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This document contains 34 pages (including this one) and consists of

## **2000 TMSCA Middle School State Meet Tests**

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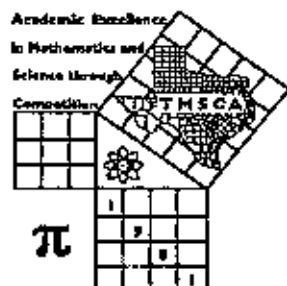
**2000 TMSCA**

**Championship Meet**

**School**

**Test Packet**

1st Score: _____	2nd Score: _____	3rd Score: _____	Final Score
Grader: _____	Grader: _____	Grader: _____	
PLACE ID LABEL IN THIS SPACE			



**TMSCA MIDDLE SCHOOL  
 CALCULATOR  
 CHAMPIONSHIP MEET  
 APRIL 8, 2000**

**GENERAL DIRECTIONS**

**I. About this test:**

- A. You will be given 30 minutes to take this test.
- B. There are 80 problems on this test.

**II. How to write the answers:**

- A. For all problems except stated problem as noted below write three significant digits.

- 1. Examples (\* means correct, but not recommended)

Correct: 12.3, 123, 123\*, 1.23x10\*, 1.23x10<sup>0\*</sup>, 1.23x10<sup>1</sup>, 1.23x10<sup>01</sup>, .0190, 1.90x10<sup>-2</sup>

Incorrect: 12.30, 123.0, 1.23(10)<sup>2</sup>, 1.23·10<sup>2</sup>, 1.230x10<sup>2</sup>, 1.23\*10<sup>2</sup>, 0.19, 1.9x10<sup>-2</sup>, 19.0x10<sup>-3</sup>, 1.90E-02

- 2. Plus or minus one digit error in the third significant digit is permitted.

- B. For stated problems:

- 1. Except for integer, dollar sign, and significant digit problems, as detailed below, answers to stated problems should be written with three significant digits.
- 2. Integer problems are indicated by (integer) in the answer blank. Integer problems answers must be exact, no plus or minus one digit, no decimal point or scientific notation.
- 3. Dollar sign (\$) problems should be answered to the exact cent, but plus or minus one cent error is permitted. The decimal point and cents are required for exact dollar answers.
- 4. Significant digit problems are indicated by underlined numbers and by (SD) in the answer blank. Plus or minus one digit error in the last significant digit is permitted.

**III. Some symbols used on the test.**

- A. Angle measure: rad means radians; deg means degrees.
- B. Inverse trigonometric functions: arcsin for inverse sine, etc.
- C. Special numbers:  $\pi$  for 3.14159 . . . ; e for 2.71828.
- D. Logarithms: Log means common (base 10); Ln means natural (base e).

**IV. Scoring:**

- A. All questions answered correctly are worth FIVE points. FOUR points will be deducted for all questions answered incorrectly or skipped before the last question attempted.

# 1999-2000 TMSCA Middle School State Meet Calculator Applications

1.  $482 - 3250$  ..... 1= \_\_\_\_\_
2.  $221 - 231 - 241$  ..... 2= \_\_\_\_\_
3.  $684 + 405 - 201$  ..... 3= \_\_\_\_\_
4.  $4620 - 522 - 952 + 155$  ..... 4= \_\_\_\_\_
5.  $645 - 382 - 561 - 466$  ..... 5= \_\_\_\_\_
6.  $8.42 - 9.30 + 22.1 - 9.03 - 1.15$  ..... 6= \_\_\_\_\_
7.  $33.2 - 7.21 + 6.35 - 58.1 + 49.6$  ..... 7= \_\_\_\_\_
8.  $8.22 \times 0.255 \times 0.199 \times 0.0826$  ..... 8= \_\_\_\_\_
9.  $10.2 \times 3.35 \times 0.646 \times 2.94$  ..... 9= \_\_\_\_\_
10.  $0.552 \times 0.325 \times 0.655 \times 0.731$  ..... 10= \_\_\_\_\_
11. In one month, I wrote twenty-three checks and made three deposits to my checking account. My bank charged me \$8.90 as a service charge for these transactions. How much per transaction did the bank charge me? ..... 11= \_\_\_\_\_ ¢
12. A "megabyte", which is  $2^{20}$ , contains how many bytes? ..... 12= \_\_\_\_\_ Integer
13. What is three plus four divided by ten minus the quantity of six plus seven multiplied by thirty-nine? ..... 13= \_\_\_\_\_

14.  $\frac{(7.65 + 6.33 - 2.28)}{(5.46 + 2.61) - (0.233 + 9.51)}$  ----- 14= \_\_\_\_\_
15.  $\frac{(1.56 - 11.2)(0.557)}{(821 \times 4.36)(0.255)}$  ----- 15= \_\_\_\_\_
16.  $6.01 \times 0.433 \times 0.824 - 0.316$  ----- 16= \_\_\_\_\_
17.  $\frac{22.1 \times 0.726}{0.974 + 5.46}$  ----- 17= \_\_\_\_\_
18.  $\{(0.877)(4.33 - 2.95)(6.25)\} + 4.07$  ----- 18= \_\_\_\_\_
19.  $\frac{721 + 17400 - 254}{(0.0855)(-12.1)(32.0)}$  ----- 19= \_\_\_\_\_
20.  $(6.57 + 3.24 - \pi + 14.3)(-5.07)$  ----- 20= \_\_\_\_\_
21.  $62.4 / 51.3 + 46.2 - 6.14$  ----- 21= \_\_\_\_\_
22.  $\frac{(644 + 548)(7.33 + 8.01)}{(0.225 / \pi) / 1.05}$  ----- 22= \_\_\_\_\_
23.  $(\pi - 8) - \frac{(78 / 55)(18 / 14)}{621}$  ----- 23= \_\_\_\_\_
24. It costs fifty cents for a daily paper and one dollar and fifty cents for a Sunday newspaper when bought at a store. A subscription for a year costs \$155.40. How much would Samantha save by subscribing to a newspaper for a year instead of buying the papers at a store? (Assume 365 days in a year.) 24=\$ \_\_\_\_\_
25. A positive number, when multiplied by three, then divided by eight is equal to the number of items in a gross. What is the number? 25= \_\_\_\_\_ Integer
26. A pipe is four inches in diameter. What is its circumference? 26= \_\_\_\_\_ cm

27.  $\left[\left(\frac{1}{2200}\right)(\pi)\right] + \left[\left(\frac{1}{2220}\right)/(3.56)\right]$  ..... 27= \_\_\_\_\_

28.  $\frac{85.1 + (6.44 \times 10^8)}{0.124 - 0.588}$  ..... 28= \_\_\_\_\_

29.  $[8.55 + 23.8] - \left[\frac{(4.22 \times 10^3)}{-8.91 - 4.83}\right]$  ..... 29= \_\_\_\_\_

30.  $(5.48 \times 10^6)(1.35 \times 10^{-4})(5.33 \times 10^8)$  ..... 30= \_\_\_\_\_

31.  $[(3.38 \times 10^{-4}) + (4.31 \times 10^3)] - \pi$  ..... 31= \_\_\_\_\_

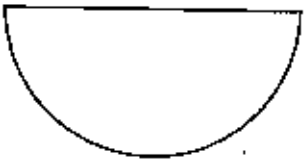
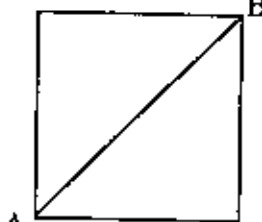
32.  $\frac{58.3(4.98 \times 10^8)}{(784 - 1430)(1970 + 471)}$  ..... 32= \_\_\_\_\_

33.  $\frac{1}{4.98 + 3.02} + \frac{1}{15.3 - 85.4}$  ..... 33= \_\_\_\_\_

34.  $\left[\frac{69.4 + 4.16 + 7.52}{\sqrt{\pi} - 3.04}\right]^2$  ..... 34= \_\_\_\_\_

35. How many times will  $e$  go into  $[\sqrt{902} \div 677]$ ? ..... 35= \_\_\_\_\_

36. Amanda took six hours to drive two hundred seventy-five miles. If she stopped forty-five minutes for lunch, what was her average speed while moving? ..... 36= \_\_\_\_\_ mph

<p>37. SEMICIRCLE</p> <p style="text-align: center;">Radius = 897</p> <div style="text-align: center;">  </div> <p style="text-align: center;">Area = ?</p> <p>37 = _____</p>	<p>38. SQUARE</p> <div style="text-align: center;">  </div> <p style="text-align: center;">AB = 1.13</p> <p style="text-align: center;">Area = ?</p> <p>38 = _____</p>
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39.  $(7.05 \times 10^3) / (-2.13 \times 10^{-5}) - (\pi / 2.35)$  ----- 39= \_\_\_\_\_

40.  $\frac{1}{7.08 + 99.3} - \frac{1}{\pi - 5.99} (2.66)$  ----- 40= \_\_\_\_\_

41.  $\left[ \frac{16.1 - \sqrt{44.3/29}}{3.21 - \pi} \right]^6$  ----- 41= \_\_\_\_\_

