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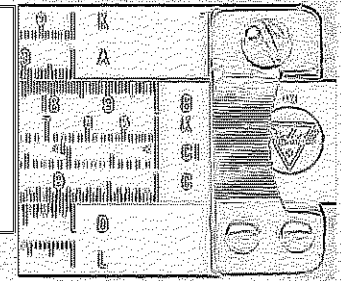
2008 UIL Calculator Appl State
(12 pages)
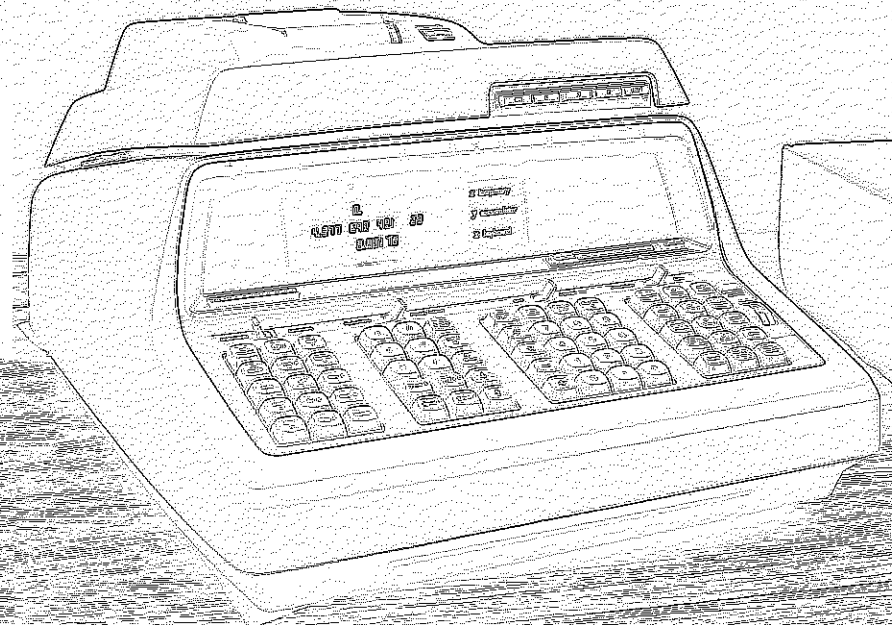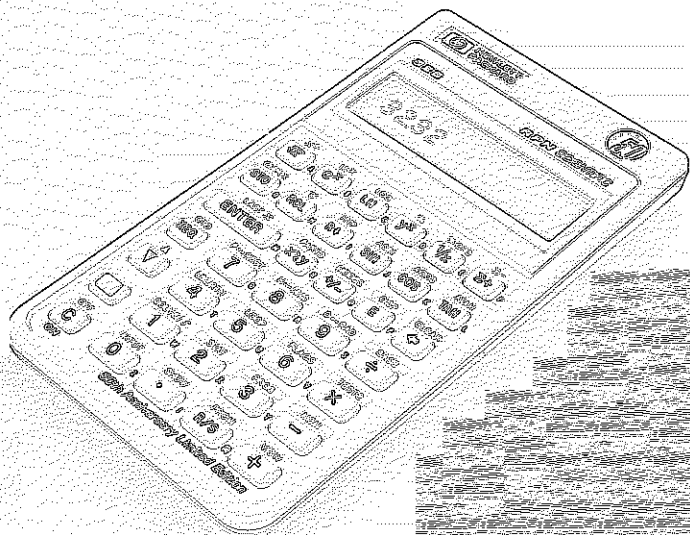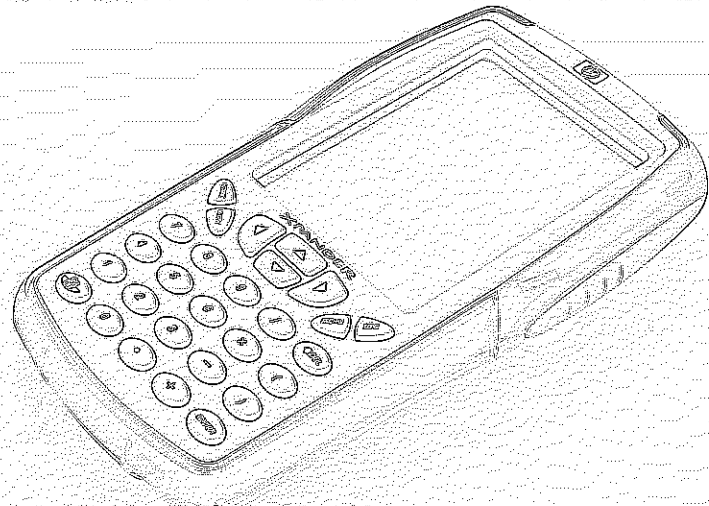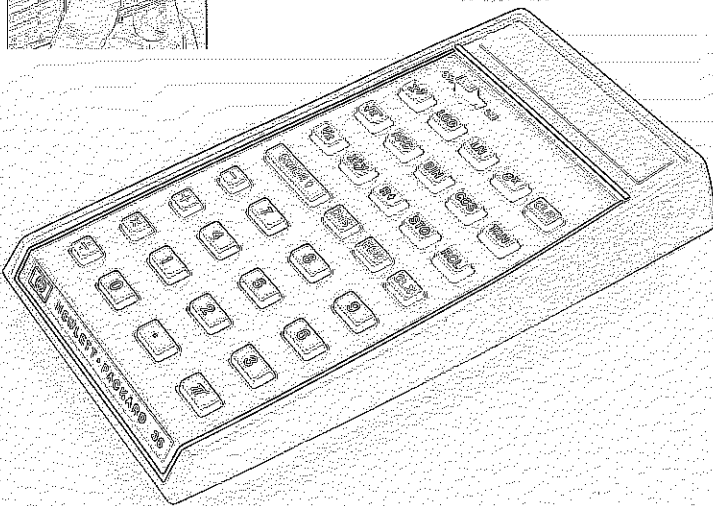