

## TI-82/83 Procedure 20: *Using Formulas in Program Form*

### Example

Write a program that uses the quadratic formula to solve a user-specified equation.

**NOTE:** In this procedure, the keystrokes used to type single letters ( **ALPHA** [A]) will be symbolized by the single letter (**A**) in boldface.

**STEP 1:** Press **PRGM** **◀** **ENTER** to create a new program. Type the title QUADFORM and press **ENTER**.

**STEP 3:** Next, have the program calculate the determinant. Press **B** **⊗** **⊖** **4 A C** **STO▶ D** **ENTER**. The determinant will fall into one of three cases:  $D < 0$ ,  $D = 0$ , and  $D > 0$ . Since the number of solutions varies with the value of  $D$ , each case will be handled separately.

```
PROGRAM: QUADFORM
: Prompt A, B, C
: B2-4AC→D
:
:
```

**STEP 5:** Use an **If-Then-Else** branch for the other two cases. For  $D = 0$ , press **PRGM** **1 D** **2nd** **[TEST]** **1 0** **ENTER** **PRGM** **2** **ENTER** **(-)** **B** **÷** **2** **÷** **A** **STO▶ X** **ENTER** **PRGM** **▶** **3** **2nd** **[A-LOCK]** **["SOLUTION\_IS"]** **ALPHA** **▶** **X** **ENTER**.

```
PROGRAM: QUADFORM
: End
: If D=0
: Then
: -B/2/A→X
: Disp "SOLUTION
: IS", X
:
```

**STEP 2:** First have the program ask for the coefficients of the quadratic equation. Press **PRGM** **▶** **2 A** **▶** **B** **▶** **C** **ENTER** to prompt for the values of  $a$ ,  $b$ , and  $c$ .

**STEP 4:** Use an **If-Then** branch to treat each number of solutions differently. For  $D < 0$ , press **PRGM** **1 D** **2nd** **[TEST]** **5 0** **ENTER** **PRGM** **2** **ENTER** **PRGM** **▶** **3** **2nd** **[A-LOCK]** **["NO\_SOLUTION"]** **ENTER** **PRGM** **F** **ENTER** **PRGM** **7** **ENTER**. If  $D < 0$  the program displays NO SOLUTION and stops. (**Stop** ends a program. **End** ends an **If-Then** branch).

```
PROGRAM: QUADFORM
: If D<0
: Then
: Disp "NO SOLUTI
: ON"
: Stop
: End
:
```

**STEP 6:** For  $D > 0$ , press **PRGM** **3** **ENTER** **(** **(-)** **B** **+** **2nd** **[√]** **\* D** **)** **÷** **2** **÷** **A** **STO▶ X** **ENTER** **(** **(-)** **B** **-** **2nd** **[√]** **\* D** **)** **÷** **2** **÷** **A** **STO▶ Y** **ENTER** **PRGM** **▶** **3** **2nd** **[A-LOCK]** **["SOLUTIONS\_ARE"]** **ALPHA** **▶** **X** **▶** **2nd** **[A-LOCK]** **["AND"]** **ALPHA** **▶** **Y** **ENTER** **PRGM** **7** **ENTER** **PRGM** **F** **ENTER**.

```
PROGRAM: QUADFORM
: Else
: (-B+√D)/2/A→X
: (-B-√D)/2/A→Y
: Disp "SOLUTIONS
: ARE", X, "AND", Y
: End
: Stop
```

\* **TI-83:** The  $[\sqrt{\quad}]$  function automatically adds an opening parenthesis. Insert the closing parenthesis after "**D**".

### Exercises

Write a program that uses each formula.

1. Distance Formula:  $D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

2. Pythagorean theorem:  $c^2 = a^2 + b^2$

3. Law of Cosines:  $c^2 = a^2 + b^2 - 2ab \cos C$