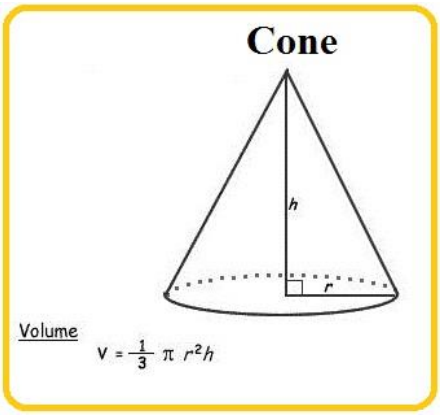
CSCI 1470 **Fall 2024** **Mr. Gustavo Dietrich**

Lab 8: Value-returning and void functions **Due:** 10/2/24

Problem: Suppose your math professor asks you to create a calculator to determine the volume of a cone based on its height and radius. To make it more charming you decide that your program will ask the user's name before asking for the needed data to calculate the volume. You must use the formula shown below where r is the radius and h is the height of the cone.



The **height** and the **radius** must be **whole** numbers, but the **volume** must be a **double precision real** number with three decimal digits.

Your task: implement in C++ the algorithm solution shown below.

Algorithm solution (in pseudocode):

To solve this problem your program must perform the following tasks:

Declares a global **constant variable** called **PI** above main() that holds value **3.141592**

Declares a variable named **name** that holds text
Declares variables named **height** and **radius** that hold **whole** numbers
Declare a variable named **volume** that holds **double** precision **real** numbers
Prompts the user "May I get your first name please?: "
Read the value from the keyboard and stores it in **name**
Prompt the user "Thanks ", name, ", now enter radius and height of the cone please: "
Read the values from the keyboard and stores them in **radius** and **height** respectively
Call function **volume_cone()** to calculate the volume of the cone and assign the result to volume
Call function **print_data()** to print the values entered by the user and the volume of the cone

1) To calculate the square of a number you **must** define a **value-returning** function named **square( )**. It receives a real number and returns its squared value (a real number). You must use it to calculate the square of the radius. ***Do NOT use pow() in THIS FUNCTION to determine the square of the value received.***

2) To calculate the volume of the cone you **must** define a **value-returning** function named **volume_cone()**. It receives the radius and the height of the cone (whole numbers) and returns the calculated volume (a real number) rounded to the third decimal digit. To round the volume use the round_off() function that you created for lab 6 (see below please). Implement the formula for the volume of the cone exactly as it is displayed above.

3) To round a number define a **value-returning** function named **round_off( )**. It receives the number to be rounded (a real number) and the number of decimal digits that the number should be rounded to (a whole number), and returns the number rounded to the specified number of decimal digits.

4) To print the data you **must** define a **void** function named **print_data( )**. It receives the name (text), the radius of the cone (a whole number), the height of the cone (a whole number), and the volume of the cone (a real number). After formatting the output to display the volume in fixed format with three decimal digits it displays the following message (n, r, h, and v are the name, the radius, the height, and the volume respectively):

"Ok ", n
"For a radius: ", r, " and a height: ", h, " the cone's volume is ", v

The program must compile without errors or warnings.

Open **lab08.cpp** in your IDE and implement the above algorithm (already provided in the source code as comments).

Implement the above algorithm (already provided in the source code as comments).

Note:

- Do NOT remove or modify the statements that I use to test certain things in your program.
- Pay attention to the input and the output formats. Your solution must behave exactly like mine.
- Carefully analyze the following figure and use it as a reference to ensure you do the right things.

```
May I get your first name please?: Emma

Thanks Emma, now enter radius and height of the cone please: 2 6

Ok Emma

For a radius: 2 and a height: 6 the cone's volume is 25.133


Testing your solution
```

- Test and compare your solution with mine for different values of radius and height to ensure they always produce the same outputs. Pay attention to the output format.
- Ensure your formula does not use mixed data types by defining your literal values appropriately and using the static_cast operator where needed.

Don't forget to include at the top of the program the comments shown below with your information (name, class and section number, etc.)

//
//
Name: <Put your name here>
Due date:
Class: <Your class number and section number, like: CSCI 1470.02>
Semester: <This semester, like: Fall 2012>
CSCI/CMPE 1470 Instructor: <Your lecture instructor's name>
//
Program Description: Enter here **your** description of what the program does
//
//

When done, submit your solution through Blackboard using the "Assignments" tool. Do Not email it.

Paste the link to your final solution along with your source code in the textbox opened when you click on Create Submission before you click on Submit.

The following is the basic criteria to be used to grade your submission:

You start with 100 points and then lose points as you don't do something that is required.

-5: Minor mistakes
incorrect declaration of the constant
wrong variable names
wrong data types
no/too few comments
mixed data types in expression
did not display three decimal digits
incorrect way to round the value off
incorrect input format
incorrect output format
program does not pass test (each)
-10: Moderate mistakes
no declaration/use of the constant
didn't round the value off
incorrect implementation of the function (each)
incorrect function call (each)
missing libraries
-20: Major mistakes
didn't implement the required functions (each)
program does not implement the provided algorithm
Incorrect/missing source code
Incorrect/missing link to your solution
-50: program doesn't compile
-100: The code submitted is not your creation (you got it from a web site or another person)
-10: Late

Important: more points may be lost for other reasons not specified here.

The following are sample runs of the program.

```
May I get your first name please?: Niko

Thanks Niko, now enter radius and height of the cone please: 5 5

Ok Niko

For a radius: 5 and a height: 5 the cone's volume is 130.900

Testing your solution
```

```
May I get your first name please?: Julie

Thanks Julie, now enter radius and height of the cone please: 3 4

Ok Julie

For a radius: 3 and a height: 4 the cone's volume is 37.699

Testing your solution
```

```
May I get your first name please?: Luna

Thanks Luna, now enter radius and height of the cone please: 7 5

Ok Luna

For a radius: 7 and a height: 5 the cone's volume is 256.563

Testing your solution
```