

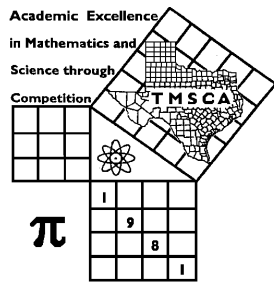
1st Score: _____	2nd Score: _____	3rd Score: _____	<b>Final Score</b>
S & G _____	S & G _____	S & G _____	
Grader: _____	Grader: _____	Grader: _____	

## PLACE LABEL BELOW

Name: \_\_\_\_\_ School: \_\_\_\_\_

SS/ID Number: \_\_\_\_\_ City: \_\_\_\_\_

Grade:    5    6    7    8                                  Classification:    1A    2A    3A    4A    5A    6A



## TMSCA MIDDLE SCHOOL CALCULATOR STATE MEET © APRIL 16, 2016 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.

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 problems answered correctly are worth FIVE points. FOUR points will be deducted for all problems answered incorrectly or skipped before the last problem attempted.

**2015-2016 TMSCA Middle School Calculator State Meet**

1.  $465 + 1420$  ----- 1= \_\_\_\_\_

2.  $21 + 80 + 33$  ----- 2= \_\_\_\_\_

3.  $77 + 32 + 113$  ----- 3= \_\_\_\_\_

4.  $67 + 45 - 46 - 32$  ----- 4= \_\_\_\_\_

5.  $-267 - 82 - 258 - 165$  ----- 5= \_\_\_\_\_

6.  $-128 - 35.3 - 129 - 59.1 + 24.6$  ----- 6= \_\_\_\_\_

7.  $-1.58 - 1.68 + 0.353 - 0.47 - 1.45$  ----- 7= \_\_\_\_\_

8.  $1.92 + 0.604 + 2.78 + 0.719 + \pi$  ----- 8= \_\_\_\_\_

9.  $17.8 \times 95.9 \times 100$  ----- 9= \_\_\_\_\_

10.  $4030 \times 201 \times 157 \times 618$  ----- 10= \_\_\_\_\_

11. Terry worked, in order, three-fourths of her calculator test. She got one-twelfth of those problems wrong. Calculate her final score. --- 11= \_\_\_\_\_ INT.

12. Calculate the product of the least common multiple and the greatest common factor of 72 and 93. ----- 12= \_\_\_\_\_ INT.

13. A six foot tree casts a shadow of two and three-fifths feet. A building casts a shadow of thirty-three and five-eighths feet. How much taller is the building than the tree? ----- 13= \_\_\_\_\_ ft.

14.  $(-48/144)[142 - 39]$  -----14= \_\_\_\_\_

15.  $54 - [91/37 + 4.44]$  -----15= \_\_\_\_\_

16.  $(168 + 39)[43 - 72 - 258]$  -----16= \_\_\_\_\_

17.  $\left[\frac{121}{112}\right] [(96/122) + 0.225]$  -----17= \_\_\_\_\_

18.  $\left[\frac{46/132}{127/35}\right] \{0.00109 + 4.97 \times 10^{-4} - 2.08 \times 10^{-4}\}$  -----18= \_\_\_\_\_

19.  $\left[\frac{(1210/254) - (338/1050)}{65.1/112}\right]$  -----19= \_\_\_\_\_

20.  $(0.00234)[634/611 \times 447/351] - 0.00115$  -----20= \_\_\_\_\_

21.  $\frac{(\pi)(7/7)(10/12)}{174}$  -----21= \_\_\_\_\_

22.  $\left[\frac{525 + 843}{894 - 156}\right] \left[\frac{296}{174}\right]$  -----22= \_\_\_\_\_

23.  $\frac{(\pi)(160/660)(824/803)}{(414/447)}$  -----23= \_\_\_\_\_

24. Calculate the Root Mean Square of 27, 38, 49, and 50. -----24= \_\_\_\_\_

25. In a 30-60-90 right triangle, the side opposite the 60 degree angle is 22.8 cm. Calculate the length of the hypotenuse in centimeters. -----25= \_\_\_\_\_ cm

26. The area of a circle is five hundred fifty-five square feet. The circle is inscribed in a square. Calculate the area of the square in square feet. -26= \_\_\_\_\_ ft.<sup>2</sup>

