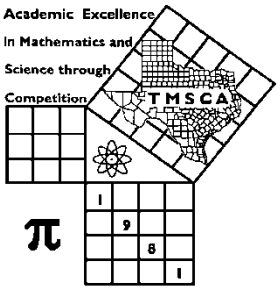
1st Score: _____	2nd Score: _____	3rd Score: _____	
S & G _____	S & G _____	S & G _____	_____. ____
Grader: _____	Grader: _____	Grader: _____	**Final Score**

PLACE LABEL BELOW

Name:_____School:_____

SS/ID Number:_____City: _____

Grade: 9 10 11 12 Classification: 1A 2A 3A 4A 5A 6A



TMSCA HIGH SCHOOL CALCULATOR INVITATIONAL ©

2023-2024

GENERAL DIR ECTIONS

I. About this test:
A. You will be given 30 minutes to take this test.
B. There are 70 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*, $1.23x10^0$*, $1.23x10^1$, $1.23x10^{01}$, .0190, $1.90x10^{-2}$
Incorrect: 12.30, 123.0, $1.23(10)^2$, $1.23\cdot10^2$, $1.230x10^2$, $1.23*10^2$, 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. 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. Plus or minus one digit error in the last significant digit is permitted.
III. Some symbols used on the test.
A. Angle measure: rad means radians; deg means degrees.
B. Inverse trigonometric functions: arcsine 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).
IV. Scoring:
A. All problems answered correctly are worth FIVE points. TWO points will be deducted for all problems answered incorrectly or skipped before the last problem attempted.

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2024 TMSCA High School Calculator Invitational Meet

24K-1. $(\pi + 21.2) \times 8.06$ ---------- 1=_____

24K-2. $(0.814 \times 0.948) - (0.741 - 0.928)$ ---------- 2=_____

24K-3. $(9.1 - 7.91 + 18.8) \times (-5.79) - 135$ ---------- 3=_____

24K-4. $\dfrac{(9780 - 8290)}{\{(0.0891)/(-0.0951)\}} + (1150 - 909)$ ---------- 4=_____

24K-5. $\dfrac{(0.15 + 0.0453 - 0.0479)(-0.22)}{(0.305)(0.0128)(-0.827)}$ ---------- 5=_____

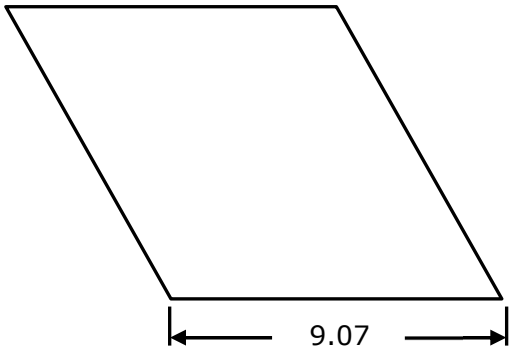
24K-6. Find the product of 147 and 259.---------- 6=_____

24K-7. Find the base-10 logarithm of the sum of 842 and 1967.---------- 7=_____

24K-8. What is the ratio of Ln(1097) and 1.312?---------- 8=_____

24K-9.

RHOMBUS

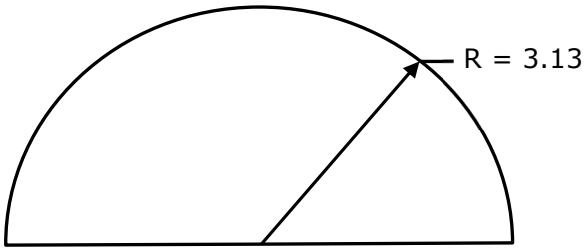


Perimeter = ?

24K-9 =_____

24K-10.

SEMICIRCLE



Perimeter = ?

