

Deber 1

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Curso: Organización de computadores (2309)

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- Transform the following numbers from one base to another.

Decimal to binary

$$10 \quad \begin{array}{r} 1010 \\ \textcircled{0} \ 5 \text{ } |2 \\ \textcircled{1} \ 2 \text{ } |2 \\ \textcircled{0} \ 1 \text{ } |2 \\ \textcircled{1} \ 0 \end{array} = (1010)_2 //$$

1369

$$1369 \quad \begin{array}{r} 10101011001 \\ 16 \quad 684 \text{ } |2 \\ 10 \quad 08 \quad 342 \text{ } |2 \\ \textcircled{1} \quad 04 \quad 14 \quad 171 \text{ } |2 \\ \textcircled{0} \quad 02 \quad 11 \quad 85 \text{ } |2 \\ \textcircled{0} \quad \textcircled{1} \quad 05 \quad 42 \text{ } |2 \\ \textcircled{1} \quad 02 \quad 21 \text{ } |2 \\ \textcircled{0} \quad 01 \quad 10 \text{ } |2 \\ \textcircled{0} \quad 5 \text{ } |2 \\ \textcircled{1} \quad 2 \text{ } |2 \\ \textcircled{0} \quad 1 \text{ } |2 \\ \textcircled{1} \quad 0 \end{array} = (10101011001)_2 //$$

9.234.876

$$\begin{array}{r} 9.234.876 \text{ } |2 \\ 12 \quad 4617438 \text{ } |2 \\ 03 \quad 06 \quad 2308719 \text{ } |2 \\ 14 \quad 017 \quad 03 \quad 1154359 \text{ } |2 \\ 08 \quad 14 \quad 10 \quad 15 \quad 577179 \text{ } |2 \\ 07 \quad 03 \quad 08 \quad 14 \quad 17 \quad 288589 \\ 16 \quad 18 \quad 07 \quad 03 \quad 17 \\ \textcircled{0} \quad \textcircled{0} \quad 11 \quad 15 \quad 11 \\ 19 \quad 19 \quad 19 \quad 19 \quad 19 \end{array}$$

288589 L2

08 144294 L2

08 04 72147 L2

05 02 12 36073 L2

18 09 014 16 18036 L2

09 14 07 007 003 9018 L2

① ① ① 13 16 10 4509

① ① ① 018

①

4509 L2

05 2254 L2

10 02 1127 L2

09 05 12 563 L2

① 14 07 16 281 L2

① ① 03 08 140 L2

① ① ① ① 70 L2

10 35 L2

① 15 17 L2

① 18 L2

① 4 L2

① 2 L2

① 1 L2

① 0 L2

$= (10001100111010011011100)_2$  //

49263749

49.263749 L2

09 24631874 L2

12 04 10315937 L2

06

03

6157968 L2

03

03

11

015

3078984 L2

17

11

15

17

10

1539492 L2

14

18

19

19

18

13

09

07

13

16

07

19

①

14

17

08

18

14

09

①

①

①

18

04

12

①

①

769746 L2

16 384873 L2

09 18 192436 L2

17 04 12 96218 L2

14 08 04 16 48109 L2

06 07 03 02 08 24054 L2

⑥ 13 16 018 010 04 12027 L2

① ⑥ ⑥ ⑥ ⑥ ⑥ ⑥ 002 6013 L2

⑥ ⑥ ⑥ ⑥ ⑥ ⑥ ⑥ ⑥ ⑥ 007 0013 3006 L2

⑥ ⑥ ⑥ ⑥ ⑥ ⑥ ⑥ ⑥ ⑥ ⑥ 1503

⑥ ⑥ ⑥ ⑥ ⑥ ⑥ ⑥ ⑥ ⑥ ⑥ 006

⑥

1503 L2

10 751 L2

03 15 375 L2

① 11 17 187 L2

① ① 15 07 93 L2

① ① 13 46 L2

① C6 23 L2

⑥ 03 11 L2

① ① 5 L2

① 2 L2

⑥ 1 L2

① 0

$$= (1011101111011010010000101)_2 \quad //$$

Decimal to binary using 2's complement

use the minimum number of bits required to express the number

-20

20 L2

⑥ 10 L2

⑥ 5 L2

① 2 L2

⑥ 1 L2

① 0

$$\begin{array}{r} \text{compl} \\ = 10100 \rightarrow 01011 \\ + \underline{1} \\ (01100)_2 \end{array}$$

$$=(101100)_2 \quad //$$

-1025

$$\begin{array}{r} 1025 \quad |2 \\ 02 \quad 512 \quad |2 \\ 05 \quad 11 \quad 256 \quad |2 \\ \textcircled{1} \quad 12 \quad 05 \quad 128 \quad |2 \\ \textcircled{0} \quad 16 \quad 08 \quad 64 \quad |2 \\ \textcircled{0} \quad \textcircled{0} \quad 04 \quad 32 \quad |2 \\ \textcircled{0} \quad 12 \quad 16 \quad |2 \\ \textcircled{0} \quad \textcircled{0} \quad 8 \quad |2 \\ \textcircled{0} \quad 4 \quad |2 \\ \textcircled{0} \quad 2 \quad |2 \\ \textcircled{0} \quad 1 \quad |2 \\ \textcircled{1} \quad 0 \end{array}$$

$$\begin{aligned} &= 10000000001 \xrightarrow{\text{compl.}} 0111111110 \\ &\quad + \frac{1}{(0111111111)_2} \\ &= (10111111111)_2 // \end{aligned}$$

-3925

$$\begin{array}{r} 3925 \quad |2 \\ 19 \quad 1962 \quad |2 \\ 12 \quad 16 \quad 981 \quad |2 \\ 05 \quad 02 \quad 18 \quad 490 \quad |2 \\ \textcircled{1} \quad \textcircled{0} \quad \textcircled{0} \quad \textcircled{1} \quad 09 \quad 245 \quad |2 \\ \textcircled{1} \quad \textcircled{0} \quad \textcircled{5} \quad 04 \quad 122 \quad |2 \\ \textcircled{0} \quad \textcircled{0} \quad 05 \quad 02 \quad 61 \quad |2 \\ \textcircled{1} \quad \textcircled{0} \quad \textcircled{0} \quad \textcircled{1} \quad 30 \quad |2 \\ \textcircled{1} \quad \textcircled{0} \quad 10 \quad 15 \quad |2 \\ \textcircled{0} \quad \textcircled{1} \quad 7 \quad |2 \\ \textcircled{1} \quad 3 \quad |2 \\ \textcircled{1} \quad 1 \quad |2 \\ \textcircled{1} \quad 0 \end{array}$$
$$\begin{aligned} &= 11110101010101 \xrightarrow{\text{compl.}} 000010101010 \\ &\quad + \frac{1}{(000010101011)_2} \\ &= (1000010101011)_2 // \end{aligned}$$

