# Week 1 Tutorial & Practical

## Intro to Computer Systems

1. 15

240

3840

61440

983040

15728640

Total: FF FFFF / 16777215

1. D
2. 107/2 = 1

53/2 = 1

26/2 = 0

13/2 = 1

6/2 = 0

3/2 = 1

½ = 1

BINARY

Result 107 in base 10 = 1101011

OCTAL

1 101 011 = 1 5 3 in base 8

HEXADECIMAL

110 1011 = 6 B in base 16

1. OCTAL

11 111 011 110 = 3 7 3 6 in base 8

DECIMAL

1 + 2 \* 0 = 1

1 + 2 \* 1 = 3

1 + 2 \* 3 = 7

1 + 2 \* 7 = 15

1 + 2 \* 15 = 31

0 + 2 \* 31 = 62

1 + 2 \* 62 = 125

1 + 2 \* 125 = 251

1 + 2 \* 251 = 503

1 + 2 \* 503 = 1007

0 + 2 \* 1007 = 2014

210 29 28 27 26 25 24 23 22 21 20

1024 512 256 128 64 32 16 8 4 2 1

1 1 1 1 1 0 1 1 1 1 0

1024 + 512 + 256 + 128 + 64 + 16 + 8 + 4 + 2 = 2014

Total = 2014

1. 9A9

Into BINARY

1001 1010 1001

Into DECIMAL

211 210 29 28 27 26 25 24 23 22 21 20

2048 1024 512 256 128 64 32 16 8 4 2 1

1 0 0 1 1 0 1 0 1 0 0 1

2048 + 256 + 128 + 32 + 8 + 1 =

Total = 2473

9 \* 162 + 10 \* 16 + 9 \* 1

2304 + 160 + 9

Total = 2473

DEAD

Into DECIMAL

13 \* 163 + 14 \* 162 + 10 \* 16 + 13 \* 1

53248 + 3584 + 160 + 13

Total = 57005

**QUESTION 1**

1. 117

BINARY

117/2 = 1

58/2 = 0

29/2 = 1

14/2 = 0

7/2 = 1

3/2 = 1

½ = 1

Result = 111 0101

HEXADECIMAL

0111 0101

7 5

Result = 75

1. 127

BINARY

127/2 = 1

63/2 = 1

31/2 = 1

15/2 = 1

7/2 = 1

3/2 = 1

½ = 1

Result = 111 1111

HEXADECIMAL

0111 1111

7 F

Result = 7F

1. 128

BINARY

128/2 = 0

64/2 = 0

32/2 = 0

16/2 = 0

8/2 = 0

4/2 = 0

2/2 = 0

½ = 1

Result = 1000 0000

HEXADECIMAL

1000 0000

8 0

Result = 80

1. 255

BINARY

255/2 = 1

127/2 = 1

63/2 = 1

31/2 = 1

15/2 = 1

7/2 = 1

3/2 = 1

½ = 1

Result = 1111 1111

HEXADECIMAL

1111 1111

F F

Result = FF

**QUESTION 2**

1. 1101 base 2

1 + 2 \* 0 = 1

1 + 2 \* 1 = 3

0 + 2 \* 3 = 6

1 + 2 \* 6 = 13

Total = 13

1. 7014 base 8

7 \* 83  + 0 \* 82 + 1 \* 81 + 4 \* 80

7 \* 512 + 0 \* 64 + 1 \* 8 + 4 \* 1

3584 + 0 + 8 + 4

Total = 3596

OR

CONVERT TO BINARY (EASIER WITHOUT CALCULATOR)

7 0 1 4

111 000 001 100

BINARY = 1110 0000 1100

1 + 2 \* 0 = 1

1 + 2 \* 1 = 3

1 + 2 \* 3 = 7

0 + 2 \* 7 = 14

0 + 2 \* 14 = 28

0 + 2 \* 28 = 56

0 + 2 \* 56 = 112

0 + 2 \* 112 = 224

1 + 2 \* 224 = 449

1 + 2 \* 449 = 899

0 + 2 \* 899 = 1798

0 + 2 \* 1798 = 3596

Total = 3596

1. 7DE base 16

Into BINARY first (no calculator)

7 D E

0111 1101 1110

BINARY to DECIMAL

0 + 2 \* 0 = 0

1 + 2 \* 0 = 1

1 + 2 \* 1 = 3

1 + 2 \* 3 = 7

1 + 2 \* 7 = 15

1 + 2 \* 15 = 31

0 + 2 \* 31 = 62

1 + 2 \* 62 = 125

1 + 2 \* 125 = 251

1 + 2 \* 251 = 503

1 + 2 \* 503 = 1007

0 + 2 \* 1007 = 2014

Total = 2014

**QUESTION 3**

1. 111 001 010 111 011 111 111

7 1 2 7 3 7 7

Result: 7127377

1. 1010 1001 0101 1111 1000

A 9 5 F 8

Result: A95F8

1. 6 7 1

0110 111 001

Result: 0001 1011 1001

1. D E A D F A C E

1101 1110 1010 1101 1111 1010 1100 1110

Result: 1101 1110 1010 1101 1111 1010 1100 1110

**Question 4**

1. 217/7 0

31/7 3

4/7 4

Result: 4307

1. 1101

1 + 2 \* 0 = 1

1 + 2 \* 1 = 3

0 + 2 \* 3 = 6

1 + 2 \* 6 = 13

13/5 3

2/5 2

Result: 235  //Remember read upwards not downwards

1. 7014

CONVERT TO BINARY (EASIER WITHOUT CALCULATOR)