42.  $(1/66)(0.278) \sqrt{(3.47 \times 10^{-7})} + \pi$  ----- 42= \_\_\_\_\_

43.  $(6.78 \times 10^{-8}) - (5.68/33.2)^0$  ----- 43= \_\_\_\_\_

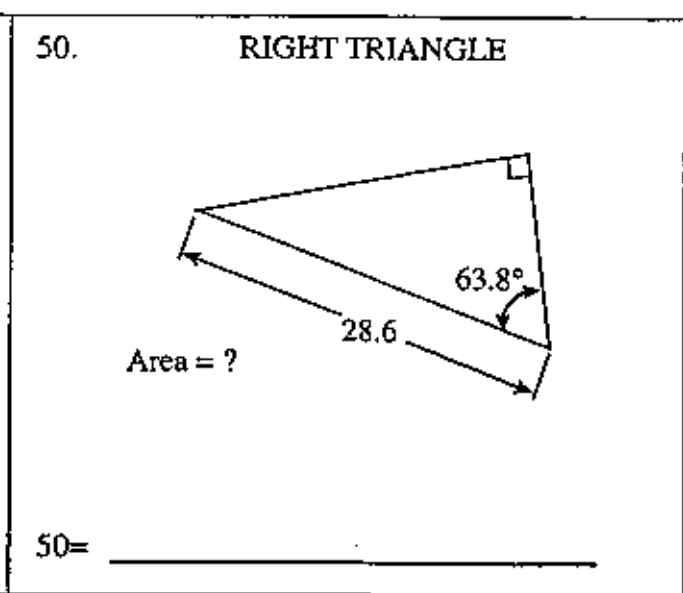
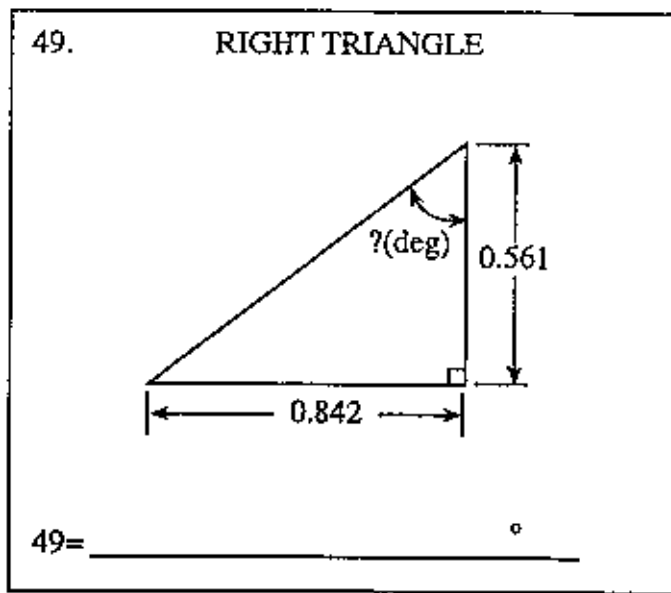
44.  $(0.761)(459) + \sqrt{(1320)/(8.35)} + (1.06)^3$  ----- 44= \_\_\_\_\_

45.  $[(85.2)(1.20 \times 10^{-5})(4.31)]^{1/2} - 5.46$  ----- 45= \_\_\_\_\_

46.  $\sqrt[3]{(591)} - (462/12) + 1/\sqrt{1.45 + 16.1}$  ----- 46= \_\_\_\_\_

47. The sum of two integers is thirty-nine. Their difference is five. What is the product of these two integers? 47= \_\_\_\_\_ Intege

48. Calculate  $541^{241}$ . 48= \_\_\_\_\_



51.  $\left[ \frac{89.7 - 259 + \sqrt{57/2.36}}{-957 + 345} \right]^2$  ----- 51= \_\_\_\_\_

52.  $\sqrt{5.74 \times 10^6} - \sqrt{\frac{\pi^2}{\pi(1/0.483)}}$  ----- 52= \_\_\_\_\_

53.  $[-15.7 + 47.3]^{1/2} \times [4.07 - 2.14]^2$  ----- 53= \_\_\_\_\_

54.  $\left[ \frac{0.187 + 1.06 - \sqrt{2.44}}{8.12 + 3.44} \right]^3 - \sqrt{3.17}$  ----- 54= \_\_\_\_\_

55.  $\sqrt[4]{\frac{\sqrt{6.23 + 85.2 - 19.2}}{(1.45 + 10.1)}} + (16.1)^4$  ----- 55= \_\_\_\_\_

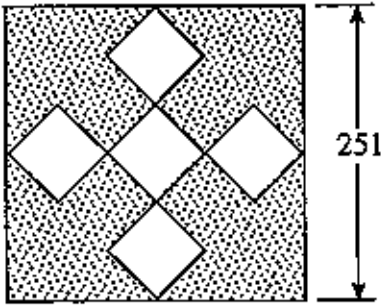
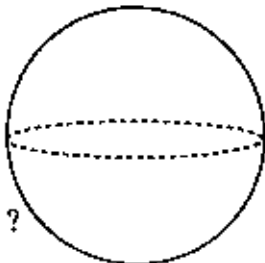
56.  $\sqrt{\frac{\pi(4.10)}{462 - 225}} - 0.233$  ----- 56= \_\_\_\_\_

57.  $\sqrt{\frac{1/(322 - 234)}{(107)(1.35 + 15.3)^3}}$  ----- 57= \_\_\_\_\_

58.  $\sqrt{207 - 62.8} + 1/\left(\frac{1}{133} + \frac{1}{492}\right)$  ----- 58= \_\_\_\_\_

59. A dog is tied with a twelve-foot leash to the corner of a building that is sixteen feet long by eight feet wide. What is his total roaming area? 59= \_\_\_\_\_ ft<sup>2</sup>

60. As Yvonne writes checks she rounds up the amount of check to the nearest dollar when she writes down the check in her checkbook. One month, her balance in her checkbook was \$18.32 less than the bank's balance of \$982.67. What was the percent error in Yvonne's checkbook balance? 60= \_\_\_\_\_ %

<p>61. <b>SQUARE &amp; INSCRIBED IDENTICAL SQUARES</b></p>  <p style="text-align: center;">Shaded area = ?</p> <p>61= _____</p>	<p>62. <b>SPHERE</b></p>  <p>Volume = 8260</p> <p>Total Surface Area = ?</p> <p>62= _____</p>
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63. (deg)  $\frac{\cos\{(44.1^\circ) / (44.6^\circ)\}}{\sin\{21.7^\circ + 238^\circ\}}$  ----- 63= \_\_\_\_\_

64. (deg)  $\frac{\sin(95.2)}{\cos(95.2)} \sqrt{\{\sin(0.433 \times 2.31)\}^3}$  ----- 64= \_\_\_\_\_

65. (rad)  $\tan[(45.2) / (61.4)]$  ----- 65= \_\_\_\_\_

66. (rad)  $\frac{\sin(12.8)}{1250/106}$  ----- 66= \_\_\_\_\_

67. (deg)  $[(640 - 122)\tan(64.2^\circ)]$  ----- 67= \_\_\_\_\_

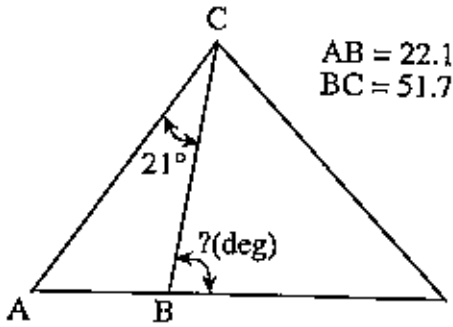
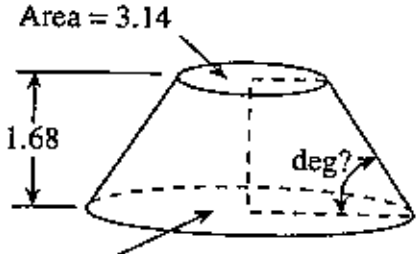
68.  $(121 + 314)^{0.561} - 1/(24.2 - 21.4)^{0.755}$  ----- 68= \_\_\_\_\_

69.  $(1/15!) + 10!$  ----- 69= \_\_\_\_\_

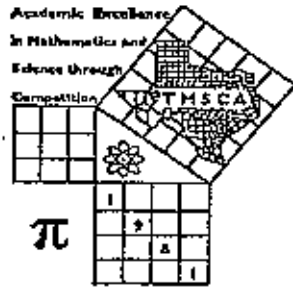
70.  $\frac{(2.23 - 2.15 + 101)^0}{(6.21 - 0.134)^{-2} - (3.23 - 3.03)^0}$  ----- 70= \_\_\_\_\_

71. If the density of gold is  $19.2 \text{ g/cm}^3$ , what is the length of the side of a cube of gold that has a mass of fifty kilograms? 71= \_\_\_\_\_ cm

72. A light year is a term used to measure the distance light can travel in a year. Since we know that light travels one hundred eighty-six thousand miles per second, how many miles are in one light year? (Assume 365 days in a year.) 72= \_\_\_\_\_ mile

<p>73. <b>SCALENE TRIANGLES</b></p>  <p style="text-align: right;">AB = 22.1 BC = 51.7</p> <p style="text-align: center;">21° ?(deg)</p> <p>A B C</p> <p>73= _____</p>	<p>74. <b>CONICAL FRUSTUM</b></p>  <p style="text-align: center;">Area = 3.14</p> <p style="text-align: center;">1.68</p> <p style="text-align: center;">Area = 12.6</p> <p style="text-align: center;">deg?</p> <p>74= _____ °(deg)</p>
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75.  $[402 + 233]^4 + \text{Ln} \left[ \frac{(4.14)(9.02)}{(2.35)} \right]^4$  ..... 75= \_\_\_\_\_
76.  $\left[ \sqrt{\sqrt{\sqrt{423000}}} \right]^6$  ..... 76= \_\_\_\_\_
77.  $10^{(3.22 - 1.04 + 5.28)}$  ..... 77= \_\_\_\_\_
78.  $620 - e^{(0.121 + 0.324)}$  ..... 78= \_\_\_\_\_
79.  $\frac{\text{Log}(19.1 + 12.3)}{4320 + 2530}$  ..... 79= \_\_\_\_\_
80.  $(e^{0.124}) (e^{0.322}) (e^{0.421})$  ..... 80= \_\_\_\_\_



**TMSCA MIDDLE SCHOOL  
MATHEMATICS  
CHAMPIONSHIP MEET  
APRIL 8, 2000**

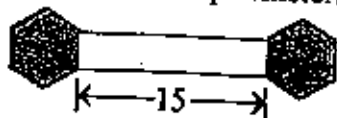
**GENERAL DIRECTIONS**

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/Chataworth card provided. If you are using an answer sheet be sure to use **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 questions 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 questions answered correctly are worth **FIVE** points. **TWO** points will be deducted for all questions answered incorrectly. No points will be added or subtracted for questions not answered.
9. In case of ties, percent accuracy will be used as a tie breaker.