-104.596

104.596  $\underline{L_2}$

|     |                                    |
|-----|------------------------------------|
| 04  | 52298 $\underline{L_2}$            |
| 05  | 12 26149 $\underline{L_2}$         |
| 19  | 02 06 13074 $\underline{L_2}$      |
| 16  | 09 014 10 6537 $\underline{L_2}$   |
| (0) | 18 09 07 05 3268 $\underline{L_2}$ |
| (0) | 1 14 13 12 1634 $\underline{L_2}$  |
| (0) | 17 06 03 817                       |
| (0) | 08 14                              |
| (0) | 0                                  |

817  $\underline{L_2}$

017 408  $\underline{L_2}$

(1) 008 204  $\underline{L_2}$

(0) 004 102  $\underline{L_2}$

(0) 02 51  $\underline{L_2}$

(0) 11 25  $\underline{L_2}$

(1) 05 12  $\underline{L_2}$

(1) (0) 6  $\underline{L_2}$

(0) 3  $\underline{L_2}$

(1) 1  $\underline{L_2}$

(1) 0

= 11001100010010100  $\xrightarrow{\text{comp}}$  00110011101101011

+  
 (001100111011010100),  
 $= (100110011101101100)_2$

$= (100110011101101100)_2$

Unsigned binary to hex

Use the long and the short methods

1100 1111 0101 0110 0110 1110 1101 1000 0010 1001

\* Short

1100 = C

1111 = F

0101 = 5

0110 = 6

0110 = 6

1110 = E

1101 = D

1000 = 8

0010 = 2

1001 = 9

$= (CF566ED829)_{16}$

\* Long:

Conversion a base decimal:

$$1 \cdot 2^{39} = 549755813888$$

$$1 \cdot 2^{38} = 274877906944$$

$$0 \cdot 2^{37} = 0$$

$$0 \cdot 2^{36} = 0$$

$$1 \cdot 2^{35} = 34359738368$$

$$1 \cdot 2^{34} = 17179869184$$

$$1 \cdot 2^{33} = 8589934592$$

$$1 \cdot 2^{32} = 4294967296$$

$$0 \cdot 2^{31} = 0$$

$$1 \cdot 2^{30} = 1073741824$$

$$0 \cdot 2^{29} = 0$$

$$1 \cdot 2^{28} = 268435456$$

$$0 \cdot 2^{27} = 0$$

$$1 \cdot 2^{26} = 67108864$$

$$1 \cdot 2^{25} = 33554432$$

$$0 \cdot 2^{24} = 0$$

$$0 \cdot 2^{23} = 0$$

$$1 \cdot 2^{22} = 4194304$$

$$1 \cdot 2^{21} = 2097152$$

$$0 \cdot 2^{20} = 0$$

$$1 \cdot 2^{19} = 524288$$

$$1 \cdot 2^{18} = 262144$$

$$1 \cdot 2^{17} = 131072$$

$$0 \cdot 2^{16} = 0$$

$$1 \cdot 2^{15} = 32768$$

$$1 \cdot 2^{14} = 16384$$

$$0 \cdot 2^{13} = 0$$

$$1 \cdot 2^{12} = 4096$$

$$1 \cdot 2^{11} = 2048$$

$$0 \cdot 2^{10} = 0$$

$$0 \cdot 2^9 = 0$$

$$0 \cdot 2^8 = 0$$

$$0 \cdot 2^7 = 0$$

$$0 \cdot 2^6 = 0$$

$$1 \cdot 2^5 = 32$$

$$0 \cdot 2^4 = 0$$

$$1 \cdot 2^3 = 8$$

$$0 \cdot 2^2 = 0$$

$$0 \cdot 2^1 = 0$$

$$1 \cdot 2^0 = 1$$

$$(890508335105)_{10}$$

Conversiones a hexadecimales

890508335145  $\underline{16}$

(9) 55656770946  $\underline{16}$

(2) 3478548184  $\underline{16}$

(8) 217409261  $\underline{16}$

217409261  $\underline{16}$

(13) 13588078  $\underline{16}$

(14) 849254  $\underline{16}$

(6) 53078  $\underline{16}$

(6) 3317  $\underline{16}$

(5) 207  $\underline{16}$

(15) 12  $\underline{16}$

(12) 0

= 12 15 5 6 6 14 13 8 29

= (C F 5 6 6 E D 8 29)  $_{16/11}$

1000 0111 1000 1110 0011 1000 1110 0011 1111 0011

\* Short

1000 = 8

0111 = 7

1000 = 8

1110 = E

0011 = 3

1000 = 8

1110 = E

0011 = 3

1111 = F

0011 = 3

= (878E38E3F3)  $_{16/11}$

\* Long:

Conversion a base decimal:

$$\begin{aligned}1 \cdot 2^{39} &= 549755813888 \\0 \cdot 2^{38} &= 0 \\0 \cdot 2^{37} &= 0 \\0 \cdot 2^{36} &= 0 \\0 \cdot 2^{35} &= 0 \\1 \cdot 2^{34} &= 17179869184 \\1 \cdot 2^{33} &= 8589934592 \\1 \cdot 2^{32} &= 4294967296 \\1 \cdot 2^{31} &= 2147483648 \\0 \cdot 2^{30} &= 0 \\0 \cdot 2^{29} &= 0 \\0 \cdot 2^{28} &= 0 \\1 \cdot 2^{27} &= 134217728 \\1 \cdot 2^{26} &= 67108864 \\1 \cdot 2^{25} &= 33554432 \\0 \cdot 2^{24} &= 0 \\0 \cdot 2^{23} &= 0 \\0 \cdot 2^{22} &= 0 \\1 \cdot 2^{21} &= 2097152 \\1 \cdot 2^{20} &= 1048576 \\1 \cdot 2^{19} &= 524288 \\0 \cdot 2^{18} &= 0 \\0 \cdot 2^{17} &= 0 \\0 \cdot 2^{16} &= 0 \\1 \cdot 2^{15} &= 32768 \\1 \cdot 2^{14} &= 16384 \\1 \cdot 2^{13} &= 8192 \\0 \cdot 2^{12} &= 0 \\0 \cdot 2^{11} &= 0 \\0 \cdot 2^{10} &= 0 \\1 \cdot 2^9 &= 512 \\1 \cdot 2^8 &= 256 \\1 \cdot 2^7 &= 128 \\1 \cdot 2^6 &= 64 \\1 \cdot 2^5 &= 32 \\1 \cdot 2^4 &= 16 \\0 \cdot 2^3 &= 0 \\0 \cdot 2^2 &= 0 \\1 \cdot 2^1 &= 2 \\1 \cdot 2^0 &= 1\end{aligned} +$$

