① **ⓐ** 13_{10}

$13 \div 2 = 6 \quad r = 1$

$6 \div 2 = 3 \quad r = 0$

$3 \div 2 = 1 \quad r = 1$

$1 \div 2 = 0 \quad r = 1$

$13 \div 16 = 0 \quad r = 13$

$(1011)_2$

$(D)_{16}$

ⓑ 15_{10}

$15 \div 2 = 7 \quad r = 1$

$7 \div 2 = 3 \quad r = 1$

$3 \div 2 = 1 \quad r = 1$

$1 \div 2 = 0 \quad r = 1$

$(1111)_2$

$(F)_{16}$

---

② **ⓐ** 10011100

$2^7 \ 2^6 \ 2^5 \ 2^4 \ 2^3 \ 2^2 \ 2^1 \ 2^0$

$(152)_{10}$

$2^7 + 2^4 + 2^3 + 2^2$

$128 + 16 + 8 + 4 = 152$

$\begin{array}{r} 128 \\ +\ 28 \\ \hline 152 \end{array}$

ⓑ $(9C)_{16}$

$16^1 \ 16^0$

$(16 \times 9) + 12 = (156)_{10}$

$\begin{array}{r} 16 \\ \times\ 9 \\ \hline 144 \\ +\ 12 \\ \hline 156 \end{array}$

③

ⓐ $2^{16} = 2^{10} \cdot 2^{6}$

$K \cdot 64 = \boxed{64 \, KB}$

ⓑ $2^{24} = 2^{20} \cdot 2^{4}$

$M \cdot 16 = \boxed{16 \, MB}$

---

④ **ⓐ** 13

$(1101)_2$

$13 \div 2 = 6 \quad r = 1$
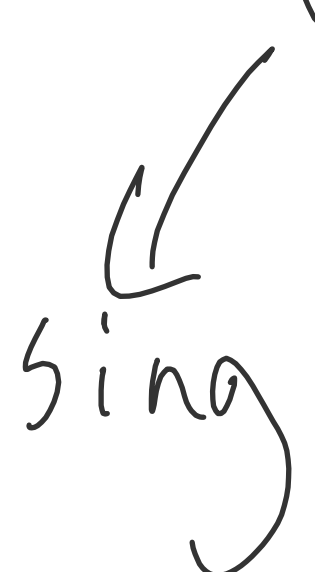
$6 \div 2 = 3 \quad r = 0$

$3 \div 2 = 1 \quad r = 1$

$1 \div 2 = 0 \quad r = 1$

① 0010

② $\overset{0010}{\underset{\overline{0011}}{\overset{1}{}0010}} \quad 1 \quad \boxed{(0011)_2}$

ⓑ -13 $\quad$ same thing, 0011 or 1001

$\underset{sing}{}$

④ ⓐ 12 + 8 with 5 bits precision

$12 \div 2 = 6 \quad r = 0$

$6 \div 2 = 3 \quad r = 0 \qquad (1100)_2 = 12$

$3 \div 2 = 1 \quad r = 1$

$1 \div 2 = 0 \quad r = 1$

$8 \div 2 = 4 \quad r = 0$

$4 \div 2 = 2 \quad r = 0 \qquad 1000 = 8$

$2 \div 2 = 1 \quad r = 0$

$1 \div 2 = 0 \quad r = 1$

$$
\begin{array}{r}
01100 \\
+ \quad 01000 \\
\hline
10100
\end{array}
$$

No overflow

$$
\begin{array}{r}
\;0\,0\,1\,1\,0\,0 \\
+\;0\,0\,1\,0\,0\,0 \\
\hline
0\,1\,0\,1\,0\,0
\end{array}
$$

6 **a** 5×4

$5 \times 2^2 = (101 << 2)$

$5 \div 2 = 2 \quad r = 1$

$2 \div 2 = 1 \quad r = 0$

$1 \div 2 = 0 \quad r = 1$

$= 10100$

b $13 \times 12 = 13 \times (8+4) = 13 \times (2^3 + 2^2)$

$= (13 \times 2^3) + (13 \times 2^2)$

$13 \div 2 = 6 \quad r = 1$

$6 \div 2 = 3 \quad r = 0$

$3 \div 2 = 1 \quad r = 1$

$1 \div 2 = 0 \quad r = 1$

$(1101 << 3) + (1101 << 2)$

$$
\begin{array}{r}
\;0\,1\,1\,0\,1\,0\,0\,0 \\
+\;0\,0\,1\,1\,0\,1\,0\,0 \\
\hline
1\,0\,0\,1\,1\,1\,0\,0
\end{array}
$$

2) a) "52"

0x5350

b) "-127"

0x 2D3132 37

ⓑ ⓐ $12 \times 4 = 12 \times 2^2 = (1100 << 2)$

$$= 110000$$

$12 \div 2 = 6 \quad r = 0$

$6 \div 2 = 3 \quad r = 0$

$3 \div 2 = 1 \quad r = 1$

$1 \div 2 = 0 \quad r = 1$

Ⓑ $8 \times 16 = 8 \times 2^4 = (1000 << 4)$

$$= 1000\ 0000$$

$8 \div 2 = 4 \quad r = 0$

$4 \div 2 = 2 \quad r = 0$

$2 \div 2 = 1 \quad r = 0$

$1 \div 2 = 0 \quad r = 1$

$2^3 \times 2^4 = 2^7 = 128$

9 Short-circuit evaluation means that when evaluatin Boolean expressions
you can stop as soon as you find the first condition which satisfies or
negates the expression.
shor circuit meaning they do not evaluate the right hand side

but not--short circuiting the & operator combines two Boolean balues
using the rules for and , but always evaluates both operand.

10 Context describes the broader environment in which a piece of work is
situated. A statement's importance is greatly increased by its context, which
also makes it much simpler to comprehend. IN literary works, context cues
build the relationship between the author and the reader while also
illuminating the purpose and meaning of the work.