1999-2000 TMSCA Middle School Mathematics State Championship

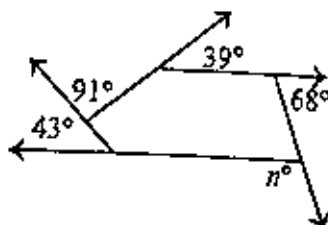
- What is the largest palindrome smaller than eight hundred forty-two?  
A. 848                      B. 844                      C. 855                      D. 838                      E. NOT
- The diagonal of a square is 14 m. What is the area of the square?  
A.  $98 m^2$                       B.  $56 m$                       C.  $196 m^2$                       D.  $49 m^2$                       E. NOT
- $\frac{6}{7} \times \frac{14}{3} \div \frac{2}{5} =$   
A.  $2\frac{5}{8}$                       B.  $1\frac{3}{8}$                       C. 10                      D.  $3\frac{1}{3}$                       E. NOT
- How many positive integers less than twenty-six are relatively prime to twenty-six?  
A. 13                      B. 8                      C. 12                      D. 10                      E. NOT
- Mr. Ventura bought a camera which was on sale at eighteen percent off. If the regular price of the camera was fifty-six dollars, how much money did he save?  
A. \$45.92                      B. \$10.08                      C. \$38.00                      D. \$18.00                      E. NOT
- $0.515151\dots =$  \_\_\_\_\_ (fraction)  
A.  $\frac{17}{33}$                       B.  $\frac{37}{66}$                       C.  $\frac{51}{100}$                       D.  $\frac{7}{15}$                       E. NOT
- Which of the following integers are nine units to the right of negative four on the number line?  
A. -13                      B. 5                      C. 13                      D. 11                      E. NOT
- Simplify:  $\sqrt{50} - \sqrt{98} + \sqrt{18} =$   
A.  $4\sqrt{5}$                       B.  $\sqrt{2}$                       C.  $-\sqrt{30}$                       D.  $15\sqrt{2}$                       E. NOT
- Sid made the following scores on his TMSCA general science tests: 202, 168, 130, 213, 127, 184, 114 and 170. Find the median of his scores.  
A. 170                      B. 213                      C. 114                      D. 169                      E. NOT
- The product of the LCM and GCF of seventy-one and fifty-two is:  
A. 3,692                      B. 3,296                      C. 3,557                      D. 3,672                      E. NOT
- The diameter of a silver atom is about 0.0000000025 m. Express that number using scientific notation.  
A.  $2.5 \times 10^9$                       B.  $2.5 \times 10^{-9}$                       C.  $2.5 \times 10^{-10}$                       D.  $2.5 \times 10^{-11}$                       E. NOT
- The profits of a business are shared in a ratio of 4:3:2. If the company earned \$38,241.27 in profits this past month, how much will the partner with the smallest share receive?  
A. \$8,498.06                      B. \$7,840.12                      C. \$4,249.03                      D. \$12,747.09                      E. NOT
- The bases and height of a trapezoid are 17 cm, 30 cm and 22 cm respectively. What's its area?  
A.  $585 cm^2$                       B.  $442 cm^2$                       C.  $517 cm^2$                       D. 69 cm                      E. NOT

14. A bag contains six blue, five green and four red marbles. A person selects two marbles without replacement. What is the probability of selecting two green marbles in a row?  
 A.  $\frac{2}{35}$       B.  $\frac{2}{21}$       C.  $\frac{2}{3}$       D.  $\frac{13}{21}$       E. NOT
15. 70% of 135 = 45% of what?  
 A. 90      B. 300      C. 175      D. 210      E. NOT
16.  $\overline{\text{XLVIII}} - \text{XIX} =$  \_\_\_\_\_ (Arabic Number)  
 A. 47,019      B. 29,000      C. 29      D. 47,981      E. NOT
17. What are the coordinates of the point at which the lines  $2x - 3y = 5$  and  $-5x + y = 7$  intersect?  
 A. (-2, -3)      B. (6, 5)      C. (-1, 4)      D. (7, -8)      E. NOT
18. In the sequence: 9, 17, 25, 33, ... 177 is the \_\_\_\_\_ term.  
 A. 21st      B. 23rd      C. 19th      D. 22nd      E. NOT
19.  $27 + 36 \div 3 - 4 \times 2 - 5^2 =$   
 A. 9      B. 6      C. -2      D. 29      E. NOT
20. If  $a = -7$ ,  $b = 12$ ,  $c = 13$  and  $d = -4$ , then  $5adc - b^2 =$   
 A. 220      B. 1,796      C. 1,676      D. -1,964      E. NOT
21.  $\frac{5}{13}$  of two hours thirty-six minutes is what?  
 A. 43 min.      B. 1 hr. 3 min.      C. 57 min.      D. 1 hr.      E. NOT
22. To do a job alone, it would take Mindy three days, Wendy four days and Cindy six days. How long would it take to do the job if they all worked together?  
 A.  $\frac{3}{4}$  days      B.  $1\frac{1}{3}$  days      C.  $2\frac{4}{7}$  days      D.  $1\frac{5}{8}$  days      E. NOT
23. Dawn averaged fifteen points the first eight games. She averaged twenty-two points in her next six games. What is her overall average?  
 A. 19      B. 20      C. 18      D. 21      E. NOT
24. If the circumferences of two circles are in the ratio 16:25, then their areas are in what ratio?  
 A. 4:5      B. 114:327      C. 256:625      D. 8:13      E. NOT
25. Which figure cannot contain an obtuse angle?  
 A. rhombus      B. parallelogram      C. square      D. triangle      E. NOT
26. A rectangle shares a common side with two regular hexagons. If the combined perimeters of the hexagons equal 132, what is the area of the rectangle?  
 A. 165      B. 202      C. 147      D. 52      E. NOT



27. The 3 sides of a triangle have lengths of  $(5x + 13)$  cm,  $(4x - 6)$  cm and  $(2x + 9)$  cm. What is the length of the second longest side if the perimeter of the triangle is 93 cm?  
 A. 22 cm      B. 29 cm      C. 48 cm      D. 23 cm      E. NOT
28. Evaluate:  $2 \begin{bmatrix} 4 & 15 \\ 7 & -5 \end{bmatrix} - 3 \begin{bmatrix} -8 & 1 \\ 12 & 3 \end{bmatrix} =$   
 A.  $\begin{bmatrix} 41 & 26 \\ -9 & -17 \end{bmatrix}$       B.  $\begin{bmatrix} 32 & 27 \\ -22 & -19 \end{bmatrix}$       C.  $\begin{bmatrix} -16 & 27 \\ 50 & -1 \end{bmatrix}$       D.  $\begin{bmatrix} 36 & 21 \\ -6 & -51 \end{bmatrix}$       E. NOT
29. The prime twin of fifty-nine is:  
 A. 61      B. 53      C. 57      D. 67      E. NOT
30. How many three-digit numbers end in 1, 5, 7, or 8?  
 A. 360      B. 450      C. 24      D. 270      E. NOT
31. Solve:  $4m + 21 \geq 11m - 42$   
 A.  $m > 6$       B.  $m < 7$       C.  $m \leq 9$       D.  $m \geq -6$       E. NOT
32. The simple interest on six thousand, five hundred sixty-four dollars at 7% for eleven months is:  
 A. \$386.00      B. \$417.63      C. \$398.45      D. \$421.19      E. NOT
33.  $82^2 - 18^2 =$   
 A. 7,026      B. 5,994      C. 6,400      D. 7,200      E. NOT
34. Fred delivers newspapers to earn extra money. He is paid three cents each for regular newspapers and seven cents each for Sunday papers. If he delivers four hundred seventeen regular newspapers and two hundred twenty-two Sunday newspapers, how much will he earn?  
 A. \$35.85      B. \$33.15      C. \$29.64      D. \$28.05      E. NOT
35.  $123_9 - 244_9 =$  \_\_\_\_\_  
 A. 36      B. -121      C. 56      D. 40      E. NOT
36. Two trains leave the station at the same time traveling in opposite directions. One train travels at 69 mph while the other travels at 73 mph. How long will it take for the trains to be 994 miles apart?  
 A. 7 hours      B. 10 hours      C. 6.5 hours      D. 9 hours      E. NOT
37. At the beginning of training camp, Joe weighed two hundred forty pounds. By the first game of the season he weighed one hundred ninety-two pounds. What is the percent decrease in his weight?  
 A. 30      B. 25      C. 20      D. 15      E. NOT
38. To make a box for her cat to climb on, Naomi wants to cover a wooden cube with carpeting material on five of its faces. If the cube has an edge of twenty-three inches, how much area will Naomi have to cover?  
 A.  $2,645 \text{ in}^2$       B.  $529 \text{ in}^2$       C.  $230 \text{ in}^2$       D.  $3,174 \text{ in}^2$       E. NOT

