1. (a) $\boxed{1111_2}$ (b) $\boxed{11111_2}$

   (c) $125 = 64+32+16+8+4+1 = \underline{1}\cdot 2^6+\underline{1}\cdot 2^5+\underline{1}\cdot 2^4+\underline{1}\cdot 2^3+\underline{1}\cdot 2^2+\underline{0}\cdot 2^1+\underline{1}\cdot 2^0 = \boxed{1111101_2}$

   (d) $249 = 128+64+32+16+8+1 = \underline{1}\cdot 2^7+\underline{1}\cdot 2^6+\underline{1}\cdot 2^5+\underline{1}\cdot 2^4+\underline{1}\cdot 2^3+\underline{0}\cdot 2^2+\underline{0}\cdot 2^1+\underline{1}\cdot 2^0 = \boxed{11111001_2}$

2. (a) $\boxed{5_{10}}$ (b) $\boxed{5_{10}}$ (c) $\boxed{115_{10}}$ (d) $\boxed{170_{10}}$

3. Recall: $1+1=10$ in binary.

   (a) $\boxed{1111011_2}$

$$\begin{array}{cccccccc} & & & {\scriptstyle 1} & {\scriptstyle 1} & & & \\ & & 1 & 0 & 1 & 1 & 1 & 0 \\ + & 1 & 0 & 0 & 1 & 1 & 0 & 1 \\ \hline & 1 & 1 & 1 & 1 & 0 & 1 & 1 \end{array}$$

   (b) $\boxed{11011_2}$

$$\begin{array}{cccccccc} & {\scriptstyle 0} & {\scriptstyle 1} & {\scriptstyle 1} & {\scriptstyle 10} & {\scriptstyle 1} & {\scriptstyle 10} & \\ & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ - & & 1 & 0 & 1 & 1 & 1 & 0 \\ \hline & & & 1 & 1 & 0 & 1 & 1 \end{array}$$

   (c) $\boxed{1010010001_2}$

$$\begin{array}{cccccccccc} & & & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ & & \times & & & & 1 & 0 & 0 & 1 \\ \hline & & & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 & 0 & 0 & 1 & & & \\ \hline 1 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \end{array}$$

   (d) $\boxed{1001_2}$

$$\begin{array}{cccccccccc} & & & & & & & 1 & 0 & 0 & 1 \\ \hline 1 & 1 & 0 & 1 & | & 1 & 1 & 0 & 1 & 0 & 1 \\ & & & & - & 1 & 1 & 0 & 1 & & \\ \hline & & & & & & & & 1 & 1 & 0 & 1 \\ & & & & & & & - & 1 & 1 & 0 & 1 \\ \hline & & & & & & & & & & & 0 \end{array}$$

4. (a) $\boxed{22_{10}}$ (b) $\boxed{42_{10}}$ (c) $\boxed{11010010_2}$ (d) $\boxed{10010001_2}$

5. Recall: in binary, $1+1=10$.

   (a) $\boxed{1000010_2}$

$$\begin{array}{ccccccc} & {\scriptstyle 1} & {\scriptstyle 1} & {\scriptstyle 1} & & {\scriptstyle 1} & \\ & 1 & 0 & 1 & 1 & 0 & 1 \\ + & & 1 & 0 & 1 & 0 & 1 \\ \hline 1 & 0 & 0 & 0 & 0 & 1 & 0 \end{array}$$

(b) $\boxed{11001_2}$

$$\begin{array}{cccccc} {\scriptstyle 0} & {\scriptstyle 1} & {\scriptstyle 10} & {\scriptstyle 0} & {\scriptstyle 1} & {\scriptstyle 10} \\ 1 & 0 & 0 & 1 & 0 & 0 \\ - & & 1 & 0 & 1 & 1 \\ \hline & 1 & 1 & 0 & 0 & 1 \end{array}$$

(c) First do $10011_2 - 10001_2 = 10_2$. Then do $10_2 + 1101_2 = \boxed{1111_2}$

6. Refer to the calculations above to see how they are done.

   (a) First we find $1101_2 \times 1001_2 = 1110101_2$. Then find $1110101_2 \times 11000_2 = \boxed{101011111000_2}$

   (b) $\boxed{1011_2}$

   (c) Using order of operations, we find that $1101001_2 \div 101_2 = 10101_2$. Then we find $111_2 + 10101_2 = 11100_2$. Finally, we find $11100_2 \div 100_2 = \boxed{111_2}$

7. (a) $\boxed{85_{10}}$ (b) $\boxed{119_{10}}$

8. (a) $10_{10} = 8 + 2 = 1 \cdot 2^3 + 0 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0 = \boxed{1010_2}$

   (b) $572_{10} = 512+32+16+8+4 = 1\cdot2^9+0\cdot2^8+0\cdot2^7+0\cdot2^6+1\cdot2^5+1\cdot2^4+1\cdot2^3+1\cdot2^2+0\cdot2^1+0\cdot2^0 = \boxed{1000111100_2}$