

Name _____

Tie Breaker: Points scored on Stated and Geometry Problems

5x(Last Problem Attempted)	+	_____	+	_____	+	_____
7x(Number Incorrect)	-	_____	-	_____	-	_____
2x(Number Incorrect SDs)	-	_____	-	_____	-	_____
TOTAL SCORE		_____		_____		_____

UIL Calculator Applications

Test 21F (District)

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*, 1.23x10^{0*}
 1.23x10¹, 1.23x10⁰¹, .0190, 0.0190, 1.90x10⁻²

Incorrect: 12.30, 123.0, 1.23(10)², 1.23•10², 1.230x10²,
 1.23*10², 0.19, 1.9x10⁻², 19.0x10⁻³, 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.

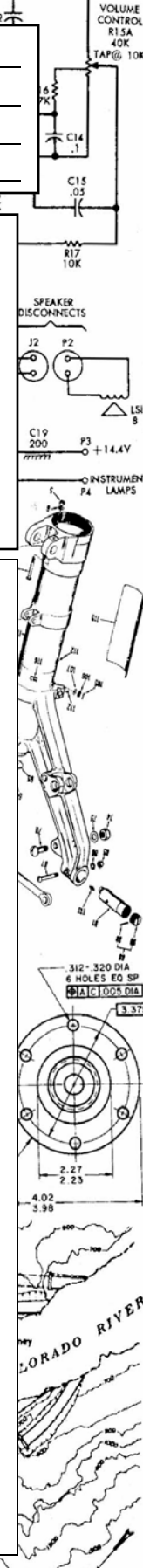
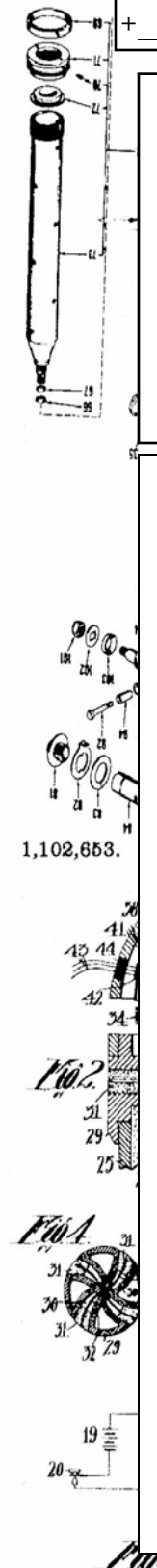
2. Integer problems are indicated by (integer) in the answer blank. Integer problems answers must be exact, no plus or minus one digit, no decimal point or scientific notation.

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.



Witnesses:
G. P. Wilson
A. J. Hartnett

21F-1. $(-67.8 + 238) \times 62.6$ ----- 1= _____

21F-2. $(61.7 \times 64.5) - (1140 - 1500)$ ----- 2= _____

21F-3. $(1.55 - 1.52 + 1.52 + 0.86)/(6.96)$ ----- 3= _____

21F-4. $\{(190)(0.691 + 0.801 - 0.614)(701)\} + 67600$ ----- 4= _____

21F-5. $\frac{38600 + 36200}{(758)(715)(747)} + 3.75 \times 10^{-4} - 9.47 \times 10^{-5}$ ----- 5= _____

21F-6. What is the product of 2.53 and 0.313? ----- 6= _____

21F-7. Calculate the product of 605 and $8.22/0.686$. ----- 7= _____

21F-8. Solve for positive z if 0.343 times z equals 0.137 divided by z. ----- 8= _____

21F-9.

ISOSCELES TRAPEZOID

Area = ?

21F-9 = _____

21F-10.

PARALLELOGRAM

Perimeter = 23.8

21F-10 = _____

21F-11. $\frac{(0.384 + 0.0613)(0.512 + 2.22)}{(-8.89)(0.166)(4110 - 10300)}$ ----- 11= _____

21F-12. $\frac{-0.612(8.28 \times 10^{-5} + 3.72 \times 10^{-5})}{(487 - 627)(-5.18)} - \frac{-6.62 \times 10^{-10}}{0.115 - 0.0421}$ ----- 12= _____

21F-13. $\frac{-24000 + 9840 - 53700 + 5060 + 24500}{(-8.69)(23.4 + 10.6)(3.54 + 2.44)}$ ----- 13= _____

