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 18A

(Invitational A)

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*, $1.23\text{x}10^{0*}$ $1.23\text{x}10^{1}$, $1.23\text{x}10^{01}$, .0190, 0.0190, $1.90\text{x}10^{-2}$

Incorrect: 12.30, 123.0, $1.23(10)^{2}$, $1.23\cdot10^{2}$, $1.230\text{x}10^{2}$, $1.23*10^{2}$, 0.19, $1.9\text{x}10^{-2}$, $19.0\text{x}10^{-3}$, 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}.

18A-1. (–11.2 – 9.46)/(92.7) ---------- 1=_____

18A-2. (–0.147 – 0.0922)/(–3.39) + 0.0231 ---------- 2=_____

18A-3. (–23.6 + 82 – 61.4)/(37.6) + 0.0625 ---------- 3=_____

18A-4. {(–0.857)(0.856 + 1.89 – 0.328)(–0.39)} + 0.656 ---------- 4=_____

18A-5. $\frac{(-0.00182 - 8.61\text{x}10^{-4})(0.142)}{\{(-0.947)/(-0.312)\}} - (-1.86\text{x}10^{-4} - 9.17\text{x}10^{-5})$ ----- 5=_____

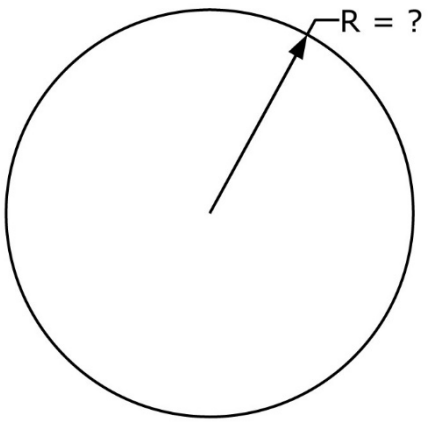
18A-6. Average 46.2, 8.73, 39 and -14.3. ---------- 6=_____

18A-7. What is the sum of the positive square root of 7.25 times 3 and the square of 0.385 plus 4.04? ---------- 7=_____

18A-8. Calculate the reciprocal of the product of 749 and 0.521. ---------- 8=_____

18A-9.

CIRCLE

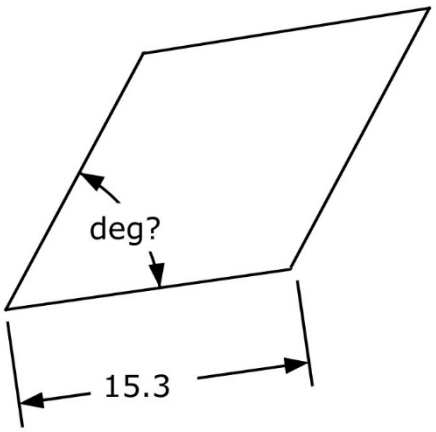


Area = 0.514

18A-9 =_____

18A-10.

RHOMBUS



Area = 188

18A-10 =_____

18A-11. $\dfrac{(2.5)(2.82) + (\pi)(6.07)}{-17.2 + 2.57 - (-4.02)(0.741)}$ ---------- 11=_____

18A-12. $\dfrac{\{-0.582 + (0.858)(\pi)(1.04)\}}{(0.472 + 0.576)(7.84)(2.11 + 0.415)}$ ---------- 12=_____

18A-13. $\dfrac{9.75\text{x}10^{5} + 1.98\text{x}10^{6}}{(-2.24)(-0.241) + \pi} + \dfrac{7690 - 1530 + 2920}{(-7.29\text{x}10^{-4})(-5.82)}$ ---------- 13=_____

18A-14. $\dfrac{1580}{7.96} + \dfrac{285 + 171 - 486}{0.278 - 0.423} + \dfrac{(0.0516 + 0.0556)}{\{(-0.0414)/(-99.6)\}}$ ---------- 14=_____

