

1. Number Systems (Unsigned Integers)

Numbering Systems (Unsigned integers)

1. integer to binary, binary to octal and binary to hex

a) 42

2 | 42

2 | 21 - 0

2 | 10 - 1

2 | 5 - 0

2 | 2 - 1

2 | 1 - 0

0 - 1

= (42) = (101010)₂

binary to octal = 101010 = 52₈

binary to hex = 101010 = 2A₁₆

b) 195

2 | 195

2 | 97 - 1

2 | 48 - 0

2 | 24 - 0

2 | 12 - 0

2 | 6 - 0

2 | 3 - 0

2 | 1 - 1

0 - 1

= 195 = (11000011)₂

binary to octal = 11000011 = 303₈

binary to hex = 11000011 = C3₁₆

c) 19809

2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

19809 -

16384

3425 -

2048

1377 -

1024

353 -

256

97 -

64

33 -

32

1 -

1

0

Integer to binary

$$= 100110101100001$$

binary to octal (010101) = (5A) =

$$= \underline{100} \underline{110} \underline{101} \underline{100001}$$

$$= 46541$$

$$= (46541)_8$$

binary to hex

$$= 100110101100001$$

$$= \underline{0100} \underline{1101} \underline{0110} \underline{0001}$$

$$= 4D61$$

$$= (4D61)_{16}$$

d) 29291 =

29291 -

16384

12907 -

8192

4715 -

4096

619 -

512

1071 - 0

$$(11064011) = 3P1 =$$

43 -

32

11 -

8

3 -

2

1 = 0

$$\begin{aligned}
 &= 111\ 001\ 001\ 101\ 011 && -26D && 26D\ (1) \\
 &\text{binary to octal.} && \underline{512} && \\
 &= \underbrace{111}_1 \underbrace{001}_2 \underbrace{001}_3 \underbrace{101}_4 \underbrace{011}_5 && -811 && \\
 &\quad + 000110001 && 10 && \\
 &\quad - 100 && -PA && \\
 &= 71530011001 = && 58 && \\
 &2^{10} = (7153)111001000000 = && -f1 && \\
 &\quad + 0111000110111111 = && 01 && \\
 &\quad -1 && && \\
 &\text{binary to hex.} && 1 && \\
 &= 111\ 001\ 001\ 101\ 011\ 111 && 0 && \\
 &= \underbrace{011}_1 \underbrace{001}_2 \underbrace{001}_3 \underbrace{101}_4 \underbrace{011}_5 \underbrace{111}_6 && && \\
 &\quad \text{PG1 - (b)} && && \\
 &= 7\ 2\ 6\ D && -PG1 && \\
 &= (726D) && 881 && \\
 &\quad 4 && -1 &&
 \end{aligned}$$

2. More Number Conversion!

$$\begin{aligned}
 &2. \text{ float number conversion.} && 1 && \\
 &A2 = 101010 \dots 6 \text{ bits.} && 0 && \\
 &-A2 = 00101010 \dots 8 \text{ bits.} \cdot 2^{10} = 10000001 \text{ - PG1} && && \\
 &\quad = 11010101 + && + 01111110 = PG1 - && \\
 &\quad \quad \quad 1 && 1 && \\
 &\quad \quad \quad 11010110 \leftarrow \text{negative binary. } 11111110 && && \\
 &b) 19809 = 10011010100001 \dots 15 \text{ bits.} && && \\
 &-19809 = 010011010100001 \dots 16 \text{ bits.} && && \\
 &\quad = 1011001010011110 + && && \\
 &\quad \quad \quad 1 && && \\
 &\quad \quad \quad 1011001010011110 && &&
 \end{aligned}$$

625 -

Info of person

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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$$= 100110001 = 10 \text{ bits.}$$

= 0000001001110001 = 16 bits

1100010100100110

129-

a d e f =

$$24d2 - 010101 = 5A$$
$$129 = 10000001 = 8 \text{ bits}$$
$$-129 = 01111101$$

1

0111111 → and get 00110011

3. Real Number Conversion

Question 3

Question 3 Convert real number to binary.

