# Software Development 1, Lab 2

**This is individual assessed coursework**. You are allowed to discuss this assessment with other students, but you should not copy their code, and you should not share your own code with other students. Note that we will carry out plagiarism checks on all submissions.

This lab script consists of **three tasks**, which require you to apply your knowledge of variables, types, operators, expressions and conditional execution. These topics were covered in the lectures in Week 2. You should attempt to **complete all tasks before getting your solutions marked**.

The deadline for completing this lab is the <u>end of the lab session in Week 4</u>. Before this deadline, you should show your code (whether you have completed all the tasks or not) to either a lab helper or your lecturer, and also upload your code (as instructed at the end of this document) to Vision. Uploading your code to Vision is mandatory; you will not receive any marks if you do not do this.

## Task 1

Write a program called **`Cone.java`** that calculates the surface area of a cone using the formula:

$$A = \pi r^2 + \pi r s, \quad \text{where A is the area, r is the radius, and s is the slant height.}$$

The program should:
- Read in values for radius and slant height from the user. These should be stored in appropriately-named variables of an appropriate type. You should use a `Scanner` and a call to `scan.nextDouble()` to read each value from the user. *[1 mark]*
- Declare a constant to represent PI ($\pi$), using a value of 3.1416. *[1 mark]*
- Calculate the surface area using the above formula. *[1 mark]*
- Output the volume to the user in the form "The surface area of a cone with radius r and slant height s is A", where r, s and A are replaced with appropriate values. *[1 mark]*

## Task 2

Make a copy of the program from Task 1 and extend it so that, based on a choice input by the user, it calculates the surface area of either a cone, a sphere, or a cylinder.
Call this new program **`SurfaceArea.java`**

The surface area of a sphere is calculated using the formula:
$$A = 4\pi r^2, \quad \text{where A is the area and r is the radius.}$$

The surface area of a cylinder is calculated using the formula:
$$A = 2\pi r(r+l), \quad \text{where A is the area, r is the radius, and l is its length.}$$

The program should:
- Ask the user which shape they wish to calculate the volume of.
  You can use a call to `scan.next()` to read each string from the user.
  An `if…else` statement should then be used to process the user's input. *[2 marks]*
- Read in appropriate numerical values for the chosen shape, calculate the surface area using the appropriate formula, and output the volume to the user. *[1 mark]*
- Be correctly formatted and commented with sensible variable names. *[1 mark]*

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Your program, when run, might do something like this (user input shown in bold):

```
Which shape would you like to calculate the volume of?
Choose: cone, sphere, cylinder.
sphere
Please enter the radius of the sphere:
10
The surface area of a sphere with radius 10.0 is 1256.637
```

## Task 3

Make a copy of your program from Task 2 and rename it `SurfaceAreaSwitch.java`. Then, modify the code so that it uses a `switch…case` statement instead of an `if…else` statement.
*[2 marks]*

Next, show your solutions to a lab helper or your lecturer. Once they have marked your work, **upload your .java file for each task to Vision** using the appropriate submission link found in the Lab 2 folder under the "Assessment" tab. If you have not been able to finish all the tasks, please show us what you have been able to do, and then upload the solutions to Vision.

All of your solutions to Lab 2 must be uploaded to Vision by midnight on Friday 5th October. Late submissions will be marked according to the university's late submissions policy, i.e. a 30% deduction if submitted within 5 working days of the deadline (e.g. within the following lab), and no mark after that. If you have mitigating circumstances (e.g. illness), please submit the form available at: https://www.hw.ac.uk/students/studies/examinations/mitigating-circumstances.htm