Com a regla general, si no ens diuen el contrari, en aquelles conversions de part decimal d'un nombre en base 10 a binari ens quedarem amb tres *bits* per cada xifra del nombre original. De tota manera als exercicis resolts aquí es calcularan totes les xifres.

1. (a) $100110_2 = 2^5 + 2^2 + 2 = 38_{10}$

   (b) $110011_2 = 2^5 + 2^4 + 2 + 1 = 51_{10}$

   (c) $110111_2 = 2^5 + 2^4 + 2^2 + 2 + 1 = 55_{10}$

   (d) $1001,10_2 = 2^3 + 1 + 2^{-1} = 9,5_{10}$

   (e) $101010110,001_2 = 2^8 + 2^6 + 2^4 + 2^2 + 2 + 2^{-3} = 342,125_{10}$

2. (a) $93_{10} \longrightarrow$

$$
\begin{array}{c|c}
93 & 2 \\
\hline
13 & 46 \\
1 &
\end{array}
\quad
\begin{array}{c|c}
46 & 2 \\
\hline
06 & 23 \\
0 &
\end{array}
\quad
\begin{array}{c|c}
23 & 2 \\
\hline
03 & 11 \\
1 &
\end{array}
\quad
\begin{array}{c|c}
11 & 2 \\
\hline
1 & 5 \\
\end{array}
\quad
\begin{array}{c|c}
5 & 2 \\
\hline
1 & 2 \\
\end{array}
\quad
\begin{array}{c|c}
2 & 2 \\
\hline
0 & 1 \\
\end{array}
$$

$$93_{10} = 1011101_2$$

   (b) $647_{10} \longrightarrow$

$$
\begin{array}{c|c}
647 & 2 \\
\hline
04 & 323 \\
07 & \\
1 &
\end{array}
\quad
\begin{array}{c|c}
323 & 2 \\
\hline
12 & 161 \\
03 & \\
1 &
\end{array}
\quad
\begin{array}{c|c}
161 & 2 \\
\hline
1 & 80 \\
\end{array}
\quad
\begin{array}{c|c}
80 & 2 \\
\hline
0 & 40 \\
\end{array}
\quad
\begin{array}{c|c}
40 & 2 \\
\hline
0 & 20 \\
\end{array}
$$

$$
\begin{array}{c|c}
20 & 2 \\
\hline
0 & 10 \\
\end{array}
\quad
\begin{array}{c|c}
10 & 2 \\
\hline
0 & 5 \\
\end{array}
\quad
\begin{array}{c|c}
5 & 2 \\
\hline
1 & 2 \\
\end{array}
\quad
\begin{array}{c|c}
2 & 2 \\
\hline
0 & 1 \\
\end{array}
$$

$$647_{10} = 1010000111_2$$

   (c) $310_{10} \longrightarrow$

$$
\begin{array}{c|c}
310 & 2 \\
\hline
11 & 155 \\
10 & \\
0 &
\end{array}
\quad
\begin{array}{c|c}
155 & 2 \\
\hline
15 & 77 \\
1 &
\end{array}
\quad
\begin{array}{c|c}
77 & 2 \\
\hline
17 & 38 \\
1 &
\end{array}
\quad
\begin{array}{c|c}
38 & 2 \\
\hline
18 & 19 \\
0 &
\end{array}
\quad
\begin{array}{c|c}
19 & 2 \\
\hline
1 & 9 \\
\end{array}
$$

$$
\begin{array}{c|c}
9 & 2 \\
\hline
1 & 4 \\
\end{array}
\quad
\begin{array}{c|c}
4 & 2 \\
\hline
0 & 2 \\
\end{array}
\quad
\begin{array}{c|c}
2 & 2 \\
\hline
0 & 1 \\
\end{array}
$$

$$310_{10} = 100110110_2$$

(d) $131_{10} \longrightarrow$

$$
\begin{array}{r|l} 1\,3\,1 & 2 \\ \hline 1\,1 & 6\,5 \\ 1 & \end{array}
\quad
\begin{array}{r|l} 6\,5 & 2 \\ \hline 0\,5 & 3\,2 \\ 1 & \end{array}
\quad
\begin{array}{r|l} 3\,2 & 2 \\ \hline 1\,2 & 1\,6 \\ 0 & \end{array}
\quad
\begin{array}{r|l} 1\,6 & 2 \\ \hline 0 & 8 \end{array}
\quad
\begin{array}{r|l} 8 & 2 \\ \hline 0 & 4 \end{array}
$$

