

UIL Calculator Applications

Test 10A

(Invitational A)

I. Calculation Applications rules and examples—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.

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.

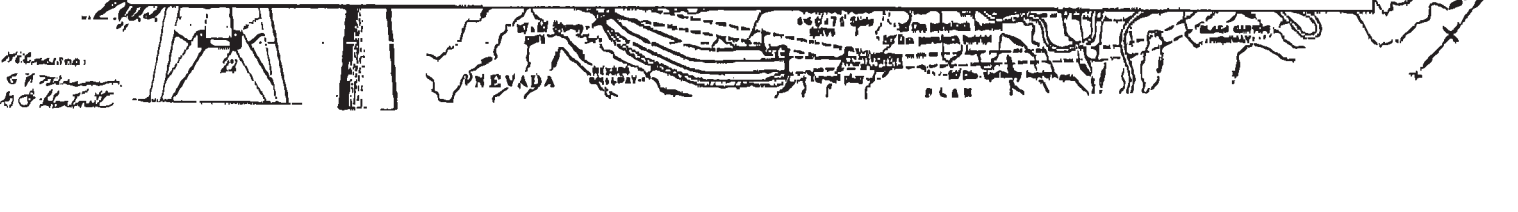
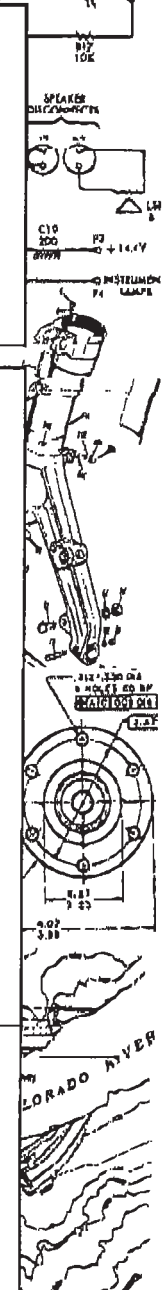
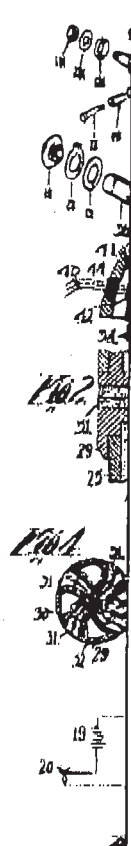
III. Some symbols used on the test

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.



Page 10A-1

10A-1. $36.4 + 11.9 - 45.8$ ----- 1= _____

10A-2. $(10.2 - 5.72)/(-37.1) + 0.0986$ ----- 2= _____

10A-3. $(93.4 - 45.7 + 112) \times (-79.5) - 24200$ ----- 3= _____

10A-4. $\{(5.22)(0.468 + 1.66 - 0.679)(-0.997)\} + \pi$ ----- 4= _____

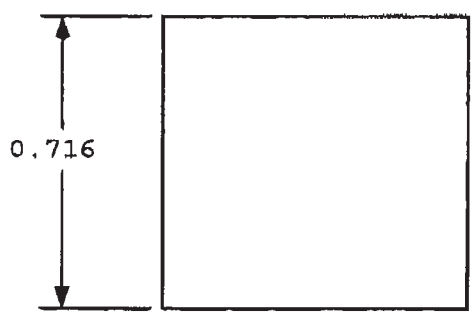
10A-5. $\frac{\{(963 - 538 + 5380)/(987)\}}{\{(252)(-589)/(-536)\}}$ ----- 5= _____

10A-6. What is the sum of 0.95, 3.44 and 2.88? ----- 6= _____

10A-7. When 5 is added to a number, the result is 13 times the sum of the number and -8. What is the number? ----- 7= _____

10A-8. The unofficial world's record for typing the alphabet is 1.328 sec. For this typist, what was the average time needed to type one letter? ----- 8= _____ ms

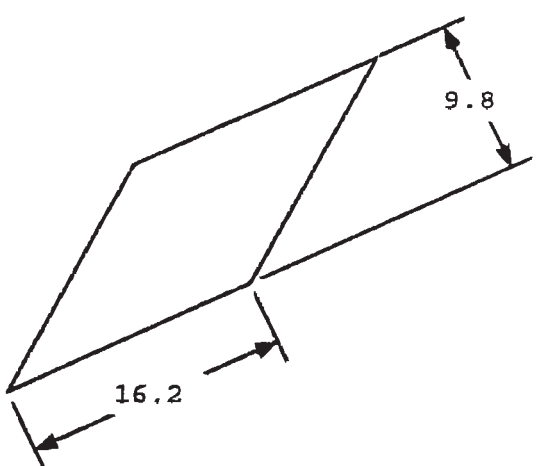
10A-9. **SQUARE**



Perimeter = ?

