Tutorial 2
Number Bases

Exercise 1

1. Convert the following numbers into their base-10 representations:
   (1) 462_7 (3) 11101101_2 (5) 377_8 (7) $12AD_{16}$
   (2) $4BA_{12}$ (4) 1022_3 (6) BAC_{16}

2. Convert the following base-10 numbers into the specified base. You should use the successive division method.
   (1) 275 → base 2 (3) 687 → base 16 (5) 4,321 → base 8
   (2) 564 → base 2 (4) 3,201 → base 16

Exercise 2

Quick conversion into a base-2^n representation:
   (1) $AC7E_{16}$ → base 2
   (2) BCD_{16} → base 2
   (3) 1234_{16} → base 2
   (4) 5567_8 → base 2
   (5) $ABCD_{16}$ → base 8
   (6) 2074_8 → base 16
   (7) 1111100100101010_2 → base 16
   (8) 1110101100101010_2 → base 8

Exercise 3

1. Work out the value of the base (b) so that the following identities are true:
   (1) $132_b = 30_{10}$ (2) $2A_{16} = 36_b$ (3) $22_b \times 21_b = 502_b$

2. Work out the smallest values of the bases (a and b) so that the following identities are true:
   (1) $101_a = 401_b$ (2) $501_a = 50001_b$ (3) $12_a = 1002_b$

Exercise 4

1. How can an even number be identified in an even base?
2. How can an even number be identified in an odd base?

Exercise 5

1. Convert the following numbers into their base-10 representations:
   (1) 1101.011_2 (2) 123.42_8 (3) $BAC.028_{16}$

2. Convert the following numbers into the specified base:
   (1) 164.76_{10} → base 8 (3 digits after the point)
   (2) 24.42_{10} → base 2 (7 digits after the point; why 7 digits?)
   (3) 69.23_{10} → base 16 (3 digits after the point)
   (4) 11011000111.010011011_2 → base 16
   (5) 1011110100.1111011_2 → base 8