18A-15. $\dfrac{(51700 + 17500 - 19100)(0.106 - 0.0757 - 0.487)}{(953)(217)(371)(3.94 + 2.17 + 4.78)}$ ---------- 15=_____

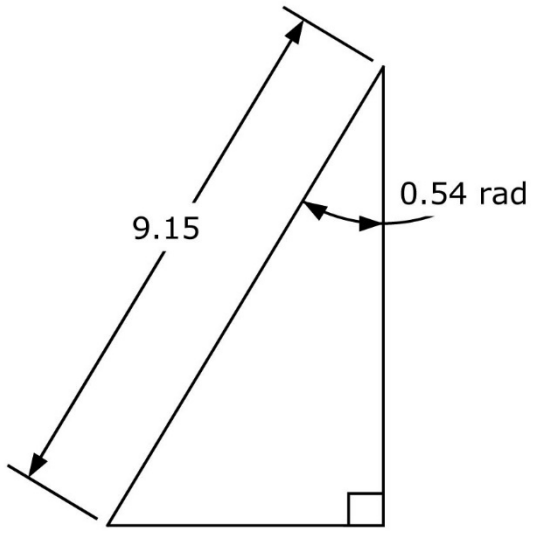
18A-16. The movie, *Guardians of the Galaxy II*, runs 2 hr 16 min, and a ticket costs $11.35. What is the movie cost per minute of run time? --------- 16=_____cents

18A-17. Andy counts 100 numbers per minute. How long would it take him to count to a billion? Assume he neither eats nor sleeps. ---------- 17=_____yr

18A-18. Shiprock is a mountain rising 1583 ft above the desert floor in northwestern New Mexico. What is the percent error in using 511.1 meters? ---------- 18=_____%(SD)

18A-19.

RIGHT TRIANGLE

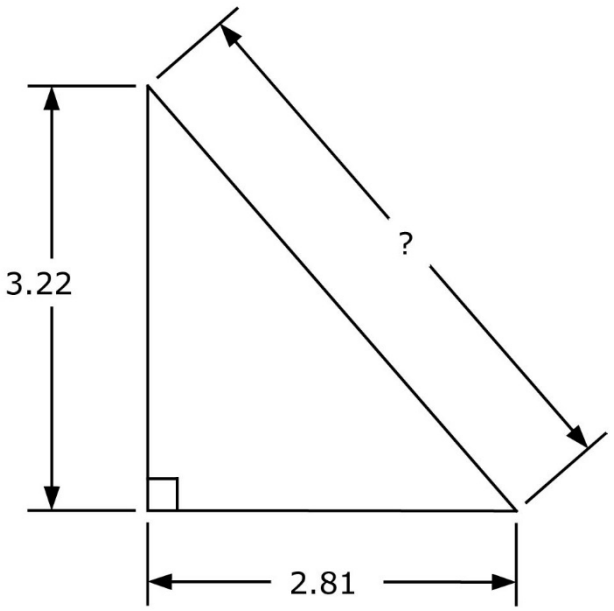


Area = ?

18A-19 =_____

18A-20.

RIGHT TRIANGLE



18A-20 =_____

18A-21. $\left[\frac{(0.809)(0.127)}{2.13} + 0.0457\right]^2 + \sqrt{5.69\text{x}10^{-5}}$ ---------- 21=_____

18A-22. $\left[\frac{\sqrt{1.37 - 0.844}}{1.56} + \frac{(2.56)}{9.14}\right]^2$ ---------- 22=_____

18A-23. $(107)(0.0317) + \sqrt{(10.2)/(4.93)} + [(0.219)(7.62)]^2$ ---------- 23=_____

18A-24. $(-0.0461)(-18.1)\sqrt{(-0.42)^2/0.378} + 1/\sqrt{1.52 + \pi}$ ---------- 24=_____

18A-25. $\frac{\sqrt{7.17 + 5.54 + (10.2)/(2.92)}}{-7.24 + \pi}$ ---------- 25=_____

