

### Program: Area (18)

This problem tests working with reading input using the Keyboard class, writing output with `System.out.println()` and evaluating arithmetic expressions in Java, as covered in Chapter 3.

Write a program `Area.java`. It reads three floating point numbers corresponding to the lengths  $a$  and  $b$  of two sides of a triangle, and  $q$ , the angle between the sides in degrees, as input. As output it writes the area of the triangle described. It then waits for the user to press return and exits.

An example session:

```
Enter the length of side a: 5
Enter the length of side b: 3.14159
Enter the angle between them: 35.3
The area of the triangle is: 9.07695867094
```

The mathematical formula for the area is  $0.5 * a * b * \sin(q)$ . You can use the java `Math.sin(double angle)` method/function to do that. However, `Math.sin` takes its angle in radians, so you must convert degrees to radians.  $q$  degrees is  $q * \text{Math.PI} / 180$  in radians.

### Program: Quadratic Roots (30)

In mathematical terms, the roots of the quadratic refers to those values of  $x$  for which the quadratic polynomial  $a * x^2 + b * x + c$  has a value of 0. There is a well-defined formula to calculate what the roots are. Write a program that asks the user for a set of values for the coefficients  $a$ ,  $b$  and  $c$  and then calculates both roots of the polynomial. Typical output may look like:

```
Enter the value for a : 1
Enter the value for b : 0
Enter the value for c : -1
The first root of (1)*x*x + (-1) is : 1
The second root of (1)*x*x + (-1) is : -1
```

Note that your program will not work for all cases – this is normal.

### Program: Mini Eliza (30)

Eliza is a famous artificial intelligence program from the 60s, which created the illusion of intelligent conversation by using parts of user responses in phrasing subsequent questions. For this exercise, you are required to build a very simple Eliza-like program to collect information from users, while addressing them in a conversational manner. You will need to use variables to collect input Strings and then output them at appropriate places.

The output of your program should look like:

```
Hello, I am Mini-Eliza. What is your name? Ivan
Well, Hello Ivan! What do you study at UCT? Computer Science
Computer Science is a fascinating subject – what year are you in? First year
WOW! First year in Computer Science! That's impressive. How many more years will you be here for? 3
Ah! 3 years is not a long time, especially if you are studying Computer Science. Best of luck, Ivan!
```

The information collected was as follows:

Name: Ivan  
Subject: Computer Science  
Year of study: First year  
Number of years left: 3