UIL Calculator Applications

Test 09H
(Region)

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.*, 1.23x10*, 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}.

09H-1. 0.999 + 0.294 - 2.43 --- 1=_____

09H-2. (54.8 - 30.6)/(-49.5) + 0.156 ---------------------------- 2=_____

09H-3. $\dfrac{(66.1)(-37.9)(25.1)}{32.8}$ + 1600 ------------------------------ 3=_____

09H-4. $\{(-40.1)(0.613 + 0.742 - 0.549)(-21.8)\}$ + 189 --------------- 4=_____

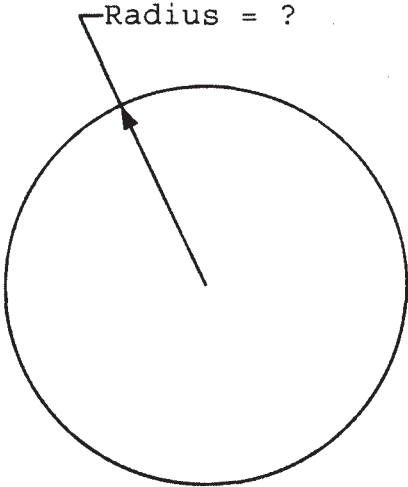09H-5. 0.235 + 0.223 - 0.284 + $\dfrac{(-94600 + 58900)}{(-291)(592)}$ ------------------ 5=_____

09H-6. Two consecutive integers sum to 31. What is their
product? --- 6=_____ integer

09H-7. What is the percent difference in the number of letters
in a state with the longest name, Massachusetts, and the
number of letters in a state with the shortest name, Iowa? --- 7=_____ %

09H-8. A popular cookie has 50 calories. If there are 66
cookies in a package, and 3500 calories intake equals one
pound of weight, how much extra weight would a person put on
by consuming an entire package? --------------------------------- 8=_____ lbs
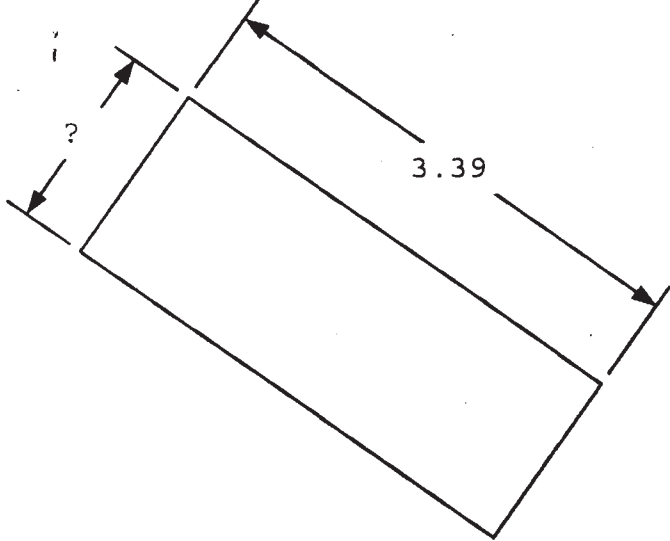

09H-9.

CIRCLE

Radius = ?

Area = 7420

09H-9 = _____

09H-10.

RECTANGLE

?

3.39

Area = 4.29

09H-10 = _____

09H-11. $\dfrac{(-29.8 + 22.9)\,(75.9 + 262)}{(-1.48)\,(0.482)\,(5110 - 5660)}$ ----------------------------- 11=_____

09H-12. $\dfrac{-7.52 + 3.78}{(0.926)\,(2.19)\,(-2.71 \times 10^{-7})} + (878 + 6630)\,(618 - 239)$ -------- 12=_____

09H-13. $\dfrac{-36700 + 34900 - 75400 + 22900 + 91200}{(28)\,(36 + 5.9)\,(923 + 217)}$ -------------- 13=_____

09H-14. $\dfrac{(31.3 + 14.6)\,(9.91 + 19.5)\,(48.2 - 49.3)}{(8.56 + 7.55)\,(-7.58)\,\{\,(-4.4)\,/\,(-7.31)\,\}}$ --------------- 14=_____