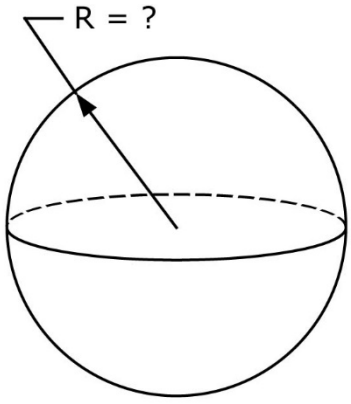
18A-26. Deneb is the brightest star in the Northern Cross. Its diameter is $2.82\text{x}10^8$ km. Its volume is equivalent to how many Earth volumes? --------- 26=_____

18A-27. The monthly payment for a loan MP is given by $MP=P\left[i+\frac{i}{(1+i)^n-1}\right]$ where P is the principal, i is the annual interest rate divided by 12 and n is the number of months. If June can afford to pay $450 monthly for a car, the annual interest rate is 4.4%, and she takes out a 60-month loan, how much car can she afford? Assume she pays $3000 down and finances the rest of the car cost. ---------- 27=$_____

18A-28. What is the smallest value of m for which $7.45^m > 91{,}500$? ---------- 28=_____ integer

18A-29.

SPHERE

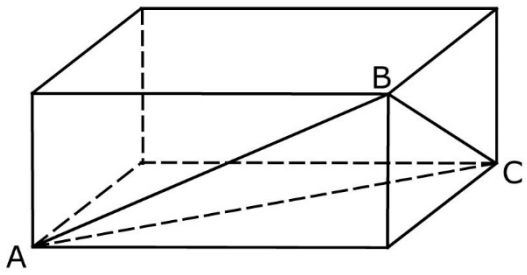


Total Surface Area = 88.8

18A-29 =_____

18A-30.

RECTANGULAR SOLID



AB = 5.42 BC = 3.95 AC = 5.90

Volume = ?

18A-30 =_____

18A-31. $\sqrt{\dfrac{4.66}{\sqrt{17 + 2.24}}} \times \left[\dfrac{1}{(9.1 - 6.53)^2} + \dfrac{1}{(2.96 + \pi)^2}\right]$ ---------- 31=_____

18A-32. $\sqrt{\dfrac{1/(550 - 105)}{(173)(1.26 + 0.435)^2}} + (-0.00909)^2(11.2)$ ---------- 32=_____

18A-33. $\dfrac{(3.99\text{x}10^{5})^2(4.98\text{x}10^{-12} + 3.62\text{x}10^{-12})}{10 + (-0.807)(62.2)} + \dfrac{1}{\dfrac{1}{-0.00878} + \dfrac{1}{(0.0134)}}$ 33=_____

18A-34. $\dfrac{(3.78)^2 + \sqrt{62.9}}{\sqrt{(8.25)(-27.1)^2}} + \dfrac{\sqrt{\sqrt{(11500)(0.345)}}}{-4.84 + 41.1}$ ---------- 34=_____

18A-35. $\dfrac{\left[\dfrac{(201 + 146)}{(115 + 232)}\right]^2 + \sqrt{\dfrac{0.143 + 0.707}{\sqrt{0.279}}}}{\{(-40.3)/(-605)\}^2}$ ---------- 35=_____

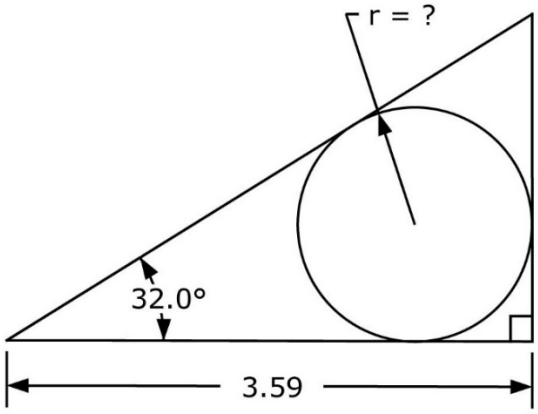
18A-36. The half life of Phosphorus-32 is 14.26 days. What is τ if the decay were modelled using $N = N_o \exp(-t/\tau)$? ---------- 36=_____dy