10A-9 = _____

10A-10. **RHOMBUS**



Area = ?

10A-10 = _____

Page 10A-2

10A-11. $\frac{(2350 + 1240)}{(0.784 - 1.72)} + \frac{(-3250 + 6000)}{(9.65 - 8.76)}$ ----- 11= _____

10A-12. $\frac{4.25 + 2.15}{(0.347)(1.73)(2.42 \times 10^{-5})} + (827 + 1350)(305 - 200)$ ----- 12= _____

10A-13. $\frac{\{(-0.946 + 0.322)(55.3 + 78.6) + (-160)\}(0.887)}{(9.62)(8.31 + 10.2)(\pi)}$ ----- 13= _____

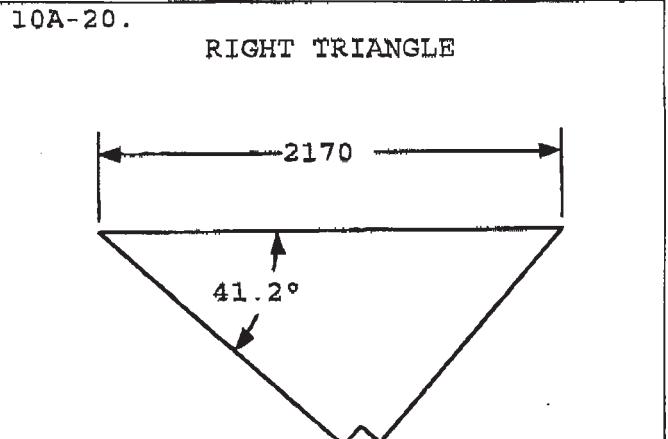
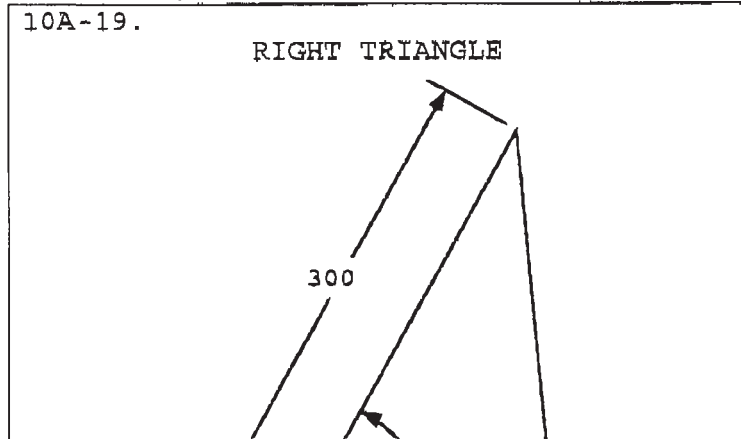
10A-14. $\frac{780 + 641 - 1670}{(0.868)(59.7)} - \frac{(-232)(8.18 \times 10^{-4} + 7.97 \times 10^{-4})}{0.898 + 0.329 - 1.14}$ ----- 14= _____

10A-15. $\frac{(57900 + 11900 - 20100)(0.386 - 0.189 - 0.349)}{(128)(-331)(-212)(1.93 + 1.9 + 5.55)}$ ----- 15= _____

10A-16. How wide is a canyon if a person hears their echo in 4 sec? The speed of sound is 1110 ft/sec. ----- 16= _____ mi

10A-17. Mike has \$25 to spend at a restaurant for dinner. If tax is 8.025% and he tips 15% of the total (including tax), how much can he spend on food? ----- 17= \$ _____

10A-18. A small library of 1000 books was flooded. As a result, the books begin to deteriorate, each book deteriorating at 1%/day. If the librarians can repair 10 books per day, and if a book that has deteriorated by 65% is beyond repair, how many books will be lost? ----- 18= _____ integer



