Mu Alpha Theta National Convention: Denver, 2001
Calculator Programming Test Answers

There really aren't "answers" for this test, other than an ideal program, I suppose. But, there are a number of test cases that each program should be fed, and a correct answer that is expected from the program for each. The ability to handle these test cases correctly will determine the "mathematical accuracy" portion of the program's score.

Mathematical accuracy: In general, I believe that points in this area should be assigned such that the first positive achievement is worth a lot, the second is worth a bit less, etc., so that getting three of five things right would be worth more than 60%. This is somewhat qualitative, and specific examples will be given for each problem. Perhaps if the number of test cases they got right is *n*, and the total number of test cases is *m*, their score for mathematical accuracy should be near MA = 70*(n/m)^.415?

Ease of use is somewhat qualitative as well, and I leave it up to each judge to assign their points as they like. However, some guidelines are that programs that function fine and don't do anything annoying should get roughly medium points for this category (15). If they're excessively cumbersome in some way, they should receive less, and if they have some features you think are helpful, they should get more. Some things to consider in general might be:

Can the program be run multiple times without exiting and re-running?
Is the input visible while you're viewing the output?
Is there a title page?
Is there a menu option to get information on what the program does?
Is the program's name intuitive? I would think that either names like "CalcProb1" or "PtsCrcl" might count for this, while "Joe", or "1" might not.
Did it take an unreasonably long amount of time to use the program?
Were you able to break the program in any way?
When you entered "bad" data at an input, did the program break or behave oddly (bad), or give a nice error message (good)?
Was it always obvious what a prompt was asking for?

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1. Triangular Numbers

Test Case	"Correct" Result
Enter the number 1.	"Yes"
Enter the number 2.	"No: 3"
Enter the number 3.	"Yes"
Enter the number 11.	"No: 15"
Enter the number 253.	"Yes"
Enter the number 1517.	"No: 1540"
Enter the number 93096.	"Yes" (how long did it take?)
Enter the number 25.8.	"No: 28"
Enter the number –6.	"No: 1" (bonus for explanation)

Ease of use: Some things to consider might be:

Were you told which triangular number you'd picked (or missed)?

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2. Points in a Circle

Test Case	"Correct" Result
Enter the three points (-3, 19), (-3, 19), and (5, 5).	(1, 12) (no error)
Enter the three points (5, 31), (5, 31) and (5, 31).	(5, 31) (no error) (nice error message about degenerate circles okay)
Enter the three points (17, -3), (12, 2), and (22, -8).	(17, -3) (no error)
Enter the three points (-24, 31), (-6, 7), and (-12,6).	(-15, 19)
Enter the three points (5, 3), (8, 6), and (-1, -2).	(3.5, 2)
Enter the three points (9, 2), (8, 9), and (0, 5).	(5, 5)
Enter the three points (-4, -8), (-4, 18), and (-16, -12).	(-9, -13)
Enter the three points (-67, 37), (45, 51), and (-46, -40).	(-7, 12)

Ease of use: Some things to consider might be:

Can the data set entered be reviewed to see if any errors were made in entering it?
Was a graph made of the data points and the corresponding smallest circle?
Can you edit a data set if you made a mistake, or must you re-run the program?

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3. Digits of $n!$

Test Case	"Correct" Result
Enter the number 7.	504
Enter the number 8.	032
Enter the number 10.	288
Enter the number 15.	368
Enter the number 25.	984
Enter the number 36.	352