Introduction to UIL High School Calculator Applications Contest

Andy Zapata
Azle High School
Andy Zapata

Azle ISD – 1974 to present

Azle HS – Physics teacher

Married – 4 children & 2 grandchildren

Co-founded Texas Math and Science Coaches Association (TMSCA)

Current president of TMSCA

Coached all 4 UIL math & science events + slide rule

Current UIL Elem/JH number sense, mathematics and calculator consultant

azapata@azleisd.net
The Calculator Applications Contest is exactly what the title of the contest implies. It is not a mathematics contest where proofs of geometry or algebra theorems are worked out; it is not a typing contest where the fastest button pusher always has the superior score. It is a contest where engineering type problems are solved. I am not an engineer, but I know a few people that do engineering work, and the ability to use the calculator as a tool to solve; or least begin the problem solving process is very important. But I will also be the first to tell you that the problem topics covered in these contest papers cover finance problems, navigation problems, exponential and compound growth and decay problem, problems involving probability and problems involving calculus that go beyond the averaging processes that occur when calculus cannot be used.

If you have students that are curious and competitive, they like math and they like to solve problems; then here is a great opportunity for them to flourish and learn more about the problem solving process than they would normally learn in the high school math program.
In 1982 I moved up from teaching seventh grade math to teaching a few classes of physics and different math classes until there were enough students taking physics so that I could have all my classes be physics classes. So I was really gratified to see problems involving acceleration and force concepts on this contest.

However the whole concept of mixing competition and learning is really exciting to me. It is one of the foundation principles of the UIL, being directly applied in this contest. You need to think quickly, accurately and logically to master this contest. You have to learn how to “model” some real life problems before you even try to use that tool called the calculator.

When I first started coaching at Azle Junior High in the Fall of 1974, I was teaching young 7th and 8th graders (and later high school students) how to use a slide rule to solve problems that did not require problem solving. The student had to be accurate. Today the student has to know numerous conversions, numerous problem solving strategies, numerous mathematics topics and yes, how to manipulate that tool called the calculator in this contest.
Today I would like to share some of my thoughts on how to start to build a team (program) for the Calculator Applications contest. This presentation will be geared more for the high school teacher, but most of the principles will work for building a middle school/junior high program as well. I hope you will take away enough information that will enable you to feel comfortable in building a program that you, your students and your community will appreciate.

Of course if at any time you have a question please feel free to raise your hand and ask that question. I’m a teacher foremost and I will have an answer for you.
Beginning

Let’s start with the two most important individuals in this contest: you and the student.  

Being “good” at most anything requires the commodity of time. So I ask you this: How much time can you give to working on being good in this contest? How much time can your student(s) give to being good in this contest? At Azle HS we normally practice from 3:30 to 5:00 after school on Monday and Thursday. We usually compete 10 – 12 Saturdays during the school year at practice tournaments. Those tournaments are usually at least 8 hour days. As a coach I also spend 2 to 3 additional hours preparing practice material and notes each week on problem solving.

If after all the practices and practice meets, Azle did qualify a student to the UIL regional meet, then I think I did good. This is a personal “bar” that I set for myself.

You probably work with some athletic coaches at your school.
Think of how much time they individually put into the sport they are coaching. It does not matter whether they are coaching a team sport or an individual sport, those coaches put in lots and lots of hours trying to get that student or students to be the best. Believe me it is usually not a two day per week coaching effort.

So again I ask you – how much time do you want to give to this coaching calculator applications contest endeavor? Go ahead and write down how many hours per week/day you will give to the coaching of this contest.

_________ hours

Now how about that other person – the student? Is the student involved in any other extracurricular activities? If you are teaching a small school in Texas (1A – 3A), the answer is almost always yes. It is not that
unusual for a football player to change to a band uniform and play with the marching band during half time. And it is certainly not unusual for a “math” team student to compete in the number sense, calculator and mathematics contests. So when you are working with students in small schools you are always sharing with other extracurricular events/programs.

So now you ask the question: How many hours per week can the student work on the calculator contest?

__________ hours

Is the student competitive? Does the student like math? Does the student enjoy learning? Has the student competed before in the UIL math team events in the earlier grades?

Starting with a time survey is a good starting point, but lets next look
at some other issues to consider.

How did you get to this point in your teaching career? Were you asked to coach/sponsor by your administrator; a student or groups of students; the student parents; or did you volunteer to start a calculator applications contest program on your own initiative? Please answer why.

Along with time another commodity needed is money. Hopefully your administration will support this program with funds. It takes money to get calculators. It takes money to get practice materials. It takes money to attend practice meets. If you do take students to practice meets: who pays for transportation and meals?