$(582206678003)_{10}$

Conversiones a Hexadecimal

582206678003  $\underline{16}$

(3) 36387917375  $\underline{16}$

(15)

2274244835  $\underline{16}$

(3) 142140302  $\underline{16}$

(14) 8883768

8883768  $\underline{16}$

(8) 555235  $\underline{16}$

(3) 34702  $\underline{16}$

(14) 2168  $\underline{16}$

(8) 135  $\underline{16}$

(7) 8  $\underline{16}$

(8) 0

= 8 F 8 14 3 8 14 3 15 3

= (8 F 8 E 3 8 E 3 F 3)<sub>16</sub>

1010 1101 0101 1100 0110 0101 0100 1010 1010 1010

\* Short:

1010 = A

1101 = D

0101 = 5

1100 = C

0110 = 6

0101 = 5

0100 = 4

1010 = A

1010 = A

1010 = A

= (AD5C654AAA)<sub>16</sub>

\* Lang: conversión a base decimal

$$1 \cdot 2^{39} = 549755813888$$

$$0 \cdot 2^{38} = 0$$

$$1 \cdot 2^{37} = 137438953472$$

$$0 \cdot 2^{36} = 0$$

$$1 \cdot 2^{35} = 34359738368$$

$$1 \cdot 2^{34} = 17179869184$$

$$0 \cdot 2^{33} = 0$$

$$1 \cdot 2^{32} = 4294967296$$

$$0 \cdot 2^{31} = 0$$

$$1 \cdot 2^{30} = 1073741824$$

$$0 \cdot 2^{29} = 0$$

$$1 \cdot 2^{28} = 268435456$$

$$1 \cdot 2^{27} = 134217728$$

$$1 \cdot 2^{26} = 67108864$$

$$0 \cdot 2^{25} = 0$$

$$0 \cdot 2^{24} = 0$$

$$0 \cdot 2^{23} = 0$$

$$1 \cdot 2^{22} = 4194304$$

$$1 \cdot 2^{21} = 2097152$$

$$0 \cdot 2^{20} = 0$$

$$0 \cdot 2^{19} = 0$$

$$1 \cdot 2^{18} = 262144$$

$$0 \cdot 2^{17} = 0$$

$$1 \cdot 2^{16} = 65536$$

$$0 \cdot 2^{15} = 0$$

$$1 \cdot 2^{14} = 16384$$

$$0 \cdot 2^{13} = 0$$

$$0 \cdot 2^{12} = 0$$

$$1 \cdot 2^{11} = 2048$$

$$0 \cdot 2^{10} = 0$$

$$1 \cdot 2^9 = 512$$

$$0 \cdot 2^8 = 0$$

$$1 \cdot 2^7 = 128$$

$$0 \cdot 2^6 = 0$$

$$1 \cdot 2^5 = 32$$

$$0 \cdot 2^4 = 0$$

$$1 \cdot 2^3 = 8$$

$$0 \cdot 2^2 = 0$$

$$1 \cdot 2^1 = 2$$

$$0 \cdot 2^0 = 0$$

+

$$(744579484330)_{10}$$

Conversion a Hexadecimal:

$$744579484330 \text{ } |_{16}$$

$$(16) \quad 46536217770 \text{ } |_{16}$$

$$(16) \quad 2908513610 \text{ } |_{16}$$

$$(16) \quad 181782100 \text{ } |_{16}$$

$$(4) \quad 11361381$$

$$11361381 \text{ } |_{16}$$

$$(5) \quad 710086 \text{ } |_{16}$$

$$(6) \quad 44380 \text{ } |_{16}$$

$$(12) \quad 2773 \text{ } |_{16}$$

$$(5) \quad 173 \text{ } |_{16}$$

$$(13) \quad 10 \text{ } |_{16}$$

$$(10) \quad 0$$

$$= 10 \ 13 \ 5 \ 12 \ 6 \ 5 \ 4 \ 10 \ 10 \ 10$$

$$= (A \ D \ 5 \ C \ 6 \ 5 \ 4 \ A \ A \ A)_{16,11}$$

1010 0010 1010 1010 1010 1010 1011 1111 1100 0000

\* Short

$$1010 = A$$

$$0010 = 2$$

$$1010 = A$$

$$1010 = A$$

$$1010 = A$$

$$1010 = A$$

$$1011 = B$$

$$1111 = F$$

$$1100 = C$$

$$0000 = 0$$

$$= (A_2 AAAABF(C))_{16,11}$$

\* Gang

Conversion a base decimal

$$1 \cdot 2^{39} = 549755819888$$

$$0 \cdot 2^{38} = 0$$

$$1 \cdot 2^{37} = 137438953472$$

$$0 \cdot 2^{36} = 0$$

$$0 \cdot 2^{35} = 0$$

$$0 \cdot 2^{34} = 0$$

$$1 \cdot 2^{33} = 8589934592$$

$$0 \cdot 2^{32} = 0$$

$$1 \cdot 2^{31} = 2147483648$$

$$0 \cdot 2^{30} = 0$$

$$1 \cdot 2^{29} = 536870912$$

$$0 \cdot 2^{28} = 0$$

$$1 \cdot 2^{27} = 134217728$$

$$0 \cdot 2^{26} = 0$$

$$1 \cdot 2^{25} = 33554432$$

$$0 \cdot 2^{24} = 0$$

$$1 \cdot 2^{23} = 8388608$$

$$0 \cdot 2^{22} = 0$$

$$1 \cdot 2^{21} = 2097152$$

$$0 \cdot 2^{20} = 0$$

$$1 \cdot 2^{19} = 524288$$

$$0 \cdot 2^{18} = 0$$

$$1 \cdot 2^{17} = 131072$$

$$0 \cdot 2^{16} = 0$$

$$1 \cdot 2^{15} = 32768$$

$$0 \cdot 2^{14} = 0$$

$$1 \cdot 2^{13} = 8192$$

$$1 \cdot 2^{12} = 4096$$

$$1 \cdot 2^{11} = 2048$$

$$1 \cdot 2^{10} = 1024$$

$$1 \cdot 2^9 = 512$$

$$1 \cdot 2^8 = 256$$

$$1 \cdot 2^7 = 128$$

$$1 \cdot 2^6 = 64$$

$$0 \cdot 2^5 = 0$$

$$0 \cdot 2^4 = 0$$

$$0 \cdot 2^3 = 0$$

$$0 \cdot 2^2 = 0$$

$$0 \cdot 2^1 = 0$$

$$0 \cdot 2^0 = 0$$

$$(698648018880)_{10}$$

+

Conversion a hexadecimal:

