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TI-92 Program Editor
Writing Programs that Solve Cubics and Quartics

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Overview

This workshop will explore the Program Editor of the TI-92. It is intended for people who have had no experience in the Program Editor through those who are very well versed in the progamming language of the TI-92. The menus in the Program Editor will be explored and used. Programs will be written for solving polynomial functions of degree two, three, and four. These are better known as quadratics, cubics, and quartic polynomials. Once a program is written, there will be time to customize the program to help make it more user friendly. Materials will be handed out that fully develop the concepts involved in the three formulas.

Description

The workshop will begin by making sure that everyone can program the quadratic formula into the TI-92 Program Editor. There are certain areas of the Program Editor that will be explored during this exercise. The Input/Output (I/O) and Control (CTL) sub-menus will be introduced as well as the capabilities of a word processor in copying, pasting, or deleting. This part of the workshop will be used to orientate all beginners on the Program editor. After completing this program, everyone will pause to think of ways of customizing their program so that a person who has never used the program could easily navigate the program and obtain the solutions to any quadratic.

The second part of the workshop will be to program the cubic formula into the Program Editor. From the materials passed out and working in pairs, time will be allowed to develop a plan of attack before writing the program. The materials for both the cubic and quartic formulas came from the CRC Standard Math Tables. At the end of this time period, the group will decide what tools are necessary to create this program. and then develop a plan. Once the plan is developed, I will test their overall strategy with a walk through of their program. Does this remind you of the flow chart process? After all participants are satisfied with their plan of action, a fifteen minute time period will be given to write the program in the Program editor and during this time period I will give the participants two or three problems with the solutions so that they can test and debug their programs. Five-ten minutes will be allowed to have participants show their completed programs. This would also be a good time to have some of the participants whose programs did not work, analyzed by the rest of the participants. Again, time will be allowed for each participant to customize their program or to have a correct program sent to their calculator by the link.

The third part of the workshop would be the development and writing of the program for the quartic formula. The beauty of this formula is that the cubic formula is embedded within the quartic formula. Therefore, the cut and paste or copy command will be invaluable. Again, the same process will be followed as with the cubic formula. Although, I believe that it will take less time to write this formula except the if-then statements may cause a little bit of concern.

Now, there are three different programs to solve three different types of polynomials. The rest of the workshop will be devoted to combining all three formulas into one program. Time permitting, one further activity would be to show the different ways of presenting the opening view of a program using menus, popup menus, or dialog boxes.

On this page and the next two pages are actual programs of the three formulas.

Quadratic Formula Program

```
Prgm
ClrIO
Disp "Quadratic Formula"
Disp "Please input the coefficients!"
setMode("Complex Format","RECTANGULAR")
setMode("Exact/Approx","EXACT")
Prompt a,b,c
(-b+(b^2-4*a*c))/(2*a)→d
(-b-(b^2-4*a*c))/(2*a) →e
ClrIO
Output 1,1,"The solutions in exact value are:"
Output 20,10,d
Output 20,90,e
setMode("Exact/Approx","APPROXIMATE")
Output 40,1,"The solutions in decimals are:"
Output 60,10,d
Output 60,90,e
setMode("Exact/Approx","EXACT")
EndPrgm
```

Cubic Formula Program

```
Prgm
ClrIO
setMode("Angle","RADIAN")
setMode("Complex Format","RECTANGULAR")
setMode("Exact/Approx","APPROXIMATE")
Disp "COEF. OF x^3 IS"
Input a
Disp "COEF. OF x^2 IS"
Input b
Disp "COEF. OF x IS"
Input c
Disp "CONSTANT IS"
Input d
b/a→p
c/a→q
d/a→r
1/3*(3*q-p^2) →e
1/27*(2*p^3-9*p*q+27*r) →f
(-f/2+(f^2/4+e^3/27)^(0.5))^(1/3) →g
(-f/2-(f^2/4+e^3/27)^(0.5))^(1/3) →h
setMode("Complex Format","RECTANGULAR")
g+h-p/3→x
-(g+h)/2+(g-h)/2*(√-3)-p/3→y
-(g+h)/2-(g-h)/2*(√-3)-p/3→z
Disp "THE ROOTS ARE"
Disp x,y,z
setMode("Exact/Approx","AUTO")
EndPrgm
```

Quartic Formula Program

```
Prgm
ClrIO
setMode("Complex Format","REAL")
setMode("Exact/Approx","APPROXIMATE")
setMode("Angle","Radian")
Disp "COEF. OF x^4"
Input f
Disp "COEF. OF x^3"
Input g
Disp "COEF. OF x^2"
Input h
Disp "COEF. OF x"
Input i
Disp "CONSTANT"
Input j
g/f→a
h/f→b
i/f→c
j/f→d
-b→p
a*c-4*d→q
-a^2*d+4*b*d-c^2→r
1/3*(3*q-p^2) →e
1/27*(2*p^3-9*p*q+27*r) →f
setMode("ComplexFormat","RECTANGULAR")
-f/2+(f^2/4+e^3/27)^(0.5) →g
-f/2-(f^2/4+e^3/27)^(0.5) →h
setMode("Complex Format","REAL")
g^(1/3) →g
h^(1/3) →h
setMode("Complex Format","RECTANGULAR")
g+h-p/3→y
a^2/4-b+y→r
If abs(r)<6E-6 Then
0→r
Goto a
EndIf
√(3*a^2/4-r-2*b+(4*a*b-8*c-a^3)/(4*√r))) →m
√(3*a^2/4-r-2*b-(4*a*b-8*c-a^3)/(4*√r))) →n
Goto b
Lbl a
√(3*a^2/4-2*b+2*√(y^2-4*d))→m
√(3*a^2/4-2*b-2*√(y^2-4*d))→n
Lbl b
-a/4+√(r)/2+m/2→u
-a/4+√(r)/2-m/2→v
-a/4-√(r)/2+n/2→w
-a/4-√(r)/2-n/2→x
ClrIO
Disp "The solutions are"
Disp u,v,w,x
setMode("Exact/Approx","AUTO")

EndPrgm
```