Have you ever heard of the Texas Math and Science Coaches Association (TMSCA)? TMSCA has a dues requirement and they have a test pool of materials that can be purchased, but again there is that money thing.
Do you feel confident enough to create some of your own practice material? There are some coaches out there in math team land that will often swap material so that their students will be able to practice on “fresh” material.

Have you purchased a copy of the *UIL Calculator Applications Contest Manual* (called *the manual* from hereon)? Most of my remarks can be found in this wonderful resource. If you feel that you indeed will be able to coach this contest, **you need to get this manual first and foremost.** There is also a drill manual available from the UIL containing 26 tests of just button pushing (number cruncher) type problems and another manual that contains almost 1000 problems of stated and geometry problems – with answers.

Do you have a budget for purchasing calculators and calculator practice material? There are slides at the end of this presentation giving information on calculator prices and sources of calculator practice material.
Beginning

We’ll get back to the economics of working with a calculator team later, but let’s now focus on another idea.

Let’s explore what this calculator applications contest is all about. First of all, the contest has a total of 70 problems. There is a time limit of 30 minutes. The calculator must be battery operated and used that way during the actual contest. The grading/scoring of the contest is found using this formula:

\[
\text{Score} = (5) \left\{ \frac{\text{Last Problem Attempted}}{\text{Number of Problems}} \right\} - (7) \left\{ \frac{\text{Incorrect / Skipped}}{\text{Number of SD-Problems}} \right\} - (2) \left\{ \text{Answered Correctly but with the Wrong Number of SD's} \right\}
\]

The last category – SD problems will be discussed later. The calculator test is composed of 21 “punch or number cruncher” numerical problems, 21 stated/word and 14 geometry problems shown as pictures for a total of 70
Beginning

problems. The cruncher problems are generated by a computer program and the stated and geometry problems are created by the test author.

The object is to solve as many problems correctly as possible in the 30 minutes to get the highest score. Obviously a perfect score of 350 points (70 x 5) would be the ultimate goal, but there are other goals for improving one’s score. Dr. Bourell describes this process of maximizing one’s score on the calculator contest on pages 10 – 11 in the manual.

Before we discuss particular problems on the contest let’s talk about types of calculators. Dr. Bourell gives some hints on choosing a calculator on pages 4 and 5 of the manual. I will also tell you that at the UIL Student Activity Conferences (SAC)– held each Fall (and FREE), Dr. Bourell also tells the participants of the type of calculators used at that last year’s UIL State Meet through a pie graph presentation at one of his sessions. Before the calculus, and matrix problems were introduced to the contest, the primary calculator of
Beginning

choice was some version of the Hewlett Packard (hp) calculator. After the introduction of those problem types, the need for graphing and clear visualization of matrices made the use of some variation of the Texas Instrument (ti) calculator a must and today the student is most likely to have both in hand while taking the test. Note that only, at most two calculators, are allowed during the contest. So be sure to at least get scientific calculators.

If you or your district purchases the calculators and you assign the calculators to the students then you have to keep up with the condition and whereabouts of the calculator. If the student has to get their own calculator then they are ultimately responsible for their calculator. Having said that, at Azle we usually take three extra hp and ti calculators for those, for whatever reason, that need to borrow one for the contest that day. The Hewlett Packard and Texas Instrument companies or whatever retail outlet you purchase the
calculators from usually make a profit and these calculators can be expensive any way you want to look the cost matter.

Now if you choose to go with another brand of calculator that is “scientific” in nature, please be sure that the calculator has a “Equation Solver” feature. There is a specific problem type, located on page 5 of the contest that usually requires the student to use that feature. There are also other occasions on the stated and geometry problems when the equation solver is very handy to solve the problem.

Remember this is a timed, 30 minute, test. You probably should have a timer for each student to look at as they work through the test. According to the contest rules the timer must not make sounds prior to the contest ending. Also don’t forget writing utensils. The student can write their answers with either a pencil or pen. The student should not be erasing and rewriting, since this takes up too much time. At Azle we also carry extra pencils/pens, and
Beginning

timers to the practice tournaments. Again, just as with calculators it is best if the students have their own timers and pens.

So what does a high school calculator application contest look like? First of all if you are familiar with the middle school calculator test, the high school test does NOT follow a similar format with respect to the numerical problems.