698648018880  $\underline{16}$

(9) 49665501180  $\underline{16}$

(10) 2729093823  $\underline{16}$

(11) 130563363  $\underline{16}$

(12) 10660522  $\underline{16}$

(13) 666282

666282  $\underline{16}$

(14) 41642  $\underline{16}$

(15) 2602  $\underline{16}$

(16) 162  $\underline{16}$

(17) 10  $\underline{16}$

(18) 0

= 10 2 10 10 10 10 11 15 12 0

= (A 2 A A A A B F C O)  $_{16//}$

Signed binary to octal

Use the long and short methods

$$\begin{array}{r} 111 \quad 111 \quad 000 \quad 001 \quad 111 \quad 100 \quad 000 \quad 001 \quad 110 \quad 101 \quad 011 \\ 000 \quad 000 \quad 111 \quad 110 \quad 000 \quad 011 \quad 111 \quad 110 \quad 001 \quad 010 \quad 100 \\ + \quad \underline{\underline{000 \quad 000 \quad 111 \quad 110 \quad 000 \quad 011 \quad 111 \quad 110 \quad 001 \quad 010 \quad 101}} \\ \hline & & & & & & & & & & \end{array}$$

\* Short

000 = 0

000 = 0

111 = 7

110 = 6

000 = 0

011 = 3

111 = 7

110 = 6

001 = 1

010 = 2

101 = 5

$$= (-00760376125)_8$$

$$= (-760376125)_8 //$$

\* Lang: conversion a base decimal

$$0 \cdot 2^{32} = 0$$

$$0 \cdot 2^{31} = 0$$

$$0 \cdot 2^{30} = 0$$

$$0 \cdot 2^{29} = 0$$

$$0 \cdot 2^{28} = 0$$

$$0 \cdot 2^{27} = 0$$

$$1 \cdot 2^{26} = 67108864$$

$$1 \cdot 2^{25} = 33554432$$

$$1 \cdot 2^{24} = 16777216$$

$$1 \cdot 2^{23} = 8388608$$

$$1 \cdot 2^{22} = 4194304$$

$$0 \cdot 2^{21} = 0$$

$$0 \cdot 2^{20} = 0$$

$$0 \cdot 2^{19} = 0$$

$$0 \cdot 2^{18} = 0$$

$$0 \cdot 2^{17} = 0$$

$$1 \cdot 2^{16} = 65536$$

$$1 \cdot 2^{15} = 32768$$

$$1 \cdot 2^{14} = 16384$$

$$1 \cdot 2^{13} = 8192$$

$$1 \cdot 2^{12} = 4096$$

$$1 \cdot 2^{11} = 2048$$

$$1 \cdot 2^{10} = 1024$$

$$0 \cdot 2^9 = 0$$

$$0 \cdot 2^8 = 0$$

$$0 \cdot 2^7 = 0$$

$$1 \cdot 2^6 = 64$$

$$0 \cdot 2^5 = 0$$

$$1 \cdot 2^4 = 16$$

$$0 \cdot 2^3 = 0$$

$$1 \cdot 2^2 = 4$$

$$0 \cdot 2^1 = 0$$

$$1 \cdot 2^0 = 1$$

+

$$\underline{(130153557)_{10}}$$

Conversión a octal

130153557  $\underline{18}$

(5) 16269194  $\underline{18}$

(2) 2033649  $\underline{18}$

(1) 254206  $\underline{18}$

(6) 31775  $\underline{18}$

(7) 3971  $\underline{18}$

(3) 496  $\underline{18}$

(8) 62  $\underline{18}$

(6) 7  $\underline{18}$

(7) 0

= (-760376125) $_{8/11}$

010 101 010 101 111 111 111 110 000 000

\* Short

$$010 = 2$$

$$101 = 5$$

$$010 = 2$$

$$101 = 5$$

$$111 = 7$$

$$111 = 7$$

$$111 = 7$$

$$111 = 7$$

$$110 = 6$$

$$000 = 0$$

$$000 = 0$$

= (25257777600) $_{8/11}$

\* Long:

Conversion a base decimal:

$$0 \cdot 2^{32} = 0$$

$$1 \cdot 2^{31} = 2147483648$$

$$0 \cdot 2^{30} = 0$$

$$1 \cdot 2^{29} = 536870912$$

$$0 \cdot 2^{28} = 0$$

$$1 \cdot 2^{27} = 134217728$$

$$0 \cdot 2^{26} = 0$$

$$1 \cdot 2^{25} = 33554432$$

$$0 \cdot 2^{24} = 0$$

$$1 \cdot 2^{23} = 8388608$$

$$0 \cdot 2^{22} = 0$$

$$1 \cdot 2^{21} = 2097152$$

$$1 \cdot 2^{20} = 1048576$$

$$1 \cdot 2^{19} = 524288$$

$$1 \cdot 2^{18} = 262144$$

$$1 \cdot 2^{17} = 131072$$

$$1 \cdot 2^{16} = 65536$$

$$1 \cdot 2^{15} = 32768$$

$$1 \cdot 2^{14} = 16384$$

$$1 \cdot 2^{13} = 8192$$

$$1 \cdot 2^{12} = 4096$$

$$1 \cdot 2^{11} = 2048$$

$$1 \cdot 2^{10} = 1024$$

$$1 \cdot 2^9 = 512$$

$$1 \cdot 2^8 = 256$$

$$1 \cdot 2^7 = 128$$

$$0 \cdot 2^6 = 0$$

$$0 \cdot 2^5 = 0$$

$$0 \cdot 2^4 = 0$$

$$0 \cdot 2^3 = 0$$

$$0 \cdot 2^2 = 0$$

$$0 \cdot 2^1 = 0$$

$$\underline{0 \cdot 2^0 = 0}$$

+

$$(2864709504)_{10}$$

Conversión a octal:

2864709504<sub>18</sub>

(5) 358088688<sub>18</sub>

(6) 44761086<sub>18</sub>

(7) 5595135<sub>18</sub>

(7) 699391<sub>12</sub>

(7) 87423<sub>18</sub>

(7) 10927<sub>12</sub>

(7) 1365

1365<sub>18</sub>

(5) 170<sub>18</sub>

(2) 21<sub>18</sub>

(5) 2<sub>18</sub>

(2) 0

= (25257777600)<sub>8</sub>

<sub>11</sub>

111 000 111 000 000 111 111 110 000 010 101 0  
000 111 000 111 111 000 000 001 111 101 010 1