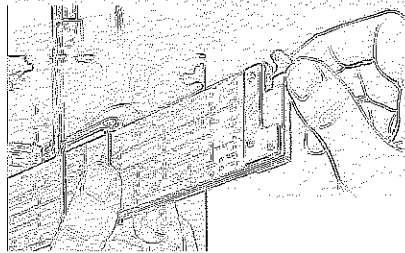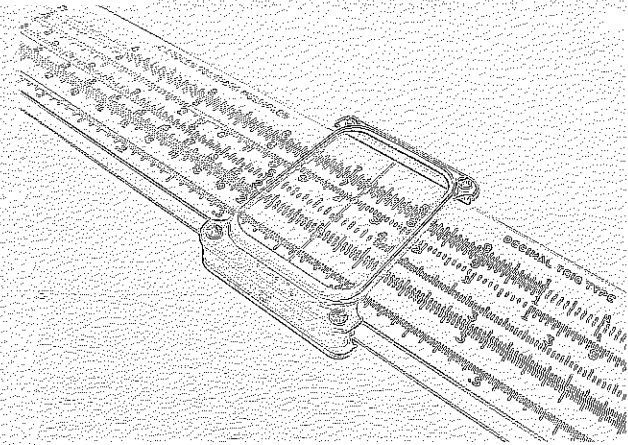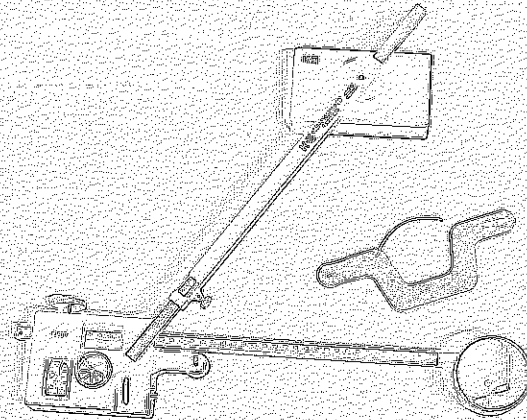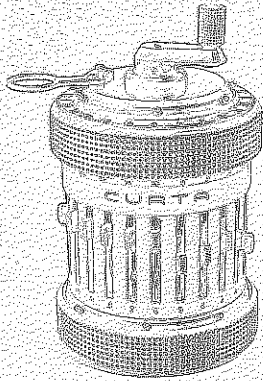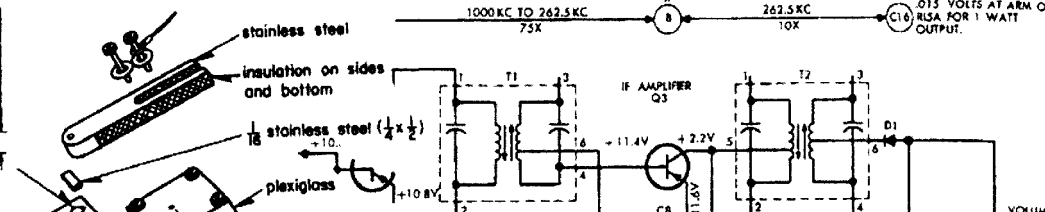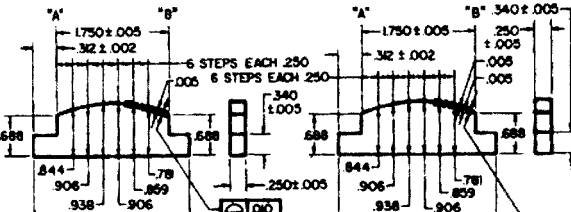
UIL Calculator Applications

