

1 Information representation – Part 1 —Answers

Answers

Work through these after you have tried the questions yourself.

2.1 Divide by 2: $45 \div 2 = 22 \text{ r } 1$, $22 \div 2 = 11 \text{ r } 0$, $11 \div 2 = 5 \text{ r } 1$, $5 \div 2 = 2 \text{ r } 1$, $2 \div 2 = 1 \text{ r } 0$, $1 \div 2 = 0 \text{ r } 1$. Remainders bottom to top: 101101; padded to 8 bits, $45 = 00101101$.

2.2 $(1 \times 2^5) + (1 \times 2^4) + (1 \times 2^2) = 32 + 16 + 4 = 52$.

2.3 $1110 = \text{E}$ and $1010 = \text{A}$, so $11101010 = 0\text{xEA}$.

2.4 $2\text{F} = 2 \times 16 + 15 = 47$.

2.5 $+12 = 00001100$; flip $\rightarrow 11110011$; add 1 $\rightarrow 11110100$. So $-12 = 11110100$.

2.6 $7 = 0111$ and $2 = 0010$, so 72 in BCD is 0111 0010.

2.7 One hex digit stands for four binary bits, so numbers are much shorter and easier to read (and less error-prone) —for example memory addresses or colour codes.

2.8 The left-most bit is the sign bit. In two's complement all negative numbers have it set to 1 and all non-negative numbers have it set to 0, so that single bit shows the sign at a glance.