

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.

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

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

```
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
:
:
:
```

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: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
```