Completiendo con 0's a la igualdad

000 001 110 001 111 110 000 000 011 111 010 101  
+ \_\_\_\_\_  
000 001 110 001 111 110 000 000 011 111 010 110

\* short

000 = 0

001 = 1

110 = 6

001 = 1

111 = 7

110 = 6

000 = 0

000 = 0

011 = 3

111 = 7

010 = 2

110 = 6

= (016176003726)<sub>8</sub>

= (-16176003726)<sub>8</sub>

<sub>11</sub>

\* Lang

Conversion a base decimal

$$0 \cdot 2^{35} = 0$$

$$0 \cdot 2^{34} = 0$$

$$0 \cdot 2^{33} = 0$$

$$0 \cdot 2^{32} = 0$$

$$0 \cdot 2^{31} = 0$$

$$1 \cdot 2^{30} = 1073741824$$

$$1 \cdot 2^{29} = 536870912$$

$$1 \cdot 2^{28} = 268435456$$

$$0 \cdot 2^{27} = 0$$

$$0 \cdot 2^{26} = 0$$

$$0 \cdot 2^{25} = 0$$

$$1 \cdot 2^{24} = 16777216$$

$$1 \cdot 2^{23} = 8388608$$

$$1 \cdot 2^{22} = 4194304$$

$$1 \cdot 2^{21} = 2097152$$

$$1 \cdot 2^{20} = 1048576$$

$$1 \cdot 2^{19} = 524288$$

$$0 \cdot 2^{18} = 0$$

$$0 \cdot 2^{17} = 0$$

$$0 \cdot 2^{16} = 0$$

$$0 \cdot 2^{15} = 0$$

$$0 \cdot 2^{14} = 0$$

$$0 \cdot 2^{13} = 0$$

$$0 \cdot 2^{12} = 0$$

$$0 \cdot 2^{11} = 0$$

$$1 \cdot 2^{10} = 1024$$

$$1 \cdot 2^9 = 512$$

$$1 \cdot 2^8 = 256$$

$$1 \cdot 2^7 = 128$$

$$1 \cdot 2^6 = 64$$

$$0 \cdot 2^5 = 0$$

$$1 \cdot 2^4 = 16$$

$$0 \cdot 2^3 = 0$$

$$1 \cdot 2^2 = 4$$

$$1 \cdot 2^1 = 2$$

$$0 \cdot 2^0 = 0$$

$$(1912080342)_{10}$$

+

\* Conversión a octal

1912080342 18

(6) 299010042 18

(2) 29876255 18

(7) 3734531 18

(3) 466816 18

(0) 58352 18

(0) 7294

7294 18

(6) 911 18

(7) 113 18

(1) 14 18

(6) 1 18

(1) 0

= (-16176003726)<sub>8</sub>

11

0 101 010 101 010 000 010 101 010 101 111 100 0  
010 101 010 101 111 101 010 101 010 000 011 1

Se agregan 0's a la izquierda

$$\begin{array}{r} 000 \ 101 \ 010 \ 101 \ 011 \ 111 \ 010 \ 101 \ 010 \ 100 \ 000 \ 11 \\ + \ 000 \ 101 \ 010 \ 101 \ 011 \ 111 \ 010 \ 101 \ 010 \ 100 \ 001 \ 000 \\ \hline 000 \ 101 \ 010 \ 101 \ 011 \ 111 \ 010 \ 101 \ 010 \ 100 \ 001 \ 000 \end{array}$$

\* short:

000 = 0

101 = 5

010 = 2

101 = 5

011 = 3

111 = 7

010 = 2

101 = 5

010 = 2

100 = 4

001 = 1

000 = 0

= (-052537252410)<sub>8</sub>

= (-52537252410)<sub>8</sub>

11

米 Long.