09H-15. $\dfrac{(59500 + 12000 - 22300)\,(0.603 - 0.13 - 0.262)}{(3.2)\,(8.7)\,(1.68)\,(1.79 + 0.62 + 1.86)}$ ----------- 15=_____

09H-16. A song lasts 5 min 35 sec at a tempo of 90 beats per minute (bpm). What is the new tempo if the song needs to be finished in exactly 5 minutes? ---------------------------- 16=_____ bpm

09H-17. How much money should Julian invest today at 4% annualized interest to end up with $10,000 5 years from now? 17=$_____

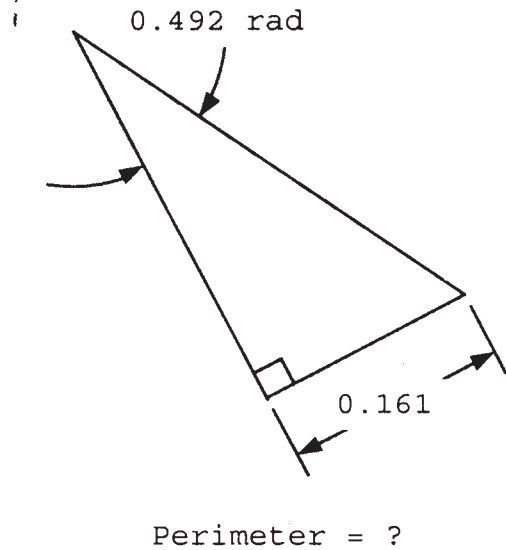09H-18. The moon cycles through its phases every 28 days. If there was a full moon on April 19, on what day in May will it be full again? --- 18=_____ integer

09H-19.

RIGHT TRIANGLE

Area = 0.236
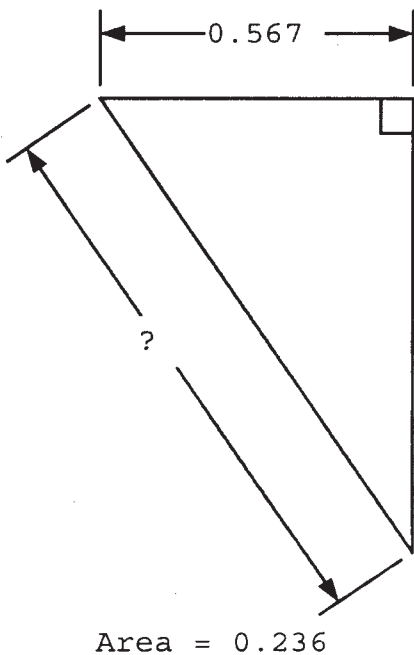
09H-19 = _____

09H-20.

RIGHT TRIANGLE

Perimeter = ?

09H-20 = _____

09H-21. $\dfrac{-0.12 + 1/(-3.37)}{1/(2.76) + 1.16} + \dfrac{1}{(-0.789)}$ ----------------------------- 21=_____

09H-22. $\sqrt{\dfrac{(1.43)\,(5.48)}{149 + 72.4}} + 0.0415$ ------------------------------ 22=_____

09H-23. $\left[\dfrac{2.16 + 1.89 + \sqrt{0.339/0.985}}{0.0793 + 0.0147}\right]^2$ ------------------------- 23=_____

09H-24. $(1.27)\,(0.604)\sqrt{(-0.755)^2/0.956} + 1/\sqrt{0.402 + 2.55}$ --------- 24=_____

09H-25. $\dfrac{\sqrt{1.39 + 0.686 + (19.7)/(9.52)}}{\pi + 0.322}$ ------------------------- 25=_____

09H-26. If one hectare is 10,000 m^2, how many acres are there in one hectare? --- 26=_____ acres

09H-27. A wheelchair ramp must have one inch of vertical drop for every foot of horizontal run. It must also have a 5 ft long, non-slanting landing every 15 ft of horizontal run. What is the horizontal run for a wheelchair ramp with a 4 ft vertical drop? -- 27=_____ ft