(1) 72.8125

128	64	32	16	8	4	2	1
0	1	0	0	1	0	0	0

0.5 0.25 0.125 0.0625

$$\begin{array}{r} 72.8125 \\ 64.0000 \\ \hline 8.8125 \\ 8.0000 \\ \hline 0.8125 \end{array}$$
$$\begin{array}{r} 0.8125 - \\ 0.5 \\ \hline 0.3125 \\ 0.25 \\ \hline 0.0625 \end{array}$$

Answer: 01001000.1101 \leftarrow (Ans)

b) 6.7182 convert to binary.

	0.5^1	0.5^2	0.5^3	0.5^4	0.5^5	0.5^6
4 2 1	0.5	0.25	0.125	0.0625	0.03125	0.015625
1 1 0	1	0	1	1	0	0
	0.5^7	0.5^8	0.5^9			
	0.0078125	0.00390625	0.001953125			
	1	1	1			
	0.5^{10}	0.5^{11}	0.5^{12}			
	0.0004765625	0.00023828125	0.000119140625			
	0	0	0			

Ans: 110.101100111000...

\therefore According to the lecture, when we have reach to 12 decimal place and still do not have a finished answer. Thus, we assume that the value 6.7182 is an ~~irrational~~ irrational number.

4. Octal

Question 4.

convert the following octal numbers to binary and hexadecimal.

(a) 456271

4	5	6	2	7	1
100	101	110	010	111	001

Binary = (100101110010111001)₂ ← (Ans)

hexa decimal = 001001011001011001

8421	8421	8421	8421
0010	0101	1001	0110
0	1	0	1

(2n/4) → 1011 0001 0010 1001

= 2 5 C B 9

= (25CB9)₁₆ ← (Ans)

⑥ 36251

$$\begin{array}{ccccccc}
 & 3 & 6 & 2 & 5 & 1 & \\
 011 & 110 & 010 & 101 & 001 & & \\
 \hline
 = (011100101001)_2 \leftarrow \text{(Ans)}
 \end{array}$$

Hex $\begin{array}{cccc} 8 & 4 & 2 & 1 \end{array} \begin{array}{cccc} 8 & 4 & 2 & 1 \end{array}$

$$= 0011100101001$$

A = 10

B = 11

C = 12 = 3 E A 9

$$= (3CA9)_{16} \leftarrow \text{(Ans)}$$

(Ans) \rightarrow (227F) =

① 77554

octal to binary.

7 7 5 5 4
111 111 101 101 100

Binary = $(111\ 111\ 101\ 101\ 100)_2 \leftarrow \text{(Ans)}$

Hexa-decimal

8 4 2 1 8 4 2 1 8 4 2 1 8 4 2 1
0 1 1 1 1 1 1 1 0 1 1 0 1 0 0 0

A=10 = 7 ' F 6 $\leftarrow \text{(Ans)}$
B=11
C=12
D=13
E=14
F=15

5. Hexadecimal

Question 5

Convert binary to octal
hex to binary

14D

1

004

1101

D

15+2

C=12

0101

D=13

8+2
0001

8+2
0100

8+2
1101

Binary = (0001 0100 1101)₂ ← (Ans)

Binary to octal

4 2 1 4 2 1 4 2 1 4 2
0001 0100 1101

[] [] [] []

5 1 5

= (515)₈ ← (Ans)

(b) A B C

Hex to binary

A

B

C

A = 10

B = 11

C = 12

8+2+1

1010

8+2+1

1011

8+2+1

1100

Binary = (101010111100)₂ ← (Ans)

Binary to octal

8+2+1 8+2+1 8+2+1 8+2+1
101 010 111 100

= 5 2 7 4

= (5274)₈ ← (Ans)

987

②

9

8

7

8421

8421

8421

1001

1000

0111

Binary = $(100110000111)_2 \leftarrow$

Binary to octal

= $\begin{array}{cccc} 4^3 & 1 & 1^2 & 1 & 4^2 & 1 & 1^2 & 1 \\ 1 & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 1 & 1 & 1 \end{array}$

= 4 6 0 7

= $(4607)_8 \leftarrow \text{(Ans)}$