18A-37. A cube has a side dimension of 10 in. It shrinks at a constant volume rate equal to -20 in^3/min. At the same time, a sphere with zero initial radius starts growing with its center at the cube center. Its radius increases at 0.2 in/min. How long until the sphere contacts the cube? ------- 37=_____min

18A-38. An "oval" 440 yd running track is actually two 120 ft radius semicircles separated by straight-aways. John starts from the middle of a semicircular arc running around the track at a 7 min per mi pace. Jim starts running at the same spot and time but runs along a straight line toward the other semicircular arc midpoint. If they meet at the opposite end of the track, what was Jim's running velocity? ---------- 38=_____ft/s

18A-39.

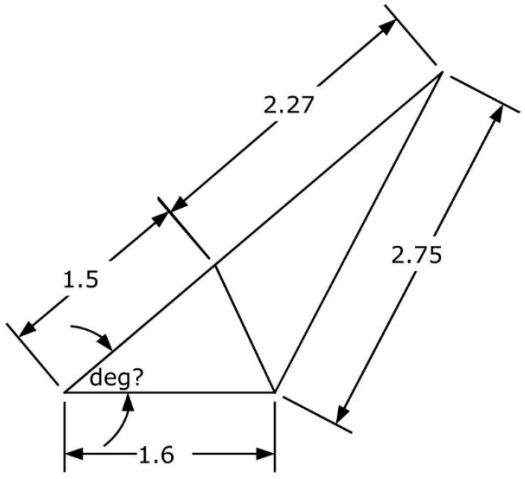
RIGHT TRIANGLE AND CIRCLE



18A-39 =_____

18A-40.

SCALENE TRIANGLES



18A-40 =_____

18A-41. $(-0.0664)(-0.0976)10^{\{0.0442/0.0128\}}$ ---------- 41=_____

18A-42. $\dfrac{(-2.53\text{x}10^{6})}{(1.51\text{x}10^{6})}\left[1 - e^{-(0.734)(0.344)}\right]$ ---------- 42=_____

18A-43. $\dfrac{\text{Ln}(0.127 + 0.305 - 0.112)}{(-0.186)}$ ---------- 43=_____

18A-44. $(710 + 1930)^{1/3} + 1/\{(653)^{-0.381}\}$ ---------- 44=_____

18A-45.(deg) $\dfrac{\cos\{(52.5°)/(3.68)\}}{\sin\{177° - 359°\}}$ ---------- 45=_____

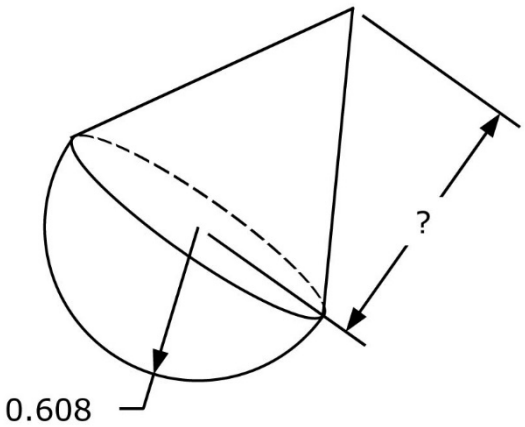
18A-46. A 3D printed artwork is 14 in long and weighs 4 lb 3 oz. How long is the same artwork built larger that weighs 17 lbs? ---------- 46=_____in

18A-47. Calculate the correlation coefficient for these data: (1, 3.5), (2, 8), (3, 9), (4, 14), (5, 20). ---------- 47=_____

18A-48. (rad) If $-\pi/2<r<0$, what is r if $1/r = \tan(r)$? ---------- 48=_____

18A-49.

