1, convert the following binary numbers to decimal equivalents:

A, 001100
B, 000011
C, 011100
D, 111100
E, 111111

Answer

For the binary representation of $y = \{...b_2 b_1 b_0 . b_{-1} b_{-2} b_{-3} ...\}$, the value of Y is

$$y = \sum_i b_i \times 2^i$$

A, 001100 = $0\times 2^5 + 0\times 2^4 + 1\times 2^3 + 1\times 2^2 + 0\times 2^1 + 0\times 2^0 = 8 + 4 = 12$

B, 000011 = $0\times 2^5 + 0\times 2^4 + 0\times 2^3 + 0\times 2^2 + 1\times 2^1 + 1\times 2^0 = 2 + 1 = 3$

C, 011100 = $0\times 2^5 + 1\times 2^4 + 1\times 2^3 + 1\times 2^2 + 0\times 2^1 + 0\times 2^0 = 16 + 8 + 4 = 28$

D, 111100 = $1\times 2^5 + 1\times 2^4 + 1\times 2^3 + 1\times 2^2 + 0\times 2^1 + 0\times 2^0 = 32 + 16 + 8 = 60$

E, 111111 = $1\times 2^5 + 1\times 2^4 + 1\times 2^3 + 1\times 2^2 + 1\times 2^1 + 1\times 2^0 = 32 + 16 + 8 + 4 + 2 + 1 = 63$

2, Convert the following binary numbers to their decimal equivalents:

A, 11100.001
B, 110011.10011
C, 101010101010.1

Answer

For the binary representation of $y = \{...b_2 b_1 b_0 . b_{-1} b_{-2} b_{-3} ...\}$, the value of Y is

$$y = \sum_i b_i \times 2^i$$

A, 11100.001=

$$1\times 2^4 + 1\times 2^3 + 1\times 2^2 + 0\times 2^1 + 0\times 2^0 + 0\times 2^{-1} + 0\times 2^{-2} + 1\times 2^{-3} = 28 + 0.125 = 28.125$$

B, 110011.10011=

$$1\times 2^5 + 1\times 2^4 + 0\times 2^3 + 0\times 2^2 + 1\times 2^1 + 1\times 2^0 + 1\times 2^{-1} + 0\times 2^{-2} + 0\times 2^{-3} + 1\times 2^{-4} + 1\times 2^{-5}$$
$$= 51 + 0.5 + 0.0625 + 0.03125 = 51.59375$$

C, 101010101010.1=

$$1\times 2^{11} + 1\times 2^9 + 1\times 2^7 + 1\times 2^5 + 1\times 2^3 + 1\times 2^1 + 1\times 2^{-1}$$
$$= 2048 + 512 + 128 + 32 + 8 + 2 + 0.5 = 2730.5$$

3, Convert the following decimal numbers to their binary equivalents

A, 64
B, 128
C, 256
D, 100
E, 111
F, 145
G, 255

Answer

A,	**Quotient**	**Remainder**
64/2	32	0
32/2	16	0
16/2	8	0
8/2	4	0
4/2	2	0
2/2	1	0
1/2	0	1

$64_{10} = 1000000_2$

B, $128_{10} = 10000000_2$

C, $256_{10} = 100000000_2$

D,	**Quotient**	**Remainder**
100/2	50	0
50/2	25	0
25/2	12	1
12/2	6	0
6/2	3	0
3/2	1	1
1/2	0	1

$100_{10} = 1100100_2$

E,	**Quotient**	**Remainder**
111/2	55	1
55/2	27	1
27/2	13	1
13/2	6	1
6/2	3	0
3/2	1	1
1/2	0	1

$111_{10} = 1101111_2$

F, $45_{10} = 10010001_2$

G, 255	Quotient	Remainder
255/2	127	1
127/2	63	1
63/2	31	1
31/2	15	1
15/2	7	1
7/2	3	1
3/2	1	1
1/2	0	1