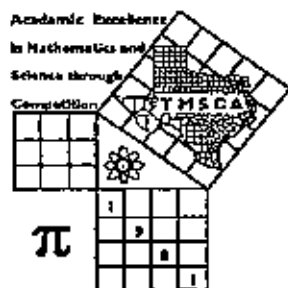
39. An angle whose measure is greater than  $193^\circ$  and less than  $356^\circ$  is a(n) \_\_\_\_\_ angle.  
 A. acute                      B. reflex                      C. obtuse                      D. straight                      E. NOT
40. The sum of the positive integer divisors of 52 is:  
 A. 97                      B. 46                      C. 51                      D. 98                      E. NOT
41. An airplane flies four hundred kilometers against the wind in two hours. It flies the same distance with the wind in one hour. What is the speed of the airplane in still air in kilometers per hour?  
 A. 225                      B. 300                      C. 100                      D. 375                      E. NOT
42. A fifty-foot ladder leaning against a wall casts a fourteen foot shadow that stretches from the foot of the ladder to the base of the wall. How far up the wall is the top of the ladder?  
 A. 64 ft                      B. 36 ft                      C. 48 ft                      D. 52 ft                      E. NOT
43. The measure of one base angle of an isosceles triangle is  $63^\circ$ . The measure of the vertex angle is:  
 A.  $117^\circ$                       B.  $63^\circ$                       C.  $44^\circ$                       D.  $54^\circ$                       E. NOT
44. How many license plates can be made using three letters followed by two digits?  
 A. 1,757,600                      B. 5,200                      C. 676,000                      D. 2,450,000                      E. NOT
45. Find the coordinates of the midpoint of the line segment whose endpoints are  $(7, -3)$  and  $(-15, 9)$   
 A.  $(-11, -6)$                       B.  $(3, -4)$                       C.  $(-4, 3)$                       D.  $(4, -3)$                       E. NOT
46. Assume you have 15 kilograms of coffee that costs  $\$4.75/\text{kg}$ . How many kilograms of coffee costing  $\$4.00/\text{kg}$  should you add to it, in order to get a mixture that costs  $\$4.45/\text{kg}$ ?  
 A. 12 kg                      B. 9 kg                      C. 10 kg                      D. 8 kg                      E. NOT
47. Slope of a line perpendicular to  $\frac{x}{6} - \frac{y}{3} + 4 = 0$  is:  
 A. 3                      B. -2                      C.  $\frac{1}{2}$                       D. -6                      E. NOT
48. Susan's age plus her father's age is thirty-two years. In twelve years, Susan will be one-third as old as her father. Find her age now.  
 A. 10                      B. 5                      C. 13                      D. 2                      E. NOT
49. Find the units digit of  $2^{39}$ .  
 A. 8                      B. 2                      C. 4                      D. 6                      E. NOT
50. From the diagram of the given polygon, find the value of  $n^\circ$ .  
 A. 94                      B. 119                      C. 61                      D. 73                      E. NOT



1999 - 2000 TMSCA Middle School Number Sense State Championship

- 1)  $98 \times 50 =$  \_\_\_\_\_
- 2)  $4725 \times 11 =$  \_\_\_\_\_
- 3)  $597 + 498 =$  \_\_\_\_\_
- 4) CXXVII = \_\_\_\_\_ Arabic Number
- 5)  $16 \times 303 =$  \_\_\_\_\_
- 6)  $\frac{4}{5} =$  \_\_\_\_\_ %
- 7)  $4 \times 1000 + 16 \times 100 + 5 \times 1 =$  \_\_\_\_\_
- 8)  $5\frac{3}{7} \times 7 =$  \_\_\_\_\_
- 9)  $15 + 20 \div 5 - 3 =$  \_\_\_\_\_
- \*10)  $398 \times 578 =$  \_\_\_\_\_
- 11)  $\frac{3}{12} + \frac{5}{20} + \frac{8}{32} =$  \_\_\_\_\_
- 12)  $49 \times 41 =$  \_\_\_\_\_
- 13)  $22^2 =$  \_\_\_\_\_
- 14) 608 millimeters = \_\_\_\_\_ decimeters
- 15)  $481 \div 9$  has a remainder of \_\_\_\_\_
- 16)  $5\frac{3}{4}\% =$  \_\_\_\_\_ decimal
- 17) X + XXX = \_\_\_\_\_ Roman Numeral
- 18) 121 nickles = \$ \_\_\_\_\_
- 19) The mean of 42, 47 and 49 is \_\_\_\_\_
- \*20)  $3737 \div 8 =$  \_\_\_\_\_
- 21)  $\frac{4}{9} + \frac{1}{6} =$  \_\_\_\_\_
- 22)  $19 \times 32 - 17 \times 32 =$  \_\_\_\_\_
- 23) Which is larger  $-\frac{3}{11}$  or  $-\frac{4}{15}$ ? \_\_\_\_\_
- 24)  $2\frac{4}{13}\% =$  \_\_\_\_\_ fraction
- 25)  $18 \div 2\frac{1}{4} =$  \_\_\_\_\_
- 26)  $(-4) + 5 \times (-3) =$  \_\_\_\_\_
- 27)  $107^2 =$  \_\_\_\_\_
- 28) The area of a square with side  $\frac{1}{3}$  is \_\_\_\_\_
- 29) If a bag of a dozen dozens of golf tees cost \$2.88, then a dozen tees cost \$ \_\_\_\_\_
- \*30)  $52,141 - 19,214 + 7,892 =$  \_\_\_\_\_
- 31) If  $6x + 5 = -19$ , then  $x =$  \_\_\_\_\_
- 32)  $24 \times 63 =$  \_\_\_\_\_
- 33)  $3\frac{7}{8} \times 3\frac{1}{8} =$  \_\_\_\_\_ mixed number
- 34)  $94 \times 89 =$  \_\_\_\_\_
- 35) If  $a = 5$  and  $b = 11$ , then  $\sqrt{a^2 + b} =$  \_\_\_\_\_
- 36) The LCM of 32 and 56 is \_\_\_\_\_
- 37)  $\sqrt{729} =$  \_\_\_\_\_
- 38)  $39 \times 79 =$  \_\_\_\_\_
- 39)  $27 \times 111 =$  \_\_\_\_\_
- \*40)  $\sqrt{12,000} =$  \_\_\_\_\_
- 41)  $16\frac{2}{3} \times 66 =$  \_\_\_\_\_
- 42)  $63_8 =$  \_\_\_\_\_ 10

- 43)  $125 \times 16 =$  \_\_\_\_\_
- 44)  $\{T, O, P\} \cup \{F, L, I, T, E\}$  has \_\_\_\_\_ elements
- 45)  $55^2 - 52^2 =$  \_\_\_\_\_
- 46)  $\frac{17}{40} =$  \_\_\_\_\_ decimal
- 47) The next term in the sequence 1, 1, 2, 6, 4, 11, ...  
is \_\_\_\_\_
- 48)  $12_{10} =$  \_\_\_\_\_  $_4$
- 49)  $5\text{ft} \times 18\text{ft} \times 6\text{ft} =$  \_\_\_\_\_  $\text{yds}^3$
- \*50) 27% of 2981 = \_\_\_\_\_
- 51) The area of a square with diagonal 11 is \_\_\_\_\_
- 52) The largest of three consecutive integers whose  
sum is 3 is \_\_\_\_\_
- 53)  $1 + 2 + 3 + \dots + 29 + 30 =$  \_\_\_\_\_
- 54)  $8^2 + 16^2 =$  \_\_\_\_\_
- 55) The number of positive, proper fractions in  
lowest terms with denominator 14 is \_\_\_\_\_
- 56)  $8\frac{2}{3} \times 4\frac{2}{3} =$  \_\_\_\_\_ mixed number
- 57) The sum of the complement and the supplement  
of a  $55^\circ$  angle is \_\_\_\_\_  $^\circ$
- 58) If  $25_b = 21_{10}$ , then  $b =$  \_\_\_\_\_
- 59)  $.03 =$  \_\_\_\_\_ fraction
- \*60)  $\pi^7 =$  \_\_\_\_\_
- 61) The area of a circle with circumference  $30\pi$   
is \_\_\_\_\_
- 62) If  $\frac{1}{3} - \frac{1}{8} = \frac{1}{x}$ , then  $x =$  \_\_\_\_\_
- 63) The probability of choosing a red 4 or a black 6  
from a standard deck of playing cards is \_\_\_\_\_
- 64) If  $3a's = 7b's$  and  $2b's = 6c's$ , then  $1a =$  \_\_\_\_\_  $c's$
- 65)  $\sqrt{128} =$  \_\_\_\_\_
- 66) If  $f(x) = x^2 - 6x + 9$ , then  $f(4) =$  \_\_\_\_\_
- 67) The diagonal of a square with side 5 is \_\_\_\_\_
- 68)  $9^{-2} =$  \_\_\_\_\_
- 69) The slope of the line passing through  $(-1, 4)$   
and  $(0, -1)$  is \_\_\_\_\_
- \*70)  $3^8 =$  \_\_\_\_\_
- 71)  $\frac{\pi}{4}$  radians = \_\_\_\_\_ degrees
- 72) The volume of a cube with edge  $\sqrt{10}$  is \_\_\_\_\_
- 73)  $11101_2 =$  \_\_\_\_\_  $_8$
- 74)  $(2x + 1)(2x - 1) =$  \_\_\_\_\_
- 75)  $993 \times 997 =$  \_\_\_\_\_
- 76)  $\sqrt{7\frac{1}{9}} =$  \_\_\_\_\_
- 77)  $42_6 - 24_6 =$  \_\_\_\_\_  $_6$
- 78) The measure of an interior angle of a regular  
15-gon is \_\_\_\_\_  $^\circ$
- 79)  $22 \text{ ft/sec} =$  \_\_\_\_\_  $\text{mi/hr}$
- \*80) The volume of a cone with radius 5 and  
height 9 is \_\_\_\_\_