Slides #17 – #32 are from a presentation at a Fall SAC created by Dr. Bourell. There is a sample calculator test from the past (2011) and some other ideas related to the format of the problems for the contest.
Beginning
UIL Calculator Applications
Test 11H
(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*, 1.23x10^4, 1.23x10^7
      Incorrect: 1.23x10^3, 1.23x10^5, .0190, .00199, 1.99x10^-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 errors 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.
11H-1. \( \frac{0.161}{0.197} + 0.218 \) ................................. 1= 

11H-2. \( 0.516/3.97 + 0.0999 - 0.13 \) ......................................... 2= 

11H-3. \( (13.7 - 11.1 + 41.4 + 9.71)/(-80.7) \) ................................. 3= 

11H-4. \( ((0.0107)(0.645 + 1.79 - 1.27)(-0.679)) + 0.00518 \) .............. 4= 

11H-5. \( \frac{-0.108 + 0.0615 - 0.0864(-0.756)}{(0.606)(-0.742)(0.32)} \) ................................. 5= 

11H-6. What is the sum of \( 10/\sqrt{7} \) and \( 7/\sqrt{10} \), divided by 3? ................................. 6= 

11H-7. What is the remainder of 9500 divided by 13? ................................. 7= integer 

11H-8. How much money does Terry have left from a $20 if he purchased two taxable items costing $6.50 and 7.80, if the additional sales tax was 8.125%? ................................. 8= 

11H-9. **RECTANGLE** 
Perimeter = 22.7

11H-10. **RHOMBUS** 
Area = 53.4
11H-11. \[
\frac{-0.175(0.957) - (-0.979)(0.153) + 0.033}{0.422 + (-0.337)(0.246)} = 11=
\]

11H-12. \[
\frac{0.0236(1.11\times10^{-5} + 5.15\times10^{-6})}{(914 - 2710)(0.0756) \cdot 0.422 - 0.151} = 12=
\]

11H-13. \[
\frac{(-0.404 + 0.339)(20.1 + 35.7) + (-6.58)(-7.52)}{(5.84)(4.49 + 26.2)(-7.43)} = 13=
\]

11H-14. \[
\frac{(0.126 + 0.154)(2.4 + a) + 1.58 - 0.403}{(-468 - 117)(-6.74 + 29.6 - 5.64)} = 14=
\]

11H-15. \[
\frac{(7350 + 6860 - 3.09\times10^{-7})(0.499 - 0.294 - 0.908)}{(16.9)(-33.8)(-32.4)(3.67 + 1.88 + 8.97)} = 15=
\]

11H-16. When 148 people “coupled up” into one-man-one-woman pairs, there were 6 people left over. How many couples were there? \(16=\) integer

11H-17. Monica has shoulder length hair, 8 in long on average. Given that the average human has 125,000 hairs on their head, what is the total length of hair on her head, assuming they are laid perfectly end to end? \(17=\) mi

11H-18. A 2X6-10 is a 10-ft long wooden plank with cross sectional dimensions of 2 in and 6 in before finishing. The finishing operation removes 3/16 in from the sides but not the ends. What is the percent decrease in volume? \(18=\) %

11H-19. \[
\text{RIGHT TRIANGLE}
\]

11H-20. \[
\text{RIGHT TRIANGLE}
\]
11H-21. \( \sqrt{5.2 - 0.704 + \left(\frac{0.0333}{1.05}\right)^2} \)  
\( \frac{5.44}{1.05} \)  
\( 21= \) 

11H-22. \( \frac{-0.818 + 1/(-0.537)}{1/0.199 + 6.64} \)  
\( \frac{1}{(-2.85)} \)  
\( 22= \) 

11H-23. \( \left[ -71.6 + \sqrt{1810} \right]^2 \times \left[ 433 + 895 \right]^2 \times \sqrt{\pi/2.93} \)  
\( 23= \) 

11H-24. \( \frac{1.01 + 0.254 \times 0.811/0.336}{-0.902 + 0.83} \)  
\( 24= \) 

11H-25. \( \sqrt{175 + 1.61 + \frac{(55100)}{1442}} \)  
\( 93.1 + 72.6 \)  
\( 25= \) 

11H-26. A sailboat travels with a speed of 5 knots with the wind and 2 knots against the wind. Speed varies sinusoidally with the sailboat's direction relative to the wind (angle equals 0° when sailing with the wind). At what positive angle less than 180° does the sailboat travel at 3.35 knots?  
\( 26= \text{deg} \) 

11H-27. Tonia runs a mile in 2 min 33 s, and Vera runs a mile in 6 min 58 s. They run a 10-km race. What is the positive difference in their finishing times?  
\( 27= \text{min(SD)} \) 

11H-28. A slug is a unit of mass accelerated at 1 ft/s² when 1 lb force is applied. A person jumping experiences a gravitational force of 195 lbs. What is their mass? 
\( 28= \text{slug} \) 

11H-29. 

