

Solutions

2.1

Use binary place values.

$$V = 1(16) + 0(8) + 1(4) + 1(2) + 0(1) = 22$$

Decimal 22.

2.2

Decompose 13 into weights 8, 4 and 1. Four-bit result 1101.

2.3

F represents 15.

$$V = 2(16) + 15 = 47$$

Decimal 47. Each hexadecimal digit supplies four bits, so binary pattern 00101111.

2.4

Column addition gives binary 10001. Carry method earns M1 and correct result A1. It represents 17 and exceeds the four-bit unsigned maximum 15, so it does not fit.

3.1

- (a) Decompose 45 as $32 + 8 + 4 + 1$. Eight-bit pattern 00101101. Hexadecimal 2D.
- (b) Subtract values or use binary borrowing.

$$V = 64 - 45 = 19$$

Decimal result 19. Eight-bit pattern 00010011.

3.2

- (a) Initial value is $V = 128 + 64 + 32 + 16 + 8 + 2 = 250$. Mathematical sum $S = 250 + 10 = 260$.
- (b) Use place weights to represent 260. Binary numeral 100000100.
- (c) Eight unsigned bits can hold at most $2^8 - 1 = 255$, so overflow occurs.
- (d) Keep the low eight bits under the explicitly stated rule. Stored pattern 00000100, value 4. The high 256-weight bit is discarded, so this stored value is the remainder modulo 256 rather than the mathematical sum 260.