27.  $\frac{(623 - 323)(193 + 449)}{(6.72 \times 10^{10})}$  -----27= \_\_\_\_\_

28.  $[1910 - (4240 + 2240)] + [(0.179)(2720 - 5650)]$  -----28= \_\_\_\_\_

29.  $(0.0806) [(6.43/\pi)(10.1/6.35)]$  -----29= \_\_\_\_\_

30.  $(11.2) [(6.70 \times 10^5) - (9.92 \times 10^5)]$  -----30= \_\_\_\_\_

31.  $\frac{(0.199 + 0.18)}{(5.56 \times 10^{12})}$  -----31= \_\_\_\_\_

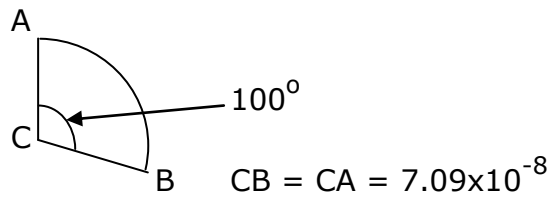
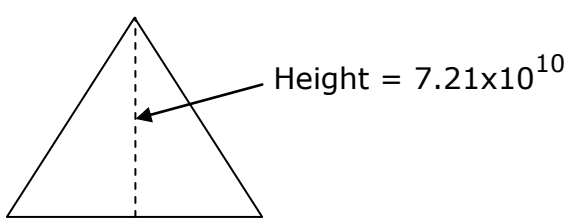
32.  $\frac{1}{-0.00143} + \frac{1}{(\pi)(0.0132 - 0.0169)}$  -----32= \_\_\_\_\_

33.  $1/(0.00117 - 8.68 \times 10^{-4}) - 1/(2.75 \times 10^{-4})$  -----33= \_\_\_\_\_

34.  $\frac{1}{897} - \frac{1}{(339 + 454)}$  -----34= \_\_\_\_\_

35. A sphere has a diameter of pi yards. Calculate the number of gallons of fluid the sphere would hold. -----35= \_\_\_\_\_ gal.

36. The strength of a particular field is inversely proportional to the cube of the radius. If the strength of the field is 72 at a radius of 17, calculate the strength of the field at a radius of 5. -----36= \_\_\_\_\_

<p style="text-align: center;"><b>SECTOR OF A CIRCLE</b></p>  <p style="text-align: center;">Arc AB = ?</p> <p>37= _____</p>	<p style="text-align: center;"><b>EQUILATERAL TRIANGLE</b></p>  <p style="text-align: center;">Area = ?</p> <p>38= _____</p>
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39.  $(2.29 + 2.29)^2(175 + 405)^2$  -----39= \_\_\_\_\_

40.  $\frac{(3420 + 10700)^2}{(0.0184 - 0.0409)^3}$  -----40= \_\_\_\_\_

41.  $\left[ \frac{623 + (1/(2.53 \times 10^{-4}))}{(2160/2320) - 0.476} \right]^2$  -----41= \_\_\_\_\_

42.  $(1/\pi) \sqrt[3]{\frac{0.512 + 1.59}{0.0274 - 0.0272}}$  -----42= \_\_\_\_\_

43.  $(1/(0.00166))(1290 - 165)^2$  -----43= \_\_\_\_\_

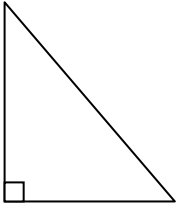
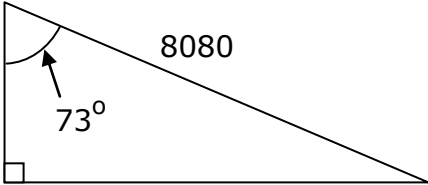
44.  $(24.8)\sqrt{14400 + 18500 + 15800}$  -----44= \_\_\_\_\_

45.  $\frac{(367 + 193)^{1/5}}{(6.34 - 3.06)^{1/2}}$  -----45= \_\_\_\_\_

46.  $\sqrt[3]{2.96 - 6340/2150} + 1/\sqrt{1.28 \times 10^5 + 1.19 \times 10^5}$  -----46= \_\_\_\_\_

47. A company combines 8 tons of copper and 1500 pounds of tin to make a certain grade of bronze. Calculate the percent of tin in this bronze. -----47= \_\_\_\_\_ %

48. Rod drives at a speed of 20 mph and reaches his destination 20 minutes late. He increases his speed by 10 mph and reaches his destination 15 minutes early. Calculate the distance to his destination in miles. -----48= \_\_\_\_\_ mi.