**SPHERE**

Diameter = 0.136

Volume = ?

\( 11H-29 = \) 

11H-30. 

**FRUSTUM**

42.3

\( 11H-30 = \) 

Total Surface Area = 61,100
11H-31. \[ \sqrt{\frac{1}{19} (927 - 494)} + (-3.75 \times 10^{-5})^2 (7.62 \times 10^5) \] \[ 31= \]  
11H-32. \[ \frac{-7.81}{7.39 + 6.33} + 7.45 \times \left\{ \frac{253}{(-18.7)^2 - \sqrt{1.36 \times 10^5}} \right\} \] \[ 32= \]  
11H-33. \[ \left( \frac{5050 - 1040}{0.556 / 0.907} \right)^{1/2} \] \[ \frac{(0.191)^2 + (0.111 + 0.228)^2 + 0.0856}{\frac{1}{0.99} + \frac{1}{0.926}} \] \[ 33= \]  
11H-34. \[ \frac{(3.32 \times 10^5)^2 (0.53) \times 10^{-12} + 1.12 \times 10^{-12}}{0.53 + (-0.563)(1.3)} + \frac{1}{0.99} + \frac{1}{0.926} \] \[ 34= \]  
11H-35. \[ \left( \frac{4.15 + 2.85}{574 + 1920} \right)^2 + \sqrt{\frac{3.67 \times 10^{-11} + 4.62 \times 10^{-11}}{0.15}} \] \[ 35= \]  

11H-36. How much 28% sugar-water concentrate must be added to a 2% sugar-water mixture to make 10 gallons of 9% sugar-water mixture? \[ 36= \text{at} \]  
11H-37. It takes Abe 30 min to row his boat 2 mi up river. He rows back to where he started in 10 min. What is the river velocity? \[ 37= \text{mph} \]  
11H-38. Four spheres are pushed together on a table so each touches two other spheres, and their centers form a square. A cone is inverted and placed in the "hole" formed in the middle of the spheres, touching each. The cone height is equal to the sphere diameter, and the cone apex touches the table. What is the ratio of the cone diameter to a sphere radius? \[ 38= \]  

11H-39. **CIRCLE AND RIGHT TRIANGLE**  
\[ R = 1140 \]  
**Triangle Area = ?**  
\[ 11H-39 = \]  

11H-40. **SCALENE TRIANGLES**  
\[ ? \]  
\[ 7 \]  
\[ 86.0^\circ \]  
\[ 1300 \]  
\[ 4740 \]  
\[ 39.8^\circ \]  
\[ 640^\circ \]  
\[ 11H-40 = \]
11H-41. \(10^{-((0.15 - 0.362)/(0.968 + 0.786))}\)  \(=\)  

11H-42. \(\frac{0.791}{(0.608 + 0.249)} = 0.213\)  \(=\)  

11H-43. \(\ln(7.55 \times 10^6 + 1.15 \times 10^7 - 4.20 \times 10^6)\) \(=\)  

11H-44. \((21100 + 23000) \times (0.873 + 0.506)\)  \(=\)  

11H-45. \((579 \sin(-28.5^\circ)) \times (551 \cos(-81.9^\circ))\)  \(=\)  

11H-46. A recipe calls for 3 cups flour to make 4 dozen 1.5-in mini-muffins. How much flour is needed to make 100 large, 4-in oversized muffins?  \(=\)  

11H-47. The lifespan of dogs is inversely proportional to their weight. Calculate the life expectancy of a Dalmatian, 24 in tall, given the following information: Irish Wolfhound 35 in tall and 8 yr; Akbash 31 in and 8 yr; Bloodhound 27 in and 10 yr; Dachshund 16 in and 18 yr; and Boston Terrier 15 in and 15 yr.  \(=\)  

11H-48. ( rad) Solve for \(t\) nearest to zero if \(18t^2 \sin(3t) = 6t + 2\).  \(=\)  

11H-49. \[
\begin{align*}
\text{CUBE AND CONE} \\
\text{2.5a} \\
a \\
\text{Total Surface Area} \frac{?}{a^2} \\
\end{align*}
\]

11H-50. \[
\begin{align*}
\text{CONGRUENT CONES, ONE OF WHICH IS TRUNCATED} \\
\text{50.4}\text{°} \\
h=79 \\
6.6h \\
\text{Total Volume} = ? \\
\end{align*}
\]
11H-51. \[ \frac{(4.01 \times 10^7) \times (10^x - 5.96)}{\sqrt{2.84 \times 10^7 + 1.98 \times 10^7}} = 51 \]