24K-10 =_____

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24K-11. $\dfrac{(0.0993)(0.0294) + (-0.06)(-0.0543)}{\pi + 0.28 - (-9.53)(0.103)}$ ---------- 11=_____

24K-12. $\dfrac{-3.48(4.83\text{x}10^{-5} + 6.82\text{x}10^{-6})}{(882 - 1320)(\pi)} - \dfrac{6.14\text{x}10^{-8}}{-0.78 - 0.568}$ ---------- 12=_____

24K-13. $\dfrac{(-3.51)(996 - 469)\{63.3 - (-1.58)(-9.26)\}}{(\pi + 3.4)(-0.562 - 0.592)}$ ---------- 13=_____

24K-14. $\dfrac{\{(0.436 + 0.681)(1.86 + 22.2) + 34.3 - 8.38\}}{(-649 - 321)(41.1 + 87.8 - 47.8)}$ ---------- 14=_____

24K-15. $\dfrac{(82400 + 64500 - 2.61\text{x}10^{5})(0.197 - 0.0917 - 0.11)}{(-0.00216)(-0.0719)(-0.083)(4.65 + 4.27 + 27.9)}$ ---------- 15=_____

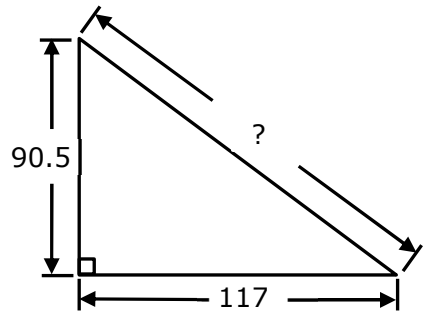
24K-16. My desk top measures 40 in by 20 in. Find the area of my desktop. 16=_____ ft^2

24K-17. The library was having a used books sale. If all children's books cost \$0.35 and Rose has \$15.45, how many books can she purchase? -------- 17=_____ integer

24K-18. How many seconds has Caleb lived when he reaches his sixth birthday?---------- 18=_____ s

24K-19.

RIGHT TRIANGLE

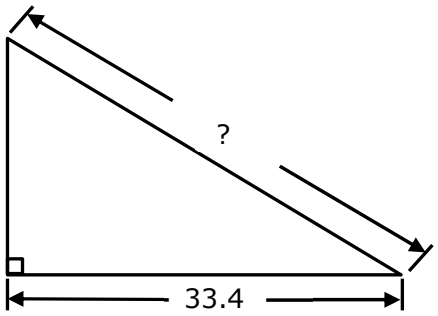


24K-19 =_____

24K-20.

RIGHT TRIANGLE

Area = 379



24K-20 =_____

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24K-21. $\left[\frac{\sqrt{0.712 - 0.18}}{-2.52} + \frac{(-0.103)}{0.959}\right]^2$ ---------- 21=_____

24K-22. $\frac{0.797 + 1/(0.793)}{1/(0.112) + 8.99} + \frac{1}{(5.49)}$ ---------- 22=_____

24K-23. $\left[\frac{0.816 + 0.168 + \sqrt{0.243/0.712}}{8.83 + 7.54}\right]^2$ ---------- 23=_____

24K-24. $[-58 + \sqrt{2670}]^2 \times [245 + 363]^2 \times \sqrt{0.158/0.822}$ ---------- 24=_____

24K-25. $(-0.0341)(-71) + \sqrt{(8.95)/(\pi)} + [(0.165)(7.47)]^2$ ---------- 25=_____

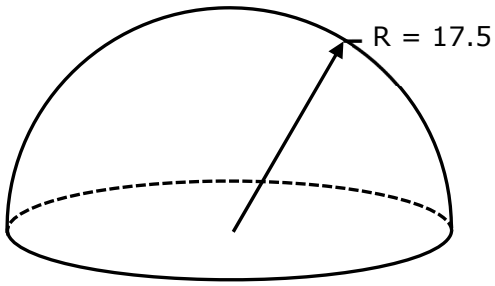
24K-26. In 1969, Carlos Lopes set a new world record in the marathon, running 26 mi 385 yd in 2 hr 7 min 12 s. Find his average velocity. ---------- 26=_____mph

24K-27. Rancher Rob stores water for his cattle in a large cylinder that has a diameter of 16 ft and a height of 15 ft. How many gallons are required to completely fill the tank?---------- 27=_____gal

24K-28. In 1970, David paid $1.32 for a gallon of milk. In 2023, David paid $4.31 for a gallon of milk. Use these prices to calculate the annual rate of inflation from 1970 to 2023.---------- 28=_____%

24K-29.

