



In this Application for Unit 2 you will write programs to evaluate some mathematical formulas.

#### Objectives:

- Use the TI Basic statements learned in Unit 2 to write a program that evaluates a formula.

### The Pythagorean Theorem

In a right triangle with legs A and B and hypotenuse C,

$$A^2 + B^2 = C^2$$

Write a program that asks the user to enter the lengths of the legs then computes the length of the hypotenuse and nicely displays all three values.

*Note: You first have to solve the formula above for C.*

### Heron's Formula

**Heron's Formula** determines the area of any triangle using only the lengths of the three sides of the triangle, A, B, and C. It is usually stated in two parts:

$S = (A + B + C) / 2$  is the 'semi-perimeter' (half the perimeter) of the triangle

$A = \sqrt{S * (S - A)(S - B)(S - C)}$  is the area of the triangle

Write a program that asks the user to enter the lengths of the three sides of a triangle and then computes the area and displays (Outputs) the sides and the area on a pretty screen.

*Note: It's possible for the user to enter three numbers that cannot be the sides of any triangle. What will happen when the user enters invalid values?*

**Teacher Tip:** Heron's formula will fail (NON-REAL answer) when the three values are impossible for a triangle (the Triangle Inequality). This can be accounted for by changing the complex MODE to a+bi.

### The Quadratic Formula

If a quadratic equation is of the form  $Ax^2 + Bx + C = 0$  then the roots of the equation are found by...

First, determining the discriminant:

$$D = B^2 - 4AC$$

And then the two roots are:

$$R1 = (-B + \sqrt{D}) / (2A)$$

$$R2 = (-B - \sqrt{D}) / (2A)$$

Write a program that asks the user to enter the three coefficients of the quadratic equation, A, B, and C and nicely displays the coefficients and the two roots of the equation.

```
NORMAL FLOAT AUTO REAL Radian MP
PROGRAM:PYTHAG
:ClrHome
:Disp "THIS PROGRAM COMPUT
ES"
:Disp "THE HYPOTENUSE"
:Disp "ENTER THE LEGS..."
:Prompt A,B
:
:
:
```

```
NORMAL FLOAT AUTO REAL Radian MP
PROGRAM:HERON
:ClrHome
:Disp "THIS PROGRAM COMPUT
ES"
:Disp "HERON'S FORMULA"
:Disp "ENTER THE SIDES..."
:
:Prompt A,B,C
:
:
:
```

```
NORMAL FLOAT AUTO REAL Radian MP
PROGRAM:QUAD
:ClrHome
:Disp "THIS PROGRAM COMPUT
ES THE"
:Disp "QUADRATIC FORMULA"
:Disp "ENTER THE COEFFICIE
NTS..."
:Prompt A,B,C
:
:
:
```



*Note: You cannot use R1 and R2 as variables! Use something else.*

*What could possibly go wrong with this program?*

**Teacher Tip:** Here are program listings for each assignment. The important steps are the formula calculations. The Output positions should be fine on any TI-84, but the TI-84 C/CE may use different values depending on the appearance desired.

### The Pythagorean Theorem

#### Answer:

```
prgmPYTHAG
ClrHome
Disp "THIS PROGRAM COMPUTES"
Disp "THE HYPOTENUSE"
Disp "ENTER THE LEGS..."
Prompt A,B
 $\sqrt{A^2+B^2} \rightarrow C$ 

ClrHome
Output(3,5,"A= ")
Output(3,8,"A)
Output(4,5,"B= ")
Output(4,8,B)
Output(6,5," HYPOTENUSE = ")
Output(6,16,C)
Pause
ClrHome
```

### Heron's Formula

#### Answer:

```
prgmHERON
ClrHome
Disp "THIS PROGRAM COMPUTES"
Disp "HERON'S FORMULA"
Disp "ENTER THE SIDES..."
Prompt A,B,C
 $(A+B+C)/2 \rightarrow S$ 
 $\sqrt{S(S-A)(S-B)(S-C)} \rightarrow D$ 

ClrHome
Output(3,5,"A= ")
Output(3,8,A)
Output(4,5,"B= ")
Output(4,8,B)
Output(5,5,"C= ")
Output(5,8,C)
Output(7,5,"AREA= ")
Output(7,11,D)
Pause
ClrHome
```

### The Quadratic Formula

#### Answer:

```
prgmQUAD
ClrHome
Disp "THIS PROGRAM COMPUTES"
Disp "THE"
Disp "QUADRATIC FORMULA"
Disp "ENTER THE COEFFICIENTS..."
Prompt A,B,C
 $B^2-4AC \rightarrow D$ 
 $(-B+\sqrt{D})/(2A) \rightarrow R$ 
 $(-B-\sqrt{D})/(2A) \rightarrow S$ 

ClrHome
Output(3,5,"A= ")
Output(3,8,A)
Output(4,5,"B= ")
Output(4,8,B)
Output(5,5,"C= ")
Output(5,8,C)
Output(7,5,"ROOT1= ")
Output(7,12,R)
Output(8,5,"ROOT2= ")
Output(8,12,S)
Pause
ClrHome
```