Test 08I

(State)

DO NOT OPEN THE TEST UNTIL INSTRUCTED TO BEGIN

I.   Calculator Applications rules and scoring—See UIL Constitution
II. How to write the answers
    A.   For all problems except stated problems as noted below—write
       three significant digits.
    1.   Examples (* means correct but not recommended)

       Correct: 12.3, 123, 123.*, 1.23×10*, 1.23×10^0*
                         1.23×10^1, 1.23×10^{01}, .0190, 0.0190, 1.90×10^{-2}

       Incorrect: 12.30, 123.0, $1.23(10)^2$, $1.23 \cdot 10^2$, 1.230×10^2,
                         $1.23 * 10^2$, 0.19, 1.9×10^{-2}, 19.0×10^{-3}, 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. Answers
       must be in fixed notation. 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. See the UIL
       Constitution and Contest Manual for details.
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: π for 3.14159 ...; e for 2.71828 ...
    D.   Logarithms: Log means common (base 10); Ln means natural

       (base e); exp(u) means e^u.
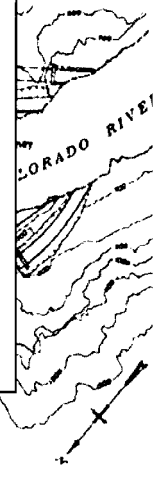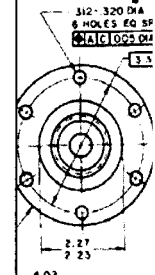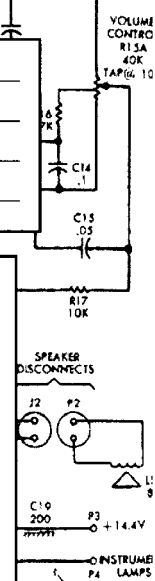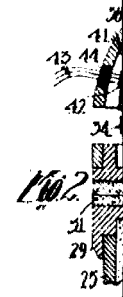
08I-1. $(-0.25 + 1.45) \times 0.488$ ----------------------------------- 1=_____

08I-2. $(0.539 + 0.183 - 0.0802) \times 0.222$ -------------------------- 2=_____

08I-3. $(2.74 - 1.4 + 1.63 + 0.83)/(-6.11)$ ------------------------ 3=_____

08I-4. $\dfrac{(0.072)(-0.0166 - 0.0103 + 0.031)}{(-0.0894)(-0.0411)}$ ------------------------ 4=_____

08I-5. $\dfrac{(-0.00133 - 3.66 \times 10^{-4})(30.6)}{\{(-91.3)/(58.3)\}} - (0.0339 - 0.0259)$ ----------- 5=_____
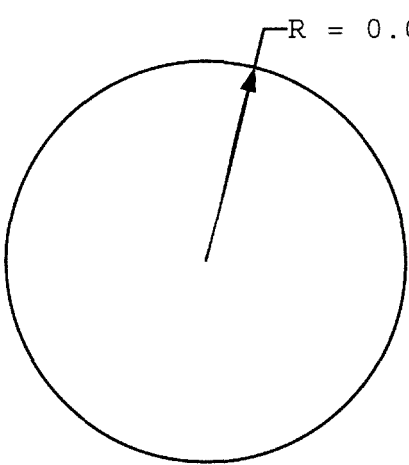
08I-6. Uma buys a \$15.75 book. After paying 8.125% tax,
how much change does she receive from a \$20 bill? ------------ 6=\$_____

08I-7. A circular field occupies 6 acres. What is the
radius? --- 7=_____ ft

08I-8. In 2006, the US birth rate was 14.16 people per
1000 population; the death rate for the period was 8.26
per 1000. If the population at the start of 2006 was
300 million people, what was the annual increase in
population for 2006? ------------------------------------- 8=_____ people

---

08I-9.

CIRCLE

R = 0.0706
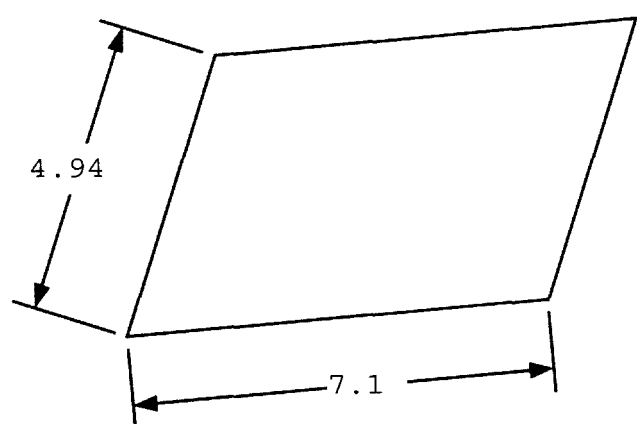
AREA = ?

08I-9 = _____

08I-10.

PARALLELOGRAM

4.94

7.1

PERIMETER = ?

08I-10 = _____

08I-11. $\dfrac{(-678)(-50.3) + (-596)(-270)}{-18.3 + 1.45 - (-7.65)(0.847)}$ ------------------------- 11=_____

08I-12. $\dfrac{0.656(9.27\times10^{-5} + 6.27\times10^{-5})}{(279 - 370)(0.35)} - \dfrac{-6.67\times10^{-8}}{0.196 - 0.135}$ -------------- 12=_____

08I-13. $\dfrac{-91100 + 52200 - 75500 + 22500 + 3.25\times10^{5}}{(-21.8)(71.3 + 18.6)(-88.2 + 8.86)}$ ---------------- 13=_____

08I-14. $\dfrac{326 + 213 - 1270}{(0.31)(-0.894)} - \dfrac{(1.64\times10^{6})(1.22\times10^{-4} + 7.87\times10^{-5})}{0.617 + 0.152 - 0.607}$ --------- 14=_____

08I-15. $\dfrac{24100 + 1.65\times10^{5} - (27800 + 34400)(1.27 - 0.55)}{(-537)(-1.56)(\pi)(783 - 398 + 1530)}$ ------------ 15=_____

08I-16. The product of two consecutive positive integers
is 118,680. What is their sum? ----------------------------- 16=_____ integer

08I-17. If the average heart rate is 80 beats/min, how
many times has the heart beat for a teenager on her 16th
birthday? Assume that the heart starts beating 33 weeks
prior to birth. --- 17=_____ beats

08I-18. The Old Testament has 592,439 words and 23,214
verses, while the New Testament has 181,253 words and 7956
verses. What is the percent difference in the average
number of words per verse in the Old and New Testaments? ----- 18=_____ %

08I-19.