09H-28. The amount of radioactive C^{14} in plants is constant at 1 part per trillion (ppt) until the plant dies. Then the C^{14} radio-decays with a half life of 5730 yr. If Aaron's Rod were now 3850 years old, what would be the C^{14} concentration? ----- 28=_____ ppt (SD)
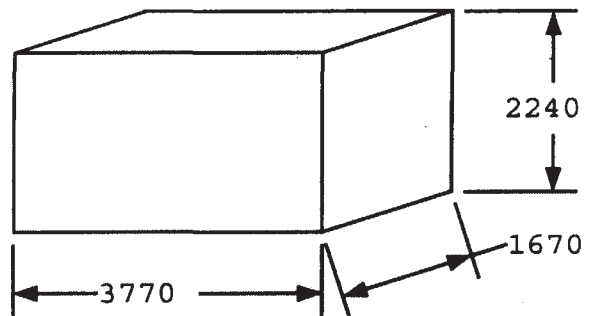
09H-29.	09H-30.
HEMISPHERE	RECTANGULAR SOLID

09H-29.

HEMISPHERE

Radius = 0.502
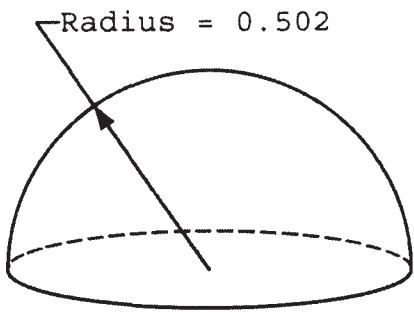
Volume = ?

09H-29 = _____

09H-30.

RECTANGULAR SOLID

2240

1670

3770

Total Surface Area = ?

09H-30 = _____

09H-31. $\left[\dfrac{-9.08\times10^5}{1.92\times10^5 + 24100} + 5.56\right]\times\left\{3490 + (-84.4)^2 - \sqrt{5.41\times10^7}\right\}$ --- 31=_____

09H-32. $\dfrac{1}{0.00122} + \dfrac{1}{\sqrt{3.35\times10^{-6}}} + \dfrac{(7.41 + 9.62 - 1.11)^2}{\sqrt{1.19 - 0.935}}$ ----------- 32=_____

09H-33. $\dfrac{\sqrt{(61.2)/\{(19)/\sqrt{22.8}\}}}{2.6 + (0.116)(1.69)} + \{0.284 + 0.425\}^{1/2}$ -------------- 33=_____

09H-34. $\dfrac{(3.98\times10^5)^2(4.45\times10^{-12} + 3.73\times10^{-12})}{24 + (-0.862)(157)} + \dfrac{1}{\dfrac{1}{-0.00635} + \dfrac{1}{(0.0101)}}$ 34=_____

09H-35. $\dfrac{\dfrac{1}{2.50\times10^9} + \dfrac{7.18\times10^{-5}}{(395+330)^2} - \dfrac{\sqrt{7.14\times10^{-33}}}{(-7.86\times10^{-4})^2}}{(-3.28\times10^{-4} + 4.45\times10^{-4})^2 + (-4.56\times10^{-8})}$ ------------------ 35=_____

09H-36. A 36-in piece of string is used to form a triangle with sides in the ratio 4:5:8. What is the triangle area? -------- 36=_____ in²

09H-37. Erica stands 20 ft away from a 10 ft tall wall. She throws a ball at a release height of 4 ft that just clears the wall. What is the ball release velocity? -------------------- 37=_____ fps

09H-38. A 6-ft board pivots like a seesaw but with the pivot 12 in from one end. The board end closest to the pivot is threaded and screwed on to a vertical threaded shaft which is fixed to the ground and rotates at 130 RPM. If the other end of the board moves with a velocity of 2 in/sec when the board is horizontal, what is the shaft thread (thd) pitch? --------- 38=_____ thd/in