HEMISPHERE AND CONE

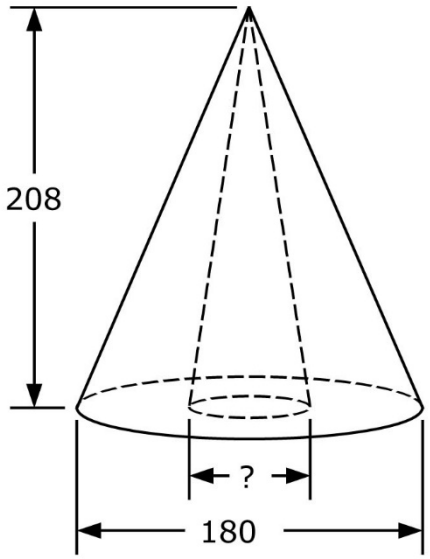


Surface Area (Hemisphere) = Surface Area (Cone)

18A-49 =_____

18A-50.

CONES



Volume (Large Cone) - Volume (Small Cone) = $1.55\text{x}10^{6}$

18A-50 =_____

18A-51. $\dfrac{(-0.0302)\ 10^{-(4.53\ -\ 3.86)}}{-0.0325\ +\ 0.0126}$ ---------- 51=_____

18A-52. $\dfrac{(9.26\text{x}10^{-7}\ -\ 1.64\text{x}10^{-7})\ e^{(0.611)(2.24)}}{e^{-(2.44\ -\ 1.51)}}$ ---------- 52=_____

18A-53. $\dfrac{\text{Ln}(65.3\ +\ 225)}{6.96}\ +\ \dfrac{\text{Ln}(42)}{36\ -\ 19.9}$ ---------- 53=_____

18A-54. $\dfrac{(5.50\text{x}10^{-5}\ +\ 1.61\text{x}10^{-4})^{-0.387}}{(7.10\text{x}10^{-4})^{-(0.493\ +\ 0.569)}}$ ---------- 54=_____

18A-55.(rad) $\dfrac{\arcsin\left\{(15400)(-86800)/(-1.90\text{x}10^{9})\right\}}{-1.41\text{x}10^{9}\ +\ (36300)(-48100)}$ ---------- 55=_____

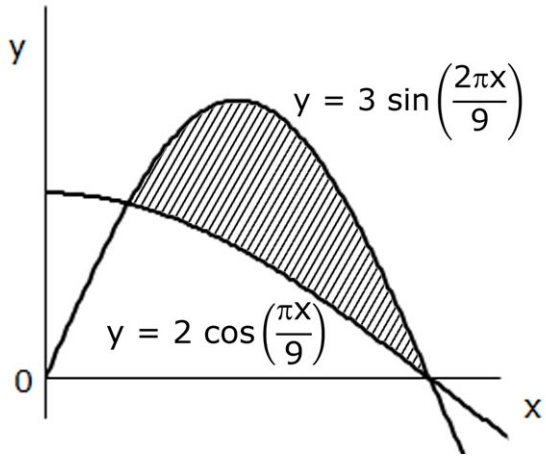
18A-56. What is the y value of the point on the curve $y = 5x^2-17x+200$ where the slope equals -4.5? ---------- 56=_____

18A-57. A cylindrical water tank is 50 ft tall with a diameter of 100 ft. It is initially full but must be drained using a valve at the bottom of the tank. The initial drain volume rate is -300 ft^3/s, and this rate is proportional to the instantaneous height of water remaining in the tank. How long does it take to drain 99% of the tank volume? ---------- 57=_____hr

18A-58. What is U_{22} if $\mathbf{U} = 2\mathbf{S} + 3\mathbf{Y}$, $\mathbf{S} = \begin{vmatrix} 13 & 34 \\ -25 & 72 \end{vmatrix}$ and $\mathbf{Y} = \begin{vmatrix} 57 & 70 \\ 29 & 19 \end{vmatrix}$. ------- 58=_____

18A-59.