$$
\begin{array}{r|l} 4 & 2 \\ \hline 0 & 2 \end{array}
\quad
\begin{array}{r|l} 2 & 2 \\ \hline 0 & 1 \end{array}
$$

$$131_{10} = 10000011_2$$

(e) $258,75_{10} \longrightarrow$

$$
\begin{array}{r|l} 2\,5\,8 & 2 \\ \hline 0\,5 & 1\,2\,9 \\ 1\,8 & \\ 0 & \end{array}
\quad
\begin{array}{r|l} 1\,2\,9 & 2 \\ \hline 0\,9 & 6\,4 \\ 1 & \end{array}
\quad
\begin{array}{r|l} 6\,4 & 2 \\ \hline 0\,4 & 3\,2 \\ 0 & \end{array}
\quad
\begin{array}{r|l} 3\,2 & 2 \\ \hline 1\,2 & 1\,6 \\ 0 & \end{array}
\quad
\begin{array}{r|l} 1\,6 & 2 \\ \hline 0 & 8 \end{array}
$$

$$
\begin{array}{r|l} 8 & 2 \\ \hline 0 & 4 \end{array}
\quad
\begin{array}{r|l} 4 & 2 \\ \hline 0 & 2 \end{array}
\quad
\begin{array}{r|l} 2 & 2 \\ \hline 0 & 1 \end{array}
$$

$$258_{10} = 100000010_2$$

$$0,75 \times 2 = 1,5 \geq 1 \Rightarrow 1$$
$$0,5 \times 2 = 1 \geq 1 \Rightarrow 1$$

$$0,75_{10} = 0,11_2 \rightarrow 258,75_{10} = 10000010,11_2$$

(f) $1,625_{10} \longrightarrow$

$$0,625 \times 2 = 1,25 \geq 1 \Rightarrow 1$$
$$0,25 \times 2 = 0,5 < 1 \Rightarrow 0$$
$$0,5 \times 2 = 1 \geq 1 \Rightarrow 1$$

$$1,625_{10} = 1,101_2$$

(g) $19,3125_{10} \longrightarrow$

$$
\begin{array}{r|l} 1\,9 & 2 \\ \hline 1 & 9 \end{array}
\quad
\begin{array}{r|l} 9 & 2 \\ \hline 1 & 4 \end{array}
\quad
\begin{array}{r|l} 4 & 2 \\ \hline 0 & 2 \end{array}
\quad
\begin{array}{r|l} 2 & 2 \\ \hline 0 & 1 \end{array}
$$

$$19_{10} = 10011_2$$

$$0,3125 \times 2 = 0,625 < 1 \Rightarrow 0$$
$$0,625 \times 2 = 1,25 \geq 1 \Rightarrow 1$$
$$0,25 \times 2 = 0,5 < 1 \Rightarrow 0$$
$$0,5 \times 2 = 1 \geq 1 \rightarrow 1$$

$$19,3125_{10} = 10011,0101_2$$

3. (a) $13_{16} = 1 \cdot 16^1 + 3 \cdot 16^0 = 19_{10}$

(b) $65_{16} = 6 \cdot 16^1 + 5 \cdot 16^0 = 101_{10}$

(c) $3F0_{16} = 3 \cdot 16^2 + F \cdot 16^1 + 0 \cdot 16^0 = 3 \cdot 16^2 + 15 \cdot 16^1 + 0 \cdot 16^0 = 1008_{10}$

(d) $D0CE_{16} = D \cdot 16^3 + 0 \cdot 16^2 + C \cdot 16^1 + E \cdot 16^0 = 13 \cdot 16^3 + 0 \cdot 16^2 +$

$12 \cdot 16^1 + 14 \cdot 16^0 = 53454_{10}$

(e) $0,2_{16} = 0 \cdot 16^0 + 2 \cdot 16^{-1} = 0,125_{10}$

(f) $12,9_{16} = 1 \cdot 16^1 + 2 \cdot 16^0 + 9 \cdot 16^{-1} = 18,5625_{10}$

(g) $F1,A_{16} = F \cdot 16^1 + 1 \cdot 16^0 + A \cdot 16^{-1} = 15 \cdot 16^1 + 1 \cdot 16^0 + 10 \cdot 16^{-1} = 241,625_{10}$

(h) $C8,D_{16} = C \cdot 16^1 + 8 \cdot 16^0 + D \cdot 16^{-1} = 12 \cdot 16^1 + 8 \cdot 16^0 + 13 \cdot 16^{-1} = 200,8125_{10}$