RIGHT TRIANGLE

rad?

816

791

08I-19 = _____

08I-20.

RIGHT TRIANGLE

24.2

35.3°

AREA = ?

08I-20 = _____
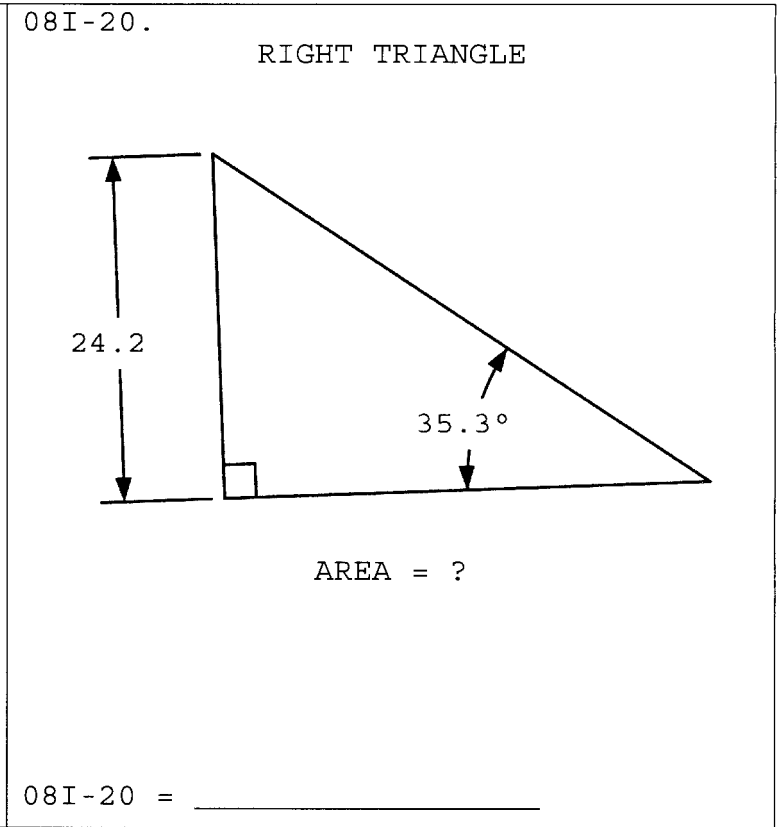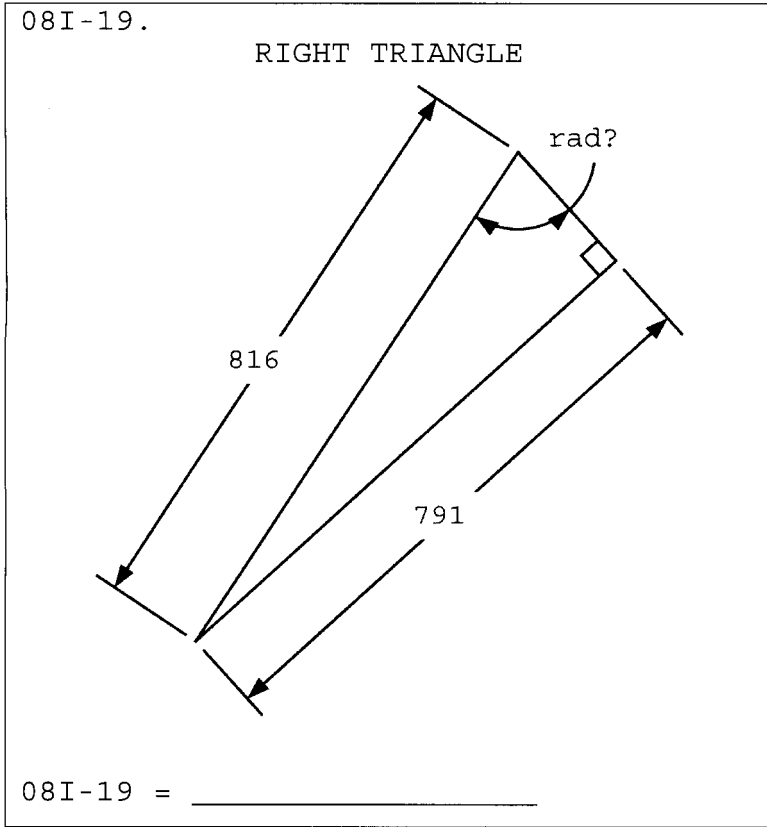
08I-21. $\left[\dfrac{\sqrt{2.39 - 0.743}}{-5.34} + \dfrac{(-0.0954)}{0.683}\right]^2$ ------------------------------- 21=_____