09H-39.
SCALENE TRIANGLE AND CIRCLE

09H-39 = _____

09H-40.
SCALENE TRIANGLE

09H-40 = _____
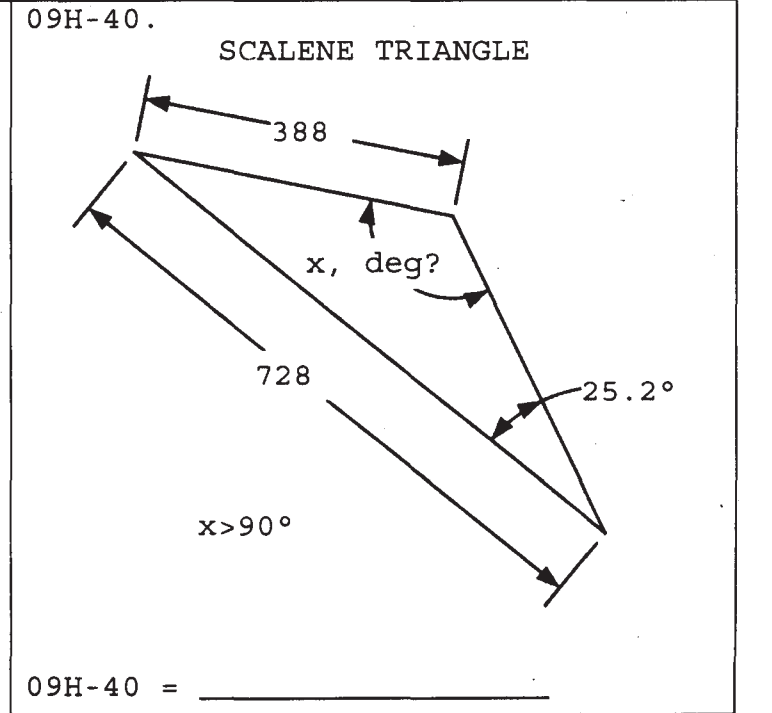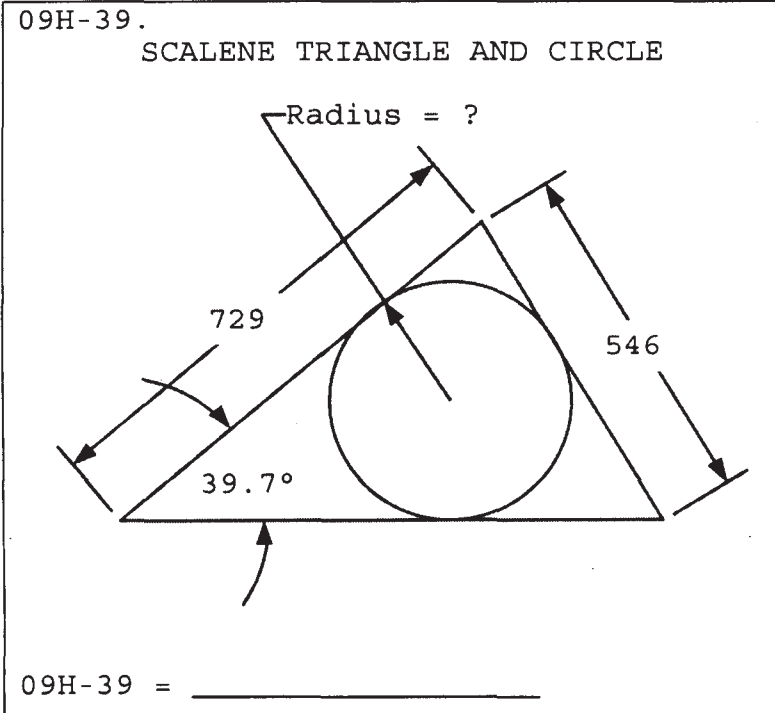
09H-41. $10^{-\{(0.312-0.662)/(0.285+0.267)\}}$ -------------------- 41=_____

09H-42. $\dfrac{(-625)}{(-924)} \left[1 - e^{-(0.169)(0.969)}\right]$ ------------------------ 42=_____