11H-52. \[ 1 + e^{\left\{ \frac{0.565 + (0.92)(1.34)}{-(6.45)(7.2) - e^{-(0.675)}} \right\}} = 52 \]

11H-53. \[ (-0.207) \ln \left[ \frac{(0.94 + (0.98)(0.543))}{0.255 + 0.38} \right] = 53 \]

11H-54. \[ \frac{1}{(0.19)(0.849)} + (0.166 + 0.231)(0.629 - 0.19) = 54 \]

11H-55. \[ \frac{\arctan \left( \frac{10.3 + (7.81)(0.607)}{\arcsin \left( \frac{347 + 208}{1710} \right) \right)}{\arcsin } = 55 \]

11H-56. What is the area bounded by \( f(x) = -7x^2 + 5x - 3 \) and \( g(x) = 4x^4 + 5x^2 - 5x - 6 \)?

11H-57. In 2010, the British Petroleum oil slick in the Gulf of Mexico grew by 1,880,000 gal/day. After 21 days, it occupied 112,000 sq. mi. Assuming the oil slick was circular and had constant thickness, how much longer after this did the outer edge of the slick move at 1 mi/day? --- 57 = _______ days

11H-58. What is the determinant of \( J \) if \( J = KL \), \( K = \begin{pmatrix} 1 & 4 \\ 3 & 5 \end{pmatrix} \) and \( L = \begin{pmatrix} -8 & 4 \\ 4 & 7 \end{pmatrix} \)? --- 58 = _______

11H-59. RADIANS

\[ Y = (x+b) \cos(x) \]

\[ x = 6.4 \]

\[ b = ? \]

11H-60. RECTANGLE AND EQUILATERAL TRIANGLE

\[ \text{Rectangle Area} = \text{Triangle Area} \]

11H-59 = _______

11H-60 = _______
11H-61. \(10^{1.45} \times \sqrt{\frac{10^{7.6}}{10^{3}}(10^{0.58})} = \) ____________

11H-62. \((92.8 - 61)^2 + (n + 4.17)e^{\ln(54)} = \) ____________

11H-63. \((\text{deg}) \sin(-58.8^\circ)\cos(118^\circ) + \cos(-58.8^\circ)\sin(118^\circ) = \) ____________

11H-64. \(1 + \frac{(0.8)^4}{2} + \frac{(0.8)^6}{6} + \frac{(0.8)^8}{24} + \frac{(0.8)^{10}}{120} = \) ____________

11H-65. \(\text{rad} \frac{\text{arctan} \left\{ e^{0.799(0.84\sqrt{(33.7)/(50.4)})} \right\}}{(19.5)/(94.1)(88.5)(0.687)} = \) ____________

11H-66. Erica stands 28 ft away from a 12 ft tall wall. She throws a ball at a release height of 5.5 ft that just clears the wall. What is the ball release velocity? ____________ f/s

11H-67. Kaitlynn makes four equal annual payments to a bank that pays 5.5% annual interest. At the end of the fourth year, she has earned $600. How much was one of the four payments? ____________

11H-68. What is the closest approach of the line 9x - 8y = 100 to the origin? ____________

11H-69. **ISOSCELES TRAPEZOID**

\[ \beta = ? \]

\[ 1.5x = 8.5 \]

11H-70. **CONGRUENT SEMICIRCLES**

\[ r = 0.326 \]

