1) Express the following base-2 numbers in decimal:

a) 0000 0000 0000 0000 0000 0000 0000 1011

b) 0000 0001 0000 1011

2) Express the following decimal numbers in 16-bit binary (note that 1024 = 2^10)

a) 1025

b) 10240

3) Express the following base-2 numbers in hex?

a) 0001 0010 0000 0000 1000 1100 0000 1011

b) 0000 0001 1111 1011

| **index** | 31 30 | | | | | 11 10 9 8 | 7654 | 3210 |
|---|---|---|---|---|---|---|---|---|
| **digits** | 0 0 0 0 | 0000 | 0000 | 0000 | 0000 | 0 0 0 0 | 0000 | 1011 |

1)

a) $(1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (1 \times 2^0)$
= (1 x 8) + (0 x 4) + (1 x 2) + (1 x 1)
= 8 + 0 + 2 + 1
= 11

b) 16-bit representation (indices go from 15 to 0):

| **index** | 15 14 13 12 | 11 10 9 8 | 7654 | 3210 |
|---|---|---|---|---|
| **digits** | 0 0 0 0 | 0 0 0 1 | 0000 | 1011 |

$(1 \times 2^8) + (1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (1 \times 2^0)$=
(1 x 256) + (1 x 8) + (0 x 4) + (1 x 2) + (1 x 1) = 256 + 11 = 267

2) $1025 = 1 + 1024 = (1 \times 2^0) + 1 \times 2^{10}$

| **index** | 15 14 13 12 | 11 10 9 8 | 7654 | 3210 |
|---|---|---|---|---|
| **digits** | 0 0 0 0 | 0 1 0 0 | 0000 | 0001 |

0000 0100 0000 0001