09H-43. $(-1.25 - 1.98)\, \text{Ln}\{(-9.24)(-\pi)\}$ ------------------------ 43=_____

09H-44. $(0.0439 + 0.427)^{-(0.471 + 0.517)}$ ----------------------- 44=_____

09H-45. (deg) $\{(-5.43 \times 10^{6}\sin(-42.8°))\} \times \{(8.12 \times 10^{6})\cos(-164°)\}$ ------ 45=_____
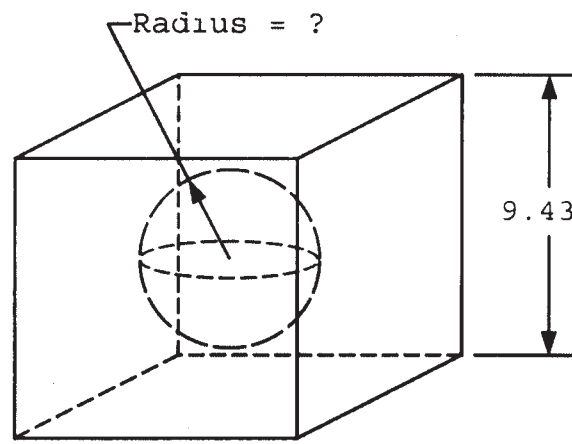
09H-46. If one adds 22.5 to a woman's shoe size, the sum is proportional to the inside length of the shoe. If a woman who is 5 ft 2 in tall wears a Size 7, how tall is a person who wears a Size 9? -- 46=_____ ft

09H-47. A supervisor assessed daily the total progress made on a home construction at the end of each day. On "Day Zero", the house was 0% complete. On the first day, the house was 1.5% complete. On Days 2 to 5, the percent of total completion was 3%, 5.5%, 7% and 9%. What is the total time required for the home construction? ------------------------ 47=_____ days

09H-48. Solve for negative y if $\dfrac{1}{6y + 3} = \dfrac{8y^{5} - 6y^{3} + 2}{15y^{2}}$. --------- 48=_____
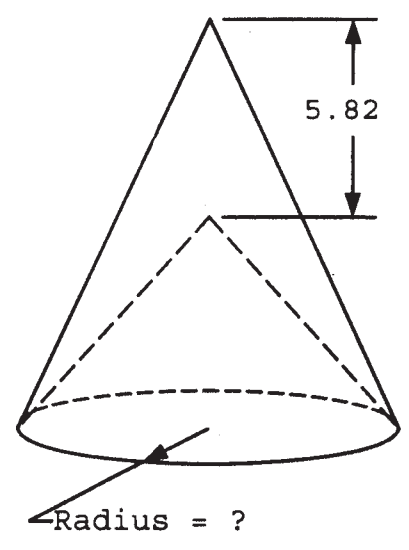
09H-49.

CUBE AND SPHERE

-Radius = ?

9.43

$\dfrac{\text{CUBE}}{\text{VOLUME}} - \dfrac{\text{SPHERE}}{\text{VOLUME}} = 725$

09H-49 = _____

09H-50.

CONE WITH CONICAL CAVITY

5.82

-Radius = ?

Volume = 200

09H-50 = _____

09H-51. $\dfrac{10^{(0.955)} \times 10^{-(0.383)} + 0.846}{10^{(\pi + 0.593)}}$ ----------------------------- 51=_____

09H-52. $\dfrac{80.4 + e^{(4.75+0.857)}}{0.101 - e^{-(0.953-0.858)}}$ ----------------------------- 52=_____