RADIANS

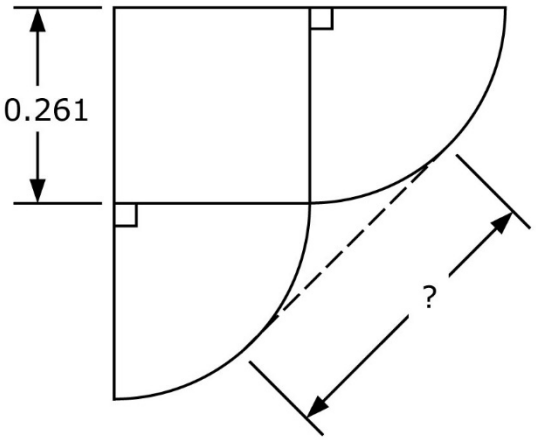


Hatched Area = ?

18A-59 =_____

18A-60.

SQUARE AND IDENTICAL QUARTER CIRCLES



18A-60 =_____

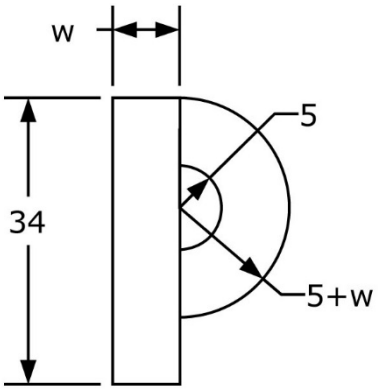
18A-61. Yellowstone National Park is roughly square in shape and has a land area of 3,468.4 sq mi. How tall would a tower erected in the middle of the park need to be for an observer on top to see all of the park? ---------- 61=_____ft

18A-62. What is Avogadro's Number (6.022×10^{23}) raised to the power 421? ---------- 62=_____

18A-63. Vinny punted a football with a hang time of 4.1 s. What is the maximum possible vertical distance? ---------- 63=_____ft

18A-64.

RECTANGLE AND SEMICIRCLES



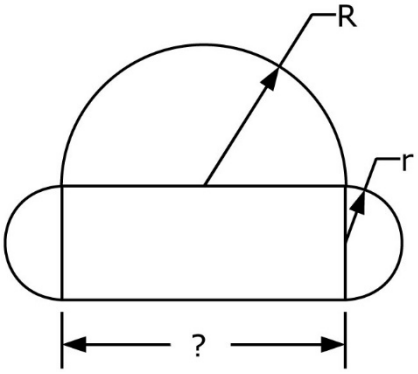
Total Area = 500

w = ?

18A-64 =_____

18A-65.

RECTANGLE AND SEMICIRCLES



R = 2.5r

Total Area = 557

18A-65 =_____

18A-66. $(1/2)\mathrm{Ln}\left[\dfrac{(3.21)\times(1.57)\times(9.89)^3}{(9.89)(3.76)^2}\right]^2$ ---------- 66=_____

18A-67. $(0.231)10^{\mathrm{Log}[(9.76)(0.65)]} + \{(8.75)(0.926)\}^{1/2}$ ---------- 67=_____

18A-68. (deg) $\left\{\cos^2(33.7°) - \sin^2(33.7°)\right\} \times \dfrac{\tan(33.7°)}{1 - \tan^2(33.7°)}$ ---------- 68=_____

18A-69. $1 + 0.48 + (0.48)^2 + \dfrac{(0.48)^4}{8} - \dfrac{(0.48)^5}{15}$ ---------- 69=_____

18A-70. (rad) $e^{(7.6)\left[\dfrac{(-6.81)\sin(1.98) - (-6.46)\cos(-1.01)}{(-1.18)\sqrt{(-6.81)^2 + (-6.46)^2}}\right]}$ ---------- 70=_____