HEMISPHERE



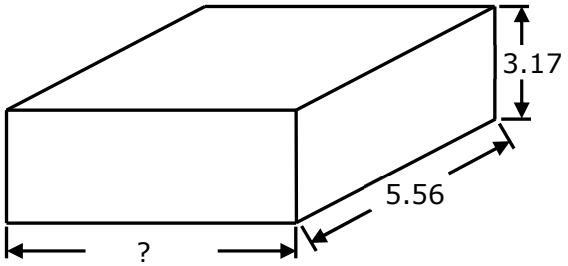
Total Surface Area = ?

24K-29 =_____

24K-30.

RECTANGULAR SOLID

Total Surface Area = 142



24K-30 =_____

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24K-31. $\sqrt{\dfrac{5.16}{\sqrt{84.9 + 13.7}}} \times \left[\dfrac{1}{(\pi - 0.425)^2} + \dfrac{1}{(2.68 + 1.07)^2}\right]$ ---------- 31=_____

24K-32. $\dfrac{(-8030 + 42200)^2}{\sqrt{33.4 - 22.2}} + \dfrac{2.76\text{x}10^{10}}{\sqrt{4370 + 9380}}$ ---------- 32=_____

24K-33. $\dfrac{\sqrt{(0.0388)/\{(2.14)/\sqrt{4.98}\}}}{0.108 + (0.892)(1.21)} + \{0.00522 + 0.00543\}^{1/2}$ ------ 33=_____

24K-34. $\dfrac{[(52500 - 7170)(0.675/0.245)]^{1/2}}{(0.306)^2 + (0.178 + 0.278)^2 + 0.152}$ ---------- 34=_____

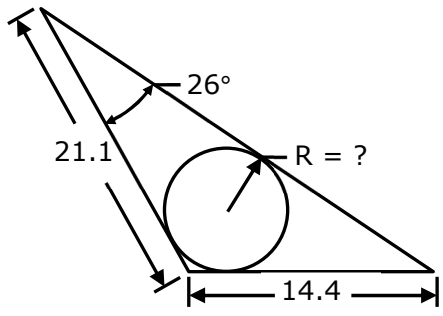
24K-35. $\dfrac{(73.4 + 163)^2 - (167 - 18.4)^2}{\sqrt{(15)(0.749)(136 + 94.9 - 180)^2}}$ ---------- 35=_____

24K-36. Martha has a jar full of nickels, dimes and quarters. She has a total of 97 coins with a value of $12.20. She has six more nickels than dimes. How many quarters does she have?---------- 36=_____integer

24K-37. A video of Catherine punching all 35 problems in 7 min 30 s has gone viral with views growing exponentially. After 2 hours, there were 2056 views. How long would it take to go from the initial posting to get 15 million views?---------- 37=_____hr

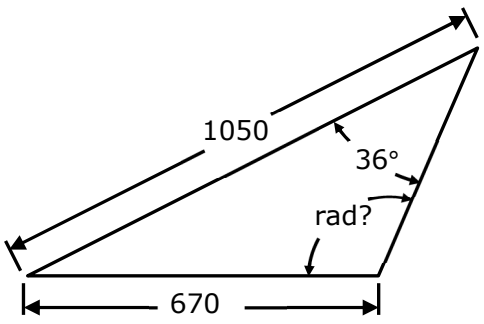
24K-38. The curve $y_1 = 3x^2 - 2x - 4$ intersects the curve $y_2 = \text{Ln}(x+6)$ at points P and Q. Find the length of the segment $\overline{PQ}$. ---------- 38=_____

24K-39. CIRCLE AND SCALENE TRIANGLE



24K-39 =_____

24K-40. SCALENE TRIANGLE



24K-40 =_____

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24K-41. $\dfrac{10^{-(1.59 - 2.21)}}{18100 + 8850}$ ---------- 41=_____