09H-53. $\dfrac{(-6.75)\mathrm{Log}(-8.98 + 23.7)}{\mathrm{Log}(0.773) - (0.929)(0.961)}$ ----------------------------- 53=_____
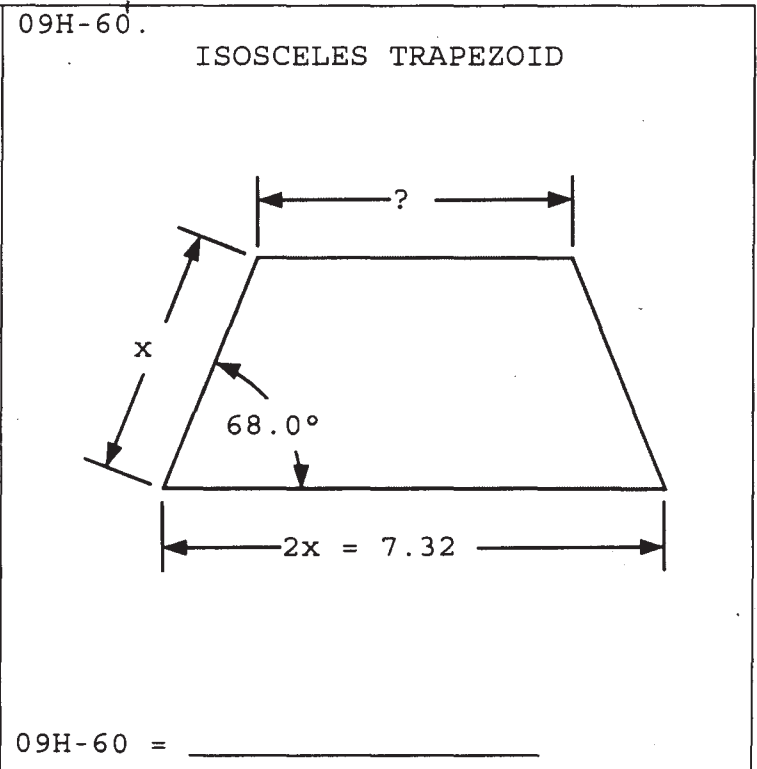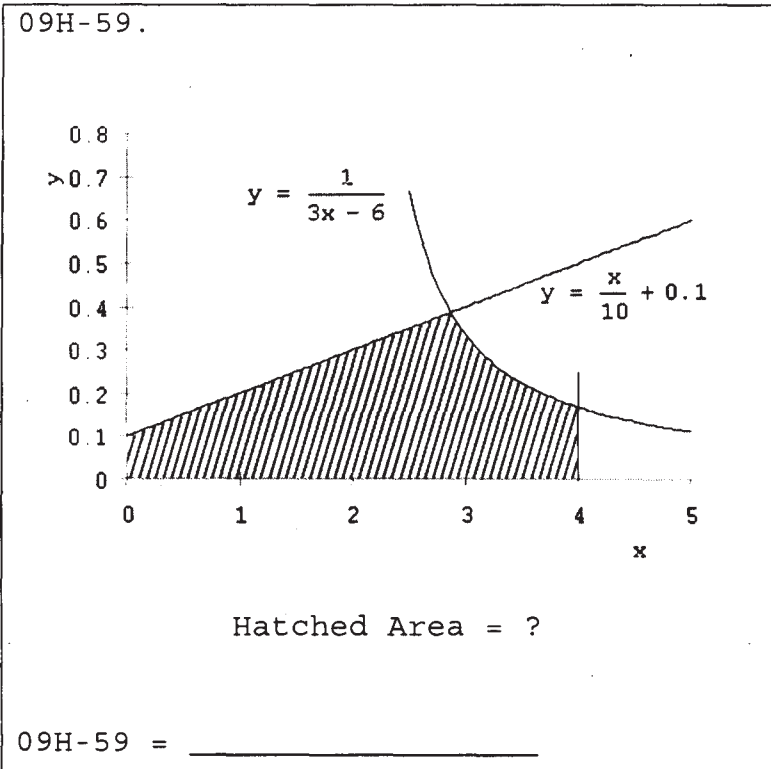
09H-54. $\dfrac{1}{(0.467)^{(-0.332)}} + (0.536 + 0.119)^{(0.969-0.977)}$ ------------ 54=_____

09H-55. (rad) $\arctan\left[\dfrac{(3310)(0.161)}{(3.05)(87.6)}\right] + (0.545)(1.58)$ --------------- 55=_____