$$0 \cdot 2^{35} = 0$$

$$0 \cdot 2^{34} = 0$$

$$0 \cdot 2^{33} = 0$$

$$1 \cdot 2^{32} = 4294967296$$

$$0 \cdot 2^{31} = 0$$

$$1 \cdot 2^{30} = 1073741824$$

$$0 \cdot 2^{29} = 0$$

$$1 \cdot 2^{28} = 268435456$$

$$0 \cdot 2^{27} = 0$$

$$1 \cdot 2^{26} = 67108864$$

$$0 \cdot 2^{25} = 0$$

$$1 \cdot 2^{24} = 16777216$$

$$0 \cdot 2^{23} = 0$$

$$1 \cdot 2^{22} = 4194304$$

$$1 \cdot 2^{21} = 2097152$$

$$1 \cdot 2^{20} = 1048576$$

$$1 \cdot 2^{19} = 524288$$

$$1 \cdot 2^{18} = 262144$$

$$0 \cdot 2^{17} = 0$$

$$1 \cdot 2^{16} = 65536$$

$$0 \cdot 2^{15} = 0$$

$$1 \cdot 2^{14} = 16384$$

$$0 \cdot 2^{13} = 0$$

$$1 \cdot 2^{12} = 4096$$

$$0 \cdot 2^{11} = 0$$

$$1 \cdot 2^{10} = 1024$$

$$0 \cdot 2^9 = 0$$

$$1 \cdot 2^8 = 256$$

$$0 \cdot 2^7 = 0$$

$$0 \cdot 2^6 = 0$$

$$0 \cdot 2^5 = 0$$

$$0 \cdot 2^4 = 0$$

$$1 \cdot 2^3 = 8$$

$$0 \cdot 2^2 = 0$$

$$0 \cdot 2^1 = 0$$

$$0 \cdot 2^0 = 0$$

$$(5729244424)_{10}$$

Tema

Día

Mes

Año

ESTILO

\* Conversión a octal

5729244420  $\underline{18}$

① 716155553  $\underline{18}$

① 89519444  $\underline{18}$

④ 11189930  $\underline{18}$

② 1398741  $\underline{18}$

⑤ 124840

174842  $\underline{18}$

② 21855  $\underline{18}$

⑦ 2731  $\underline{18}$

③ 341  $\underline{18}$

⑤ 42  $\underline{18}$

② 5  $\underline{18}$

⑤ 0

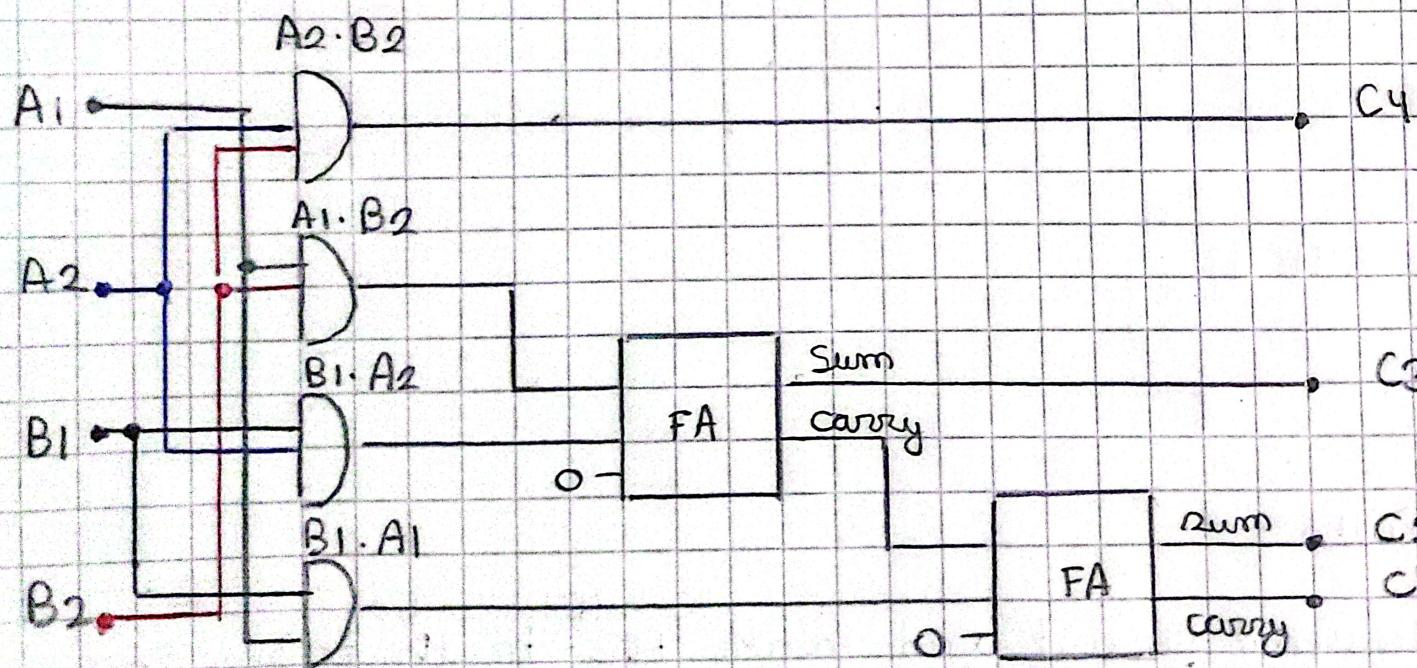
= (-52537252410)<sub>8</sub>

## 2. Boolean circuits

Draw the Boolean circuit and make the truth table for the following:

- Multiplication of two binary numbers of length 2 bits

$$\begin{array}{l} A: \quad A_1 \quad A_2 \\ B: \quad B_1 \quad B_2 \quad \times \\ \hline C: \quad C_1 \quad C_2 \quad C_3 \quad C_4 \end{array}$$