\[ \text{Hatched Area} = ? \]
11H-1 = 1.04
  = 1.04 \times 10^0

11H-2 = 0.0999
  = 9.99 \times 10^{-2}

11H-3 = -0.666
  = -6.66 \times 10^{-1}

11H-4 = -0.00328
  = -3.28 \times 10^{-3}

11H-5 = -0.698
  = -6.98 \times 10^{-1}

11H-6 = 15.2
  = 1.62 \times 10^1

11H-7 = 10
  = 1 \times 10^0

11H-8 = 5.62

11H-9 = -2.78
  = -2.78 \times 10^0

11H-10 = 7.47
  = 7.47 \times 10^0

11H-11 = 0.0304
  = 3.04 \times 10^{-2}

11H-12 = 3.37 \times 10^{-6}

11H-13 = -0.0815
  = -8.15 \times 10^{-2}

11H-14 = -0.000268
  = -2.68 \times 10^{-4}

11H-15 = 0.382
  = 3.82 \times 10^{-1}

11H-16 = 71
  = 7.1 \times 10^1

11H-17 = 15.8
  = 1.58 \times 10^1

11H-18 = 23.8
  = 2.38 \times 10^1

11H-19 = 0.700
  = 7.00 \times 10^{-1}

11H-20 = 0.0359
  = 3.59 \times 10^{-2}

11H-21 = 0.0658
  = 6.58 \times 10^{-2}

11H-22 = -0.558
  = -5.58 \times 10^{-1}

11H-23 = 1.54 \times 10^9

11H-24 = 2670
  = 2.67 \times 10^3

11H-25 = 0.130
  = 1.30 \times 10^{-1}

11H-26 = 95.7
  = 9.57 \times 10^1

11H-27 = 3.6 (2SD)
  = 3.6 \times 10^0

11H-28 = 6.06
  = 6.06 \times 10^0

11H-29 = 0.00132
  = 1.32 \times 10^{-3}

11H-30 = 104
  = 1.04 \times 10^2
<table>
<thead>
<tr>
<th>ID</th>
<th>Value</th>
</tr>
</thead>
</table>
| 11H-31 | 0.00143  
     | -1.43x10^-3 |
| 11H-32 | 3470         
        | 3.47x10^3   |
| 11H-33 | 209          
        | 2.09x10^2   |
| 11H-34 | 12.3         
        | 1.23x10^1   |
| 11H-35 | 0.580        
        | 5.80x10^-1  |
| 11H-36 | 10.8         
        | 1.08x10^1   |
| 11H-37 | 4.00         
        | 4.00x10^0   |
| 11H-38 | 1.41         
        | 1.41x10^0   |
| 11H-39 | 1,010,000    
        | 1.01x10^6   |
| 11H-40 | 6,960        
        | 6.96x10^3   |
| 11H-41 | 1.32         
        | 1.32x10^0   |
| 11H-42 | 3.52         
        | 3.52x10^0   |
| 11H-43 | 1.84x10^-6   |
| 11H-44 | 3.94x10^-7   |
| 11H-45 | -2.18x10^4   |
| 11H-46 | 119          
        | 1.19x10^2   |
| 11H-47 | 13.1         
        | 1.31x10^1   |
| 11H-48 | 0.540        
        | 5.40x10^-1  |
| 11H-49 | 7.70         
        | 7.70x10^0   |
| 11H-50 | 221,000      
        | 2.21x10^5   |
| 11H-51 | -3.680       
         | -3.68x10^3  |
| 11H-52 | -0.00166     
         | -1.66x10^-3 |
| 11H-53 | -0.174       
         | -1.74x10^-1 |
| 11H-54 | 0.911        
         | 9.11x10^-1  |
| 11H-55 | 4.55         
         | 4.55x10^0   |
| 11H-56 | 3.74         
         | 3.74x10^0   |
| 11H-57 | 554.50       |
| 11H-58 | 504          
         | 5.04x10^2   |
| 11H-59 | 2.12         
         | 2.12x10^0   |
| 11H-60 | 6.77         
         | 6.77x10^0   |
| 11H-61 | 5.85x10^6    |
| 11H-62 | 1.41x10^3    |
| 11H-63 | 0.859        
         | 8.59x10^-1  |
| 11H-64 | 1.17         
         | 1.17x10^0   |
| 11H-65 | 0.000268     
         | 2.68x10^-4  |
| 11H-66 | 48.5         
         | 4.85x10^1   |
| 11H-67 | $174.63      |
| 11H-68 | 8.30         
         | 8.30x10^0   |
| 11H-69 | 1.84         
         | 1.84x10^0   |
| 11H-70 | 0.0445       
         | -4.45x10^-2 |
# Middle

## Geometry Problems

<table>
<thead>
<tr>
<th>Problem Number</th>
<th>Problem Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>9, 10</td>
<td>Simple one-step calculation on a simple plane figure: circle, rectangle, trapezoid, triangle or a degenerative form (square, parallelogram, rhombus, semicircle, etc.)</td>
</tr>
<tr>
<td>19, 20</td>
<td>One-step solutions of right triangles</td>
</tr>
<tr>
<td>29, 30</td>
<td>One-step solid geometry problems</td>
</tr>
<tr>
<td>39, 40</td>
<td>Law of Sines, Law of Cosines, inscribed and circumscribed circles</td>
</tr>
<tr>
<td>49, 50</td>
<td>Solid geometry problems. Forms may be combined to create more complex figures</td>
</tr>
<tr>
<td>59, 60</td>
<td>Difficult plane geometry problems, calculus problems</td>
</tr>
<tr>
<td>69, 70</td>
<td>Generally complicated, multiple-step plane geometry problems from the Study List</td>
</tr>
</tbody>
</table>
Page 7 Geo Repeats From Study List