09H-56 What is the slope of the curve $y = \dfrac{7x^2 + x}{2x + 1}$ at x = 21? -- 56=_____

09H-57. Sand falls onto a conical pile at a rate of 2 ft³/min. The angle of restitution is the angle the pile makes with the ground and is 35°. At what pile height is the pile radius increasing at 1 ft/min? ------------------------------------- 57=_____ ft

09H-58 What is f if $\mathrm{Det}\begin{bmatrix} 23 & 14 & 23 \\ 6 & 21 & f \\ 22 & 0 & 25 \end{bmatrix} = -35$? ------------------------ 58=_____

09H-59.

$y = \dfrac{1}{3x - 6}$

$y = \dfrac{x}{10} + 0.1$

Hatched Area = ?

09H-59 = _____

09H-60.

ISOSCELES TRAPEZOID

68.0°

2x = 7.32

09H-60 = _____

09H-61. $2\text{Log}\sqrt{\dfrac{(2.85)\,(0.353)\,(2.38)}{(3.84)^3(5.24)^3}}$ ----------------------------------- 61=_____

09H-62. (rad) $\sin(3.02)\cos(1.69) - \cos(3.02)\sin(1.69)$ -------------- 62=_____

09H-63. (deg) $\left\{\cos^2(27.5°) - \sin^2(27.5°)\right\}\times\dfrac{\tan(27.5°)}{1 - \tan^2(27.5°)}$ ---------- 63=_____
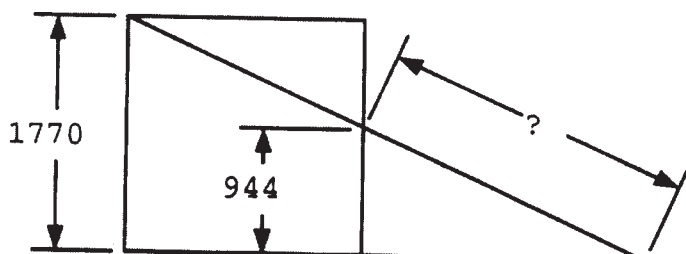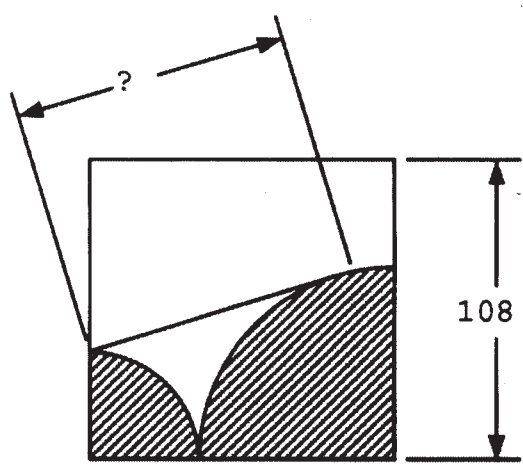
09H-64. $1 + 0.561 + (0.561)^2 + \dfrac{(0.561)^4}{8} - \dfrac{(0.561)^5}{15}$ ---------------- 64=_____

09H-65. (rad) $\dfrac{(2.7)\,(-0.367) - \text{Ln}\left\{0.113\right\} + (-3.51)e^{(-3.88)}}{\arcsin\left\{(0.307)/(2.34 + 16.6)\right\}}$ ----------- 65=_____

09H-66. How much 20% salt solution must be added to
3 gallons of a 45% salt solution to dilute it to 26%? -------- 66=_____ qt

09H-67. A pane of glass is 12 in x 48 in x 0.25 in thick.
It is shattered into square pieces 0.5 in on a side. What
is the percent increase in total surface area of glass? ------ 67=_____ %

09H-68. A thin-walled circular cylinder is filled 31% with
water, closed up and then tipped over on a table so it
would roll if pushed. What is the height of the water
level over the tabletop divided by the cylinder diameter? ---- 68=_____

09H-69.
SQUARE AND RIGHT TRIANGLE

1770

944

?