7 0 1 4

111 000 001 100

BINARY = 1110 0000 1100

1 + 2 \* 0 = 1

1 + 2 \* 1 = 3

1 + 2 \* 3 = 7

0 + 2 \* 7 = 14

0 + 2 \* 14 = 28

0 + 2 \* 28 = 56

0 + 2 \* 56 = 112

0 + 2 \* 112 = 224

1 + 2 \* 224 = 449

1 + 2 \* 449 = 899

0 + 2 \* 899 = 1798

0 + 2 \* 1798 = 3596

Total = 359610 (DECIMAL)

3596/9 5

399/9 3

44/9 8

4/9 4

Result: 48359

1. 7DE16

Into BINARY first (no calculator)

7 D E

0111 1101 1110

BINARY to DECIMAL

0 + 2 \* 0 = 0

1 + 2 \* 0 = 1

1 + 2 \* 1 = 3

1 + 2 \* 3 = 7

1 + 2 \* 7 = 15

1 + 2 \* 15 = 31

0 + 2 \* 31 = 62

1 + 2 \* 62 = 125

1 + 2 \* 125 = 251

1 + 2 \* 251 = 503

1 + 2 \* 503 = 1007

0 + 2 \* 1007 = 2014

Total = 201410

2014/6 4

335/6 5

55/6 1

9/6 3

1/6 1

Result: 131546

**Question 5**

1. 0111 1111

DECIMAL

0 + 2 \* 0 = 0

1 + 2 \* 0 = 1

1 + 2 \* 1 = 3

1 + 2 \* 3 = 7

1 + 2 \* 7 = 15

1 + 2 \* 15 = 31

1 + 2 \* 31 = 63

1 + 2 \* 63 = 127

Result: 12710

OCTAL

001 111 111

1 7 7

Result: 1778

HEXADECIMAL

0111 1111

7 F

Result: 7F16

1. 1000 0000

DECIMAL

1 + 2 \* 0 = 1

0 + 2 \* 1 = 2

0 + 2 \* 2 = 4

0 + 2 \* 4 = 8

0 + 2 \* 8 = 16

0 + 2 \* 16 = 32

0 + 2 \* 32 = 64

0 + 2 \* 64 = 128

Result: 12810

OCTAL

010 000 000

2 0 0

Result: 2008

HEXADECIMAL

1000 0000

8 0

Result: 8016

1. 1111 1111

DECIMAL

1 + 2 \* 0 = 1

1 + 2 \* 1 = 3

1 + 2 \* 3 = 7

1 + 2 \* 7 = 15

1 + 2 \* 15 = 31

1 + 2 \* 31 = 63

1 + 2 \* 63 = 127

1 + 2 \* 127 = 255

Result: 25510

OCTAL

011 111 111

3 7 7

Result: 3778

HEXADECIMAL

1111 1111

F F

Result: FF16

**Question 6**

1. 4 bits

1111

1 + 2 \* 0 = 1

1 + 2 \* 1 = 3

1 + 2 \* 3 = 7

1 + 2 \* 7 = 15

Result: 1510

1. 8 bits

1111 1111

1 + 2 \* 0 = 1

1 + 2 \* 1 = 3

1 + 2 \* 3 = 7

1 + 2 \* 7 = 15

1 + 2 \* 15 = 31

1 + 2 \* 31 = 63

1 + 2 \* 63 = 127

1 + 2 \* 127 = 255

Result: 25510

1. 16 bits

1111 1111 1111 1111

1 + 2 \* 0 = 1

1 + 2 \* 1 = 3

1 + 2 \* 3 = 7

1 + 2 \* 7 = 15

1 + 2 \* 15 = 31

1 + 2 \* 31 = 63

1 + 2 \* 63 = 127

1 + 2 \* 127 = 255

1 + 2 \* 255 = 511

1 + 2 \* 511 = 1023

1 + 2 \* 1023 = 2047

1 + 2 \* 2047 = 4095

1 + 2 \* 4095 = 8191

1 + 2 \* 8191 = 16383

1 + 2 \* 16383 = 32767

1 + 2 \* 32767 = 65535

Result: 6553510

**Question 7**

1. 2910

BINARY

29/2 1

14/2 0

7/2 1

3/2 1

½ 1

Result: 11101 // Remember to read upwards not downwards

HEXADECIMAL

0001 1101

1. D

Result: 1D16

1. 28

BINARY

28/2 0

14/2 0

7/2 1

3/2 1

½ 1

Result: 11100

HEXADECIMAL

0001 1100

1. C

Result: 1C16

28 + 29 = 57

BINARY

57/2 1

28/2 0

14/2 0

7/2 1

3/2 1

½ 1

Result: 111001

HEXADECIMAL

0011 1001

3 9

Result: 3916

1. No, as the carry would be ignored.

**Question 8**