<p style="text-align: center;"><b>RIGHT TRIANGLE</b></p>  <p style="text-align: center;">Area = 0.008272</p> <p style="text-align: center;">Perimeter = ?</p> <p>49= _____</p>	<p style="text-align: center;"><b>RIGHT TRIANGLE</b></p>  <p style="text-align: center;">Perimeter = ?</p> <p>50= _____</p>
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51.  $\frac{(0.186 + 0.0609 - 0.129)^3}{\sqrt{367 + 510 + 317}}$  -----51=\_\_\_\_\_

52.  $\left[ \frac{208 - 182 + \sqrt{2.65 \times 10^5 / 1890}}{-410 + 483} \right]^{-3}$  -----52=\_\_\_\_\_

53.  $\frac{\sqrt{23.1 + \pi + 18}}{(2.32 \times 10^5 - 34600 + 2.75 \times 10^5)^4}$  -----53=\_\_\_\_\_

54.  $(3.43)^2 \sqrt{(11.2)/(2.21)} - (22 + 11.4)$  -----54=\_\_\_\_\_

55.  $0.356 + \sqrt{(201)/(113)} - (0.238 + 0.711)^2$  -----55=\_\_\_\_\_

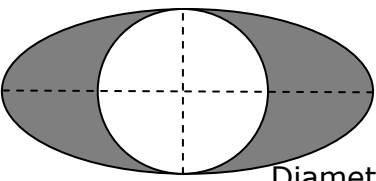
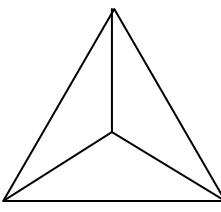
56.  $(13.7)(4.02 \times 10^7)^{1/3} - [(58200)(3.46 \times 10^5)]^{1/3}$  -----56=\_\_\_\_\_

57.  $\sqrt{\frac{(13.8)(80.9)}{(1150) + (2800)}} - 0.87$  -----57=\_\_\_\_\_

58.  $\sqrt{\frac{(82.7)(26.1)}{(692) + (514)}} + 1/(0.93)^4$  -----58=\_\_\_\_\_

59. The surface area of a sphere is 817.25 square meters. Calculate the great circumference of the sphere in meters. -----59=\_\_\_\_\_m

60. Calculate the probability of drawing a ten from a standard deck of 52 cards and rolling a sum of ten on a fair pair of dice. -----60=\_\_\_\_\_

<p style="text-align: center;"><b>CIRCLE AND ELLIPSE</b></p>  <p style="text-align: center;">Diameter of Circle = 101</p> <p style="text-align: center;">Major Axis of Ellipse = 246</p> <p style="text-align: center;">Shaded Area = ?</p> <p>61= _____</p>	<p style="text-align: center;"><b>TETRAHEDRON</b></p>  <p style="text-align: right;">Surface Area = 92817</p> <p style="text-align: right;">Edge = ?</p> <p>62= _____</p>
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63.  $\frac{43!}{32!} + 19!$  -----63= \_\_\_\_\_

64.  $(15800 - 25300)^9(1.37 \times 10^9)$  -----64= \_\_\_\_\_

65.  $(\text{deg}) (13500 + 17300)\tan(3.98^\circ)$  -----65= \_\_\_\_\_

66.  $(\text{rad}) \cos\left[\frac{(2.03)(\pi)}{(50.6)(7.17)}\right]$  -----66= \_\_\_\_\_

67.  $(\text{rad}) \frac{\tan(9)}{717/409}$  -----67= \_\_\_\_\_

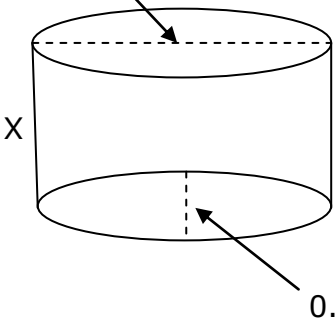
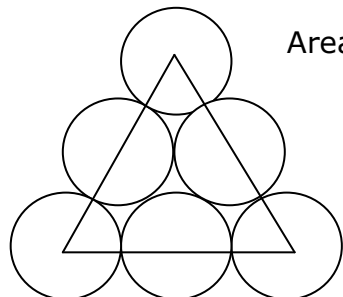
68.  $(\text{rad}) \cos[(4.21 - 0.82)(8.2)]$  -----68= \_\_\_\_\_

