

1806ICT Programming Fundamentals

Workshop Week 3: Selections & Iterations

Please complete these exercises before your workshop.

1. Given the user input of a point (x, y) and a rectangle (x, y, w, h), display whether the point is inside the rectangle.
2. Given the user input of a point (x, y) and a circle (x, y, r), display whether the point is inside the circle.
3. Write a program to generate and display a table of n and n^2 , for integer values of n ranging from 1 to 10.

n	n^2
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100

4. The factorial of an integer n , written as $n!$, is the product of the consecutive integers 1 through n . For example, 5 factorial is calculated as

$$5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$$

Write a program to generate and print a table of the first 10 factorials.

n	$n!$
1	1
2	2
3	6
4	24
5	120

6	720
7	5040
8	40320
9	362880
10	3628800

5. Given a user input of a positive integer number, write a program that computes the sum of the digits of the given integer.

Sample run:

Input	Output
2155	13
12345	15

6. Write a program that takes an integer and displays each digit of the integer in English.

Sample run:

Input	Output
0	zero
732	seven three two
-921	negative nine two one

7. Given an input consisting of a set of integer numbers, write a program that prints out the largest number. Your program must check for valid input.

Sample run:

Input	Output
11 25 43	43
-2 -5 -10	-2
0	0
	No valid numbers were input
Apple	No valid numbers were input

8. Modify the program in Q5 to print out the two largest numbers in the set of integer numbers input into the program.

Sample run:

Input	Output
11 25 43	Largest number = 43 Second largest number = 25
-2 -10 -5	Largest number = -2 Second largest number = -5
0	Largest number = 0 No second largest number
2 4 2 4 1	Largest number = 4 Second largest number = 2
1 2 2 2 2	Largest number = 2 Second largest number = 1

9. Given inputs of three integers, sort them in ascending order.

Sample run:

Input	Output
1 2 3	1 2 3
3 5 1	1 3 5

10. Given an integer number x and a value n , write a program that prints an output that is made up of the first n digits of the number x , followed by the first $n-1$ digits of the number x , and so on. Your program must check that the value n is smaller than the number of digits in the number x .

Sample run:

Input	Output
12345 3	123121
12345678 5	123451234123121
5 1	5
0 1	0
1234 9	You must enter a number that has more digits than n

11. A palindrome is a number or a text phrase that reads the same backwards as well as forwards. Examples of palindromes are 123321, 1234321, 55555, 22, 454, 1, 0. Write a program that reads in a positive integer number, and prints out whether or not that number is a palindrome.
12. Write a program that converts a binary number to its decimal equivalent. (Conversion between binary \leftrightarrow decimal numbers will be taught in 1007ICT/1807ICT Week 2 lecture)

Sample run:

Input	Output
10010	18
110	6
0	0
1	1

13. The value for the mathematical constant π can be calculated from the infinite series

$$\pi = 4 - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11} + \dots$$

A rough approximation of the π value is 3.14. Write a program to determine how many terms of the infinite series is required before you first get 3.14. Use a tolerance value of 0.001.

Sample run:

Input	Output
3.14	386