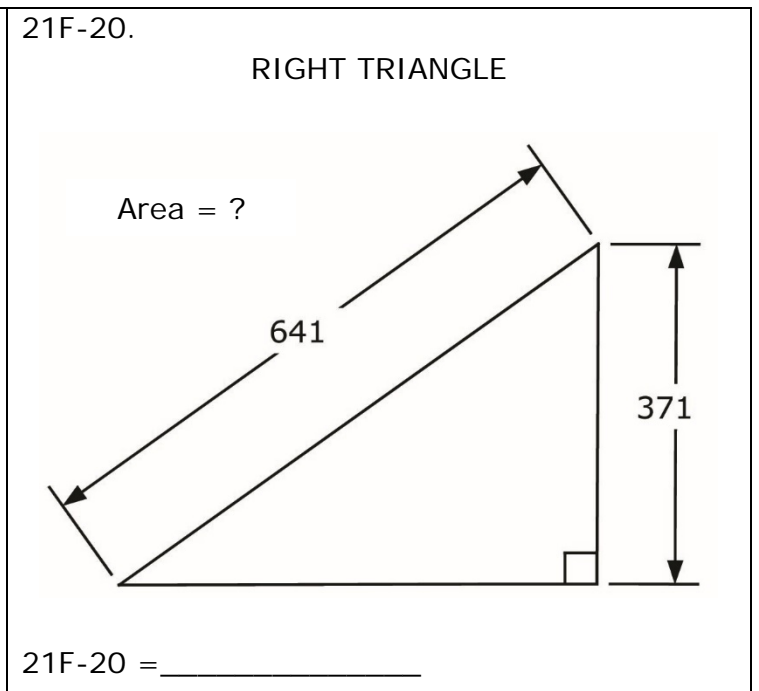
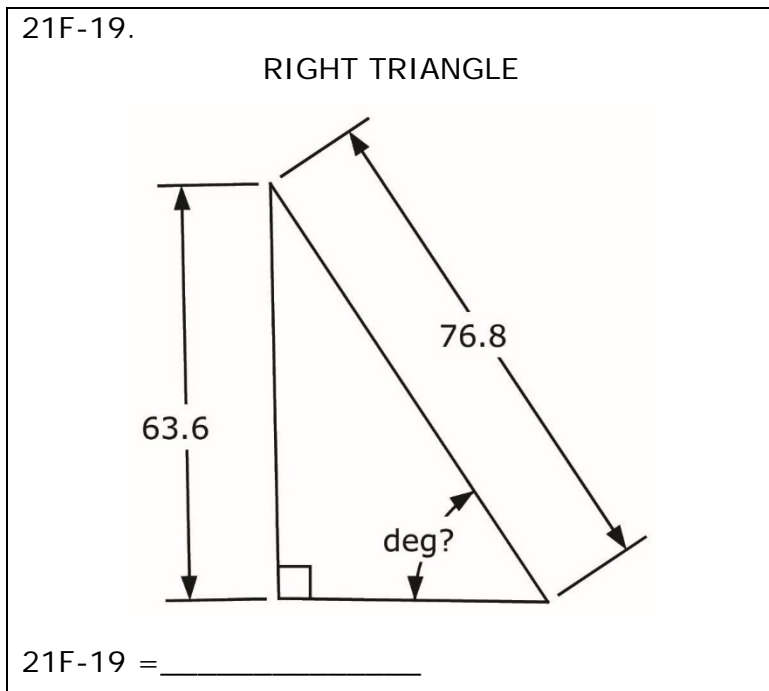
21F-14. $\frac{(1420 + 766 - 339)(0.00953 + 0.0238 - 0.0225)}{(49.3 - 17.4)(-92.2)(-55.8 - 15.5)}$ ----- 14= _____

21F-15. $\frac{17500 + 4.61 \times 10^5 - (79100 + 98100)(1.83 - 0.88)}{(-103)(0.328)(0.399)(882 - 4890 + 8120)}$ ----- 15= _____

21F-16. Daily, Walt spends 7 hr sleeping, 2 hr eating and 8 hr working.
 What is his free time in a day? ----- 16= _____ hr

21F-17. Donuts cost \$1.19 each, but a dozen costs \$11.49. What is the
 maximum number of donuts for which it's still cheaper to buy them
 individually rather than getting the dozen? ----- 17= _____ integer

