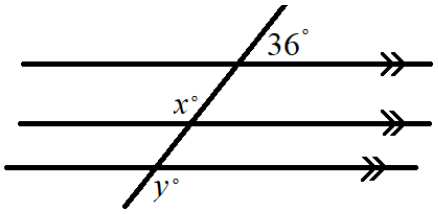


A. 4 B. 5 C. 3 D. 6 E. 8

16. MMDLIX – MCCCXLVIII – DCCCLXXV = _____ (Arabic number)
A. 421 B. 428 C. 364 D. 385 E. 336

17. A movie starts at 7:05 pm and runs for 2.2 hours. At what time will the movie end?
A. 9:25 pm B. 9:17 pm C. 9:07 pm D. 9:11 pm E. 9:21 pm

18. What is the value of $x + y$ from the picture below?



A. 144 B. 216 C. 252 D. 288 E. 236

19. What is the 7th digit after the decimal if $\frac{5}{18}$ were converted into a decimal?
A. 2 B. 0 C. 3 D. 9 E. 7

20. The length of a rectangle is $11n + 3$ inches and the width measures $4n + 7$ inches. If the perimeter of the rectangle is 80 inches, what is the measure of the length of the rectangle?
A. 50 inches B. 25 inches C. 15 inches D. 30 inches E. 36 inches

21. Manny calculated the inter-quartile range of the set {40, 66, 84, 90, 79, 72, 51} to be 47. Let n equal the correct value of the inter-quartile range. What is the value of Manny's inter-quartile range minus n?
A. 13 B. 15 C. 12 D. 14 E. 11

22. What is the probability of rolling a pair of dice and getting a sum that is not a multiple of 3?
A. ½ B. ⅔ C. ⅓ D. ¾ E. ¼

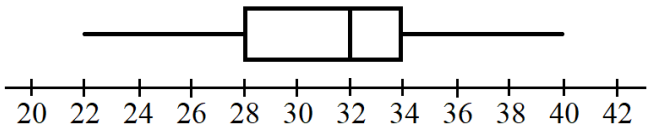
23. $8{,}500{,}000 \times 1{,}200{,}000{,}000$ = _____ (scientific notation)
A. 1.02×10^{16} B. 1.02×10^{14} C. 9.7×10^{14} D. 9.7×10^{13} E. 2.05×10^{14}

24. Points A, B and C are collinear. B lies between A and C. Find AC, if $AC = 6x + 11$, $AB = 5x - 6$ and $BC = 3x - 5$?
A. 69 B. 77 C. 58 D. 72 E. 85

25. Which formula gives the n^{th} term of the sequence? 0, 5, 12, 21, …
A. $n^2 - 2n + 3$ B. $2n^2 + n - 1$ C. $n^2 + 2n - 3$ D. $3n^2 - 2n - 1$ E. $n^2 + 2n + 3$

26. Alisha, Brett, Calvin and Diego have a total of 105 trophies. Alisha has half as many trophies as Calvin. Alisha and Brett have a total of 46 trophies. Calvin and Diego have a total of 59 trophies. Brett and Calvin have a total of 70 trophies. How many trophies does Diego have?
A. 19 B. 24 C. 22 D. 13 E. 11

27. Using the box-and-whisker plot below, what is the positive difference of the median and the interquartile range.



A. 26 B. 14 C. 32 D. 0 E. 34

28. Hank has 26 coins consisting of quarters and dimes in his pocket worth \$5.30. The number of quarters is equal to two more than twice as many dimes. How many quarters does Hank have in his pocket?
A. 16 B. 18 C. 14 D. 8 E. 6

29. Simplify: $4n(2n-3)-3(2n^2+4n-5)+5n^2$
A. $-n^2-18n-15$ B. $-n^2-18n+15$ C. $7n^2-18n+15$ D. $7n^2-24n+15$ E. $7n^2-6n+15$

30. Simple interest is calculated by the formula $I = prt$, where p = principal amount, r = rate and t = time in years. What is the simple interest accumulated if Marc deposits \$400.00 at 3% for 18 months?
A. \$108.00 B. \$216.00 C. \$21.00 D. \$18.00 E. \$21.60

31. What is the range of the graph of the quadratic equation $2x^2-8x-5=y$?
A. $y>-5$ B. $y\geq -5$ C. $y\geq 2$ D. $y\leq -4$ E. $y\geq -13$