4. (a)

$$3,A2_{16} \rightarrow 0011,1010\ 0010_2 \rightarrow 011,101\ 000\ 100_2 \rightarrow 3,504_8 \rightarrow$$

$$\rightarrow 3,6328125_{10}$$

(b)
$$1B1,9 \rightarrow 0001\ 1011\ 0001,1001_2 \rightarrow 110\ 110\ 001,100\ 1{\color{red}00}_2 \rightarrow$$
$$\rightarrow 661,44_8 \rightarrow 433,5625_{10}$$

(c)
$$6416213A,17B_{16} \rightarrow$$
$$\rightarrow 0110\ 0100\ 0001\ 0110\ 0010\ 0001\ 0011\ 1010,0001\ 0111\ 1011_2 \rightarrow$$
$$\rightarrow {\color{red}0}01\ 100\ 100\ 000\ 101\ 100\ 010\ 000\ 100\ 111\ 010,000\ 101\ 111\ 011_2 \rightarrow$$
$$\rightarrow 14405420472,0573_8 \rightarrow 1679171898,0092529296_{10}$$

5. (a) Podem passar el nombre a base 10, després a binari i d'allà és trivial obtenir el nombre en hexadecimal
$$204231,134_5 =$$
$$2{\cdot}5^5+0{\cdot}5^4+4{\cdot}5^3+2{\cdot}5^2+3{\cdot}5^1+1{\cdot}5^0+1{\cdot}5^{-1}+3{\cdot}5^{-2}+4{\cdot}5^{-3} = 6816,352_{10}$$

Part entera

6 8 1 6	2		3 4 0 8	2		1 7 0 4	2
0 8	3 4 0 8		1 4	1 7 0 4		1 0	8 5 2
0 1 6			0 0 8			0 4	
0			0			0	

8 5 2	2		4 2 6	2		2 1 3	2		1 0 6	2
0 5	4 2 6		0 2	2 1 3		0 1 3	1 0 6		0 6	5 3
1 2			0 6			1			0	
0			0							

5 3	2		2 6	2		1 3	2		6	2		3	2
1 3	2 6		0 6	1 3		1	6		0	3		1	1
1			0										

$$= {\color{red}000}1\ 1010\ 1010\ 0000_2 = 1AA0_{16}$$

Part decimal
$$0,352_{10} = 0,0101\ 1010\ 0001\ 1100\ 1010\ 1100\ 0000$$
$$1000\ 0011\ 0001\ 0010\ 0110\ 1110\ 1000$$

$$= 0,5A1CAC083126E8_{16}$$

4

$$204231,1345_5 = 1A9F,5C28F_{16}$$

Alternativament, passem a base 10 i després amb mètodes vistos en exercicis anteriors, a hexadecimal

Part entera

```
2 0 4 2 3 1 | 1 6
    4 4     | 1 2 7 6 4
    1 2 2              1 2 7 6 4 | 1 6
      1 0 3                1 5 6 | 7 9 7      7 9 7 | 1 6
          7 1                1 2 4             1 5 7 | 4 9      4 9 | 1 6
              7                  1 2               1 3          1 | 3
```

$$204231_{10} = 31DC7_{16}$$

Part decimal

$$0,36 \times 16 = 5,76 \geq 1 \Rightarrow 5$$
$$0,76 \times 16 = 12,16 \geq 1 \Rightarrow 12 \equiv C$$
$$0,16 \times 16 = 2,56 \geq 1 \Rightarrow 2$$
$$0,56 \times 16 = 8,96 \geq 1 \Rightarrow 8$$
$$0,96 \times 16 = 15,36 \geq 1 \Rightarrow 15 \equiv F$$
$$-\ -\ --\ -\ -\ -\ -\ --$$
$$0,36 \times 16 = 5,76 \geq 1 \Rightarrow 5$$

$$0,36_{10} = \overline{5C28F}...16$$

(b) $165433_7 = 1 \cdot 7^5 + 6 \cdot 7^4 + 5 \cdot 7^3 + 4 \cdot 7^2 + 3 \cdot 7^1 + 3 \cdot 7^0 = 33148_{10}$

```
3 3 1 4 8 | 1 6        2 0 7 1 | 1 6
  1 1 4   | 2 0 7 1      4 7   | 1 2 9
      2 8                1 5 1            1 2 9 | 1 6
      1 2                    7                1 | 8
```

$$33148_{10} = 817C_{16}$$