21F-18. A marathon race is 26 mi 385 yd. Eliud Kipchoge of Kenya set a
 world's record for the marathon, completing the race in 2 hr 1 min 39 s.
 What was his average time to run one mile? ----- 18= _____ min



21F-21. $\frac{0.201 + 1/(2.58)}{1/(1.78) + 0.755} + \frac{1}{(1.48)}$ ----- 21= _____

21F-22. $\left[\frac{(0.617)(0.649)}{-8.26} + 0.0415 \right]^2 + \sqrt{7.95 \times 10^{-10}}$ ----- 22= _____

21F-23. $[-24.6 + \sqrt{252}]^2 \times [777 + 2910]^2 \times \sqrt{579/692}$ ----- 23= _____

21F-24. $(0.484)(1.7)\sqrt{(-0.957)^2/0.886} + 1/\sqrt{0.812 + \pi}$ ----- 24= _____

21F-25. $(-1.65)(-17.6) + \sqrt{(4830)/(\pi)} + [(0.675)(7.51)]^2$ ----- 25= _____

21F-26. An old machine produces 235 widgets/hr round the clock. Current daily widget demand is 16,000. To meet demand, a second machine is purchased. What is the new machine's widget output? ----- 26= _____ widgets/hr

21F-27. The product of two, consecutive integers is 108,570. What is the smaller number? ----- 27= _____ integer

21F-28. Lake Sevan is a high-elevation lake in Armenia with a surface 6286 ft above sea level. If a drainage pipe were extended from the lake down to sea level, what would the exit pressure of water be, a positive number? Exit pressure is the product of the water density, gravitational constant and elevation. ----- 28= _____ psi(SD)

21F-29.

SQUARE PYRAMID

Volume = ?

21F-29 = _____

21F-30.

CONE

Volume = 0.0771

21F-30 = _____

21F-31. $\frac{(0.00506 + 0.0422)^2}{\sqrt{43.3 - 29.7}} + \frac{2.69 \times 10^{-5}}{\sqrt{0.00239 + 0.00278}}$ ----- 31 = _____

21F-32. $\left[\frac{-0.00683}{-0.00209 + 0.00199} + 134 \right] \times \left\{ 724 + (-72.6)^2 - \sqrt{8.14 \times 10^7} \right\}$ 32 = _____

21F-33. $\frac{\sqrt{(790) / \{ (895) / \sqrt{399} \}}}{3.46 + (0.527)(\pi)} + \{0.839 + 0.911\}^{1/2}$ ----- 33 = _____

21F-34. $\frac{[0.0314 / (0.226 + 0.326) + 1 / (31.3)]^{1/2}}{(319 + 388)^2 \times \sqrt{7800 - (830)}}$ ----- 34 = _____

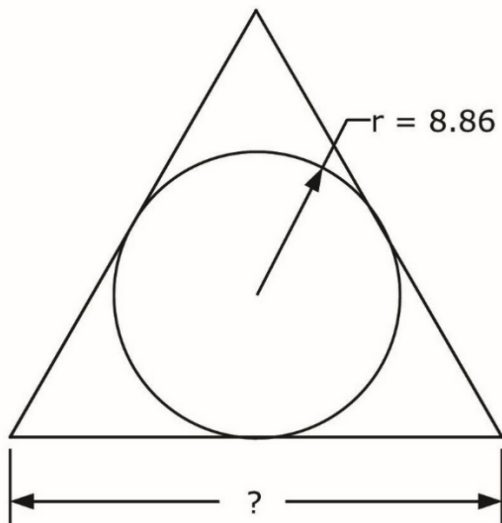
21F-35. $\frac{\left[\frac{(-41.7 + 8.26)}{(975 + 1630)} \right]^2 + \sqrt{\frac{6.01 \times 10^{-9} + 1.33 \times 10^{-8}}{\sqrt{0.311}}}}{\{(-17.9) / (31.2)\}^2}$ ----- 35 = _____

21F-36. The dwarf planet Haumea is 34.8 astronomical units (AU) from the sun. An AU is the average distance from the sun to earth, 93 million mi. What is the shortest time to travel from earth to Haumea if the vehicle speed were 10% of the speed of light? The speed of light is 186,000 mi/s. Neglect relativistic effects. ----- 36 = _____ days

21F-37. A piece of jewelry cost \$2500. If it doubles in value every 5 yr, what is it worth in 3.5 yr? ----- 37 = \$ _____