32. $1001101_2 =$ _____$_4$
A. 1012 B. 1310 C. 1031 D. 1230 E. 1211

33. What is the 5th term of the sequence? 124, 62, 31, …
A. 7.75 B. 15.75 C. 8.75 D. 12.75 E. 6.75

34. The ratio of dogs to cats in a neighborhood is 2:3. If 15 more cats are brought into the neighborhood, the ratio of dogs to cats changes to 3:5. How many dogs are in the neighborhood?
A. 45 B. 135 C. 90 D. 150 E. 60

35. If $g(x, y, z) = 3xy - 2yz + xz$, what is the value of $g\left(\frac{2}{3},\frac{3}{4},\frac{3}{2}\right)$?
A. ¾ B. ⅓ C. ½ D. ⅛ E. ¼

36. $\left(\frac{a^{-2}b^4}{a^{-7}b}\right)\left(\frac{a^2b^{-5}}{(ab)^{-1}}\right)^2 =$ _____
A. $\frac{a^{14}}{b^{13}}$ B. $\frac{b^4}{a^5}$ C. a^3b^4 D. $\frac{a^{11}}{b^5}$ E. $a^{11}b^3$

37. Which of the following is the equation to a line perpendicular to the x-axis that passes through the point (7, 2)?
A. $y = 2$ B. $x = 2$ C. $y = 7$ D. $y = x - 5$ E. $x = 7$

38. The point (10, 1) lies on a circle with its center having coordinates of $(4,-7)$. What is the equation of the circle?
A. $(x+4)^2+(y-7)^2=100$ B. $(x-4)^2+(y+7)^2=100$ C. $(x-4)^2+(y+7)^2=81$
D. $(x+4)^2+(y-7)^2=64$ E. $(x-4)^2+(y+7)^2=121$

39. If g is a linear function and $g(0) = 3$ and $g(-4) = 25$, what is the value of $g(5)$?
A. -24.5 B. -22.5 C. -17.5 D. -32.5 E. -7.5

40. How many sides does a convex regular polygon with 104 total diagonals have?
A. 52 B. 22 C. 16 D. 24 E. 26

41. Which of the following equations is the equation of the perpendicular bisector of the segment that has endpoints located at (1, 6) and (7, 10)?
A. $3x - 2y = 28$ B. $3x + 2y = -28$ C. $2x - 3y = 16$ D. $3x + 2y = 28$ E. $2x - 3y = -16$

42. 5! + 4! + 3! + 2! + 1! + 0! = _____

A. $2 \cdot 7 \cdot 11$ B. $2^3 \cdot 3 \cdot 19$ C. $2^2 \cdot 3 \cdot 17$ D. $3^2 \cdot 19$ E. $2^2 \cdot 3^2 \cdot 11$

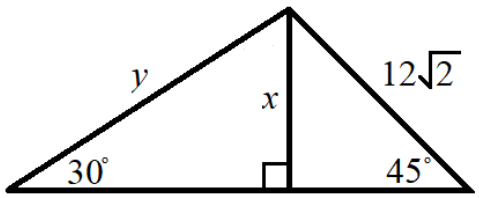
43. Using each of the digits 1, 2, 3, and 4 exactly once to form 3-digit numbers, there are exactly six that are divisible by 6. Using each of the digits 1, 2, 3, 4, and 5 exactly once to form 5-digit numbers, how many are divisible by 12?

A. 12 B. 24 C. 36 D. 120 E. 30

44. At a family BBQ cookout, ½ of the people ate only hotdogs, ⅓ ate only hamburgers, 15 people ate neither a hotdog nor a hamburger and no one ate both a hotdog and hamburger. How many family members attended the family cookout?

A. 110 B. 80 C. 90 D. 120 E. 100

45. Using the picture below, what is the value of $x + y$?



A. $24\sqrt{2}$ B. $12\sqrt{2} + 12\sqrt{6}$ C. $12\sqrt{3} + 12\sqrt{6}$ D. 24 E. 36

46. Which of the following is equivalent to $\log_6 36 - \log_6 18 + \log_6 2$?

A. $4 \log_6 3$ B. $4 \log_6 2$ C. $2 \log_6 2$ D. $2 \log_6 1$ E. $3 \log_6 2$

47. Ingrid bought an antique toy model worth \$5000. The value of the toy model increases yearly at a rate of 10%. How much will the toy model be worth after 3 years?

A. \$6,565 B. \$6,455 C. \$6,655 D. \$5,665 E. \$6,865

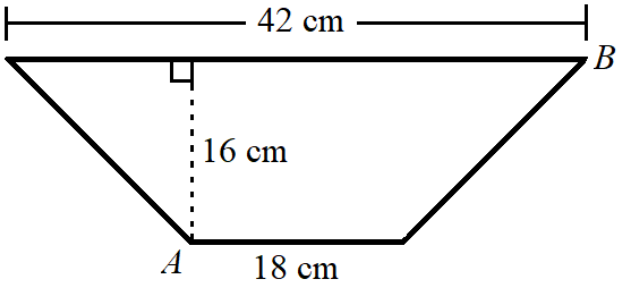
48. What is the product of the roots of the cubic equation $x^3 - 9x^2 + 3x - 4 = 0$?

