Programming the Quadratic Formula into the TI-83+

For those times when a numeric approximation to the solution of a quadratic equation will suffice, using a programmable calculator to automatically compute and simplify the quadratic formula is rather convenient. Since we shall expand upon the programmable features of the TI-83+ throughout the course this is a good starting point. ↵ = ENTER

COMMAND	**COMMENTS**
Press PRGM	*Brings up the Program Menu: EXEC EDIT NEW*
Select NEW ↵	*Use EDIT to edit an existing program*
Name=QF ↵	*Names the program QF. Other names will also suffice.*
:ClrHome ↵	PRGM → *I/O → 8. Clears the home screen.*
:a+b*i* ↵	MODE → *a+bi. Sets the TI-83+ to Complex mode.*
:Disp "SOLVES" ↵	PRGM → *I/O → 3. Screen message.*
:Disp "$Ax^2 + Bx + C = 0$" ↵	PRGM → *I/O → 3. Screen message. Use* 2nd TEST *for '='*
:Prompt A,B,C ↵	PRGM → *I/O → 2. Will prompt the user for A, B and C*
:(-B+√(B²−4AC))/(2A)▸P ↵	*Calculates the first root and stores it in P.* ▸= STO▸
:Disp P ↵	*PRGM → I/O → 3. Displays the first root.*
:(-B−√(B²−4AC))/(2A)▸Q ↵	*Calculates the second root and stores it in Q.* ▸= STO▸
:Disp Q ↵	*PRGM → I/O → 3. Displays the second root.*
:Real ↵	*MODE → Real. Resets the TI-83+ to Real mode.*

Now let's run the program. Use PGRM → EXEC → *Select Program* ↵. Note: For these examples the MODE was preset to 2 decimal accuracy.

Example 1 Solve $x^2 + 2x + 2 = 0$

We identify A = 1, B = 2 and C = 2.

PGRM → EXEC → *QF* ↵

```
SOLVES AX²+BX+C
A=?1
B=?2
C=?2
          -1.00+i
          -1.00-i
             Done
```

actual solutions

$x = -1 \pm \sqrt{-1}$

Note: Pressing ENTER at the conclusion of a program will rerun a fresh version of the program.

Example 2 Solve $x^2 + 5x = 6$

Rewrite in Standard Form: $x^2 + 5x - 6 = 0$

We identify A = 1, B = 5 and C = -6.

PGRM → EXEC → *QF* ↵

```
SOLVES AX²+BX+C
A=?1
B=?5
C=?-6
             1.00
            -6.00
             Done
```

actual solutions

x = 1 or -6

Example 3 (one double root): Solve $9x^2 - 12x + 4$

We identify A = 9, B = -12 and C = 4.

PGRM → EXEC → *QF* ↵

```
SOLVES AX²+BX+C
A=?9
B=?-12
C=?4
              .67
              .67
             Done
```

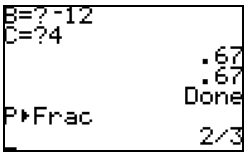
actual solutions

x = 2/3

Example 3a

We can use the built in fraction feature of the TI 83+ to convert solutions to a rational number (if possible). Since the answers remain in P and Q for later use we can try to convert them to a fraction.

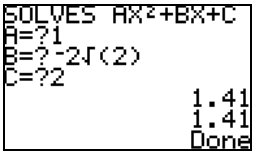
MATH → ▸Frac ↵ ↵



Example 4 (a tricky one): Solve $x^2 - 2x\sqrt{2} + 2 = 0$

We identify A = 1, B = $-2\sqrt{2}$ and C = 2.

PGRM → EXEC → *QF* ↵



Note: These solutions are irrational and cannot be converted to rationals.

actual solution $\boxed{x = \sqrt{2}}$

Now solve these problems. Write down <u>rational solutions</u> where appropriate. Be sure to work some by hand.

1) $x^2 + 11 = 6x$

2) $6(2x^2 + 1) = 17x$

3) $9x^2 + 1 = 5x$

4) $5x(5x - 14) = -7^2$

5) $3x^2 + 1 = 4x$

6) $2(x^2 + 2) = -1$

7) $4(x + 1)^2 - 4(x + 1) = 3$

8) $3x^2 + 2 = (5x - 4)^2 - 5(x - 3)$

9) $4x^2 + 1 = \dfrac{29x + 1}{7}$

10) $(t^2 - 5t)^2 + 2(t^2 - 5t) - 24 = 0$

Hint: Let $t^2 - 5t = x$.