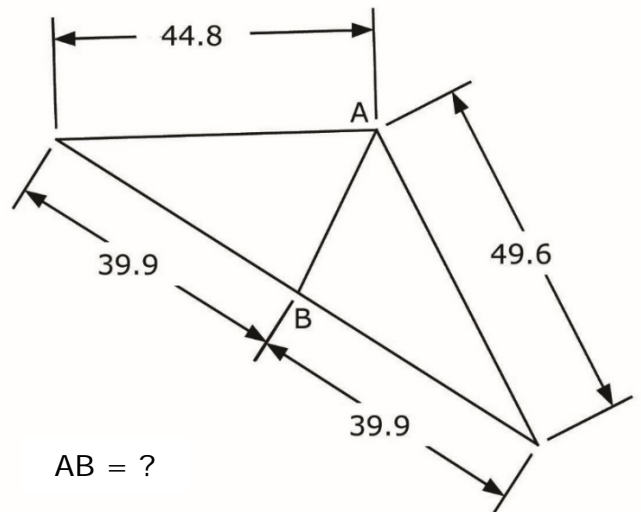
21F-38. Hours of daylight varies sinusoidally in Chicago. On the summer solstice, June 21, there are 16 hr 23 min of daylight. On the winter solstice, December 21, there are 9 hr 12 min of daylight. How many hours of daylight are there on August 17? ----- 38 = _____ hr

21F-39. EQUILATERAL TRIANGLE AND CIRCLE



21F-39 = _____

21F-40. SCALENE TRIANGLES



21F-40 = _____

21F-41. $\frac{10^{-(1.79 - 7.19)}}{-73500 + 53900}$ ----- 41 = _____

21F-42. $\frac{(\pi)}{(-1.34)} [1 - e^{-(0.637)(0.347)}]$ ----- 42 = _____

21F-43. $\frac{(0.00903)\text{Log}(0.00594 - 9.25 \times 10^{-4})}{(0.00948)}$ ----- 43 = _____

21F-44. $(135 + 175)^{1/3} + 1/\{(16.1)^{-0.477}\}$ ----- 44 = _____

21F-45. (deg) $\frac{\cos\{(32.6^\circ)/(9.75)\}}{\sin\{68.4^\circ - 77.3^\circ\}}$ ----- 45 = _____

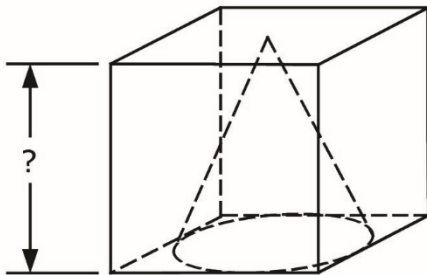
21F-46. The cost of a rubber figure scales with its volume. If a 5-in tall figure costs \$3.98, what is the height of one that costs \$35.99? ----- 46 = _____ in

21F-47. A lion is 7.2 ft long and weighs 420 lbs. A puma is 5.3 ft long and weighs 180 lbs. A lynx is 40 in long and weighs 52 lbs. Estimate the weight of an 18-in long house cat. ----- 47 = _____ lbs

21F-48. For what negative value of w less than -1 does $w^3 + w + 100 = 2/w^2$? ----- 48 = _____

21F-49.

CUBE AND CONE

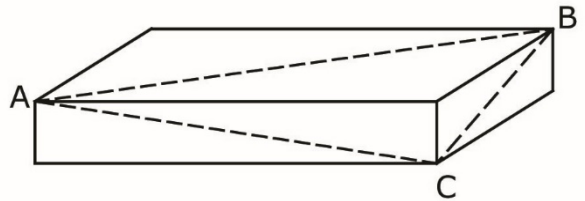


Cube Volume - Cone Volume = 500

21F-49 = _____

21F-50.

RECTANGULAR SOLID



AB = 64.4 BC = 21.1 AC = 61.7

Volume = ?

