

$$(730)_{10} = (2DA)_{16}$$

express $(2DA)_{16}$ in the binary format.

$(730)_{10}$

$(2DA)_{16}$
3 2 1



Left to right

A $\rightarrow 10 = (1010)_2$

D $\xrightarrow{13} (1101)_2$ 4 bits

2 $\rightarrow (0010)_2$ 4 bits

Double Precision IEEE Representation

1 - hexa

4 \rightarrow Nibble



σ
(-)
(1 bit)

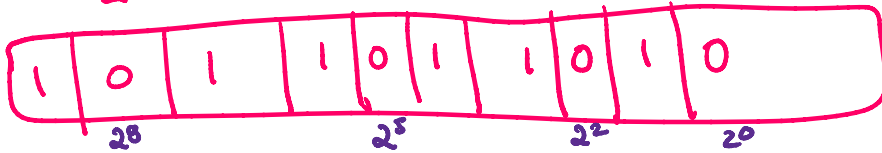
Biased expo in binary
 $e+1023$ (11 bits)

Mantissa excluding 1
(52 bits)

$(730)_{10} \rightarrow$ hexa \rightarrow binary

express $(730)_{10}$ in double precision

$$2^9 + 2^7 + 2^6 + 2^4 + 2^3 + 2^1$$



$e = 8$ places (correction!)

1.011011010
mantissa

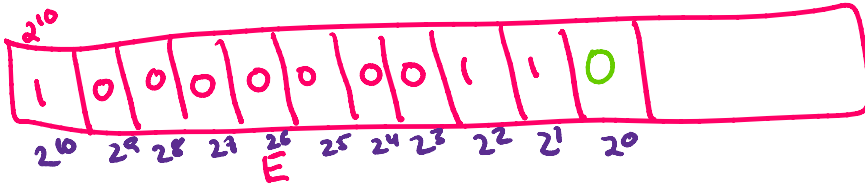
$$E = 1023 + 9 = 1032$$

$$1024 + 4 + 2$$

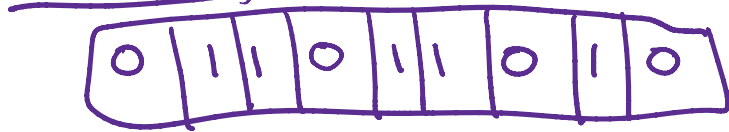
$$E = 1023 + 9 = 1032$$

$$= 1024 + 4 + 2$$

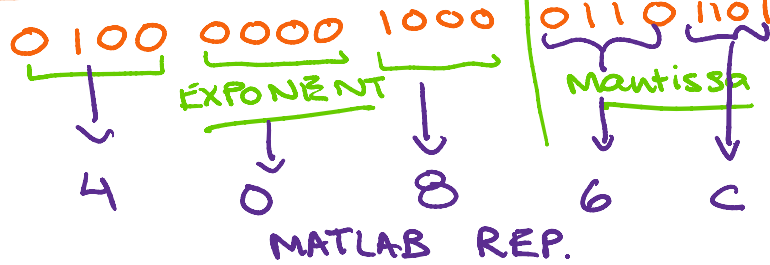
$$= 2^{10} + 2^2 + 2^1$$



mantissa part: 1011011010



Answer:



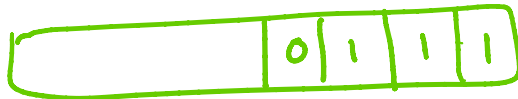
Double Precision representation =

hexa decimal \leftrightarrow binary format representation

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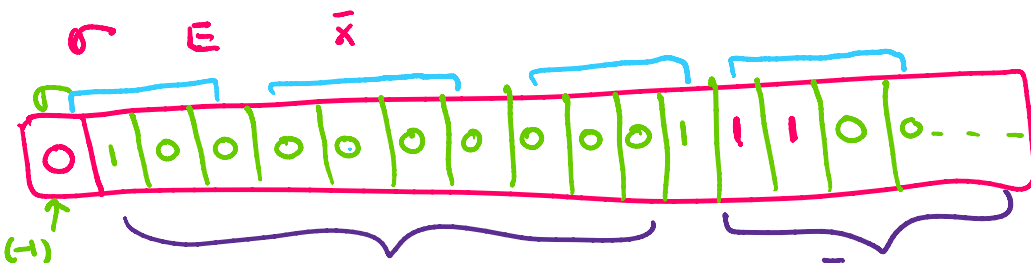
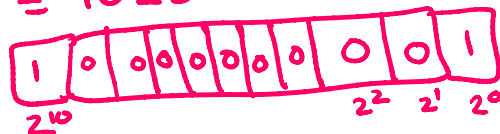
Represent 7 using IEEE double precision format

$$7 \rightarrow 2^2 + 2^1 + 2^0$$



1.11 \rightarrow mantissa
 move 2 places
 $e = 2$

$$E = 1023 + e = 1025 = 2^{10} + 2^0$$



0000	→	7	→	4
0000	→	0	→	0
0001	→	1	→	1
1100	→	12	→	C

401C ↔ hexadecimal representⁿ of 7

$$1023 + 9 = 1032$$

Errors: Mathematically same representation but numerically different.

$$\sqrt{x+1} - \sqrt{x} \quad x = 10^{15}, \dots, 10^{20} \text{ problem!}$$

subtraction of 2 numbers v. close to each other.

another example $x (\sqrt{x+1} - \sqrt{x}) \quad x = 10^{15}, \dots, 10^{20}$

$$\sqrt{x+1} - \sqrt{x} \quad \text{multiply \& divide by conjugate}$$

$$\sqrt{x+1} + \sqrt{x}$$

$$\sqrt{x+1} - \sqrt{x} \quad * \quad \frac{\sqrt{x+1} + \sqrt{x}}{\sqrt{x+1} + \sqrt{x}}$$

$$= \frac{x+1 - x}{\sqrt{x+1} + \sqrt{x}} = \frac{1}{\sqrt{x+1} + \sqrt{x}}$$

test $\frac{1}{\sqrt{x+1} + \sqrt{x}}$

$x = 10^{20}$ on MATLAB.

versus $\sqrt{x+1} - \sqrt{x}$.

versus $\frac{x}{\sqrt{x+1} + \sqrt{x}}$ versus $x (\sqrt{x+1} - \sqrt{x})$

$$\sqrt{x+1} + \sqrt{x}$$