Chapter 5 · Section 5.1 — Exercises (Mazidi)

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> Problems are paraphrased to respect copyright. Answers show the 32-bit **two's-complement** representation (hex).

How to convert (quick refresher)

- **Positive** values: write the hex value and **zero-extend to 8 hex digits** (32 bits).
- **Negative −N**: write `N` in hex (32-bit), then **invert** (bitwise NOT) and **add 1**.

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1) 32-bit representations

item	value	32-bit two's-complement
(a)	−23	**0xFFFFFFE9**
(b)	+12	**0x0000000C**
(c)	−0x28	**0xFFFFFFD8**
(d)	+0x6F	**0x0000006F**
(e)	−128	**0xFFFFFF80**
(f)	+127	**0x0000007F**
(g)	+365	**0x0000016D**
(h)	−32,767	**0xFFFF8001**

Checks (sketch):

- (a) `23 = 0x00000017`; `~17 = 0xFFFFFFE8`; `+1 → 0xFFFFFFE9`.
- (h) `32767 = 0x00007FFF`; `~ = 0xFFFF8000`; `+1 → 0xFFFF8001`.

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2) 32-bit representations

item	value	32-bit two's-complement
(a)	−230	**0xFFFFFF1A**
(b)	+1200	**0x000004B0**
(c)	−0x28F	**0xFFFFFD71**
(d)	+0x6FF	**0x000006FF**

Checks (sketch):

- (a) `230 = 0x000000E6`; `~ = 0xFFFFFF19`; `+1 → 0xFFFFFF1A`.
- (c) `0x28F`; `~ = 0xFFFFFD70`; `+1 → 0xFFFFFD71`.

Notes for learners

- The **sign bit** is bit31 (1 = negative).
- Adding a positive number to its two's-complement negative gives **0** modulo `2^32`.
- To verify: in most programmer's calculators, set **word size = 32**, **two's complement**, and toggle **DEC/HEX**.