A function is a procedural abstract, i.e., a named body of code that performs some task when it is called/invoked. Often a function will have one or more parameter that allows it to perform a more general (variable) task. For example, we used the “input” function several times in the wageCalc.py program of lab 1:

```python
hoursWorked = input("Enter number of hours worked: ")
payRate = input("Enter hourly pay rate: ")
grossPay = hoursWorked * payRate
print "Gross pay earned = $", grossPay
print "Formatted" Gross pay earned = $ %.2f' % grossPay
```

The string parameter of the input function allows the function to behave differently (print an appropriate prompt) for each value to be entered by the user.

Likewise, the cube function below (in file P:\Math-CS\810-051-fienup\common\lab2\cube.py)

```python
# Function to calculate the cube of a number
def cube(num):
    num_squared = num * num
    return num_squared * num

# call the function
value = 2
print 'The value', value, 'raised to the power 3 is', cube(value)
```

can be called with any numeric value and the corresponding cube of that number is returned.

**Terminology:**
- A formal parameter is the name of the variable used in the function definition which receives a value when the function is called. In the function cube, num is the formal parameter. Formal parameters are only known inside of the function definition. The section of a program where a variable is known is called its scope, so the scope of a formal parameter (and other local variable defined in the function such as num_squared) is limited to the function in which it is defined.
- An actual parameter is the value used in the function call that is sent to the function. In the function cube, the variable value supplies the actual parameter value of 2.
- A global variable is created outside all functions and is known throughout the whole program file, e.g. value.

**Part A:** Write a function that takes as a parameter the Celsius temperature and returns the corresponding Fahrenheit temperature. In your program, call the function with Celsius temperatures of -3.56, 5, 10, and 25.6.

Record the conversions in the following table:  (Recall the formula for the conversion is $F = \frac{9}{5}C + 32$

<table>
<thead>
<tr>
<th>Celsius Temperature</th>
<th>3.56</th>
<th>5</th>
<th>10</th>
<th>25.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fahrenheit Temperature</td>
<td>29.52</td>
<td>59</td>
<td>50</td>
<td>77.12</td>
</tr>
</tbody>
</table>

**Part B:** Write a function that calculates the cost per square inch of a circular pizza. (Recall the formula for the area of a circle: area = $\pi r^2$, where $\pi$ is about 3.14 and $r$ is the radius of the circle) Write a program using the function to determine the cost per square inch of each size of pizza, and record them in the following table:

<table>
<thead>
<tr>
<th>Pizza Size</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>8&quot;</td>
<td>12&quot;</td>
<td>16&quot;</td>
<td>20&quot;</td>
</tr>
<tr>
<td>Cost</td>
<td>$6.50</td>
<td>$9.25</td>
<td>$11.50</td>
<td>$15.00</td>
</tr>
<tr>
<td>Cost per square inch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

After you have both programs (A and B) working correctly, raise your hand and we'll check your work.
Part C: Scope and Local Variables: For the following programs, predict the output before executing them. The following programs are at P:\Math-CS\810-051-fienup\common\lab2

```python
value = 100   # a global variable

def cubePlus(num):
    num_squared = num * num
    return num_squared * num + value

# call the function
value = 2
print 'The value', value, 'raised to the power 3 + ', value, 'is', cubePlus(value)
```

<table>
<thead>
<tr>
<th>Predicted Output</th>
<th>Actual Output</th>
</tr>
</thead>
</table>

Explain the actual output:

```python
value = 100   # a global variable

def cubePlus2(num):
    result = num * num * num + value
    value = 5000
    return result

# call the function
value = 2
print 'The value', value, 'raised to the power 3 + ', value, 'is', cubePlus2(value), '. Value is', value
```

<table>
<thead>
<tr>
<th>Predicted Output</th>
<th>Actual Output</th>
</tr>
</thead>
</table>

Explain the actual output:

In cubePlus2 comment out the “global value” statement and rerun the program. What error message do you get?

Explain the error message:

After you have completed part C, raise your hand and we'll check your work.