69.  $(\text{deg}) \frac{\sin(183^\circ)}{601 + 3240}$  -----69= \_\_\_\_\_

70.  $(25.9 + 21.6 + 4.36)^{3/5}$  -----70= \_\_\_\_\_

71. Dan deposited \$10,000 in an account for 2 years compounded quarterly. At the end of those 2 years, he had \$11,000 in his account. Calculate the annual percentage rate. -----71= \_\_\_\_\_ %

72. A circular planter, 12 ft. in diameter, has a uniform circular walkway around it. The total area of the planter and walkway is 415 ft.<sup>2</sup> Calculate the uniform width of the walkway. -----72= \_\_\_\_\_ ft.

<p style="text-align: center;"><b>RIGHT ELLIPTICAL SOLID</b></p>  <p style="text-align: right;">Volume = 0.146</p> <p style="text-align: center;">X = ?</p> <p>73= _____</p>	<p style="text-align: center;"><b>CONGRUENT CIRCLES AND EQUILATERAL TRIANGLE</b></p>  <p style="text-align: right;">Area of triangle = 6702</p> <p style="text-align: right;">Area of circle parts inside triangle = ?</p> <p>74= _____</p>
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75.  $\frac{(3.02)^{0.395}(3.76)^{0.461}}{(81.6 - 32.4)^{-4}}$  -----75= \_\_\_\_\_

76.  $\frac{\text{Log}(1.37 + 0.42)}{1590 - 1200}$  -----76= \_\_\_\_\_

77.  $\frac{4710 - 2600}{\text{Log}(146 + 169)}$  -----77= \_\_\_\_\_

78.  $\frac{(e^{0.39})(e^{0.333})(e^{0.966})}{\text{Ln}(43.4 + 18.7)}$  -----78= \_\_\_\_\_

79.  $1 + 3 + 5 + \dots + 385$  -----79= \_\_\_\_\_

80.  $1 + \frac{(0.55)^4}{2} - \frac{(0.55)^6}{6} + \frac{(0.55)^8}{24} - \frac{(0.55)^{10}}{120}$  -----80= \_\_\_\_\_



## 2015-2016 TMSCA Middle School Calculator State Meet Answer Key

Page 1	Page 2	Page 3	Page 4
1 = 1890 = $1.89 \times 10^3$	14 = -34.3 = $-3.43 \times 10^1$	27 = $2.87 \times 10^{-6}$	39 = $7.06 \times 10^6$
2 = 134 = $1.34 \times 10^2$	15 = 47.1 = $4.71 \times 10^1$	28 = -5090 = $-5.09 \times 10^3$	40 = $-1.75 \times 10^{13}$
3 = 222 = $2.22 \times 10^2$	16 = -59400 = $-5.94 \times 10^4$	29 = 0.262 = $2.62 \times 10^{-1}$	41 = $1.01 \times 10^8$
4 = 34.0 = $3.40 \times 10^1$	17 = 1.09 = $1.09 \times 10^0$	30 = $-3.61 \times 10^6$	42 = 6.97 = $6.97 \times 10^0$
5 = -772 = $-7.72 \times 10^2$	18 = 0.000132 = $1.32 \times 10^{-4}$	31 = $6.82 \times 10^{-14}$	43 = $7.62 \times 10^8$
6 = -327 = $-3.27 \times 10^2$	19 = 7.64 = $7.64 \times 10^0$	32 = -785 = $-7.85 \times 10^2$	44 = 5470 = $5.47 \times 10^3$
7 = -4.83 = $-4.83 \times 10^0$	20 = 0.00194 = $1.94 \times 10^{-3}$	33 = -325 = $-3.25 \times 10^2$	45 = 1.96 = $1.96 \times 10^0$
8 = 9.16 = $9.16 \times 10^0$	21 = 0.0150 = $1.50 \times 10^{-2}$	34 = -0.000146 = $-1.46 \times 10^{-4}$	46 = 0.226 = $2.26 \times 10^{-1}$
9 = 171000 = $1.71 \times 10^5$	22 = 3.15 = $3.15 \times 10^0$		
10 = $7.86 \times 10^{10}$	23 = 0.844 = $8.44 \times 10^{-1}$	35 = 3280 = $3.28 \times 10^3$	47 = 8.57 = $8.57 \times 10^0$
11 = 255 INT.	24 = 42.1 = $4.21 \times 10^1$	36 = 2830 = $2.83 \times 10^3$	48 = 35.0 = $3.50 \times 10^1$
12 = 6696 INT.	25 = 26.3 = $2.63 \times 10^1$	37 = $1.24 \times 10^{-7}$	49 = 0.484 = $4.84 \times 10^{-1}$
13 = 71.6 = $7.16 \times 10^1$	26 = 707 = $7.07 \times 10^2$	38 = $3.00 \times 10^{21}$	50 = 18200 = $1.82 \times 10^4$