$255_{10} = 11111111_2$

4, Convert the following decimal numbers to their binary equivalents

A, 34.75
B, 25.25
C, 27.1875

A, 34.75

the integer part (34) convert to binary format

	Quotient	Remainder
34/2	17	0
17/2	8	1
8/2	4	0
4/2	2	0
2/2	1	0
1/2	0	1

$34_{10} = 100010_2$

the fraction part (0.75) covert to binary format

	product	integer part
0.75x2	1.5	1
0.5x2	1.0	1

$0.75_{10} = 0.11_2$

$34.75_{10} = 100010.11_2$

B, 25.25

the integer part is 25, convert to binary format

	Quotient	Remainder
25/2	12	1
12/2	6	0
6/2	3	0
3/2	1	1
1/2	0	1

$25_{10} = 11001_2$

the fraction part is 0.25, convert to binary format

	product	integer part
0.25x2	0.5	0
0.5x2	1.0	1 => 0.01

$0.25_{10} = 0.01_2$

$25.25_{10} = 11001.01_2$

C, 27.1875

the integer part is 27, convert to binary format

	Quotient	Remainder
27/2	13	1
13/2	6	1
6/2	3	0
3/2	1	1
1/2	0	1

$27_{10} = 11011_2$

the fraction part is 0.1875, convert to binary format

	product	integer part
0.1875x2	0.375	0
0.375x2	0.75	0
0.75x2	1.5	1
0.5x2	1.0	1

$0.1875_{10} = 0.0011_2$

$27.1875_{10} = 11011.0011_2$

5, Convert the following hexadecimal number to their decimal equivalents

a, C
b, 9F
c, B52
d, F117
e, ABCD
f, 1111.1
g, 888.8
h, EBA.C

Answer

For the hexadecimal representation of $y = \{...x_2 x_1 x_0 . x_{-1} x_{-2} x_{-3} ...\}$, the value of Y is

$$y = \sum_i x_i \times 16^i$$

a, C = $12 \times 16^0 = 12$

b, 9F= $9 \times 16^1 + 15 \times 16^0 = 159$

c, B52 = $11 \times 16^2 + 5 \times 16^1 + 2 \times 16^0 = 2898$

d, F117 = $15 \times 16^3 + 1 \times 16^2 + 1 \times 16^1 + 7 \times 16^0 = 61719$

e, ABCD = $10 \times 16^3 + 11 \times 16^2 + 12 \times 16^1 + 13 \times 16^0 = 43981$

f, 1111.1 = $1 \times 16^3 + 1 \times 16^2 + 1 \times 16^1 + 1 \times 16^0 + 1 \times 16^{-1} = 4369.0625$

g, 888.8 = $8 \times 16^2 + 8 \times 16^1 + 8 \times 16^0 + 8 \times 16^{-1} = 2184.5$

h, EBA.C $14 \times 16^2 + 11 \times 16^1 + 10 \times 16^0 + 12 \times 16^{-1} = 3770.75$

6, Convert the following decimal numbers to their hexadecimal equivalents

a, 80

	Quotient	Remainder
80/16	5	0
5/16	0	5

$80_{10} = 50_{16}$

b, 2560

	Quotient	Remainder
2560/16	160	0
160/16	10	0
10/16	0	10

$2560_{10} = A00_{16}$

c, 65536

	Quotient	Remainder
65536/16	4096	0
4096/16	256	0
256/16	16	0
16/16	1	0
1/16	0	1

$65536_{10} = 10000_{16}$

d, 204.125

the integer part 204, convert to hexadecimal format

	Quotient	Remainder
204/16	12	12
12/16	0	12

$204_{10} = CC_{16}$

the fraction part 0.125, convert to hexadecimal format

	product	integer part
0.125x16	2.0	2

$0.125_{10} = 0.2_{16}$

$204.125_{10} = CC.2_{16}$

e, 631.25

the integer part 631, convert to hexadecimal format

	Quotient	Remainder
631/16	39	7
39/16	2	7
2/16	0	2

$$631_{10} = 277_{16}$$

the fraction part 0.25, convert to hexadecimal format

	product	integer part
0.25x16	4.0	4

$$0.25_{10} = 0.4_{16}$$

$$531.25_{10} = 277.4_{16}$$

f, 100000.00390625

the integer part 100000, convert to hexadecimal format

	Quotient	Remainder
100000/16	6250	0
6250/16	390	10
390/16	24	6
24/16	1	8
1/16	0	1

$$100000_{10} = 186A0_{16}$$

the fraction part is 0.00390625, convert to hexadecimal format

	product	integer part
0.00390625x16	0.0625	0
0.0625x16	1.0	1

$$0.00390625_{10} = 0.01_{16}$$

$$100000.00390625_{10} = 186A0.01_{16}$$