21F-50 = _____

21F-51. $10^{+(0.114)} + 10^{-(0.261)} + [10^{(0.84/0.705)} - 10^{(0.91)}]^{1/2}$ ---- 51=_____

21F-52. $\frac{1 + e^{\{0.778 + (0.557)(1.41)\}}}{(64.4)(2.61 - e^{(-0.296)})}$ ----- 52=_____

21F-53. $\frac{\text{Ln}(0.00143 + 0.00313)}{1.21 \times 10^{-4}} + \frac{\text{Ln}(0.00554)}{7.44 \times 10^{-4} - 5.39 \times 10^{-4}}$ ----- 53=_____

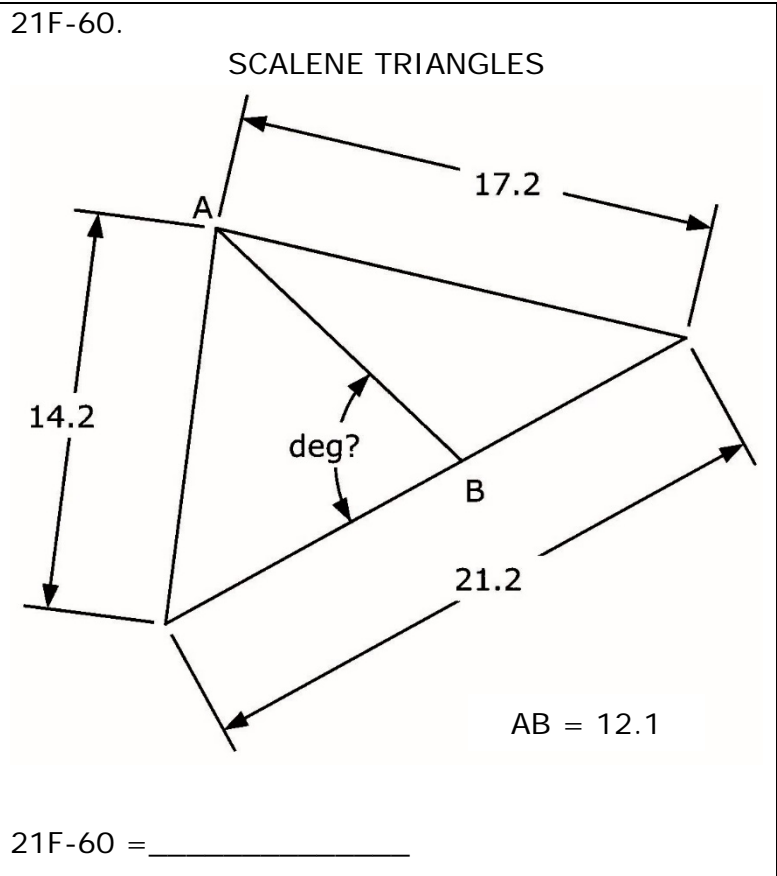
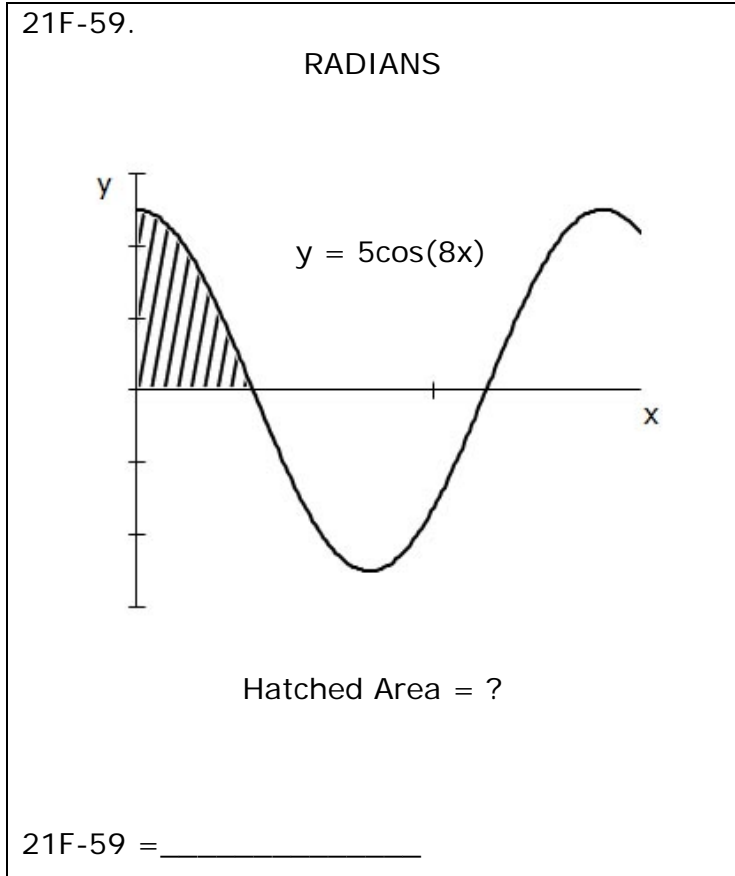
21F-54. $\frac{1}{(0.595)^{(-0.67)}} + (0.535 + 0.127)^{(0.144 - 0.114)}$ ----- 54=_____