Page 10A-2

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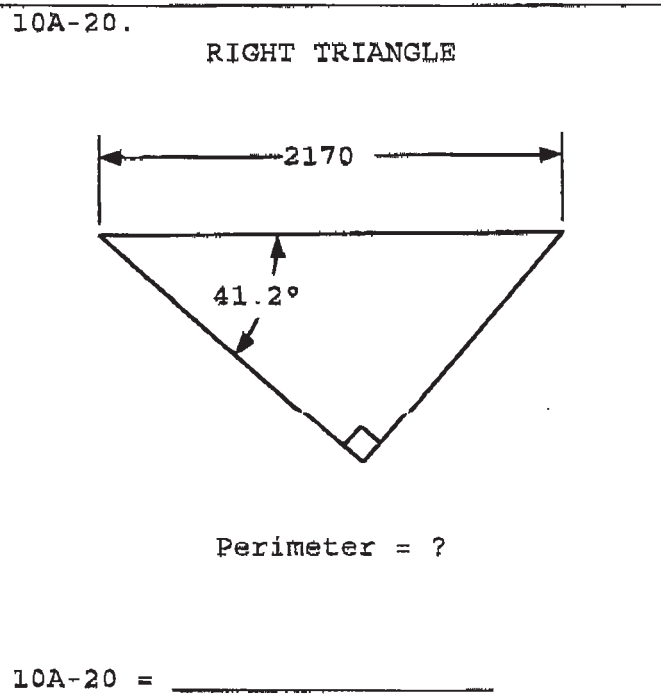
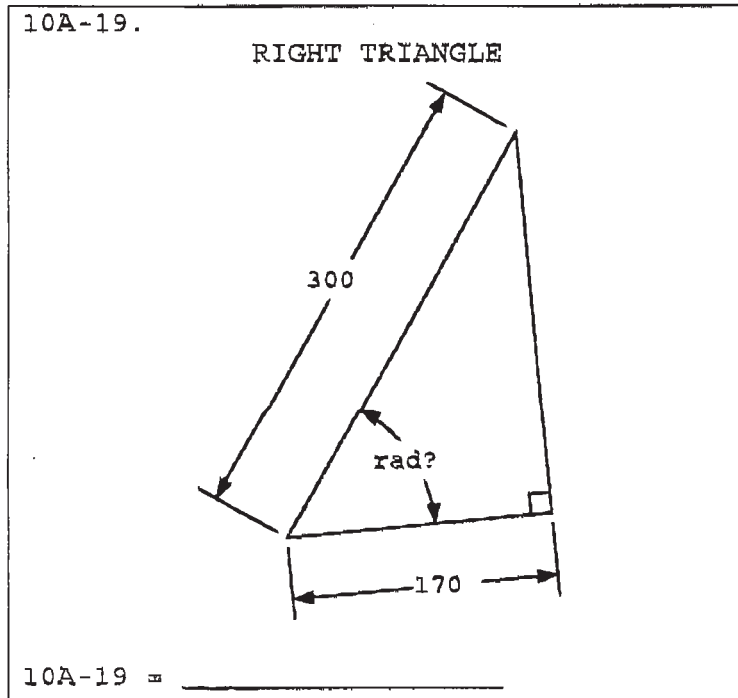
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10A-21. $\left[\frac{(0.283)(0.567)}{5.59} + 0.0167 \right]^2 + \sqrt{4.19 \times 10^{-6}}$ ----- 21= _____

10A-22. $\frac{0.0716 + 1/(6.56)}{1770 \text{ } 2291 + 6 \text{ } 84} + \frac{1}{170 \text{ } 41}$ ----- 22= _____

10A-23. $(0.019)(128) + \sqrt{(18)/(7.45)} + [(0.358)(\pi)]^2$ ----- 23= _____

10A-24. $\frac{\sqrt{0.0296 + 0.016 + (0.00149)/(0.197)}}{-0.997 + 0.158}$ ----- 24= _____

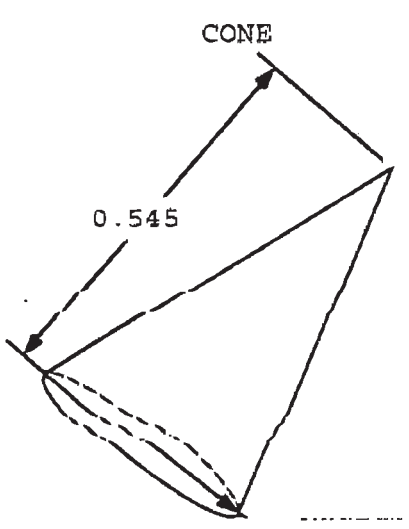
10A-25. $[-12.9 + \sqrt{39}]^2 \times [808 + 1960]^2 \times \sqrt{0.833/0.514}$ ----- 25= _____