08I-22. $\left[\dfrac{(0.347)(0.415)}{-1.45} + 0.0532\right]^2 + \sqrt{8.48 \times 10^{-7}}$ -------------------- 22=_____

08I-23. $(-34.6)(-0.00912)\sqrt{(-0.959)^2/0.83} + 1/\sqrt{\pi} + 8.98$ ------------ 23=_____

08I-24. $[-33.1 + \sqrt{921}]^2 \times [381 + 875]^2 \times \sqrt{1.42/2.21}$ ----------------- 24=_____

08I-25. $\dfrac{\sqrt{964 + 770 + (1.57 \times 10^5)/(160)}}{-198 + 103}$ ---------------------------- 25=_____

08I-26. The world 1-hr record for human powered vehicles
was broken on July 6, 2006 by "Fast Freddy" Markham who
pedaled <u>53.43</u> mi. The old record was <u>52.33</u> mi. What is
the percent difference in these distances? ------------------- 26=_____ %(SD)

08I-27. A tire manufacturer wants to offer a warranty on
their tires of 50,000 mi or x years. The desire is for
the life in years to associate with 50,000 mi travel. If
the average car drives 1.5 hr daily at 30 mph, what is x? ---- 27=_____ yr

08I-28. What is $45,678^{98,765}$? ------------------------------- 28=_____
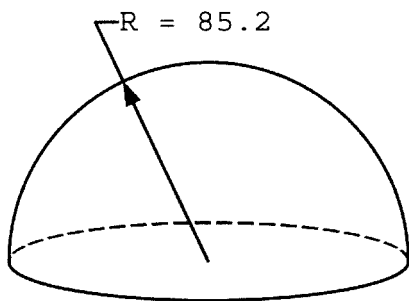
08I-29. HEMISPHERE	08I-30. SQUARE PYRAMID
R = 85.2 VOLUME = ?	28.4 46 TOTAL SURFACE AREA = ?
08I-29 = _____	08I-30 = _____
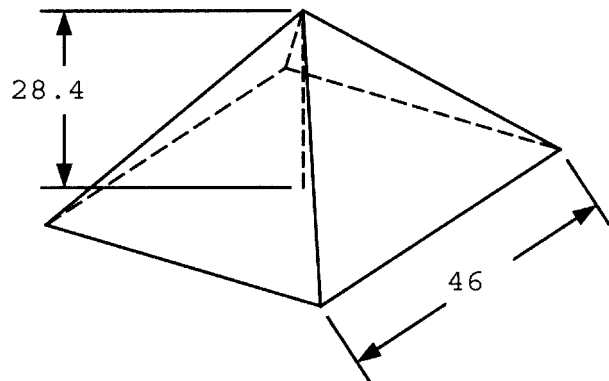
08I-31. $\sqrt{\dfrac{9.53}{\sqrt{38.2 + 26.5}}} \times \left[\dfrac{1}{(4.52 - 2.88)^2} + \dfrac{1}{(\pi + 0.669)^2}\right]$ ----------- 31=_____

08I-32. $\dfrac{(-0.571 + 0.888)^2}{\sqrt{14.4 - 4.93}} + \dfrac{0.0177}{\sqrt{0.144 + 0.185}}$ ----------------- 32=_____

08I-33. $\dfrac{(4.82)^2 + \sqrt{354}}{\sqrt{(9.39)(-14)^2}} + \dfrac{\sqrt{\sqrt{(1.12\times10^5)(0.246)}}}{4.57 + 14.1}$ --------------- 33=_____

08I-34. $\dfrac{(4.28\times10^5)^2(1.01\times10^{-12} + 4.25\times10^{-13})}{0.00269 + (-0.272)(0.0329)} + \dfrac{1}{\dfrac{1}{-28.3} + \dfrac{1}{(26)}}$ -------- 34=_____

08I-35. $\dfrac{\left[\dfrac{-1.53\times10^{-4}}{506}\right]^2 + \sqrt{\dfrac{(0.744)(0.461)}{(8.82\times10^{25})}} + (1.18\times10^{-13})}{0.902 + \sqrt{(-0.971)(-0.148)}}$ ------------ 35=_____

08I-36. A projectile's maximum vertical elevation is 57 ft and it lands 250 ft away. What is the angle of release relative to the ground? -- 36=_____ rad

08I-37. Two ships are 2 mi apart and traveling at 25 knots. The lead ship executes a turn 25° to port (left) at the same time that the trailing ship executes a 25° turn to starboard (right). How long does it take them to be 100 mi apart? One knot equals 1.15 mph. --------------- 37=_____ hr

08I-38. The end of a 15-ft long dog leash slides along a taut 75-ft long clothesline. What is the height of the clothesline if the roaming area is 1800 ft^2? ---------------- 38=_____ ft

08I-39.
EQUILATERAL TRIANGLE AND CIRCLE
R = 431

?

08I-39 = _____

08I-40.
SCALENE TRIANGLE

9170

12,400

98.8°

?