21F-55. (rad) $\frac{\arctan\{4.27 + (7.01)(0.385)\}}{\arcsin\{(0.0876 + 0.0807)/0.261\}}$ ----- 55=_____

21F-56. (rad) Calculate the area under the curve $y = 5\sin(\pi x/10) + 8$ between $0 \leq x \leq 10$. ----- 56=_____

21F-57. A ship travels north at 20.55 mph. Another ship follows at the same speed 49.35 mi behind. The lead ship changes course to east at the same time the other ship changes course to northeast. What is the distance of their closest approach? ----- 57=_____ mi(SD)

21F-58. Calculate T_{23} if $\mathbf{T} = \begin{bmatrix} 2 & -5 & 7 \\ -5 & 3 & 3 \\ 7 & 3 & 9 \end{bmatrix} \begin{bmatrix} 1 & 5 & -12 \\ 5 & 3 & 6 \\ -12 & 6 & 10 \end{bmatrix}$. ----- 58=_____

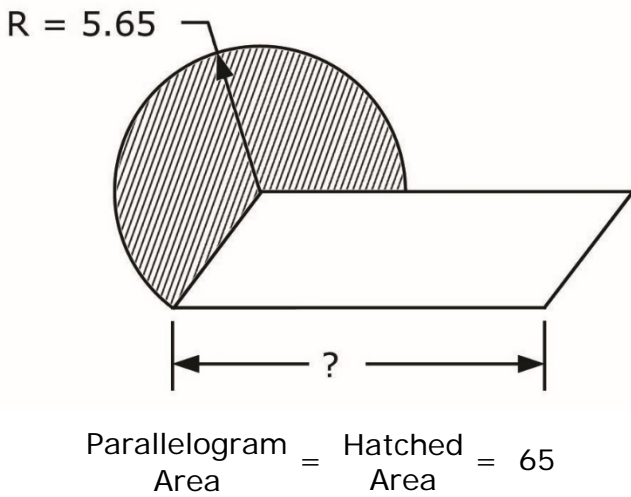


21F-61. Two 5-ft tall posts are separated by 8 ft. A string is tied to the top of each and is pulled taut. One post is then moved 6 in towards the other. Assuming the string forms a circular arc, what is the height of the string midpoint above the floor? ----- 61= _____ ft

21F-62. The universe is estimated to be 8.8×10^{26} meters across. What is this number raised to the power 307? ----- 62= _____

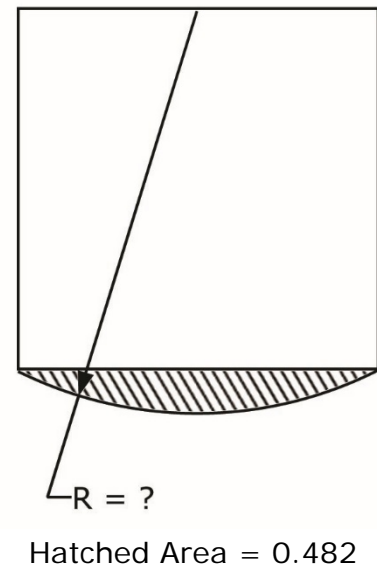
21F-63. In a football game, the fullback, next to the quarterback, starts running down the field at 30 ft/s at the same time the quarterback throws the ball with a velocity of 52 ft/s. What was the football release angle if the catch is completed? ----- 63= _____ degrees

21F-64. SECTOR AND PARALLELOGRAM



21F-64 = _____

21F-65. SQUARE AND SEGMENT



21F-65 = _____

21F-66. $\left[\frac{(10^\pi) \times 10^{\{(5.43)(0.298)\}}}{(5.25)10^{0.741}} \right]^3$ ----- 66= _____