24K-42. $\dfrac{(-5.3)}{(-7.51)}\left[1 - e^{-(0.232)(0.178)}\right]$ ---------- 42=_____

24K-43. $-0.0284 + (0.403)\text{Ln}(1.93 - 0.777)$ ---------- 43=_____

24K-44. $(6.26)^3 + (36.6 - 27.5)^{1.59}$ ---------- 44=_____

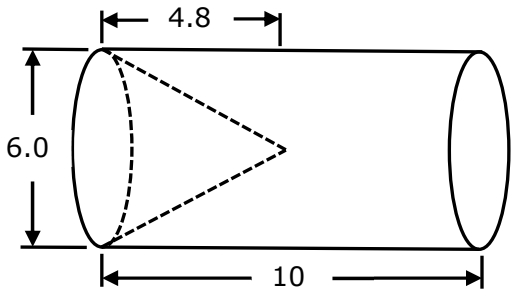
24K-45.(deg) $\dfrac{\cos\{(34.7°)/(4.45)\}}{\sin\{40.2° - 59°\}}$ ---------- 45=_____

24K-46. A 2-ft-tall statue of Abe Lincoln weighs 1.75 lb. How much does a 26-ft-tall statue made of the same material weigh?---------- 46=_____lb

24K-47. The price of a new transmission is increasing each year. Some recent data (year, cost) is: (1996, 3020), (2004, 3960), (2010, 4840), (2016, 5380) and (2020, 6110). Predict the price in 2035. ---------- 47=$_____

24K-48. Solve for w, $w > 0$, if $6w^6 = 5w^5 + 14$. ---------- 48=_____

24K-49. CYLINDER WITH CONICAL CAVITY

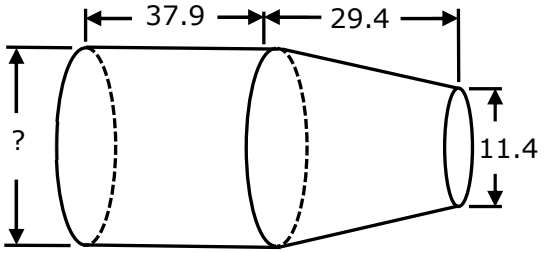


Volume = ?

24K-49 =_____

24K-50. HEMISPHERE WITH CONICAL CAVITY

Cylinder Volume = 1.5(Frustum Volume)



24K-50 =_____

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24K-51. $\dfrac{(576)\ 10^{-(5.14\ -\ 3.12)}}{620 + 502}$ ---------- 51=_____

24K-52. $\dfrac{1 + e^{+\{0.371\ +\ (0.548)(2.66)\}}}{(0.016)(9.77 - e^{(-0.376)})}$ ---------- 52=_____

24K-53. $\dfrac{\text{Ln}\{(0.75)(0.473)(0.933)\}}{0.0882 + (-0.108)\ \text{Ln}(0.189)}$ ---------- 53=_____

24K-54. $\dfrac{1}{(0.78)^{(-0.715)}} + (0.995 + 0.897)^{(0.576\ -\ 0.784)}$ ---------- 54=_____

24K-55.(rad) $\dfrac{\arctan\{1.15 + (1.19)(0.928)\}}{\arcsin\{(147 + 111)/269\}}$ ---------- 55=_____

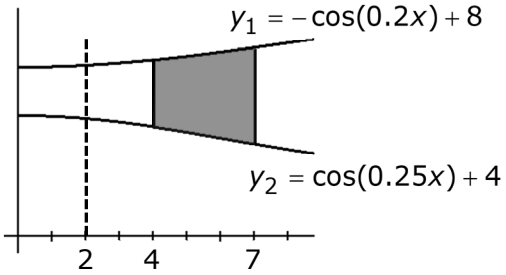
24K-56. Find the slope of the line tangent to the curve $y = -6x^3 + 8x^2 - 10x + 12$ at $x = 0.625$. ---------- 56=_____

24K-57. A 6-ft-tall man is walking away from a 22-ft-tall streetlight at 4.0 ft/s. When he is 18 ft from the streetlight, at what rate is his shadow lengthening? ---------- 57=_____ft/s

24K-58. $A = \begin{bmatrix} 7 & 2 & 4 \\ -1 & -3 & 5 \\ -2 & 4 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 \\ 4 \\ 6 \end{bmatrix}$. If $C = A \bullet B$, then C_2 = _____. -------- 58=_____integer

24K-59.