10A-26. In the 1999 movie, *The Matrix*, Neo successfully dodges a bullet shot 50 ft away by Agent Smith. If the bullet travels at 2000 mph, and Neo moves laterally 14 in to dodge it, what is Neo's minimum linear acceleration? ----- 26= _____ ft/s²

10A-27. In 2009 there were 2.1 billion Christians worldwide. Assuming there were 12 Christians in 33 AD and that growth was exponential, what was the average time interval over which the number of Christians doubled? ----- 27= _____ yr

10A-28. Two runners race each other on a 3.02 mile course. One runs a mile in 5 min 35 sec, and the other runs a mile in 5 min 58 sec. How far apart are the runners when the winner crosses the finish line? ----- 28= _____ ft (SD)

10A-29.



CONE

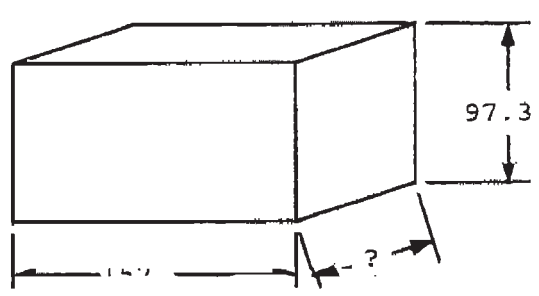
0.545

Volume = 0.0176

10A-29 = _____

10A-30.

RECTANGULAR SOLID



97.3

Total Surface Area = 72.300

10A-30 = _____

Page 10A-4

10A-31. $\frac{1}{7.11 \times 10^{-4}} + \frac{1}{\sqrt{2.94 \times 10^{-6}}} + \frac{(9.29 + 11.1 - 5.54)^2}{\sqrt{0.86 - 0.639}}$ ----- 31= _____

10A-32. $\sqrt{\frac{3.85}{\sqrt{86.4 + 49.3}}} \times \left[\frac{1}{(5.92 - 4.78)^2} + \frac{1}{(2.35 + 1.23)^2} \right]$ ----- 32= _____

10A-33. $\frac{[5.58 / (0.443 + 0.578) + 1 / (0.0624)]^{1/2}}{(0.0437 + 0.124)^2 \times \sqrt{0.424 - (0.0878)}}$ ----- 33= _____

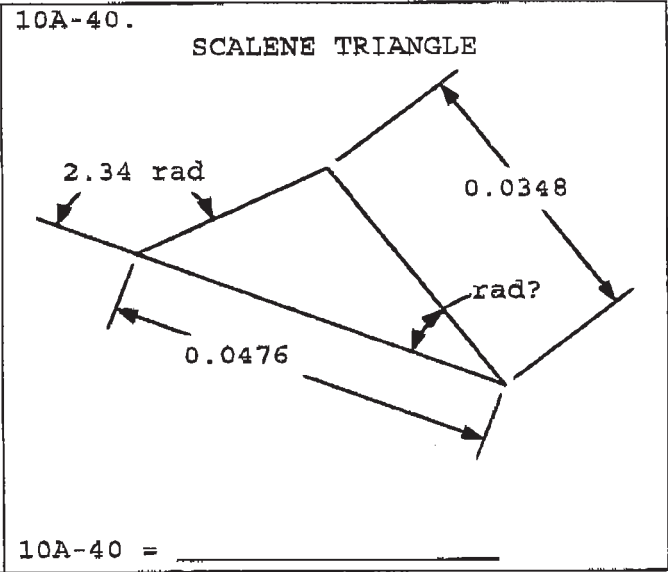
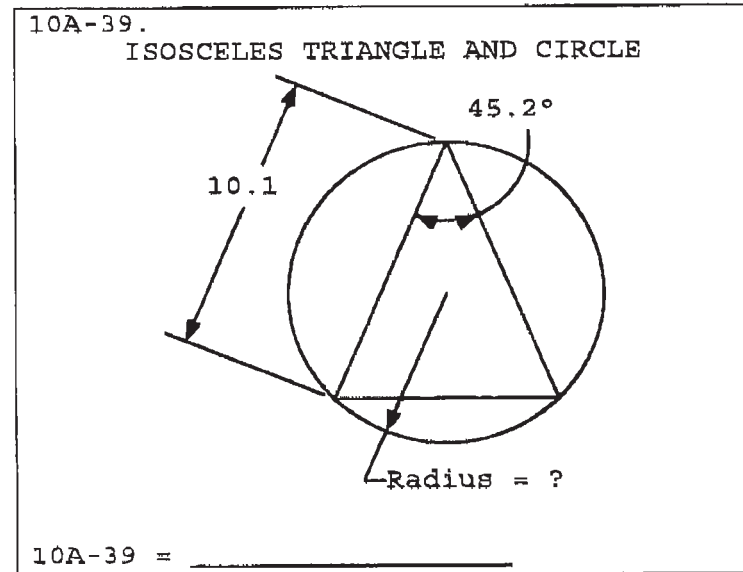
10A-34. $\frac{\sqrt{(42.8) / \{(28.6) / \sqrt{\pi}\}}}{0.657 + (0.614)(1.27)} + \{0.394 + 0.648\}^{1/2}$ ----- 34= _____

