



Exercise Sheet 01

Published: [October 29, 2024](#)

Due: [November 05, 2024](#)

Total points: 15

Please upload your solutions to WueCampus as a scanned document (image format or pdf), a typesetted PDF document, and/or as a jupyter notebook.

1. Number Systems

Decimal:

- Digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
- Base: 10
- Example: $42 = 4 \cdot 10^1 + 2 \cdot 10^0$

Binary:

- Digits: 0, 1
- Base: 2
- Example: $42 = 1 \cdot 2^5 + 0 \cdot 2^4 + 1 \cdot 2^3 + 0 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0 = 0b101010$

Hexadecimal:

- Digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F
- Base: 16
- Example: $42 = 2 \cdot 16^1 + A \cdot 16^0 = 0x2A$

(a) Convert the given decimal numbers into their binary and hexadecimal equivalents.

- (i) 85
- (ii) 142
- (iii) 511

3P

(b) Convert the given binary numbers into their decimal and hexadecimal equivalents.

- (i) 1101
- (ii) 10101101
- (iii) 101010011101

3P

(c) Convert the following hexadecimal numbers into their binary and decimal equivalents.

- (i) 0x6F
- (ii) 0xAE
- (iii) 0x13C

3P



2. Binary Adder

Calculate the sum of the following values by first converting them to binary, adding the binary values, and then converting the result back to decimal

(a) $251 + 328$

1P

(b) $317 + 563$

1P

3. Logic Operators

(a) Give the truthtable for the formula

2P

$$(X \text{ AND } Y) \text{ OR } (\neg Z)$$

The truthtable should look like this:

X	Y	Z	X AND Y	$\neg Z$	(X AND Y) OR ($\neg Z$)
0	0	0			
0	0	1			
...	...	...			

(b) Use truthtables to show that the following formulas are equivalent :

2P

- $\neg (X \text{ AND } Y)$
- $\neg X \text{ OR } \neg Y$