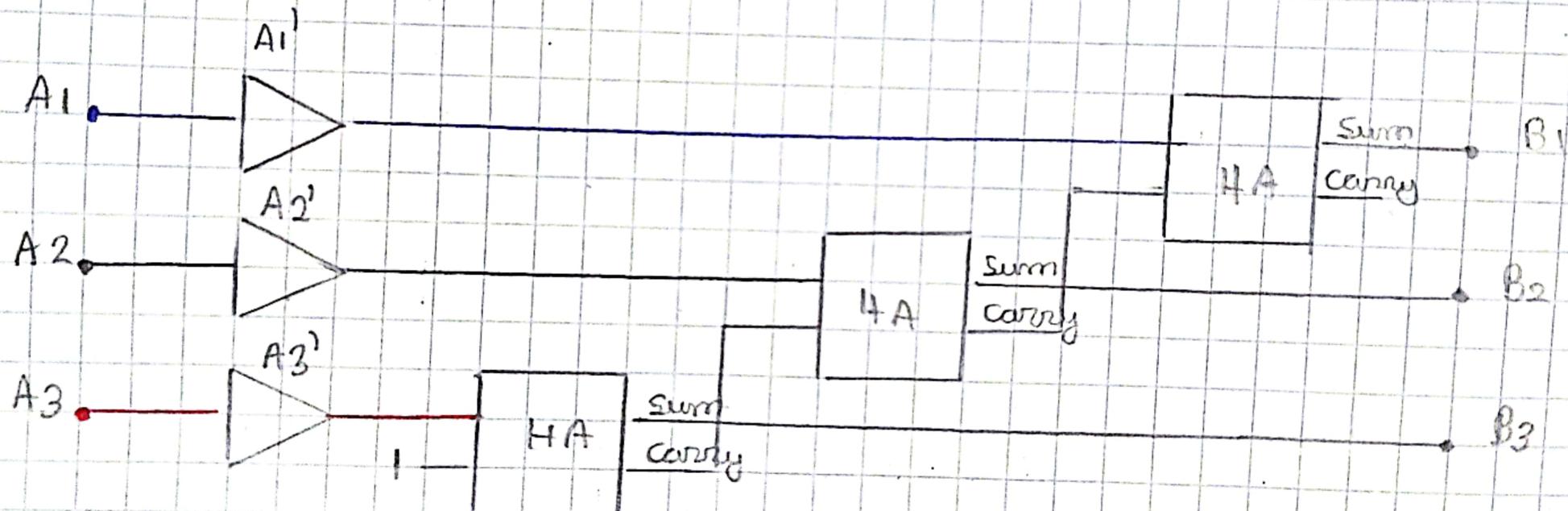


| A1 | A2 | B1 | B2 | A2*B2 | A1*B2 | A2*B1 | A1*B1 | (A1*B2)+(A2*B1) | Carry 1 | (A1*B1)+Carry 1 | Carry 2 | Output  |                 |                 |       |
|----|----|----|----|-------|-------|-------|-------|-----------------|---------|-----------------|---------|---------|-----------------|-----------------|-------|
|    |    |    |    |       |       |       |       |                 |         |                 |         | Carry 2 | (A1*B1)+Carry 1 | (A1*B2)+(A2*B1) | A2*B2 |
| C1 | C2 | C3 | C4 |       |       |       |       |                 |         |                 |         |         |                 |                 |       |
| 0  | 0  | 0  | 0  | 0     | 0     | 0     | 0     | 0               | 0       | 0               | 0       | 0       | 0               | 0               | 0     |
| 0  | 0  | 0  | 1  | 0     | 0     | 0     | 0     | 0               | 0       | 0               | 0       | 0       | 0               | 0               | 0     |
| 0  | 0  | 1  | 0  | 0     | 0     | 0     | 0     | 0               | 0       | 0               | 0       | 0       | 0               | 0               | 0     |
| 0  | 0  | 1  | 1  | 0     | 0     | 0     | 0     | 0               | 0       | 0               | 0       | 0       | 0               | 0               | 0     |
| 0  | 1  | 0  | 0  | 0     | 0     | 0     | 0     | 0               | 0       | 0               | 0       | 0       | 0               | 0               | 0     |
| 0  | 1  | 0  | 1  | 1     | 0     | 0     | 0     | 0               | 0       | 0               | 0       | 0       | 0               | 0               | 1     |
| 0  | 1  | 1  | 0  | 0     | 0     | 1     | 0     | 1               | 0       | 0               | 0       | 0       | 0               | 1               | 0     |
| 0  | 1  | 1  | 1  | 1     | 0     | 1     | 0     | 1               | 0       | 0               | 0       | 0       | 0               | 1               | 1     |
| 1  | 0  | 0  | 0  | 0     | 0     | 0     | 0     | 0               | 0       | 0               | 0       | 0       | 0               | 0               | 0     |
| 1  | 0  | 0  | 1  | 0     | 1     | 0     | 0     | 1               | 0       | 0               | 0       | 0       | 0               | 1               | 0     |
| 1  | 0  | 1  | 0  | 0     | 0     | 0     | 1     | 0               | 0       | 1               | 0       | 0       | 1               | 0               | 0     |
| 1  | 0  | 1  | 1  | 0     | 1     | 0     | 1     | 1               | 0       | 1               | 0       | 0       | 1               | 1               | 0     |
| 1  | 1  | 0  | 0  | 0     | 0     | 0     | 0     | 0               | 0       | 0               | 0       | 0       | 0               | 0               | 0     |
| 1  | 1  | 0  | 1  | 1     | 1     | 0     | 0     | 1               | 0       | 0               | 0       | 0       | 0               | 1               | 1     |
| 1  | 1  | 1  | 0  | 0     | 0     | 1     | 1     | 1               | 0       | 1               | 0       | 0       | 1               | 1               | 0     |
| 1  | 1  | 1  | 1  | 1     | 1     | 1     | 1     | 0               | 1       | 0               | 1       | 1       | 0               | 0               | 1     |

• Complemento de 2 para un número binario de longitud 3 bits

$$A_1 \ A_2 \ A_3 \rightarrow A_1' \ A_2' \ A_3'$$

$$+ \frac{1}{B_1 \ B_0 \ B_3}$$





3. Do the following multiplications in binary

Use the minimum number of bits required

•  $-5 \times 8 = 40 = 101000$  (6 bits)

$$\begin{array}{r} 5 \\ \times 8 \\ \hline 101000 \end{array}$$

Step-by-step calculation:

1.  $5 \times 2 = 10 \rightarrow 010$   
2.  $0 \times 1 = 0$   
3.  $0 \times 0 = 0$

$$\begin{array}{r} 010 \\ + 0 \\ \hline 010 \end{array}$$

Final result: 000011

$$\begin{array}{r} 8 \\ \times 4 \\ \hline 1000 \end{array}$$

Step-by-step calculation:

1.  $8 \times 2 = 1000 \rightarrow 001000$   
2.  $0 \times 1 = 0$   
3.  $0 \times 0 = 0$

$$\begin{array}{r} 001000 \\ + 0 \\ \hline 001000 \end{array}$$

$$\begin{array}{r} MD = 000011 \\ MR = 001000 \\ \hline 111101 \end{array}$$

MD  
000011

PD  
000000

MR  
001000

Mx  
0

OK  
000110

$$\begin{array}{r} MD \\ 000011 \\ \hline \end{array}$$

PD  
000000

MR  
000100

Mx  
0

CK  
000101

MD  
000011

PD  
000000

MR  
000010

Mx  
0

CK  
000100

MD  
000011

$$\begin{array}{r} MD \\ 000011 \\ \hline \end{array}$$

PD  
000000

MR  
000001

Mx  
0

CK  
000011

$$PD = PD - MD$$

$$+ \begin{array}{r} 000000 \\ 111101 \\ \hline 111101 \end{array}$$

$$\begin{array}{l} MD \\ 000011 \\ \hline PD \quad MR \quad Mx \\ 111101 \quad 000001 \quad 0 \\ CK \\ 000011 \end{array}$$

$$\begin{array}{l} MD \\ 000011 \\ \hline PD \quad MR \quad Mx \\ 111110 \quad 100000 \quad 1 \\ CK \\ 000010 \end{array}$$

$$PD = PD + MR$$

$$+ \begin{array}{r} 000011 \\ 100001 \\ \hline 111110 \end{array}$$

$$\begin{array}{l} MD \\ 000011 \\ \hline PD \quad MR \quad Mx \\ 000001 \quad 100000 \quad 1 \\ CK \\ 000010 \end{array}$$

$$\begin{array}{l} MD \\ 000011 \\ \hline PD \quad MR \quad Mx \\ 000000 \quad 110000 \quad 0 \\ CK \\ 000001 \end{array}$$

$$MD \\ 000011$$

$$\begin{array}{l} PD \quad MR \quad Mx \\ 000000 \quad 011000 \quad 0 \\ CK \\ 000000 \end{array}$$

$$PD + MR = 000000, \underline{011000} = 011000,$$

$$\bullet 11 \times (-10) = 110 = 1101110 \text{ (7 bits)}$$

$$\begin{array}{r}
 11 \underline{12} \\
 1 \quad 5 \underline{12} \\
 1 \quad 2 \underline{12} \\
 0 \quad 1 \underline{12} \\
 \hline
 10 \quad 10
 \end{array}
 = 1011 = 0001011$$

$$\begin{array}{r}
 10 \underline{12} \\
 0 \quad 5 \underline{12} \\
 1 \quad 2 \underline{12} \\
 0 \quad 1 \underline{12} \\
 \hline
 1010 = 0101
 \end{array}
 + \frac{1}{0110 = 0000110}$$

$$\begin{array}{l}
 MD = 0001011 \Rightarrow 1110100 \\
 MR = 0000110
 \end{array}
 + \frac{1}{1110101}$$