21F-67. $(92.8 - 92.3)^2 + (9.49 + 14.4)e^{\ln(0.0019)}$ ----- 67= _____

21F-68. $(\text{rad}) \frac{98.2}{6(0.186)} \{ (0.633) + (0.132)\sin(-4.74) \}^5$ ----- 68= _____

21F-69. $\frac{1}{(0.72)} + \frac{1}{3(0.72)^3} + \frac{1}{5(0.72)^5} + \frac{1}{7(0.72)^7}$ ----- 69= _____

21F-70. $(\text{rad}) e^{(2)} \left[\frac{(1.04)\sin(1.23) - (0.314)\cos(-2.78)}{(9.64)\sqrt{(1.04)^2 + (0.314)^2}} \right]$ ----- 70= _____

21F-1	= 10700 = 1.07×10^4	21F-11	= 0.000133 = 1.33×10^{-4}	21F-21	= 1.12 = 1.12×10^0
21F-2	= 4340 = 4.34×10^3	21F-12	= -9.22×10^{-8}	21F-22	= 7.69×10^{-5}
21F-3	= 0.346 = 3.46×10^{-1}	21F-13	= 21.7 = 2.17×10^1	21F-23	= 9.47×10^8
21F-4	= 185000 = 1.85×10^5	21F-14	= 9.54×10^{-5}	21F-24	= 1.34 = 1.34×10^0
21F-5	= 0.000465 = 4.65×10^{-4}	21F-15	= -5.60 = -5.60×10^0	21F-25	= 93.9 = 9.39×10^1
21F-6	= 0.792 = 7.92×10^{-1}	21F-16	= 7.00 = 7.00×10^0	21F-26	= 432 = 4.32×10^2
21F-7	= 7250 = 7.25×10^3	21F-17	= 9 integer	21F-27	= 329 integer
21F-8	= 0.632 = 6.32×10^{-1}	21F-18	= 4.64 = 4.64×10^0	21F-28	= 2725 = 2.725×10^3 (4SD)
21F-9	= 0.00446 = 4.46×10^{-3}	21F-19	= 55.9 = 5.59×10^1	21F-29	= 1.60×10^8
21F-10	= 7.64 = 7.64×10^0	21F-20	= 97000 = 9.70×10^4	21F-30	= 0.609 = 6.09×10^{-1}

21F-31	= 0.000980 = 9.80×10^{-4}	21F-41	= -12.8 = -1.28×10^1	21F-51	= 4.57 = 4.57×10^0	21F-61	= 3.80 = 3.80×10^0
21F-32	= -612000 = -6.12×10^5	21F-42	= -0.465 = -4.65×10^{-1}	21F-52	= 0.0481 = 4.81×10^{-2}	21F-62	= $9.04 \times 10^8 271$
21F-33	= 2.14 = 2.14×10^0	21F-43	= -2.19 = -2.19×10^0	21F-53	= -69900 = -6.99×10^4	21F-63	= 54.8 = 5.48×10^1
21F-34	= 7.14×10^{-9}	21F-44	= 10.5 = 1.05×10^1	21F-54	= 1.69 = 1.69×10^0	21F-64	= 14.3 = 1.43×10^1
21F-35	= 0.00107 = 1.07×10^{-3}	21F-45	= -6.45 = -6.45×10^0	21F-55	= 2.04 = 2.04×10^0	21F-65	= 2.75 = 2.75×10^0
21F-36	= 1.96 = 1.96×10^0	21F-46	= 10.4 = 1.04×10^1	21F-56	= 112 = 1.12×10^2	21F-66	= 7.87×10^9
21F-37	= \$4061.26	21F-47	= 17.7 = 1.77×10^1	21F-57	= 18.89 = 1.889×10^1 (4SD)	21F-67	= 0.295 = 2.95×10^{-1}
21F-38	= 14.8 = 1.48×10^1	21F-48	= -4.57 = -4.57×10^0	21F-58	= 108 = 1.08×10^2	21F-68	= 23.0 = 2.30×10^1
21F-39	= 30.7 = 3.07×10^1	21F-49	= 8.78 = 8.78×10^0	21F-59	= 0.625 = 6.25×10^{-1}	21F-69	= 4.74 = 4.74×10^0
21F-40	= 25.3 = 2.53×10^1	21F-50	= 8790 = 8.79×10^3	21F-60	= 71.4 = 7.14×10^1	21F-70	= 0.899 = 8.99×10^{-1}