



## UNIVERSITY OF KWAZULU-NATAL

COMP102: Compute Programming

### Practical 7: Consolidating Class Creation & Method Instantiation

Thursday, 6 October 2022

## Introduction

Consider the following 3D shapes:

[1] A **right cylinder** has a circle base with radius  $r$  and a height  $h$ , as shown in Figure 1.

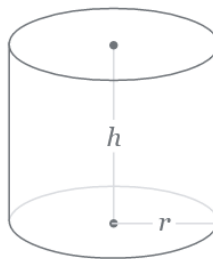


Figure 1: Illustration of right cylinder (credit: google.com)

[2] A **right rectangular prism** is a six-sided object with a rectangular base and height  $h$ , as shown in Figure 2.

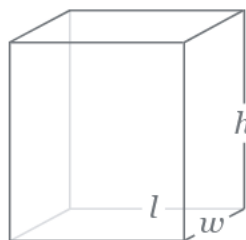


Figure 2: An illustration of a right rectangular prism (credit: google.com).

[3] A **cone** has a circular base with some radius  $r$ , and rises to a single point at a height  $h$ , as shown in Figure 3.

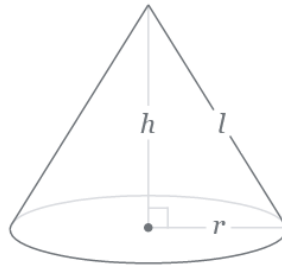


Figure 3: Illustration of a cone (credit: google.com).

[4] A **right regular pentagonal prism** has a pentagonal base with an edge length of  $a$ , and a height of  $h$ , as shown in Figure 4.

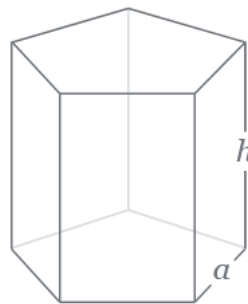


Figure 4: An illustration of a right regular pentagonal prism (credit: google.com).

## Question One: 3D Shape Class

For each 3D shape described above:

1. Create a class for the shape. Include a constructor that allows a user of the class to create objects and initialise them appropriately. The user should be able to define the height, radius, width, length, etc. of the relevant shape. Make sure that they cannot create objects with attributes equal to or less than 0
2. Provide **get** and **set** methods for each attribute in your class. Ensure that the user cannot alter an attribute to have a value equal to or less than 0
3. Implement the **toString()** method
4. For each 3D shape class, create a method called **getVolume()** which will return the volume of the object
5. For each 3D shape class, create a method called **getSurfaceArea()** which will return the surface area of the object
6. Each 3D shape has a particular base shape, i.e. circle, rectangle or pentagon. Write a method for each 3D shape class that will return the area of the base. Name this method **getBaseArea()**.

## Question Two: Test Classes

For each 3D shape class you created above, write a class to test the methods. For each test class:

1. Create an array of ten objects using randomly generated values
2. Create a method called `getLargestVolume()` that will return the 3D shape with the largest volume
3. Create a method called `getSmallestSurfaceArea()` that will return the 3D shape object with the smallest surface area

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