18A-1 = -0.223
= -2.23×10^{-1}

18A-2 = 0.0937
= 9.37×10^{-2}

18A-3 = -0.0173
= -1.73×10^{-2}

18A-4 = 1.46
= 1.46×10^{0}

18A-5 = 0.000152
= 1.52×10^{-4}

18A-6 = 19.9
= 1.99×10^{1}

18A-7 = 24.2
= 2.42×10^{1}

18A-8 = 0.00256
= 2.56×10^{-3}

18A-9 = 0.404
= 4.04×10^{-1}

18A-10 = 53.4
= 5.34×10^{1}

18A-11 = -2.24
= -2.24×10^{0}

18A-12 = 0.107
= 1.07×10^{-1}

18A-13 = 2.94×10^{6}

18A-14 = 663
= 6.63×10^{2}

18A-15 = -2.74×10^{-5}

18A-16 = 8.35
= 8.35×10^{0}

18A-17 = 19.0
= 1.90×10^{1}

18A-18 = 5.9 (2SD)
= 5.9×10^{0}

18A-19 = 18.5
= 1.85×10^{1}

18A-20 = 4.27
= 4.27×10^{0}

18A-21 = 0.0164
= 1.64×10^{-2}

18A-22 = 0.555
= 5.55×10^{-1}

18A-23 = 7.62
= 7.62×10^{0}

18A-24 = 1.03
= 1.03×10^{0}

18A-25 = -0.982
= -9.82×10^{-1}

18A-26 = 1.08×10^{13}

18A-27 = $27,196.69

18A-28 = 6 integer

18A-29 = 2.66
= 2.66×10^{0}

18A-30 = 36.0
= 3.60×10^{1}

18A-31 = 0.184
= 1.84×10^{-1}

18A-32 = 0.00305
= 3.05×10^{-3}

18A-33 = -0.0595
= -5.95×10^{-2}

18A-34 = 0.504
= 5.04×10^{-1}

18A-35 = 511
= 5.11×10^{2}

18A-36 = 20.6
= 2.06×10^{1}

18A-37 = 20.9
= 2.09×10^{1}

18A-38 = 9.96
= 9.96×10^{0}

18A-39 = 0.800
= 8.00×10^{-1}

18A-40 = 40.2
= 4.02×10^{1}

18A-41 = 18.4
= 1.84×10^{1}

18A-42 = -0.374
= -3.74×10^{-1}

18A-43 = 6.13
= 6.13×10^{0}

18A-44 = 25.6
= 2.56×10^{1}

18A-45 = 27.8
= 2.78×10^{1}

18A-46 = 22.3
= 2.23×10^{1}

18A-47 = 0.977
= 9.77×10^{-1}

18A-48 = -0.860
= -8.60×10^{-1}

18A-49 = 1.05
= 1.05×10^{0}

18A-50 = 62.7
= 6.27×10^{1}

18A-51 = 0.324
= 3.24×10^{-1}

18A-52 = 7.59×10^{-6}

18A-53 = 1.05
= 1.05×10^{0}

18A-54 = 0.0119
= 1.19×10^{-2}

18A-55 = -2.47×10^{-10}

18A-56 = 187
= 1.87×10^{2}

18A-57 = 1.67
= 1.67×10^{0}

18A-58 = 201
= 2.01×10^{2}

18A-59 = 3.82
= 3.82×10^{0}

18A-60 = 0.369
= 3.69×10^{-1}

18A-61 = 1160
= 1.16×10^{3}

18A-62 = 1.87×10^{10011}

18A-63 = 67.6
= 6.76×10^{1}

18A-64 = 8.02
= 8.02×10^{0}

18A-65 = 24.6
= 2.46×10^{1}

18A-66 = 3.55
= 3.55×10^{0}

18A-67 = 4.31
= 4.31×10^{0}

18A-68 = 0.462
= 4.62×10^{-1}

18A-69 = 1.72
= 1.72×10^{0}

18A-70 = 507
= 5.07×10^{2}