

CS-150 Concepts of Computer Science Worksheets

The worksheets are designed to help you practice the materials covered in the lectures and labs. You do not need to submit them or get them graded, they are purely for you to be able to see how you are doing as the module progresses. No marks are awarded and they do not contribute to your module grade, however being able to identify areas in which you may benefit from a little extra revision will hopefully help you to understand the content.

I will release the solutions 2 weeks after the release of each worksheet for you to check your answers and working.

CS-150 Worksheet 1

Release date: 08/10/2019

This lab is about getting familiar with base conversions and binary arithmetic. Complete each of the follow tasks, remembering to provide your working.

□ Task 1.1

This task is about conversion of decimal (base 10) to base x .

1. Convert the following to binary:
 - $12 = 1110$ in base 2
 - $9002 = 10001100101010$ in base 2
2. Convert the following to octal:
 - $341 = 525$ in base 8
 - $55 = 67$ in base 8
3. Convert the following to hexadecimal:
 - $150 = 96$ in base 16
 - $2019 = 7E3$ in base 16

□ Task 1.2

This task is about conversion of base x into decimal.

1. Convert the following from binary:
 - $1101110110 = 886$ in base 10
 - $100101 = 37$ in base 10
2. Convert the following from octal:
 - $47231 = 20121$ in base 10
 - $1013 = 523$ in base 10
3. Convert the following from hexadecimal:
 - $AB23 = 43811$ in base 10
 - $39F = 927$ in base 10

Please turn over

□ Task 1.3

This task is about addition and subtraction in binary.

1. Calculate the following additions (no limit of word size):

- $101010 + 11010 = \mathbf{1000100}$

- $11101101 + 1111011 = \mathbf{101101000}$

2. Calculate the following subtractions using 8-bit Two's Complement (remember $A-B = A+(-B)$ rule):

- $01111011 - 00001100 = \mathbf{01111011 + 11110100 = 01101111}$

- $00110101 - 00101010 = \mathbf{00110101 + 11010110 = 00001011}$

- $10011101 - 11110111 = \mathbf{10011101 + 00001001 = 10100110}$

□ Challenge Task 1.4

Write a program, in either Java or Python, which implements the base conversion algorithm for integers via the repeated division method given in the lectures. Try extending this to allow for the conversion of a real number. You might want to make use of the **division** and **modulo** operators.