10A-35. $\frac{\left[\frac{(78.5 + 64.5)}{(223 + 266)} \right]^2 + \sqrt{\frac{0.00445 + 0.00532}{\sqrt{0.435}}}}{\{(-11.3) / (76.2)\}^2}$ ----- 35= _____

10A-36. In 2009, American Idol winner Kris Allen got 100 million votes in the final tally. How many people actually voted if 10% voted only once, another 10% voted twice, another 10% voted three times, etc.? ----- 36= _____

10A-37. Traveling on the earth's surface, it is 3800 mi from Dallas to Hawaii. What is the percent difference between this arc length and the "burrow-through the earth" straight line distance? ----- 37= _____ %

10A-38. One point (a,b) on the line $y = 5x + 3$ is equidistant from the points (4,8) and (-3, -5). What is a? ----- 38= _____



Page 10A-5

10A-41. $\frac{10^{-(1.18 - 7.46)}}{-32.7 + 17.6}$ ----- 41= _____

10A-42. $\frac{e^{+0.72} + e^{-0.805}}{(-3.48 \times 10^{-7} + 5.01 \times 10^{-9})}$ ----- 42= _____

10A-43. $-0.0238 + (0.436) \ln(1.2 - 0.516)$ ----- 43= _____

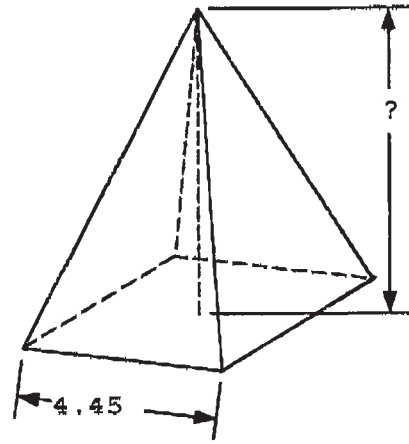
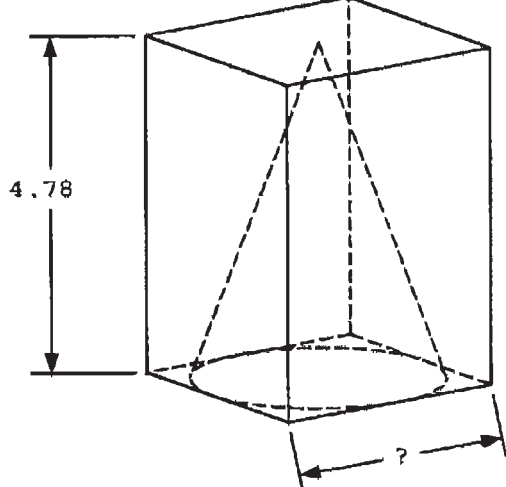
10A-44. $(795 + 1210)^{1/3} + 1/\{(503)^{-0.231}\}$ ----- 44= _____

10A-45. (deg) $\frac{\cos\{(80.9^\circ)/(5.67)\}}{\sin\{142^\circ - 150^\circ\}}$ ----- 45= _____