09H-69 = _____

09H-70.
SQUARE, QUARTER CIRCLES

?

108

Hatched Area = 4940

09H-70 = _____

09H-1 = -1.14
       = -1.14×10^{0}

09H-2 = -0.333
       = -3.33×10^{-1}

09H-3 = -317
       = -3.17×10^{2}

09H-4 = 894
       = 8.94×10^{2}

09H-5 = 0.381
       = 3.81×10^{-1}

09H-6 = 240 integer

09H-7 = -69.2
       = -6.92×10^{1}

09H-8 = 0.943
       = 9.43×10^{-1}

09H-9 = 48.6
       = 4.86×10^{1}

09H-10 = 1.27
       = 1.27×10^{0}

09H-11 = -5.94
       = -5.94×10^{0}

09H-12 = 9.65×10^{6}

09H-13 = 0.0276
       = 2.76×10^{-2}

09H-14 = 20.2
       = 2.02×10^{1}

09H-15 = 52.0
       = 5.20×10^{1}

09H-16 = 101
       = 1.01×10^{2}

09H-17 = $8219.27

09H-18 = 17 integer

09H-19 = 1.01
       = 1.01×10^{0}

09H-20 = 0.802
       = 8.02×10^{-1}

09H-21 = -1.54
       = -1.54×10^{0}

09H-22 = 0.230
       = 2.30×10^{-1}

09H-23 = 2430
       = 2.43×10^{3}

09H-24 = 1.17
       = 1.17×10^{0}

09H-25 = 0.588
       = 5.88×10^{-1}

09H-26 = 2.47
       = 2.47×10^{0}

09H-27 = 63.0
       = 6.30×10^{1}

09H-28 = 0.628 (3SD)
       = 6.28×10^{-1}

09H-29 = 0.265
       = 2.65×10^{-1}

09H-30 = 3.70×10^{7}

09H-31 = 4430 = 4.43×10^3

09H-32 = 1870 = 1.87×10^3

09H-33 = 2.24 = 2.24×10^0

09H-34 = -0.0287 = -2.87×10^{-2}

09H-35 = -0.0125 = -1.25×10^{-2}

09H-36 = 36.7 = 3.67×10^1

09H-37 = 38.2 = 3.82×10^1

09H-38 = 5.42 = 5.42×10^0

09H-39 = 186 = 1.86×10^2

09H-40 = 127 = 1.27×10^2

09H-41 = 4.31 = 4.31×10^0

09H-42 = 0.102 = 1.02×10^{-1}

09H-43 = -10.9 = -1.09×10^1

09H-44 = 2.10 = 2.10×10^0

09H-45 = -2.88×10^{13}

09H-46 = 5.52 = 5.52×10^0

09H-47 = 54.8 = 5.48×10^1

09H-48 = -1.15 = -1.15×10^0 *or -.357 — or* -3.57×10^{-1}

09H-49 = 3.00 = 3.00×10^0

09H-50 = 5.73 = 5.73×10^0

09H-51 = 0.000844 = 8.44×10^{-4}

09H-52 = -436 = -4.36×10^2

09H-53 = 7.85 = 7.85×10^0

09H-54 = 1.78 = 1.78×10^0

09H-55 = 1.97 = 1.97×10^0

09H-56 = 3.50 = 3.50×10^0

09H-57 = 0.668 = 6.68×10^{-1}

09H-58 = 2.00 = 2.00×10^0

09H-59 = 0.976 = 9.76×10^{-1}

09H-60 = 4.58 = 4.58×10^0

09H-61 = -3.53 = -3.53×10^0

09H-62 = 0.971 = 9.71×10^{-1}

09H-63 = 0.410 = 4.10×10^{-1}

09H-64 = 1.88 = 1.88×10^0

09H-65 = 137 = 1.37×10^2

09H-66 = 38.0 = 3.80×10^1

09H-67 = 94.9 = 9.49×10^1

09H-68 = 0.348 = 3.48×10^{-1}

09H-69 = 2230 = 2.23×10^3

09H-70 = 91.6 = 9.16×10^1