## 2015-2016 TMSCA Middle School Calculator State Meet Answer Key

### Page 5

$$51 = 4.74 \times 10^{-5}$$

$$52 = 7.18 \\ = 7.18 \times 10^0$$

$$53 = 1.34 \times 10^{-22}$$

$$54 = -6.91 \\ = -6.91 \times 10^0$$

$$55 = 0.789 \\ = 7.89 \times 10^{-1}$$

$$56 = 1970 \\ = 1.97 \times 10^3$$

$$57 = -0.338 \\ = -3.38 \times 10^{-1}$$

$$58 = 2.67 \\ = 2.67 \times 10^0$$

$$59 = 50.7 \\ = 5.07 \times 10^1$$

$$60 = 0.00641 \\ = 6.41 \times 10^{-3}$$

### Page 6

$$61 = 11500 \\ = 1.15 \times 10^4$$

$$62 = 231 \\ = 2.31 \times 10^2$$

$$63 = 3.51 \times 10^{17}$$

$$64 = -8.63 \times 10^{44}$$

$$65 = 2140 \\ = 2.14 \times 10^3$$

$$66 = 1.00 \\ = 1.00 \times 10^0$$

$$67 = -0.258 \\ = -2.58 \times 10^{-1}$$

$$68 = -0.889 \\ = -8.89 \times 10^{-1}$$

$$69 = -1.36 \times 10^{-5}$$

$$70 = 10.7 \\ = 1.07 \times 10^1$$

$$71 = 4.79 \\ = 4.79 \times 10^0$$

$$72 = 5.49 \\ = 5.49 \times 10^0$$

### Page 7

$$73 = 0.549 \\ = 5.49 \times 10^{-1}$$

$$74 = 6080 \\ = 6.08 \times 10^3$$

$$75 = 1.67 \times 10^7$$

$$76 = 0.000648 \\ = 6.48 \times 10^{-4}$$

$$77 = 845 \\ = 8.45 \times 10^2$$

$$78 = 1.31 \\ = 1.31 \times 10^0$$

$$79 = 37200 \\ = 3.72 \times 10^4$$

$$80 = 1.04 \\ = 1.04 \times 10^0$$

**11.** She answered  $\frac{3}{4}(80) = 60$  questions. She missed  $\frac{1}{12}(60) = 5$  questions Score:  $60(5) - 9(5)$

**12.** The product of the LCM and the GCF is always the product of the two numbers.  $72(93)$

**13.**  $\frac{6}{2.6} = \frac{x}{33.625}$   $x = \frac{6(33.625)}{2.6}$   
This problem can be worked with fractions as well.

**24.** root mean square =

$$\sqrt{\text{mean of squares of the #'s}}$$

$$\sqrt{\frac{27^2 + 38^2 + 49^2 + 50^2}{4}}$$

**25.** The short leg:  $\frac{22.8}{\sqrt{3}}$  The hypotenuse is twice the short leg.

**26.** Area of circle =  $555 = \pi r^2$  so  $r = \sqrt{\frac{555}{\pi}}$  diameter =  $2\left(\sqrt{\frac{555}{\pi}}\right)$

The side of the square = the diameter. Area of square =

$$\left[2\left(\sqrt{\frac{555}{\pi}}\right)\right]^2$$

**35.**  $\pi$  yards =  $36\pi$  inches for diameter. Radius =  $18\pi$  inches. Volume =  $\frac{4}{3}\pi r^3 = \frac{4}{3}\pi(18\pi)^3$  There are 231 in.<sup>3</sup> in a gallon. Divide Volume by 231.