10A-46. On a map scaled at 1:8,400,000, France is 3.6 in across. If France is crudely square, what is the percent error in the calculated land area if the actual value is 545,630 km²? ----- 46= _____ %

10A-47. A certain type of spherical tumor grows at a constant volume rate. A patient visited the doctor at 30-day intervals; the tumor diameter was measured at 2.3 mm, 3.9 mm, 4 mm, 5.1 mm, 5.6 mm and 5.8 mm. Estimate the time from the last visit at which point the tumor diameter became 1 cm. ----- 47= _____ days

10A-48. (rad) For what positive value of w less than 10 does $w \sin(w/3) = w/2$? ----- 48= _____

| | |
|---|---|
| <p>10A-49. SQUARE PYRAMID</p>  <p style="text-align: center;">Total Surface Area = 78.5</p> <p>10A-49 = _____</p> | <p>10A-50. RECTANGULAR SOLID WITH CONICAL CAVITY</p>  <p style="text-align: center;">Volume = 27.8</p> <p>10A-50 = _____</p> |
|---|---|

Page 10A-6

10A-51. $10^{+(0.545)} + 10^{-(0.973)} + [10^{(0.725/0.545)} - 10^{(0.631)}]^{1/2}$ 51= _____

10A-52. $\frac{(8.76 - \pi) e^{(0.591)(1.61)}}{e^{-(9.04 - 3.9)}}$ ----- 52= _____

10A-53. $\frac{\ln(0.00724 + 0.00951)}{5.35 \times 10^{-4}} + \frac{\ln(0.00444)}{0.00524 - 0.00451}$ ----- 53= _____

10A-54. $\frac{(2.34)^{0.735} - (2.45)^{-0.804}}{296 + 49.3}$ ----- 54= _____

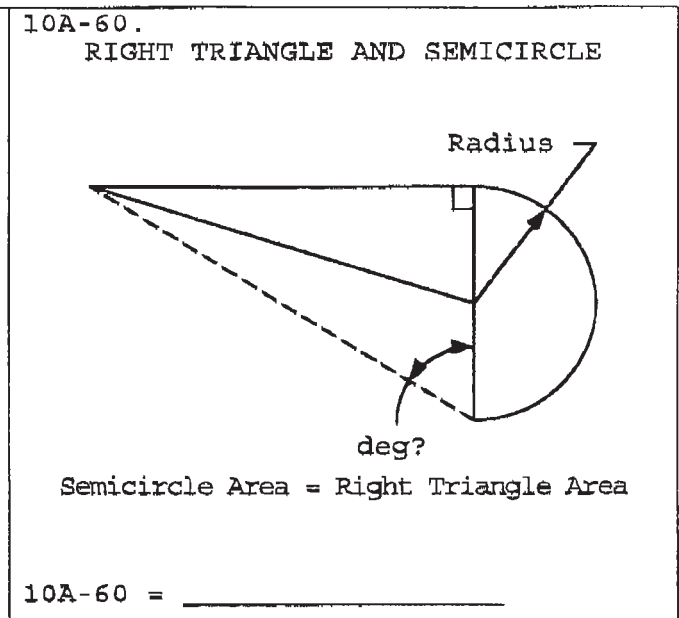
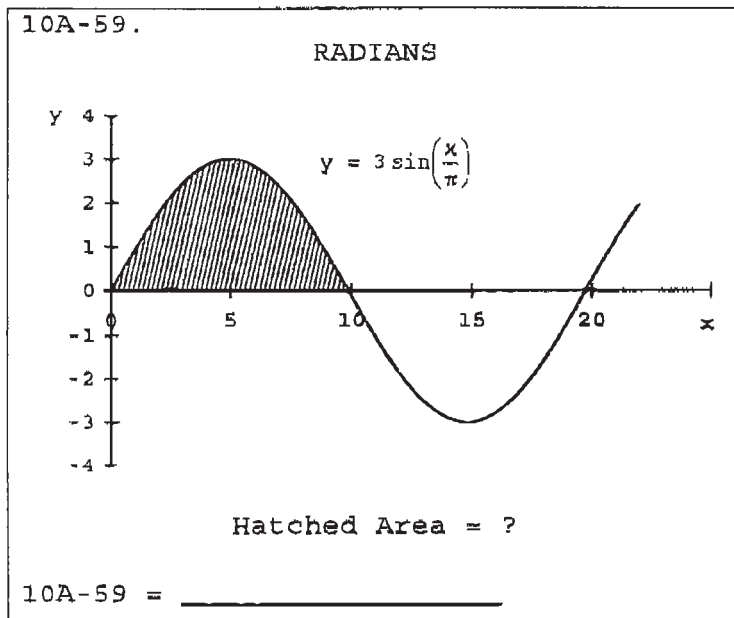
10A-55. (rad) $\frac{\arcsin\{(-24.5)(-44.9)/(3870)\}}{2990 + (62.3)(71.9)}$ ----- 55= _____

