Part A – Practical/ Programming Test

Question 2 [60 marks]

Given **program2c.cpp** that will ask the user to choose a three-dimensional object either cuboid or sphere, then enter the size of information about the object accordingly, and finally print out the volume of the object. If the user enters other inputs, the program will display an error message `"Invalid input"`. Figure 1 shows some example runs of the program. Note that the **bold** texts indicate user inputs. ***Note:*** *As for all questions (a) until (e), rewrite the codebase program into the same file and submit as* ***program2.cpp****.*

Run 1

```
Enter the type of object 1: Cuboid, 2: Sphere => 1
Enter the cuboid's dimensions, width, length and height => 2 3 4

Cuboid dimensions: 2 x 3 x 4
Volume: 24
```

Run 2

```
Enter the type of object 1: Cuboid, 2: Sphere => 2
Enter the radius => 4.5

Sphere's radius: 4.5
Volume: 381.51
```

Run 3

```
Enter the type of object 1: Cuboid, 2: Sphere => 5

Invalid input
```

Figure 1: Example results of the program

Rewrite the program using the polymorphism concept and handling the user input errors with exceptions. The new program should produce the same result as the original program. You are required to add two more classes to your program. You may use the inline style to define all the classes. Below are the expected elements your program should include:

a. Definition of the class `ThreeDimensionalObject`. (10 marks)

b. Definition of the class that represents cuboid objects. (15 marks)

c. Definition of the class that represents sphere objects. (15 marks)

d. Definition for the main function. (14 marks)

e. Handling the user input error using an exception approach (6 marks)