$$MD \\ 0001011$$

$$PD \quad MR \quad Mx \\ 0000000 \quad 0000110 \quad 0$$

$$CK \\ 0000111$$

$$MD \\ 0001011$$

$$PD \quad MR \quad Mx \\ 0000000 \quad 0000011 \quad 0$$

$$CK \\ 0000110$$

$$PD = PD - MD$$

$$MD \\ 0001011$$

$$0000000$$

$$1110101 \rightarrow \\ 1110101$$

$$PD \quad MR \\ 1110101 \quad 0000011$$

$$CK \\ 0000110$$

$$MD \\ 0001011$$

$$PD \quad MR \quad Mx \\ 1110100 \quad 1000001 \quad 1$$

$$CK \\ 0000101$$

$$MD \\ 0001011$$

$$PD \quad MR \quad Mx \\ 111101 \quad 0100000 \quad 1$$

$$CK \\ 0000100$$

$$PD = PD + MD$$

1111101

0001011 +  
10001000

PD  
0001000

MD  
0001011

MR  
0100000

Mx  
1



MP  
0001011

PD  
0000100

MR  
0010000

Mx  
0

CK  
0000100

CK  
0000011

MD  
0001011

PD  
0000010

MR  
0001000

Mx  
0

CK  
0000010

PD  
0000001

MR  
0000100

Mx  
0

CK  
0000001

MD  
0001011

PD  
0000000

MR  
1000010

Mx  
0

CK  
0000000

$$PD + MD = 0000000100000101$$

$$= 100001011$$

$$\bullet 2 \times S = 6 = 110 \text{ (3 bits)}$$

$$2 \underline{12} = 010$$

$$\begin{array}{r} 0 \\ 1 \\ 1 \\ 0 \end{array}$$

$$3 \underline{12} = 011$$

$$\begin{array}{r} 1 \\ 1 \\ 2 \\ 0 \end{array}$$

$$MD = 010 \rightarrow 101$$

$$+ 1$$

$$MR = 011 \quad 110$$

$$MD$$

$$010$$

$$\begin{array}{rrr} PD & MR & MX \\ 000 & 011 & 0 \end{array}$$

$$CK$$

$$011$$

$$PD = PD + MD$$

$$000$$

$$+ \frac{110}{110}$$

$$MD$$

$$010$$

$$\begin{array}{rrr} PD & MR & MX \\ 110 & 011 & 0 \end{array}$$

$$CK$$

$$011$$

$$MD$$

$$010$$

$$\begin{array}{rrr} PP & MR & MX \\ 111 & 001 & 1 \end{array} \rightarrow \begin{array}{rrr} PP & MR & MX \\ 111 & 100 & 1 \end{array}$$

$$CK$$

$$010$$

$$MD$$

$$010$$

$$PD = PD + MD$$

$$111$$

$$+ \underline{010}$$

$$\begin{array}{r} PD \\ 001 \end{array}$$

$$\begin{array}{r} MP \\ 010 \end{array}$$

$$+ \underline{100}$$

$$\begin{array}{r} CK \\ 001 \end{array}$$

$$\begin{array}{r} MR \\ 100 \end{array}$$

$$+ \underline{1}$$

$$\begin{array}{r} CK \\ 001 \end{array}$$

$$\rightarrow$$

$$MD$$

$$010$$

$$\begin{array}{rrr} PD & MR & MX \\ 000 & 110 & 0 \end{array}$$

$$CK$$

$$000$$

$$PD + MD = 000 \underline{110} = 110_{11}$$

•  $(-4) \times (-8) = 32$  (100000) 6 bits

$$\begin{array}{r}
 4 \mid 2 \\
 \textcircled{0} \quad 2 \mid 2 \\
 \textcircled{0} \quad 1 \mid 2 \\
 \textcircled{1} \quad 0
 \end{array}
 \begin{array}{r}
 100 \rightarrow 011 \\
 + \underline{1} \\
 100 \rightarrow 000100
 \end{array}$$

$$\begin{array}{r}
 8 \mid 2 \\
 \textcircled{0} \quad 4 \mid 2 \\
 \textcircled{0} \quad 2 \mid 2 \\
 \textcircled{0} \quad 1 \mid 2 \\
 \textcircled{1} \quad 0
 \end{array}
 \begin{array}{r}
 1000 \rightarrow 0111 \\
 + \underline{1} \\
 1000 \rightarrow 001000
 \end{array}$$

$$MD = 000100 \rightarrow 111011$$

$$MR = 001000 \quad \begin{array}{r} + \\ \hline 111100 \end{array}$$

$$\begin{array}{ccc}
 MD & & MD \\
 000100 & & 000100
 \end{array}
 \rightarrow
 \begin{array}{ccc}
 PD & MR & Mx \\
 000000 & 000100 & 0
 \end{array}$$

$$CK \quad 000110$$

$$\begin{array}{c}
 MD \\
 000100
 \end{array}
 \quad
 \begin{array}{c}
 MD \\
 000100
 \end{array}$$

$$\begin{array}{ccc}
 PD & MR & Mx \\
 000000 & 000010 & 0
 \end{array}
 \rightarrow
 \begin{array}{ccc}
 PD & MR & Mx \\
 000000 & 000001 & 0
 \end{array}$$

$$CK \quad 000100$$

$$CK \quad 000011$$

$$PD = PD - MD$$

$$\begin{array}{r}
 000000 \\
 + \underline{111100} \\
 111100
 \end{array}$$

$$\begin{array}{cccc}
 PD & MR & Mx \\
 111100 & 000001 & 0
 \end{array}$$

$$CK \quad 000011$$

$$MD \quad 000100$$

$$MD \quad 000100$$

$$\begin{array}{ccc}
 PD & MR & Mx \\
 111110 & 000000 & 1
 \end{array}$$

$$CK \quad 000010$$

$$PD = PD + ND$$

$$\begin{matrix} ND \\ 000100 \end{matrix}$$

$$\begin{matrix} MP \\ 000100 \end{matrix}$$

$$\begin{matrix} 11110 \\ 000100 \\ \hline 1000010 \end{matrix}$$

$$\begin{matrix} PD & MR \\ 000010 & 000000 \end{matrix}$$

$Mx$  →

$$\begin{matrix} PD & MR & Mx \\ 000001 & 000000 & 0 \end{matrix}$$

$$\begin{matrix} CK \\ 000010 \end{matrix}$$

$$\begin{matrix} CK \\ 000001 \end{matrix}$$

$$\begin{matrix} MD \\ 000100 \end{matrix}$$

$$\begin{matrix} PD & MR & Mx \\ 000000 & 100000 & 0 \end{matrix}$$

$$PD + MR = 00000011000000$$

$$= 100000,1$$

$$\begin{matrix} CK \\ 000000 \end{matrix}$$