A. -4 B. -3 C. 3 D. ⅓ E. 4

49. What is the solution set for the equation $5 - 3|x - 5| - 2 = -36$?

A. no solution B. $\{-8, 18\}$ C. $\{-4, 16\}$ D. $\{-8, -4\}$ E. $\{-3, 12\}$

50. Given the isosceles trapezoid below, what is the distance from *A* to *B*?



A. 21 cm B. 32 cm C. 76 cm D. 34 cm E. 36 cm

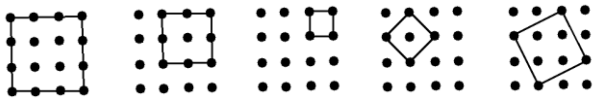
2018 – 2019 TMSCA Middle School Mathematics Tune-Up Test Answer Key

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

2018-2019 TMSCA Middle School Mathematics Tune-Up Test Selected Answers

12. To solve $8 - n \leq 24$, first subtract 8 from both sides. This gives us $-n \leq 16$. Now, divide both sides by -1 and remember that when dividing by a negative, you must flip the inequality symbol. Therefore, $n \geq -16$.

15. There are 5 different sized squares that can be drawn on the 4×4 grid. They are as follows:



27. The median of the box-and-whisker plots is 32. The interquartile range is 34 – 28 = 6. Therefore, the positive difference between the median and interquartile range is 32 – 6 = 26.

30. In our problem, we are given a principal of \$400.00, a rate of 3% and a time of 18 months. Since time must be in years, 18 divided by 12 is equal to 1.5 years. Therefore, the simple interest accumulated with the given information, is 400(0.03)(1.5) = \$18.00.

31. The *x*-coordinate of vertex of a quadratic function in standard form $Ax^2 + Bx + C$ is found by $\frac{-B}{2A}$. In our equation $2x^2 - 8x - 5 = y$, our *x*-coordinate is then $\frac{8}{4} = 2$. Substituting in and $y = 2(2)^2 - 8(2) - 5 = -13$. Because *A* is positive, the graph of the function opens upward. Using the *y*-coordinate, the range is then $y \geq -13$.

39. If *g* is a linear function, then any two points on the line will have the same slope between them. We are given, $g(0) = 3$ and $g(-4) = 25$, so the slope between them is $\frac{25-3}{-4-0} = -\frac{11}{2}$. We will use the point (0, 3) and we know that the value of $g(5) = y$, so the slope between the points is $\frac{y-3}{5-0} = -\frac{11}{2}$. Cross multiply and get $2y - 6 = -55$. Add 6 to both sides and get $2y = -49$. Divide both sides by 2 and $y = -\frac{49}{2} = -24.5$.

42. Because 0! = 1, 5! + 4! + 3! + 2! + 1! = 120 + 24 + 6 + 2 + 1 + 1 = 154. The prime factorization of 154 is equal to $2 \cdot 7 \cdot 11$.

44. Since ½ of the people ate hotdogs and ⅓ ate hamburgers, we know that $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$. That leaves $\frac{1}{6}$ of the people that ate neither a hotdog or hamburger. It was given that 15 people ate neither a hotdog or hamburger, so $15 = \frac{1}{6}x$. Solve the equation by multiplying both sides by 6 and $x = 90$. 90 Family members attended the cookout.

48. The product of the roots of a cubic equation $ax^3 + bx^2 + cx + d = 0$ can be found by $\frac{-d}{a}$. We are given the equation $x^3 - 9x^2 + 3x - 4 = 0$, so $a = 1$ and $d = -4$. By substituting, the product of the roots of the equation is $\frac{-d}{a} = \frac{4}{1} = 4$.

50. Draw point *C* by extending the bottom base line from *A*. Draw a segment from *B* that is perpendicular to Both bases to *C*. We know *BC* = 16 cm. Because the trapezoid is isosceles, 42 – 18 = 24 and $24 \div 2 = 12$. So, *DC* = 12 and *AC* = 18 + 12 = 30 cm. We now have right triangle *ACB*. We use the Pythagorean theorem to find *AB*, $AB = \sqrt{16^2 + 30^2} = \sqrt{1156} = 34$. Therefore, *AB* = 34 cm.