10A-56. What is x when 6 raised to the power (5x+4) has a slope equal to 3? ----- 56= _____

10A-57. A length of string is 36 inches long. It is cut into two pieces. One piece is formed into a semicircle and the other into a square. What is the length of the longer piece of string if the combined semicircle and square area is minimized? ----- 57= _____ in

10A-58. Solve for d if $G = HI$, $G_1 = 1847$, $H = \begin{bmatrix} 2 & 65 \\ 3 & 58 \end{bmatrix}$, and

$I = \begin{bmatrix} d \\ d \end{bmatrix}$. ----- 58= _____



Page 10A-7

10A-61. $\frac{\sqrt{(1.63)^3} \times \{e^{(\pi)(-0.0282)}\}^3}{\sqrt[3]{e^{(-9.61)} \times e^{(4.43)}}}$ ----- 61= _____

10A-62. (rad) $\frac{\sin(9.97)}{\cos(9.97)} \sqrt{1 - \{\sin(0.54 \times 3.4)\}^2}$ ----- 62= _____

10A-63. (rad) $\frac{1}{(5000)(0.111)} \ln\{(6.8) + (-3.35)\sin(1.17)\}$ ----- 63= _____

10A-64. $1 + 0.4 + (0.4)^2 + \frac{(0.4)^4}{8} - \frac{(0.4)^5}{15}$ ----- 64= _____

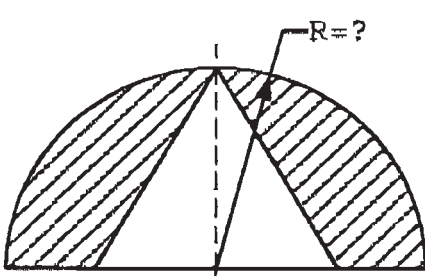
10A-65. (rad) $\frac{(-0.55)(0.122) - \ln\{(0.0256) + (-5.38)e^{(-6.44)}\}}{\arcsin\{(0.609)/(2.96 + 16.6)\}}$ ----- 65= _____

10A-66. The life expectancy for men is 75.2 years and for women is 79.5. If the total average is 78.1 years, what is the number of women divided by the number of men? ----- 66= _____

10A-67. Eight tablespoons of dye are added to two gallons of water to make dyestock. How much dye is needed to make thirty 55-gallon drums of diestock? ----- 67= _____ gal

10A-68. Don peels an orange in 1 min 22 s, and Daniel can peel one in 59 s. Don starts peeling 300 oranges at 8 AM, and after a time t, Daniel joins him, and they work together until all oranges are peeled, finishing at 2 PM. What is t? -- 68= _____ min