08I-40 = _____

08I-41. $\dfrac{10^{-(\pi - 6.5)}}{-0.0918 + 0.0669}$ --- 41=_____

08I-42. $\dfrac{e^{+0.466} + e^{-0.931}}{(-2.89 \times 10^{-6} + 9.66 \times 10^{-7})}$ ------------------------------- 42=_____

08I-43. $\dfrac{(3380) \operatorname{Log}(10200 - 7770)}{(-64300)}$ ---------------------------------- 43=_____

08I-44. $(8.88)^3 + (32.4 - 8.8)^{0.511}$ ---------------------------- 44=_____

08I-45.(deg) $\{(74.6)\sin(-31.9°)\} \times \{(-90.9)\cos(-69.8°)\}$ ------------- 45=_____

08I-46. On a Texas map scaled at 1:1,100,000, the straight-line distance from San Antonio to Victoria is 5.77 in. In exactly the opposite direction, the distance from San Antonio to Pecos measures 18.9 in. What is the actual distance between Pecos and Victoria? ------------------ 46=_____ mi(SD)

08I-47. A toy dinosaur is 1.25 in long and grows enormously when placed in water. Its length was measured after placing in water at 10 minute intervals: 1.6 in, 2.2 in, 2.9 in, 3.4 in, 4.5 in and 6.25 in. What is the best-fit average linear growth rate? ----------------------- 47=_____ in/min

08I-48. Solve for (real) q if $7.5q^{5.8} - 3 = 5q^2 - 2q$. ----------- 48=_____
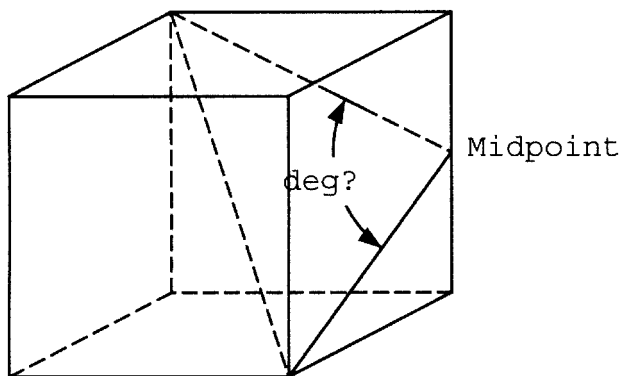
08I-49.	08I-50.
CUBE	RECTANGULAR SOLID WITH CYLINDRICAL CAVITY

08I-49 = _____

R = 8.24
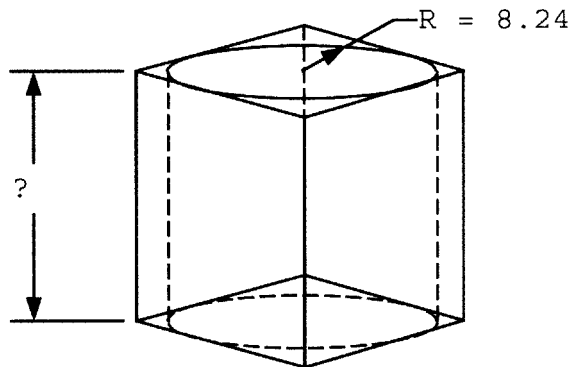
TOTAL SURFACE AREA = 1920

08I-50 = _____

08I-51. $\dfrac{(-0.0039)\ 10^{-(7.34\ -\ 3.58)}}{0.00673\ +\ 0.00537}$ -- 51=_____

08I-52. $\dfrac{1\ +\ e^{+\left\{0.455\ +\ (0.19)\ (\pi)\right\}}}{(0.537)\,(1.4\ -\ e^{(-0.112)})}$ ------------------------------ 52=_____

08I-53. $\dfrac{\text{Log}\left\{4.69 \times 10^{-10}\ +\ (3.81 \times 10^{-5})\,(1.62 \times 10^{-5})\right\}}{21.6\ -\ \text{Log}\left\{(54.8)/(0.0358)\right\}}$ ----------------- 53=_____

08I-54. $\dfrac{(8.66)^{0.625}\ -\ (\pi)^{-0.567}}{7.71 \times 10^{-4}\ +\ 1.29 \times 10^{-4}}$ ------------------------- 54=_____

08I-55. (rad) $\dfrac{\arcsin\left\{(7.68)\,(9.6)/(316)\right\}}{3.32\ +\ (-3.42)\,(-8.06)}$ ------------------------ 55=_____

08I-56. (rad) What is the maximum value of y for
$y = 30\sin x - x^2$? --- 56=_____

08I-57. A 5-in long string is cut into two pieces. One is
used to form a circle and one a square. What is the
length of the latter piece if the sum of the areas is
minimized? -- 57=_____ in

08I-58. What is r if Det[**C**] = 0 and [**C**] = $\begin{bmatrix} 4 & -6 & 9 \\ -6 & 7 & r \\ 9 & 3 & 3 \end{bmatrix}$? ------- 58=_____

08I-59.
SOLID OF REVOLUTION (RAD)
(Axis of Revolution: x = 1)

$y = 4\cos\left(\dfrac{\pi x}{4}\right) + 6$
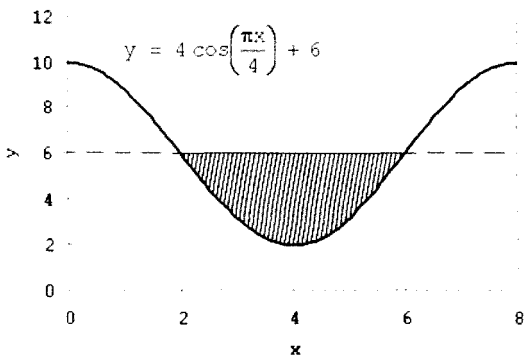
VOLUME = ?

