Solutions: Hexadecimal Expansion (Example 5)

Part A — Worked Example

Shown step-by-step:

$$177130 \div 16 = 11070\, r10 \quad (A)$$
$$11070 \div 16 = 691\, r14 \quad (E)$$
$$691 \div 16 = 43\, r3$$
$$43 \div 16 = 2\, r11 \quad (B)$$
$$2 \div 16 = 0\, r2$$

Digits: $(2B3EA)_{16}$.

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Part B — Easier Practice Solutions

1. $(255)_{10}$:

$$255 \div 16 = 15\, r15 \quad (F)$$
$$15 \div 16 = 0\, r15 \quad (F)$$

Answer: $(255)_{10} = (FF)_{16}$.

2. $(4095)_{10}$:

$$4095 \div 16 = 255\, r15 \quad (F)$$
$$255 \div 16 = 15\, r15 \quad (F)$$
$$15 \div 16 = 0\, r15 \quad (F)$$

Answer: $(4095)_{10} = (FFF)_{16}$.

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Part C — Harder Challenge Solution

$$1048575 = 2^{20} - 1.$$

Successive division by 16 gives all remainders equal to 15:

$$1048575 \div 16 = 65535\, r15 \quad (F)$$
$$65535 \div 16 = 4095\, r15 \quad (F)$$
$$4095 \div 16 = 255\, r15 \quad (F)$$
$$255 \div 16 = 15\, r15 \quad (F)$$

$$15 \div 16 = 0\,r15 \quad (F)$$

Answer:

$$(1048575)_{10} = (FFFFF)_{16}.$$

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Teaching Notes

- Highlight that A–F are digits 10–15.
- Easier problems illustrate short expansions (FF, FFF).
- The challenge problem emphasizes recognizing special forms like $2^n - 1$.