**36.**  $72(17^3) = x(5^3)$  so  $x = \frac{72(17^3)}{5^3}$

**37.** We are looking for  $\frac{100}{360}$  of the circumference of the circle with radius of  $7.09 \times 10^{-8}$ .

$$\frac{100}{360}(2\pi)(7.09 \times 10^{-8})$$

**38.**  $\frac{h^2\sqrt{3}}{3} = \frac{(7.21 \times 10^{10})^2\sqrt{3}}{3}$

**47.** 16000 lb. copper; 1500 lb. tin  
Total of 17500 lb.  $\frac{1500}{17500} = \frac{x}{100}$

**48.**

	Rate	Time	distance
Slow	20	$X + 1/3$	$20(X + 1/3)$
Fast	30	$X - 1/4$	$30(X - 1/4)$

$20(X + 1/3) = 30(X - 1/4)$ . Solve for  $x$ .  $x = \left(\frac{20}{3} + \frac{30}{4}\right) \div 10$  This is the time. Substitute this value in either of the expressions in the table for distance.

**49.**  $A = \frac{1}{2}bh$

$$.008272 = \frac{1}{2}(.088)h$$

Height =  $\frac{2(.008272)}{.088}$  Now find the hypotenuse using the Pythagorean Theorem.

$$hyp = \sqrt{\left[\frac{2(.008272)}{.088}\right]^2 + .088^2}$$

Add: height, hypotenuse, .088

**50.** Short leg:  $\frac{\cos 73}{1} = \frac{x}{8080}$   
 $x = 8080(\cos 73)$

Long leg:  $\frac{\sin 73}{1} = \frac{y}{8080}$

$$y = 8080(\sin 73)$$

Perimeter: Add:  $x + y + 8080$

**59.** Surface area:  $4\pi r^2 = 817.25$

$$r = \sqrt{\frac{817.25}{4\pi}}$$

Great circumference =  $2\pi r$

**60.**  $\frac{4}{52} \times \frac{3}{36}$  based on 4 tens in each deck of 52 cards and 3 ways of rolling a 10 [(6,4),(4,6),(5,5)] of 36 possible rolls when rolling two dice.

**61.** Ellipse minus circle

$$\left(\frac{101}{2}\right)\left(\frac{246}{2}\right)\pi - \pi\left(\frac{101}{2}\right)^2$$

**62.** A tetrahedron consists of 4 equilateral triangles. Area of one triangle =  $\frac{92817}{4}$  Area of equilateral triangle is also

$$A = \frac{s^2\sqrt{3}}{4} \text{ so } \frac{92817}{4} = \frac{s^2\sqrt{3}}{4}$$

$$92817 = s^2\sqrt{3}$$

$$\text{Side or edge} = \sqrt{\frac{92817}{\sqrt{3}}}$$

**71.** Amount =  $P\left(1 + \frac{r}{n}\right)^{nt}$

where P = principle, r = rate, n = number of compounding periods per year, t = years.

$$11000 = 10000\left(1 + \frac{r}{4}\right)^{(4 \times 2)}$$

$$r = 4\left(\sqrt[8]{\frac{11000}{10000}} - 1\right)$$

**72.**  $(6 + x)^2\pi = 415$

$$6 + x = \sqrt{\frac{415}{\pi}}$$

$$x = \sqrt{\frac{415}{\pi}} - 6$$

**73.**  $\pi\left(\frac{44}{2}\right)\left(\frac{.77}{2}\right)h = .146$

$$h = \frac{.146}{(.22\pi)\left(\frac{.77}{2}\right)}$$

**74.** triangle A =  $6702 = \frac{s^2\sqrt{3}}{4}$

$$\text{Side of triangle} = \sqrt{\frac{6702(4)}{\sqrt{3}}}$$

$$\text{Radius} = \frac{1}{4}\left(\sqrt{\frac{6702(4)}{\sqrt{3}}}\right)$$

The inner circles consist of 3 sectors that are  $\frac{1}{6}$  of the circle and 3 sectors that are  $\frac{1}{2}$  circles.

So area of inner circles =

$$3\left(\frac{1}{6} + \frac{1}{2}\right)r^2\pi$$