08I-59 = _____

08I-60.
SQUARE AND ISOSCELES TRIANGLE

deg?

PERIMETER(SQUARE)=PERIMETER(TRIANGLE)

08I-60 = _____

08I-61. $\dfrac{(10^{8.19})\,(10^{2.77})\,(10^{0.27})}{10^{\{(\pi)\,(0.823)\}}}$ ---------------------------------- 61=_____

08I-62. $e^{\text{Ln}[(5.83)(49.1)]} + 10^{\text{Log}[(0.715)(190)]}$ ------------------- 62=_____

08I-63. $(\text{rad})\ \dfrac{98.2}{6\,(-8.24)}\{(3.2) + (0.859)\sin(-4.27)\}^{5}$ ---------------- 63=_____

08I-64. $1 + 0.26 + (0.26)^{2} + \dfrac{(0.26)^{4}}{8} - \dfrac{(0.26)^{5}}{15}$ -------------------- 64=_____

08I-65. $\dfrac{6.33}{\sqrt{0.0803}}\ \text{Ln}\left[\dfrac{\sqrt{(-6.38)^{2} + (38.1)} + \sqrt{202}}{\sqrt{\pi} + (66.5)(0.00651)}\right]$ ------------- 65=_____
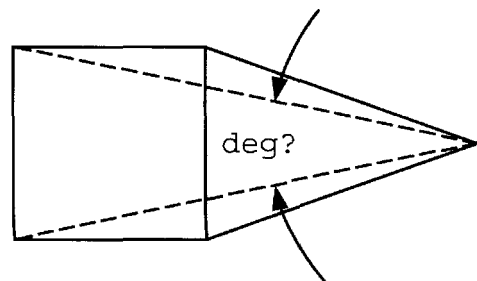
08I-66. A gun fires a bullet at 200 mph. What is the bullet's maximum range, the farthest horizontal distance it can travel? --- 66=_____ mi

08I-67. An insect population, if unchecked, would triple every 23 days. What fraction of the original population must be annihilated every 12 days to keep the population in check (i.e., to keep it from growing)? -------------------- 67=_____ %

08I-68. A slow runner runs a 1/4 mi lap in 3.1 min, and a fast runner covers that distance in 1 min 55 sec. They started running from Point O on an oval track in opposite directions. When the fast runner met the slow runner, he immediately reversed direction and raced back to Point O. There, he again reversed direction, running until he met the slow runner again. This continued until the slow runner completed one lap, returning to Point O. How far did the fast runner run? - 68=_____ ft

08I-69.

SCALENE TRIANGLES

470

deg?

775

122.6°

389
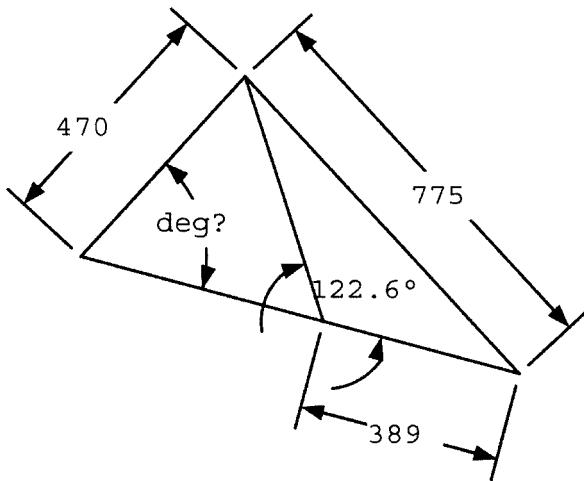
08I-69 = _____

08I-70.

REGULAR TRAPEZOID

TRAPEZOIDAL AREA = 2200

B

M

A

76.3°

M = MIDPOINT
AM = BM = ?

08I-70 = _____

Clarifications to Test 08I (State Meet)

Problem Clarification:

08I-17. The intent is to calculate the number of heartbeats from the first time it ever beat in the womb until the day given.

08I-37. The ships are traveling in a straight line initially, one directly in front of the other.
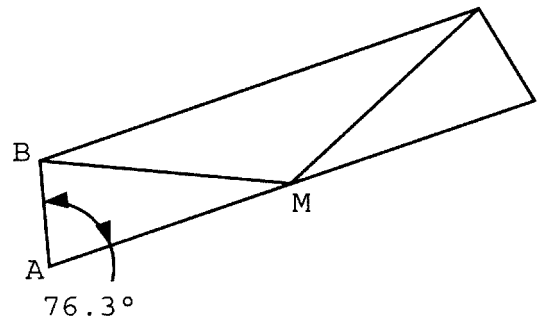
Answer Key Clarification:

Plus or minus one unit in the third digit is allowed except in the following:

6. Dollar Sign Problem: answer must be answered to the nearest cent, and scientific notation is not allowed. The only correct answers are: 2.96, 2.97 and 2.98.