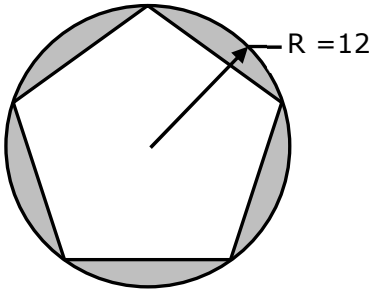
SOLID OF REVOLUTION $(x = 2)$



24K-59 =_____

24K-60.

CIRCLE AND REGULAR PENTAGON



Shaded Area = ?

24K-60 =_____

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24K-61. How many minutes after 4:30 do the hour hand and minute hand of a clock align? ---------- 61=_____ min

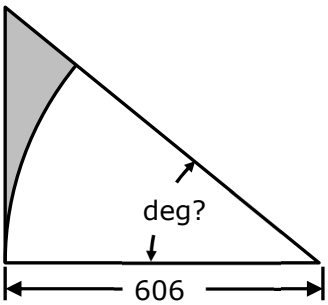
24K-62. Evaluate 3965^{18232} ---------- 62=_____

24K-63. Tom drops a baseball from the edge of the roof at the Jim Ned State Bank. If the ball is released from a height of 88 ft, how fast is the ball traveling just as it reaches the ground?---------- 63=_____ ft/s

24K-64.

RIGHT TRIANGLE AND SECTOR

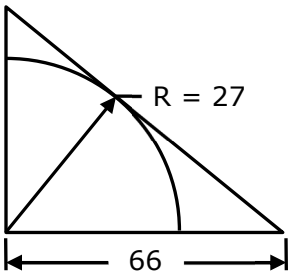
Shaded Area = 30,780



24K-69 =_____

24K-65.

RIGHT TRIANGLE AND QUARTER CIRCLE



Triangle Area = ?

24K-70 =_____

24K-66. $\left[\dfrac{(10^{5.71}) \times 10^{\{(7.86)(0.622)\}}}{(1.83)10^{0.671}}\right]^3$ ---------- 66=_____

24K-67. $(0.323)10^{\text{Log}[(9.88)(0.243)]} + \{(0.744)(0.926)\}^{1/2}$ ---------- 67=_____

24K-68. $(\text{rad})\dfrac{98.2}{6(-0.425)}\left\{(1.19) + (0.595)\sin(\pi)\right\}^5$ ---------- 68=_____

24K-69. $\dfrac{1}{(0.899)} + \dfrac{1}{3(0.899)^3} + \dfrac{1}{5(0.899)^5} + \dfrac{1}{7(0.899)^7}$ ---------- 69=_____

24K-70. $\dfrac{-77.1}{\sqrt{75.9}}\text{Ln}\left[\dfrac{\sqrt{(-65.8)^2 + (4300)} + \sqrt{41300}}{\sqrt{0.397} + (41.9)(0.00488)}\right]$ ---------- 70=_____

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2024 TMSCA High School Calculator Invitational Meet Answers

