MA1008 Introduction to Computational Thinking
Week 5 Programming: Program control – loops

This tutorial is on program control, going round loops making repeated computations. Some are better done with for loops and others better with while loops. Think carefully and decide which one is better.

1. What are the numbers less than 1000 divisible by 29? Write a program to print all these numbers. How many ways can you find to solve the problem? Which one is the most efficient (i.e. requires the least steps)?

2. The Euler's number e is defined as an infinite series:

$$e = \sum_{n=0}^{\infty} \frac{1}{n!} = \frac{1}{1} + \frac{1}{1} + \frac{1}{1 \cdot 2} + \frac{1}{1 \cdot 2 \cdot 3} + \cdots$$

   Write a program to evaluate the series accurate to 8 decimal places. Check you result against the actual value, e = 2.718281828, to 9 decimal places.

3. This question requires the use of the leap year program you wrote last week. Write a program that prints all the leap years between 1900 and 2100. Print eight years per row.

4. Write a program to generate two tables of currency conversion between Singapore dollar (S$) and Malaysian Ringgit (RM). Assume the following conversion rate:

   S$1 = RM3.03

   Allow the user to enter the start value, end value, and increment (step). These three inputs are all integer values. Use the following loops with the same input data:

   a. A for loop to generate the table for S$ to RM;
   b. A while loop to generate the table for RM to S$.

5. Write a program that reads the height from a user and prints a triangular pattern of lines with alternate "AA" and "BB", with the specified height. For example, when the user enters a height value of 3, the following pattern is printed:

   AA
   BBAA
   AABBAA

   If the height is 7, then the following pattern is printed:

   AA
   BBAA
   AABBAA
   BBAABBAA
   AABBAABBAA
   BBAABBAABBAA
   AABBAABBAABBAA