Study List

04G-69.
SEMICIRCLE, SCALENE TRIANGLE

Test 05F-70

05F-70.
SEMICIRCLE, SCALENE TRIANGLE
<table>
<thead>
<tr>
<th>Problem Number</th>
<th>Problem Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>6,7,8</td>
<td>Easy, usually one-step</td>
</tr>
<tr>
<td>16,17,18</td>
<td>Slightly harder than Page 1</td>
</tr>
<tr>
<td>26,27,28</td>
<td>Moderate difficulty</td>
</tr>
<tr>
<td>36,37,38</td>
<td>Difficult</td>
</tr>
<tr>
<td>46</td>
<td>Scaling</td>
</tr>
<tr>
<td>47</td>
<td>Best-fit line</td>
</tr>
<tr>
<td>48</td>
<td>Solver</td>
</tr>
<tr>
<td>56</td>
<td>Calculus</td>
</tr>
<tr>
<td>57</td>
<td>Calculus</td>
</tr>
<tr>
<td>58</td>
<td>Matrix algebra</td>
</tr>
<tr>
<td>66,67,68</td>
<td>Generally difficult problems from the Study List</td>
</tr>
</tbody>
</table>
From the Study List

04C-67. The life expectancy for men is 74.8 years and for women is 80.1. If the total average is 77.5 years, what is the number of women divided by the number of men?

Test 05G

05G-66. In a small community, the life expectancy for men is 72.8 years and for women is 79.1. If the total average is 76.9 years, what is the number of women divided by the number of men?
Study List

• 30 Stated Problems
• 20 Geometry Problems
• Numbers changed for contest
• Problems may be used more than once
• Revised Annually

http://www.uil.utexas.edu/academics/calc_applications/index.html
Free UIL Website
Downloads
• Sample Test and Answer Key
• Calculator Survey 2011
• Study List and Answer Key
• “Five Lessons to Prepare for the Calc. Appl. Contest”
  1. Logarithmic Solutions
  2. Simple Geometric Figures
  3. Right Triangles
  4. Scalene Triangles
  5. Linear Regression

http://www.uiltexas.org/academics/calculator-applications
Now with regards to scoring, most of the problem answers have to be within $\pm 1$ on the third significant digit EXCEPT: $\$$, integer and SD problems. Dollar sign “$” answers must be written to the cents place value (i.e. $45 \rightarrow $45.00) and are correct if the answer written is within one cent of the answer key. Integer problems have to be written as integers only – no scientific notation – and there is no $\pm$ leeway given. In other words the student answer has to exactly match the answer key. The SD, or significant digit, type problems are the problems that sometimes are a bit difficult to grade since partial credit is given to the contestant answer that rounds to the key or the key rounds to the contestant answer if the number of digits in the contestant answer does not match the number of digits on the answer key. Answers to SD problems must have at least two significant digits. When grading SD problems, if the number of digits does not match the answer key, the coach grading the test gives credit for the attempted problem, but then takes off 2
points from the final score on the test. Usually the cover sheet has process stated to deal with the SD problems. Dr. Bourell uses 10 pages (pgs. 72 – 81) in the manual to discuss in more detail the nature of this type of problem. A lot of coaches in the grading room usually start looking at the answer key before they start grading papers to see if there are types of problems just mentioned. As Dr. Bourell once stated, there will be at least one of these types of problems on test written by him.

What about the other types of problems on the calculator test? Looking at the table of contents for the manual there are: Translation, Unit Conversion, Rates, Acceleration, Trajectory, Geometric Modeling, Features on a Graph, Equation Writing, Compound Interest/Exponential Growth and Decay, Linear Interpolation and Extrapolation, Percent, Logarithmic Problems with large/Small Numbers, Transcendental Function (Solver Problems), Scaling Principle, Best Fit Line, Matrix Algebra, Differential Calculus, Integral Calculus,

*The manual* addresses all of these different problem types, so again I tell you – *Get the manual!* Oh and by the way, there is a list of formulas and conversion factors on pages 94 – 100 your student (maybe you) should study and be familiar with.
If you are a first timer in coaching this contest, and you have, the manual, you might be wondering what your next step would be – assuming you have committed to working with a calculator team?

(A) How about trying to get some funding for materials and transportation to “some” practice tournaments. Note that TMSCA and some other organizations offer “virtual meets” to help defray travel expense costs.