24K-1	= 196 = 1.96×10^{2}	24K-11	= 0.00140 = 1.40×10^{-3}	24K-21	= 0.157 = 1.57×10^{-1}
24K-2	= 0.959 = 9.59×10^{-1}	24K-12	= 1.85×10^{-7}	24K-22	= 0.297 = 2.97×10^{-1}
24K-3	= -251 = -2.51×10^{2}	24K-13	= 11900 = 1.19×10^{4}	24K-23	= 0.00918 = 9.18×10^{-3}
24K-4	= -1350 = -1.35×10^{3}	24K-14	= -0.000671 = -6.71×10^{-4}	24K-24	= 6.49×10^{6}
24K-5	= 10.0 = 1.00×10^{1}	24K-15	= -1.13×10^{6}	24K-25	= 5.63 = 5.63×10^{0}
24K-6	=38100 = 3.81×10^{4}	24K-16	=5.56 = 5.56×10^{0}	24K-26	=12.4 = 1.24×10^{1}
24K-7	=3.45 = 3.45×10^{0}	24K-17	=44 integer	24K-27	=22600 = 2.26×10^{4}
24K-8	=5.34 = 5.34×10^{0}	24K-18	= 1.89×10^{8}	24K-28	=2.26 = 2.26×10^{0}
24K-9	=36.3 = 3.63×10^{1}	24K-19	=148 = 1.48×10^{2}	24K-29	=2890 = 2.89×10^{3}
24K-10	=16.1 = 1.61×10^{1}	24K-20	=40.4 = 4.04×10^{1}	24K-30	=6.11 = 6.11×10^{0}

24K-31 = 0.149
= $1.49\text{x}10^{-1}$

24K-32 = $5.84\text{x}10^{8}$

24K-33 = 0.273
= $2.73\text{x}10^{-1}$

24K-34 = 779
= $7.79\text{x}10^{2}$

24K-35 = 198
= $1.98\text{x}10^{2}$

24K-36 =29 integer

24K-37 =4.33
$=4.33\times10^{0}$

24K-38 =2.90
$=2.90\times10^{0}$

24K-39 =4.24
$=4.24\times10^{0}$

24K-40 =1.17
$=1.17\times10^{0}$

24K-41 = 0.000155
= $1.55\text{x}10^{-4}$

24K-42 = 0.0286
= $2.86\text{x}10^{-2}$

24K-43 = 0.0290
= $2.90\text{x}10^{-2}$

24K-44 = 279
= $2.79\text{x}10^{2}$

24K-45 = -3.07
= $-3.07\text{x}10^{0}$

24K-46 =3840
$=3.84\times10^{3}$

24K-47 = $7914.44

24K-48 = 1.35
$=1.35\times10^{0}$

24K-49 =238
$=2.38\times10^{2}$

24K-50 =13.4
$=1.34\times10^{1}$

24K-51 = 0.00490
= $4.90\text{x}10^{-3}$

24K-52 = 49.7
= $4.97\text{x}10^{1}$

24K-53 = -4.12
= $-4.12\text{x}10^{0}$

24K-54 = 1.71
= $1.71\text{x}10^{0}$

24K-55 = 0.898
= $8.98\text{x}10^{-1}$

24K-56 =−7.03
$=-7.03\times10^{0}$

24K-57 =1.50
$=1.50\times10^{0}$

24K-58 =16 integer

24K-59 =228
$=2.28\times10^{2}$

24K-60 =110
$=1.10\times10^{2}$

24K-61 =57.3
$=5.73\times10^{1}$

24K-62 $=1.48\times10^{65603}$

24K-63 =75.3
$=7.53\times10^{1}$

24K-64 =42.0
$=4.20\times10^{1}$

24K-65 =976
$=9.76\times10^{2}$

24K-66 = $9.92\text{x}10^{28}$

24K-67 = 1.61
= $1.61\text{x}10^{0}$

24K-68 = -91.9
= $-9.19\text{x}10^{1}$

24K-69 = 2.21
= $2.21\text{x}10^{0}$

24K-70 = -52.0
= $-5.20\text{x}10^{1}$

6. $147 \times 259 \approx 38100$

7. $\text{Log}(842 + 1967) \approx 3.45$

8. $\dfrac{\text{Ln}(1097)}{1.312} \approx 5.34$

9. $4(9.07) \approx 36.3$

10. $\pi(3.13) + 2(3.13) \approx 16.1$

16. $\dfrac{(40)(20)}{144} \approx 5.56$

17. $\dfrac{1545}{35} \approx 44$

18. $6(365.256)(24)(3600) \approx 1.89 \times 10^8$

19. $? = \sqrt{90.5^2 + 117^2} \approx 148$

20. $\dfrac{1}{2}(33.4)h = 379$ then $x = \sqrt{33.4^2 + h^2} \approx 40.4$

26. $\dfrac{26 + \dfrac{385}{1760}}{2 + \dfrac{7}{60} + \dfrac{12}{3600}} \approx 12.4$