**TMSCA MIDDLE SCHOOL  
SCIENCE  
CHAMPIONSHIP MEET  
APRIL 8, 2000**

**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 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 questions have ONE and ONLY ONE correct [BEST] answer. There is a penalty for all incorrect answers.
7. On the back of this page is a copy of the periodic table of the elements as well as a list of some potentially useful information in answering the questions.
8. Calculators may be used. Calculators must be silent and hand-held that do not need an external power source. Each contestant may bring one spare calculator. Calculators shall not contain built in features such as measurement or unit conversions, scientific constant (except  $\pi$  and  $e$ ) or ROM base scientific formulas. Small hand-held computers are not permitted. Examples of allowed functions would include  $+$ ,  $-$ ,  $\times$ ,  $\div$ ,  $\%$ ,  $\sqrt{\quad}$ ,  $10^x$ ,  $\log(x)$ ,  $e^x$ ,  $\ln(x)$ ,  $\sin$ ,  $\sin^{-1}$ ,  $\cos$ ,  $\cos^{-1}$ ,  $\tan$ ,  $\tan^{-1}$ , with scientific notation and degree/radian capability. **THE CONTEST DIRECTOR SHALL HAVE AUTHORITY TO APPROVE OR DISAPPROVE ANY CALCULATOR.**
9. All answers within  $\pm 5\%$  will be considered correct.
10. All questions answered correctly are worth FIVE points. TWO points will be deducted for all questions answered incorrectly. no points will be added or subtracted for questions not answered.
11. In case of ties, percent accuracy will be used as a tie breaker.

# Periodic Classification of the Elements

1	2											3	4	5	6	7	8
1 H 1.0080	2 He 4.003											3 B 10.82	4 C 12.01	5 N 14.008	6 O 16.000	7 F 19.00	8 Ne 20.183
3 Li 6.940	4 Be 9.013	Transition Elements										9 Al 26.98	10 Si 28.09	11 P 30.973	12 S 32.066	13 Cl 35.457	14 Ar 39.944
11 Na 22.991	12 Mg 24.32	21 Sc 44.96	22 Ti 47.90	23 V 50.95	24 Cr 51.996	25 Mn 54.94	26 Fe 55.85	27 Co 58.94	28 Ni 58.71	29 Cu 63.54	30 Zn 65.38	31 Ga 69.72	32 Ge 72.60	33 As 74.91	34 Se 78.96	35 Br 79.906	36 Kr 83.80
19 K 39.100	20 Ca 40.08	39 Y 88.92	40 Zr 91.22	41 Nb 92.91	42 Mo 95.95	43 Tc 101.1	44 Ru 101.1	45 Rh 102.91	46 Pd 106.04	47 Ag 107.880	48 Cd 112.41	49 In 114.82	50 Sn 118.70	51 Sb 121.76	52 Te 127.61	53 I 126.91	54 Xe 131.29
37 Rb 85.48	38 Sr 87.63	57-71 see Lanthanide Series	72 Hf 178.50	73 Ta 180.95	74 W 183.86	75 Re 186.21	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 197.0	80 Hg 200.61	81 Tl 204.39	82 Pb 207.21	83 Bi 209.00	84 Po 210	85 At 210	86 Rn 222
87 Fr 223	88 Ra 226.05	89-102 see Actinide Series															

57 La 138.92	58 Ce 140.13	59 Pr 140.92	60 Nd 144.27	61 Pm	62 Sm 150.35	63 Eu 152.0	64 Gd 157.25	65 Tb 158.93	66 Dy 162.51	67 Ho 164.94	68 Er 167.27	69 Tm 168.94	70 Yb 173.04	71 Lu 174.99
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89 Ac 227	90 Th 232.05	91 Pa 231	92 U 238.07	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No
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## POSSIBLY USEFUL INFORMATION:

Avogadro's Number,  $N = 6.02 \times 10^{23}$  molecules/mole

Planck's constant,  $h = 6.63 \times 10^{-34}$  J s

Standard temperature and pressure (STP) is  $0^\circ\text{C}$  and 1 atmosphere.

Gram molecular volume at STP = 22.4 liters

Velocity of light,  $c = 3.0 \times 10^8$  m/sec

Absolute zero =  $0^\circ\text{K} = -273.16^\circ\text{C}$

Gas constant,  $R = 1.987$  cal/degree-mole  
 $= 0.082$  liter-atm/degree-mole

One Faraday = 96,500 coulombs

Dulong and Petit's constant = 6.0 amu-cal/gram-degree

Electron rest mass,  $m_e = 9.11 \times 10^{-31}$  kg

Atomic mass unit,  $m_a = 1.66 \times 10^{-27}$  kg

Boltzmann constant,  $k_B = 1.38 \times 10^{-23}$  J degree<sup>-1</sup>

Permittivity of free space  $\epsilon_0 = 8.85 \times 10^{-12}$  C<sup>2</sup>/Nm<sup>2</sup>

Permeability of free space  $\mu_0 = 4\pi \times 10^{-7}$  T m/A

1 Atmosphere =  $1.02 \times 10^5$  N/m<sup>2</sup> = 760 Torr = 760 mmHg

1 Electron Volt =  $1.6 \times 10^{-19}$  Joules

Charge of an electron =  $1.6 \times 10^{-19}$  Coulombs

1 Calorie = 4.184 Joules

Neutron Mass = 1.008665 au

Proton Mass = 1.007277 au

1 au = 931.5 MEV

1999-2000 TMSCA Middle School Science Test 15

1. What makes up the filament in a regular light bulb?  
A. mercury      B. tungsten      C. titanium      D. phosphorus      E. N.O.T.
2. A compound microscope has a 10X ocular, 10X low power objective and a 50X high power objective. A student noted that under high power five cells end to end filled to diameter of the field. If the microscope were switched to low power, how many cells would fit across the field of view?  
A. 1      B. 5      C. 10      D. 25      E. N.O.T.
3. If a set of parents have three sons, what is the probability that their fourth child will be a girl?  
A. 0%      B. 25%      C. 75%      D. 100%      E. N.O.T.
4. How many zeroes are in  $7.24 \times 10^{18}$  when it is written in standard form?  
A. 18      B. 17      C. 16      D. 15      E. N.O.T.
5. The study of \_\_\_\_\_ and its compounds is called organic chemistry.  
A. carbon      B. hydrogen      C. nitrogen      D. oxygen      E. N.O.T.
6. A Punnett Square showing all possible combinations for 4 traits (4 x 4 cross) would contain \_\_\_\_\_ squares.  
A. 32      B. 64      C. 128      D. 256      E. N.O.T.
7. An albino corn plant lacks chlorophyll and cannot carry on photosynthesis. This genetic trait recurs in corn plants because \_\_\_\_\_.  
A. albino plants mutate to green plants  
B. albino plants become green in sunlight  
C. green plants can carry the albino gene  
D. albino plants self pollinate  
E. N.O.T.
8. Color-blindness and hemophilia are examples of \_\_\_\_\_ traits.  
A. dominate      B. recessive      C. sex-linked      D. B and C      E. N.O.T.
9. Clouds are classified by their \_\_\_\_\_.  
A. altitude and moisture content      C. shape and altitude      E. N.O.T.  
B. shape and speed of movement      D. shape and moisture content
10. A function of the \_\_\_\_\_ is water conservation.  
A. pancreas      B. liver      C. small intestine      D. large intestine      E. N.O.T.
11. The molecular mass of  $\text{HC}_2\text{H}_3\text{O}_2$  (vinegar) is \_\_\_\_\_.  
A. 16      B. 32      C. 46      D. 60      E. N.O.T.