16. Integer problem: answer must be 689. Examples of *incorrect* answers are: 689. (decimal point), 6.89×10^2, 688, 690,...

26. Significant Digit (3 SD) Problem. For +5 points, the answer must be -2.05, -2.06, -2.07, -2.05×10^0, -2.06×10^0, or -2.07×10^0. For +3 points, the contestant's answer must equal either -2.1 or -2.1×10^0, or it must round exactly to -2.06 if more than 3 SDs are given. If only one SD is given, then the answer is incorrect.

46. Significant Digit (3 SD) Problem. For +5 points, the answer must 427, 428, 429, 4.27×10^2, 4.28×10^2, or 4.29×10^2. For +3 points, the contestant's answer must equal either 430 or 4.3×10^2, or it must round exactly to 428 if more than 3 SDs are given. If only one SD is given, then the answer is incorrect.

08I-1   = 0.586
        = 5.86×10^{-1}

08I-2   = 0.142
        = 1.42×10^{-1}

08I-3   = -0.622
        = -6.22×10^{-1}

08I-4   = 0.0803
        = 8.03×10^{-2}

08I-5   = 0.0251
        = 2.51×10^{-2}

08I-6   = $2.97

08I-7   = 288
        = 2.88×10^{2}

08I-8   = 1.77×10^{6}

08I-9   = 0.0157
        = 1.57×10^{-2}

08I-10 = 24.1
        = 2.41×10^{1}

08I-11 = -18800
        = -1.88×10^{4}

08I-12 = -2.11×10^{-6}

08I-13 = 1.50
        = 1.50×10^{0}

08I-14 = 606
        = 6.06×10^{2}

08I-15 = 0.0286
        = 2.86×10^{-2}

08I-16 = 689 integer

08I-17 = 7.00×10^{8}

08I-18 = -10.7
        = -1.07×10^{1}

08I-19 = 1.32
        = 1.32×10^{0}

08I-20 = 414
        = 4.14×10^{2}

08I-21 = 0.144
        = 1.44×10^{-1}

08I-22 = 0.00305
        = 3.05×10^{-3}

08I-23 = 0.619
        = 6.19×10^{-1}

08I-24 = 9.58×10^{6}

08I-25 = -0.549
        = -5.49×10^{-1}

08I-26 = -2.06
        = -2.06×10^{0} (3SD)

08I-27 = 3.04
        = 3.04×10^{0}

08I-28 =
        $9.33 \times 10^{460,215}$

08I-29 = 1.30×10^{6}

08I-30 = 5480
        = 5.48×10^{3}

08I-31 = 0.480 = 4.80×10^{-1}

08I-32 = 0.0635 = 6.35×10^{-2}

08I-33 = 1.67 = 1.67×10^{0}

08I-34 = 278 = 2.78×10^{2}

08I-35 = 2.12×10^{-13}

08I-36 = 0.739 = 7.39×10^{-1}

08I-37 = 4.11 = 4.11×10^{0}

08I-38 = 11.2 = 1.12×10^{1}

08I-39 = 747 = 7.47×10^{2}

08I-40 = 16,500 = 1.65×10^{4}

08I-41 = -91700 = -9.17×10^{4}

08I-42 = -1.03×10^{6}

08I-43 = -0.178 = -1.78×10^{-1}

08I-44 = 705 = 7.05×10^{2}

08I-45 = 1240 = 1.24×10^{3}

08I-46 = 428 = 4.28×10^{2} (3SD)

08I-47 = 0.0786 = 7.86×10^{-2}

08I-48 = 0.952 = 9.52×10^{-1}

08I-49 = 102 = 1.02×10^{2}

08I-50 = 15.3 = 1.53×10^{1}

08I-51 = -5.60×10^{-5}

08I-52 = 14.2 = 1.42×10^{1}

08I-53 = -0.487 = -4.87×10^{-1}

08I-54 = 3700 = 3.70×10^{3}

08I-55 = 0.00762 = 7.62×10^{-3}

08I-56 = 27.7 = 2.77×10^{1}

08I-57 = 2.80 = 2.80×10^{0}

08I-58 = -11.4 = -1.14×10^{1}

08I-59 = 192 = 1.92×10^{2}

08I-60 = 23.4 = 2.34×10^{1}

08I-61 = 4.41×10^{8}

08I-62 = 422 = 4.22×10^{2}

08I-63 = -1970 = -1.97×10^{3}

08I-64 = 1.33 = 1.33×10^{0}

08I-65 = 52.5 = 5.25×10^{1}

08I-66 = 0.507 = 5.07×10^{-1}

08I-67 = 77.4 = 7.74×10^{1}

08I-68 = 2130 = 2.13×10^{3}

08I-69 = 62.0 = 6.20×10^{1}

08I-70 = 50.3 = 5.03×10^{1}