27. $\dfrac{\pi(8^2)(15)(12^3)}{231} \approx 22600$

28. $431 = 132(1 + r)^{53}$ then $100r \approx 2.26$

29. $3\pi(17.5)^2 \approx 2890$

30. $2\left[(5.56)(3.17) + 5.56x + 3.17x\right] = 142$ for $x \approx 6.11$

36.
$$\begin{array}{rcrcrcl} n & + & d & + & q & = & 97 \\ 5n & + & 10d & + & 25q & = & 1220 \text{ for } q = 29 \\ n & - & d & + & 0 & = & 6 \end{array}$$

37. $2056 = e^{2k}$ for $k \approx 3.81$ then $15 \times 10^6 = e^{kt}$ and $t \approx 4.33$

38. Use the calculator to find the intersections then $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \approx 2.90$

39. $\dfrac{\sin 26°}{14.4} = \dfrac{\sin A}{21.1}$ for $A \approx 39.97$ and the third angle, $B \approx 140.03$ and $r = 14.4 \times \dfrac{\sin\left(\frac{A}{2}\right)\sin\left(\frac{B}{2}\right)}{\cos\left(\frac{26}{2}\right)} \approx 4.24$

40. $\dfrac{\sin 36°}{670} = \dfrac{\sin ?}{1050}$ for $? \approx 67.10° \times \dfrac{\pi}{180°} \approx 1.17$

46. $\dfrac{2^3}{1.75} = \dfrac{36^3}{x}$ for $x \approx 3840$

47. Use the linear regression function of the calculator for cost \$7914.44.

48. Use the solver function of the calculator for $w \approx 1.35$

49. $\pi(3^2)(10) - \dfrac{1}{3}\pi(3^2)(4.8) \approx 238$

50. $\pi R^2(37.9) = 1.5\left(\dfrac{\pi}{3}\right)(29.4)(5.7^2 + R^2 + 5.7R)$ for $2R \approx 13.4$

56. Use the numeric derivative function of the calculator for $y'(0.625) \approx -7.03$

57. $\dfrac{22}{6} = \dfrac{x + s}{s}$ for $3x = 8s$ then $3\dfrac{dx}{dt} = 8\dfrac{ds}{dt} \rightarrow 3(4) = 8\dfrac{ds}{dt}$ and $\dfrac{ds}{dt} = 1.5$ ft/s

58. Use the matrix functions of the calculator for $C_2 = 16$

59. $V = 2\pi\int_4^7 (x - 2)(y_1 - y_2)dx \approx 228$

60. The central angle of the regular pentagon is 72° then the shaded area = $\pi(12^2) - \dfrac{1}{2}(12^2)\sin 72° \approx 110$

61. $\dfrac{11}{12}T = 50 + 2.5$ for $T \approx 57.3$

62. $18232\log 3965 \approx 65603.16987$ then
$3965^{18232} \approx 10^{0.16987} \times 10^{65603} \approx 1.48 \times 10^{65603}$

63. $v^2 = {v_0}^2 + 2ad$ for $v = \sqrt{2(32.174)(88)} \approx 75.3$

64. $\frac{1}{2}(606)h - \frac{x}{360}(\pi)(606)^2 = 30780$ and
$h = 606\tan x$ then
$\frac{1}{2}(606)(606)\tan x - \frac{x}{360}(\pi)(606)^2 = 30780$ for
$x \approx 42.0$

65. $\sin\theta = \frac{27}{66}$ then $66\tan\theta = h$ for
$A = \frac{1}{2}(66)h \approx 976$