12. Which of the following is not made up of protein?  
A. butter      B. muscle      C. insulin      D. blood      E. N.O.T.
13. As waves erode sea cliffs, columns of resistant rock are formed called \_\_\_\_\_.  
A. sand bars      B. sea stacks      C. spits      D. terraces      E. N.O.T.
14. A Newton is a measure of \_\_\_\_\_.  
A. volume      B. force      C. mass      D. distance      E. N.O.T.
15. The order Coleoptera includes the \_\_\_\_\_.  
A. bony fish      B. butterflies      C. corals      D. beetles      E. N.O.T.
16. Mammalian eggs (before fertilization) contain \_\_\_\_\_ sex chromosomes.  
A. only Y      B. only X      C. X or Y      D. X and Y      E. N.O.T.
17. The cross between a horse and a donkey results in a mule. This is an example of \_\_\_\_\_.  
A. hybridization      C. selective breeding      E. N.O.T.  
D. inbreeding      D. sequencing
18. Which of the following pairs is incorrect?  
A. C, diamond      C. FeS<sub>2</sub>, pyrite      E. N.O.T.  
B. SiO<sub>2</sub>, quartz      D. Au, silver
19. A compass points to \_\_\_\_\_.  
A. geographic north      C. magnetic north      E. N.O.T.  
B. true north      D. both A and B
20. A lake contains minnows, mosquito larva, sunfish, algae and trout. Which of these organisms would probably be the most abundant?  
A. algae      B. larva      C. minnows      D. sunfish      E. N.O.T.
21. If a piece of red litmus paper is placed in Coke it will \_\_\_\_\_.  
A. change to blue      C. turn white      E. N.O.T.  
B. remain red      D. change to yellow
22. If the gene for curly hair is C and the gene for straight hair is c and curly hair is dominant over straight hair, what would be the phenotype for someone with the genes Cc?  
A. curly      B. straight      C. wavy      D. A & C      E. N.O.T.
23. The inner core of the Earth is \_\_\_\_\_.  
A. solid      B. liquid      C. gas      D. plasma      E. N.O.T.

24. Fraternal twins result when \_\_\_\_.
- A. one sperm fertilizes one egg
  - B. two different sperm fertilize two different eggs
  - C. a fertilized egg splits
  - D. and unfertilized egg splits and two different sperm fertilize each egg
  - E. N.O.T.
25. When a sip of water goes down the wrong way, the \_\_\_\_ has not functioned properly.
- A. epiglottis
  - B. larynx
  - C. pharynx
  - D. trachea
  - E. N.O.T.
26. Aluminum classified as a \_\_\_\_.
- A. metal
  - B. nonmetal
  - C. metalloid
  - D. gas
  - E. N.O.T.
27. A substance that is produced in the human body that helps fight viruses is \_\_\_\_.
- A. growth hormone
  - B. insulin
  - C. interferon
  - D. luciferase
  - E. N.O.T.
28. The substances that make up hydrocarbons are \_\_\_\_.
- A. carbon and water
  - B. carbon and oxygen
  - C. carbon and hydrogen
  - D. carbon only
  - E. N.O.T.
29. A wind sock measures \_\_\_\_.
- A. wind direction
  - B. wind speed
  - C. air purity
  - D. both A and B
  - E. N.O.T.
30. Which of the following would most likely be the correct distance from the sun to the planet Saturn?
- A. 1 A.U.
  - B. 10 A.U.
  - C. 100 million miles
  - D. 0.1 A.U.
  - E. N.O.T.
31. Warming your hands in front of an open fireplace is an example of heat \_\_\_\_.
- A. conduction
  - B. convection
  - C. conversion
  - D. radiation
  - E. N.O.T.
32. Organisms that do not need oxygen to survive are called \_\_\_\_.
- A. aerobic
  - B. anaerobic
  - C. autotrophic
  - D. heterotrophic
  - E. N.O.T.
33. If Aluminum has an atomic number of 13 and a mass number of 27, then it has \_\_\_\_ neutrons.
- A. 14
  - B. 13
  - C. 27
  - D. 40
  - E. N.O.T.
34. What is the atomic number of Copper?
- A. 6
  - B. 19
  - C. 27
  - D. 29
  - E. N.O.T.

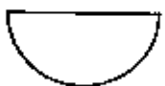
35. Which era is known as the Age of Ancient Marine Life?
- A. Cenozoic      B. Precambrian      C. Paleozoic      D. Mesozoic      E. N.O.T.
36. The cells in the retina that are used mainly at night are the \_\_\_\_.
- A. rods      B. cones      C. optics      D. lens      E. N.O.T.
37. The gastropods are known as \_\_\_\_.
- A. head-footed mollusks      C. tentacled mollusks      E. N.O.T.  
B. stomach-footed mollusks      D. two-shelled mollusks
38. Under normal conditions, how long does it take a disposable diaper to break down in our environment?
- A. 5 years      B. 25 years      C. 50 years      D. 100 years      E. N.O.T.
39. Chemicals called \_\_\_\_ are used by animals to mark their territory.
- A. pheromones      B. leukoplasts      C. cytozine      D. cambia      E. N.O.T.
40. Of the elements with the atomic numbers listed below, which one would be the least likely to react with another element?
- A. 3      B. 17      C. 86      D. 103      E. N.O.T.
41. The depressant most abused by teenagers today is \_\_\_\_.
- A. nicotine      B. marijuana      C. cocaine      D. alcohol      E. N.O.T.
42. A red object appears black if a blue light shines on it because \_\_\_\_.
- A. all colors are absorbed in blue light  
B. there is no red light for the object to reflect  
C. black is the complement of red  
D. red, blue and black are complementary colors  
E. N.O.T.
43. Nematocysts are \_\_\_\_.
- A. stinging cells      C. a type of worm      E. N.O.T.  
B. cnidarian larva      D. round cells
44. During the \_\_\_\_ phase of the moon would be the best time to go star gazing.
- A. new      B. first quarter      C. waning gibbous      D. full      E. N.O.T.
45. The \_\_\_\_ muscles are voluntary muscles.
- A. smooth      B. cardiac      C. skeletal      D. digestive      E. N.O.T.
46. Birds have a \_\_\_\_ chambered heart.
- A. 2      B. 3      C. 4      D. 5      E. N.O.T.

47. The antibiotic penicillin was developed by \_\_\_\_\_.  
A. Alexander Fleming  
B. Ernst Chain & Howard Flory  
C. Louis Pasteur  
D. Jonas Salk  
E. N.O.T.
48. A solution with a pH of 4 is \_\_\_\_\_ times more acidic than a solution with a pH of 6.  
A. 2  
B. 10  
C. 20  
D. 100  
E. N.O.T.
49. Carbon-14 dating depends on the principle that when an organism dies, the amount of radioactive carbon-14 will \_\_\_\_\_ in relation to the total carbon in the organism.  
A. increase steadily  
B. remain the same  
C. decrease steadily  
D. vary  
E. N.O.T.
50. During a volcanic eruption, the largest rock fragments that are blown into the air are called \_\_\_\_\_.  
A. ash  
B. bombs  
C. cinders  
D. dust  
E. N.O.T.

1999-2000 TMSCA Middle School State Meet Calculator Applications  
Word and Geometry Problem Solutions

11. In one month, I wrote twenty-three checks and made three deposits to my checking account. My bank charged me \$8.90 as a service charge for these transactions. How much per transaction did the bank charge me? 11= \_\_\_\_\_¢
- 23 checks + 3 deposits = 26 transactions       $\$8.90 \div 26 = \$0.342$   
 $\$0.342 \times 100\text{¢}/1\$ = 34.2\text{¢}$
12. A "megabyte", which is  $2^{20}$ , contains how many bytes? 12= \_\_\_\_\_Integer
- Put in 2 and press Enter, then put in 20 and press  $y^x$ . The answer is **1048576**. (All digits must be written out since the answer blank states "integer".)
13. What is three plus four divided by ten minus the quantity of six plus seven multiplied by thirty nine? 13= \_\_\_\_\_
- Remembering the order of operations is the key to this problem.  $[3 + (4 \div 10)] - [6 + (7 \times 39)] = -276$
24. It costs fifty cents for a daily paper and one dollar and fifty cents for a Sunday newspaper when bought at a store. A subscription for a year costs \$155.40. How much would Samantha save by subscribing to a newspaper for a year instead of buying the papers at a store? (Assume 365 days in a year.) 24=\$ \_\_\_\_\_
- $(52 \text{ weeks} \times 6 \text{ days per week} \times \$0.50) + (52 \text{ weeks} \times \$1.50) = \$234.00$  for the newspapers when bought at a store.  
 $\$234.00 - \$155.40 = \$78.60$
25. A positive number, when multiplied by three, then divided by eight is equal to the number of items in a gross. What is the number? 25= \_\_\_\_\_Integer
- Let  $x =$  the positive number       $\frac{3x}{8} = 144 \rightarrow x = 384$  (integer)
26. A pipe is four inches in diameter. What is its circumference in centimeters? 26= \_\_\_\_\_cm
- The formula for circumference is  $\pi D$ .  $\pi(4) = 12.56\dots$  Convert to centimeters by using the inches to cm conversion key, or multiply  $12.56\dots$  inches by  $2.54 \text{ cm/in} = 31.9$
35. How many times will  $e$  go into  $[\sqrt{902} + 677]$ ? 35= \_\_\_\_\_
- Put in 902 and press the Square Root key. Put in 677 and press Divide. Put in 1 and press  $e^x$ , then Divide. The answer is **0.0163**.
36. Amanda took six hours to drive two hundred seventy-five miles. If she stopped forty-five minutes for lunch, what was her average speed while moving? 36= \_\_\_\_\_mph
- The actual time spent driving is 5 hours and one quarter hours since the time she spent eating doesn't figure into her average speed while moving.  
 $275 \text{ miles} \div 5.25 \text{ hours} = 52.4$

37. SEMICIRCLE  
Radius = 897

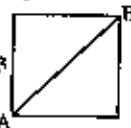


Area = ?