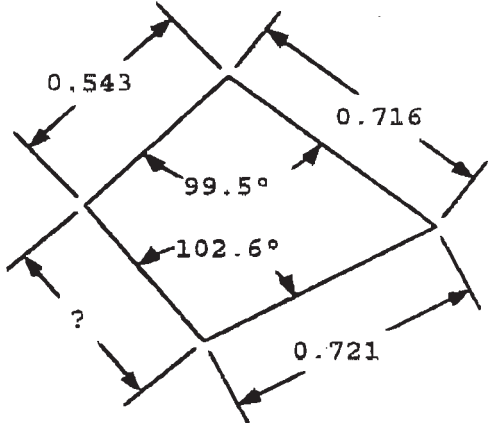
10A-69.
SEMICIRCLE AND EQUILATERAL TRIANGLE



HATCHED AREA = 0.896

10A-69 = _____

10A-70.
QUADRILATERAL



10A-70 = _____

| | | |
|---|---|---|
| 10A-1 = 2.50 = 2.50×10^0 | 10A-11 = -746 = -7.46×10^2 | 10A-21 = 0.00411 = 4.11×10^{-3} |
| 10A-2 = -0.0222 = -2.22×10^{-2} | 10A-12 = 669000 = 6.69×10^5 | 10A-22 = 0.119 = 1.19×10^{-1} |
| 10A-3 = -36900 = -3.69×10^4 | 10A-13 = -0.386 = -3.86×10^{-1} | 10A-23 = 5.25 = 5.25×10^0 |
| 10A-4 = -4.40 = -4.40×10^0 | 10A-14 = -0.498 = -4.98×10^{-1} | 10A-24 = -0.275 = -2.75×10^{-1} |
| 10A-5 = 0.0212 = 2.12×10^{-2} | 10A-15 = -8.97×10^{-5} | 10A-25 = 4.32×10^8 |
| 10A-6 = 7.27 = 7.27×10^0 | 10A-16 = 0.420 = 4.20×10^{-1} | 10A-26 = 8030 = 8.03×10^3 |
| 10A-7 = 9.08 = 9.08×10^0 | 10A-17 = \$20.12 | 10A-27 = 72.2 = 7.22×10^1 |
| 10A-8 = 51.1 = 5.11×10^1 | 10A-18 = 350 integer | 10A-28 = 1000 (2SD) = 1.0×10^3 |
| 10A-9 = 2.86 = 2.86×10^0 | 10A-19 = 0.968 = 9.68×10^{-1} | 10A-29 = 0.176 = 1.76×10^{-1} |
| 10A-10 = 159 = 1.59×10^2 | 10A-20 = 5230 = 5.23×10^3 | 10A-30 = 82.1 = 8.21×10^1 |

| | | | |
|---|---|---|---|
| 10A-31 = 2460 = 2.46x10 ³ | 10A-41 = -126000 = -1.26x10 ⁵ | 10A-51 = 7.75 = 7.75x10 ⁰ | 10A-61 = 8.97 = 8.97x10 ⁰ |
| 10A-32 = 0.487 = 4.87x10 ⁻¹ | 10A-42 = -7.29x10 ⁶ | 10A-52 = 2480 = 2.48x10 ³ | 10A-62 = 0.159 = 1.59x10 ⁻¹ |
| 10A-33 = 284 = 2.84x10 ² | 10A-43 = -0.189 = -1.89x10 ⁻¹ | 10A-53 = -15100 = -1.51x10 ⁴ | 10A-63 = 0.00236 = 2.36x10 ⁻³ |
| 10A-34 = 2.15 = 2.15x10 ⁰ | 10A-44 = 16.8 = 1.68x10 ¹ | 10A-54 = 0.00400 = 4.00x10 ⁻³ | 10A-64 = 1.56 = 1.56x10 ⁰ |
| 10A-35 = 9.42 = 9.42x10 ⁰ | 10A-45 = -6.96 = -6.96x10 ⁰ | 10A-55 = 3.86x10 ⁻⁵ | 10A-65 = 129 = 1.29x10 ² |
| 10A-36 = 18,200,000 = 1.82x10 ⁷ | 10A-46 = 8.13 = 8.13x10 ⁰ | 10A-56 = -0.922 = -9.22x10 ⁻¹ | 10A-66 = 2.07 = 2.07x10 ⁰ |
| 10A-37 = -3.79 = -3.79x10 ⁰ | 10A-47 = 629 = 6.29x10 ² | 10A-57 = 18.5 = 1.85x10 ¹ | 10A-67 = 25.4 = 2.54x10 ¹ |
| 10A-38 = -0.222 = -2.22x10 ⁻¹ | 10A-48 = 7.30 = 7.30x10 ⁰ | 10A-58 = 27.6 = 2.76x10 ¹ | 10A-68 = 324 = 3.24x10 ² |
| 10A-39 = 5.47 = 5.47x10 ⁰ | 10A-49 = 6.21 = 6.21x10 ⁰ | 10A-59 = 18.9 = 1.89x10 ¹ | 10A-69 = 0.950 = 9.50x10 ⁻¹ |
| 10A-40 = 0.583 = 5.83x10 ⁻¹ | 10A-50 = 2.81 = 2.81x10 ⁰ | 10A-60 = 57.5 = 5.75x10 ¹ | 10A-70 = 0.507 = 5.07x10 ⁻¹ |