(B) How about setting up a schedule for practice times. You’re the coach. What works for you?

(C) How about getting announcements or flyers made to attract students for the team?

(D) How about sending a letter home to the parents of the students that have decided to “try out” for the calculator team. This is probably the time when you send out the various forms that your district requires of all students that participate in extracurricular activities.
Last

(E) How about creating practice material for the students. This contest rewards students with knowledge and quickness. At Azle we teach our students to work all the number crunchers first and then begin solving the stated and geometry. Working on the crunchers does not require as much thought, but it does require eye-hand coordination akin to typing skills. If the student only completes three pages in the 30 minutes they may place at a practice meet, but they will certainly not advance beyond the UIL regional level to compete at state.

So what we do at Azle is to have our beginner students work on only the crunchers until they are capable of solving all crunchers from page 1 to page 7. We do this in various ways but most of the time we create “worksheets” with crunchers pasted from previous tests – either by hand or electronically. We try to encourage the students to strive for accuracy as well as speed. We will sometimes have competition between the students.
We don’t use all our practice time devoted to this process, but for the beginners the first 4 – 5 practices could be spent developing those skills in punching the right digits quickly and accurately.

We also create worksheets with various problem types. The drill manuals sold by the UIL for the stated and geometry are useful at this point. But before we give the students the worksheets we have to instruct them on the various formulas and problem solving techniques. Sometimes this only takes about 10 – 30 minutes and sometimes longer. Remembering those frustum and inscribed or circumscribed formulas takes a bit more time.

(F) We look up at the UIL website for tournaments that are as close as possible for our students to compete at. Note that there are all sorts of processes that need to occur before any travel with students is allowed. Restrictions vary from school district to school district. Be sure to visit with your principal about what needs to be done prior to attempting to travel
to a math tournament with students. I will tell you that I firmly believe that student competitors need to travel to a different location to compete against other students to really get a feel for their abilities. Competing against a teammate all the time may even produce a false sense of accomplishment.

Traveling to at least two tournaments in the fall and two tournaments in the spring prior to UIL district competition should be a minimum number of competitions for the student. Again the virtual tournament can save significant funds – especially if you live in a part of our state where minimum travel to competition involves more than 100 miles. But I still feel that having the students experience the competition in a “foreign” environment goes a long way to making them feel more comfortable at district and certainly Region or State competition.

Well that’s about it for starting a calculator team. I’m sure there are questions that you may have that I have not addressed in this presentation, but once again feel free to raise your hand to begin the discussion.
Some Resources

TMSCA Test Pool

• Texas Math/Sciences Coaches Association
• PO Box 206, Olney Texas, 76374-0206
• (940) 563-1005
• TMSCA.org

Offers study materials for math, number sense, calculator and science contests.
Some Resources

Dr. Numsen/Doug Ray

• PO Box 312578, New Braunfels, TX 78131
• Phone: (512) 797-2158; Fax: (208) 575-9617
• Email: doug@academicmeet.com
• Web site: www.academicmeet.com

Provides workbooks and practice tests for elementary and junior high Number Sense, Calculator Applications and Mathematics.
Some Resources

Jami Dewees

• PO 600 Farm Hill Drive, Georgetown, TX 78633
• Phone/fax: (512) 819-9585
• Email: ronjamdewees@Verizon.net

Leo Ramirez

- 9801 W. Parmer Lane #2622, Austin, TX 78717
- Phone: (956) 491-3155 (cell)
- Email: toywiz127@aol.com
- Website: http://www.rammaterials.com/

Number Sense, Calculator Applications, Mathematics, and Science Workbooks (including Number Sense: A Starter's Kit, Middle School Magic, Number Sense Magic, Revised Calculator Applications workbook), DVDs and practice tests. Mr. Ramirez is available for writing invitational meet tests and conducting workshops.
Some Resources

AMT Test Writing Service

• 675 Miller Rd., Azle, TX 76020
• ghzapata@gmail.com.com
• Phone: 817-444-3655

# Some Resources

<table>
<thead>
<tr>
<th></th>
<th>HP 35s</th>
<th></th>
<th>Ti-84 Plus</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon</td>
<td>$53.79</td>
<td></td>
<td>Amazon</td>
<td>$103.66</td>
</tr>
<tr>
<td>Wal Mart</td>
<td>$53.88</td>
<td></td>
<td>Wal Mart</td>
<td>$125.97</td>
</tr>
<tr>
<td>Best Buy</td>
<td>$95.16</td>
<td></td>
<td>Best Buy</td>
<td>$119.99</td>
</tr>
</tbody>
</table>

As of 6/17/15