37 = \_\_\_\_\_

The formula for the area of a circle is  $\pi R^2$ .  
 $\pi(897)^2 = 2527753.7\dots$  This is the area of a circle with a radius of 897.  
 Divide by 2 for the area of the semicircle.  
 $2527753.7\dots \div 2 = 1260000.$

38. SQUARE



AB = 1.13

Area = ?

38 = \_\_\_\_\_

The formula for the area of a square is  $\text{side}^2$ .  
 Find the side of the square by dividing AB, which is the diagonal, by  $\sqrt{2}$ .  
 $1.13 \div \sqrt{2} = .799\dots$   
 $.799\dots^2 = 0.638.$

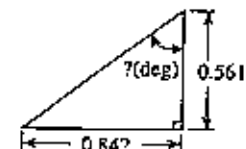
47. The sum of two integers is thirty-nine. Their difference is five. What is the product of these two integers? 47 = \_\_\_\_\_ Integer

Let  $x =$  one integer, let  $y =$  other integer  $x + y = 39$  and  $x - y = 5$  Add the two equations together.  
 $2x = 44; x = 22; y = 17$   $(x)(y) = 374$  (integer)

48. Calculate  $541^{241}$ . 48 = \_\_\_\_\_

$241 \times \text{Log}(541) = 658.70\dots$  Use the whole number as the exponent in the answer. Subtract the whole number.  $658.70\dots - 658 = .700\dots$  Now press the  $10^x$  key. This number is the mantissa in the answer.  
 The answer is  $5.02 \times 10^{658}$ .

49. RIGHT TRIANGLE



?(deg)

0.842

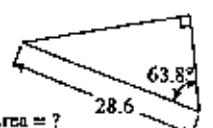
0.561

49 = \_\_\_\_\_

$$\tan ? = \frac{0.842}{0.561} = 1.50\dots$$

Convert to degrees by using the arctan buttons.  
 The answer is 56.3.

50. RIGHT TRIANGLE



63.8°

28.6

Area = ?

50 = \_\_\_\_\_

Find the base of the triangle.

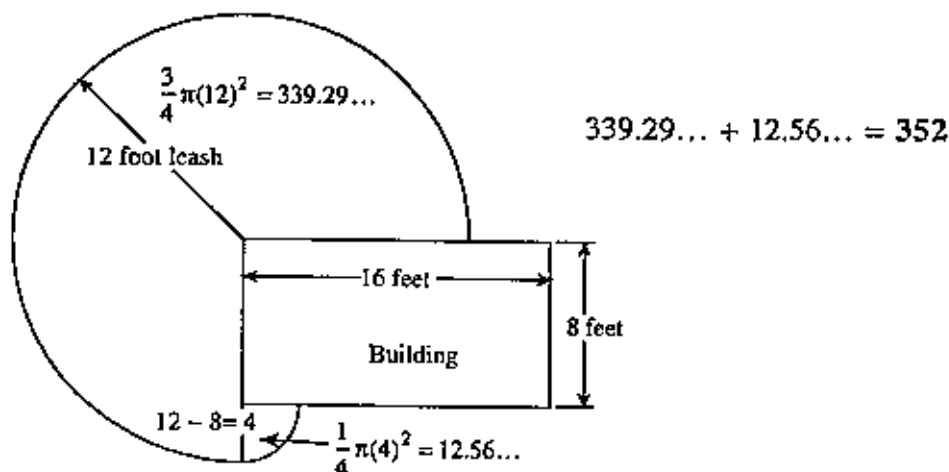
$$\cos 63.8 = \frac{\text{adjacent}}{28.6} \rightarrow \text{adjacent} = 12.62\dots$$

$$\sqrt{28.6^2 - 12.62\dots^2} = 25.66\dots = \text{side of triangle}$$

$$\text{Area} = \frac{\text{base} \times \text{height}}{2} = \frac{12.62\dots \times 25.66}{2} = 162$$

59. A dog is tied with a twelve-foot leash to the corner of a building that is sixteen feet long by eight feet wide. What is his total roaming area?

59= \_\_\_\_\_ ft<sup>2</sup>



60. As Yvonne writes checks she rounds up the amount of check to the nearest dollar when she writes down the check in her checkbook. One month, her balance in her checkbook was \$18.32 less than the bank's balance of \$982.67. What was the percent error in Yvonne's checkbook balance?

60= \_\_\_\_\_ %

$$\$982.67 - \$18.32 = \$964.35 \text{ (Yvonne's balance)}$$

$$\text{Percent error} = \left( \frac{\text{approximate}}{\text{exact}} - 1 \right) \times 100 \rightarrow \left( \frac{\$964.35}{\$982.67} - 1 \right) \times 100 = -1.86$$

61. SQUARE & INSCRIBED IDENTICAL SQUARES

251  
Shaded area = ?  
61= \_\_\_\_\_

251 is the length of the diagonals of three of the inscribed squares, as well as the length of the side of the large square.

Divide 251 by 3 and then by the square root of 2 to find the side of one of the inscribed squares.

$$251 \div 3 \div \sqrt{2} = 59.16\dots$$

Square 59.16... to find the area of one of the inscribed squares = 3500.05...

Multiply by 5 to find the total area of the inscribed squares = 17500.27...

Square 251 to find the area of the large square = 63001.00...

Subtract the area of the inscribed squares from the area of the large square to find the shaded area.

$$63001.00\dots - 17500.27\dots = 45500$$

62. SPHERE

Volume = 8260  
Total Surface Area = ?  
62= \_\_\_\_\_

$$\text{The volume of a sphere} = \frac{4}{3}\pi R^3. \quad 8260 = \frac{4}{3}\pi R^3 \rightarrow R = 12.53\dots$$

Use this radius in the formula for the total surface area of a sphere.

$$\text{Total surface area} = 4\pi R^2 = 4\pi(12.53\dots)^2 = 1980$$

71. If the density of gold is  $19.2 \text{ g/cm}^3$ , what is the length of the side of a cube of gold that has a mass of fifty kilograms?

71= \_\_\_\_\_ cm

First, convert 50 kilograms to grams.  $50 \text{ kg} \times \frac{1000 \text{ g}}{1 \text{ kg}} = 50,000 \text{ g}$

$$\text{Density} = \frac{\text{mass}}{\text{volume}} \rightarrow 19.2 \text{ g/cm}^3 = \frac{50,000 \text{ g}}{\text{volume}} \rightarrow \text{volume} = 2604.16... \text{ cm}^3$$

The volume of a cube =  $\text{side}^3$ ; take the cube root of  $2604.16... \text{ cm}^3$  to find the length of the side = 13.8

72. A light year is a term used to measure the distance light can travel in a year. Since we know that light travels one hundred eighty-six thousand miles per second, how many miles are in one light year? (Assume 365 days in a year.)

72= \_\_\_\_\_ mi

$$\frac{186,000 \text{ miles}}{1 \text{ second}} \times \frac{3600 \text{ seconds}}{1 \text{ hour}} \times \frac{24 \text{ hours}}{1 \text{ day}} \times \frac{365 \text{ days}}{1 \text{ year}} = 5.87 \times 10^{12}$$

73. SCALENE TRIANGLES

AB = 22.1  
BC = 51.7

$21^\circ$   
?(deg)

73= \_\_\_\_\_

Use the Law of Sines to find angle CAB.

$$\frac{\sin 21^\circ}{22.1} = \frac{\sin \angle CAB}{51.7} \rightarrow \angle CAB = 56.96...$$

The angles in a triangle add up to  $180^\circ$ :  
 $180^\circ - 56.96...^\circ - 21^\circ = \angle ABC = 102^\circ$

A straight line has  $180^\circ$ .  
 $180^\circ - 102^\circ = 78.0$

74. CONICAL FRUSTUM

Area = 3.14

1.68

deg?

Area = 12.6

74= \_\_\_\_\_

Area = 3.14

1.68

Area = 12.6

Find the radii of the two bases of the frustum.

$$3.14 = \pi R_1^2 \rightarrow R_1 = 1.00...$$

$$12.6 = \pi R_2^2 \rightarrow R_2 = 2.00...$$

Subtract  $R_1$  from  $R_2$  to find base of triangle, or line AB.

Base of triangle = 1.00 ...

$$\tan ? = \frac{1.68}{1.00...} \rightarrow ? = 59.2^\circ$$

1999-2000 TMSCA Middle School State Meet  
Answer Key

Page 1	Page 2	Page 3	Page 4
1 = -2770 $-2.77 \times 10^3$	14 = -6.99 $-6.99 \times 10^0$	27 = 0.00155 $1.55 \times 10^{-3}$	39 = -331000000 $-3.31 \times 10^8$
2 = -251 $-2.51 \times 10^2$	15 = -0.00588 $-5.88 \times 10^{-3}$	28 = -1390000000 $-1.39 \times 10^9$	40 = 0.943 $9.43 \times 10^{-1}$
3 = 888 $8.88 \times 10^2$	16 = 1.83 $1.83 \times 10^0$	29 = 339 $3.39 \times 10^2$	41 = $1.05 \times 10^{14}$
4 = 3300 $3.30 \times 10^3$	17 = 2.49 $2.49 \times 10^0$	30 = $3.94 \times 10^{11}$	42 = 0.00747 $7.47 \times 10^{-3}$
5 = -764 $-7.64 \times 10^2$	18 = 11.6 $1.16 \times 10^1$	31 = 4310 $4.31 \times 10^3$	43 = -1.00 $-1.00 \times 10^0$
6 = 11.0 $1.10 \times 10^1$	19 = -540 $-5.40 \times 10^2$	32 = -18400 $-1.84 \times 10^4$	44 = 363 $3.63 \times 10^2$
7 = 23.8 $2.38 \times 10^1$	20 = -106 $-1.06 \times 10^2$	33 = 0.111 $1.11 \times 10^{-1}$	45 = -5.39 $-5.39 \times 10^0$
8 = 0.0345 $3.45 \times 10^{-2}$	21 = 41.3 $4.13 \times 10^1$	34 = 64700 $6.47 \times 10^4$	46 = 8.44 $8.44 \times 10$
9 = 64.9 $6.49 \times 10^1$	22 = 268000 $2.68 \times 10^5$	35 = 0.0163 $1.63 \times 10^{-2}$	47 = 374 $3.74 \times 10^2$
10 = 0.0859 $8.59 \times 10^{-2}$	23 = -4.86 $-4.86 \times 10^0$	36 = 52.4 $5.24 \times 10^1$	48 = $5.02 \times 10^{658}$
11 = 34.2 $3.42 \times 10^1$	24 = \$78.60	37 = 1260000 $1.26 \times 10^6$	49 = 56.3 $5.63 \times 10^1$
12 = 1048576 (Integer)	25 = 384 (Integer)	38 = 0.638 $6.38 \times 10^{-1}$	50 = 162 $1.62 \times 10^2$
13 = -276 $2.76 \times 10^2$	26 = 31.9 $3.19 \times 10^1$		

1999-2000 TMSCA Middle School State Meet  
Answer Key

Page 5	Page 6	Page 7
51 = 0.0721 $7.21 \times 10^{-2}$	61 = 45500 $4.55 \times 10^4$	73 = 78.0 $7.80 \times 10^1$
52 = 2390 $2.39 \times 10^3$	62 = 1980 $1.98 \times 10^3$	74 = 59.2 $5.92 \times 10^1$
53 = 20.9 $2.09 \times 10^1$		
54 = -1.78 $-1.78 \times 10^0$	63 = -1.02 $-1.02 \times 10^0$	75 = $1.63 \times 10^{11}$
55 = 67200 $6.72 \times 10^4$	64 = -0.0253 $-2.53 \times 10^{-2}$	76 = 16600 $1.66 \times 10^4$
56 = 0.000127 $1.27 \times 10^{-4}$	65 = 0.906 $9.06 \times 10^{-1}$	77 = 28800000 $2.88 \times 10^7$
57 = 0.000152 $1.52 \times 10^{-4}$	66 = 0.0196 $1.96 \times 10^{-2}$	78 = 618 $6.18 \times 10^2$
58 = 117 $1.17 \times 10^2$	67 = 1070 $1.07 \times 10^3$	79 = 0.000219 $2.19 \times 10^{-4}$
	68 = 29.8 $2.98 \times 10^1$	80 = 2.38 $2.38 \times 10^0$
59 = 352 $3.52 \times 10^2$	69 = 3630000 $3.63 \times 10^6$	
	70 = -1.03 $-1.03 \times 10^0$	
	71 = 13.8 $1.38 \times 10^1$	
60 = -1.86 $-1.86 \times 10^0$	72 = $5.87 \times 10^{12}$	

1999-2000 TMSCA CHAMPIONSHIP MATHEMATICS  
ANSWER KEY

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

1999-2000 Middle School Mathematics State Championship

Selected Solutions

2. If the diagonal of square is  $14\text{ m}$ , then the area of the square is  $14^2 \div 2 = 196 \div 2 = 98\text{ m}^2$ .

8.  $\sqrt{50} - \sqrt{98} + \sqrt{18} = \sqrt{25 \times 2} - \sqrt{49 \times 2} + \sqrt{9 \times 2} = 5\sqrt{2} - 7\sqrt{2} + 3\sqrt{2} = 8\sqrt{2} - 7\sqrt{2} = \sqrt{2}$ .

13. The partner with the smallest share will receive  $\$(38,241.27 \div 9) \times 2 = \$8,498.06$ . We divide by 9 because it is the sum of the ratios 4:3:2.

14. Probability of selecting two green marbles in a row without replacement is:  $\frac{5}{15} \times \frac{4}{14} = \frac{1}{3} \times \frac{2}{7} = \frac{2}{21}$ .

16.  $\overline{\text{XLVIII}} - \text{XIX} = (\text{Roman}) = 48,000 - 19 (\text{Arabic}) = 47,981 (\text{Arabic})$ .

When they needed large numbers, the Romans sometimes used a bar (called a vinculum) over the number to multiply it by 1,000. (page 326, The Math Teacher's Book of Lists, 1995 Prentice Hall).

22.  $\frac{1}{\frac{1}{3} + \frac{1}{4} + \frac{1}{6}} = \frac{1}{\frac{4}{12} + \frac{3}{12} + \frac{2}{12}} = \frac{12}{9} = \frac{4}{3} = 1\frac{1}{3}$  days for Mindy, Wendy and Cindy to do the job together.

27.  $5x + 13 + 4x - 6 + 2x + 9 = 93 \Rightarrow 11x + 16 = 93 \Rightarrow 11x = 77 \Rightarrow x = 7$ . The 3 sides of the triangle are:  $5(7) + 13 = 48\text{ cm}$ ,  $4(7) - 6 = 22\text{ cm}$  and  $2(7) + 9 = 23\text{ cm}$ . Hence, the second longest side is  $23\text{ cm}$ .

31.  $4m + 21 \geq 11m - 42 \Rightarrow -7m \geq -63 \Rightarrow m \leq 9$  (dividing by a negative reverses the inequality)

37.  $\frac{240 - 192}{240} \times 100 = \frac{48}{240} \times 100 = 0.2 \times 100 = 20\%$

41. The speed of the airplane in still air is given by:  $\left(\frac{400}{2} + \frac{400}{1}\right) \div 2 = (200 + 400) \div 2 = 300\text{ km/h}$

44. Number of license plates that can be made from three letters and two digits is given by:

$$26 \times 26 \times 26 \times 10 \times 10 = 1,757,600.$$

46.  $(15 \times 4.75) + (n \times 4.00) = (15 + n) \times 4.45$

$$71.25 + 4n = 66.75 + 4.45n$$

$$71.25 - 66.75 = 4.45n - 4n$$

$$4.5 = 0.45n$$

$$450 = 45n$$

$$10 = n$$

where  $n$  = number of kilograms of coffee costing \$4.00/kg to be added.

1999 - 2000 TMSCA Middle School Number Sense State Key

- |                        |                      |  |                                 |
|------------------------|----------------------|--|---------------------------------|
| 1) 4900                | 23) $-\frac{4}{15}$  | 43) 2000                                 | 63) $\frac{1}{13}$              |
| 2) 51,975              | 24) $\frac{3}{130}$  | 44) 7                                    | 64) 7                           |
| 3) 1095                | 25) 8                | 45) 321                                  | 65) $8\sqrt{2}$                 |
| 4) 127                 | 26) -19              | 46) .425                                 | 66) 1                           |
| 5) 4848                | 27) 11,449           | 47) 8                                    | 67) $5\sqrt{2}$                 |
| 6) 80                  | 28) $\frac{1}{9}$    | 48) 30                                   | 68) $\frac{1}{81}$              |
| 7) 5605                | 29) .24              | 49) 20                                   | 69) -5                          |
| 8) 38                  | 30) 38,779 - 42,859  | 50) 765 - 845                            | 70) 6233 - 6889                 |
| 9) 16                  | 31) -4               | 51) $\frac{121}{2}, 60\frac{1}{2}, 60.5$ | 71) 45                          |
| 10) 218,542 - 241,546  | 32) 1512             | 52) 0                                    | 72) $10\sqrt{10}$               |
| 11) $\frac{3}{4}, .75$ | 33) $12\frac{7}{64}$ | 53) 465                                  | 73) 35                          |
| 12) 2009               | 34) 8366             | 54) 320                                  | 74) $4x^2 - 1$                  |
| 13) 484                | 35) 6                | 55) 6                                    | 75) 990,021                     |
| 14) 6.08               | 36) 224              | 56) $40\frac{4}{9}$                      | 76) $\frac{8}{3}, 2\frac{2}{3}$ |
| 15) 4                  | 37) 27               | 57) 160                                  | 77) 14                          |
| 16) .0575              | 38) 3081             | 58) 8                                    | 78) 156                         |
| 17) XL                 | 39) 2997             | 59) $\frac{1}{33}$                       | 79) 15                          |
| 18) 6.05               | 40) 105 - 115        | 60) 2870 - 3171                          | 80) 224 - 247                   |
| 19) 46                 | 41) 1100             | 61) $225\pi$                             |                                 |
| 20) 444 - 490          | 42) 51               | 62) $\frac{24}{5}, 4\frac{4}{5}, 4.8$    |                                 |
| 21) $\frac{11}{18}$    |                      |  |                                 |
| 22) 64                 |                      |  |                                 |

1999-2000 TMSCA Middle School Test 15 Key

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