

Ex. 3.1A

2.

	<i>preceding</i>	<i>given number</i>	<i>succeeding</i>
(a)	<i>MCMXLVIII</i>	<i>MCMXLIX</i>	<i>MCML</i>
(b)	< < <	< < < ▽	< < < ▽ ▽
(c)			
(d)			

3. The building was built in 1922.

4. (a) 121 in Roman Numerals is *CXXI*.
 (b) 42 in Roman Numerals is *XLII*.

7. (a) $3 \cdot 10^6 + 4 \cdot 10^3 + 5 = 3,004,005$
 (b) $2 \cdot 10^4 + 1 = 20,001$

10. Since the hundreds digit is greater than 7, it is either 8 or 9. The tens digit is odd but the sum must be 10 so it has to be 1. The two possibilities are 811 or 910.

14. Base twenty requires 20 different digits.

15. $2032_4 = 2 \times 4^3 + 0 \times 4^2 + 3 \times 4 + 2 \times 1 = 142$

17.

	<i>preceding</i>	<i>number</i>	<i>succeeding</i>
(a)	<i>ETE₁₂</i>	<i>EE0₁₂</i>	<i>EE1₁₂</i>
(b)	<i>11111₂</i>	<i>100000₂</i>	<i>100001₁₂</i>
(c)	<i>554₆</i>	<i>555₆</i>	<i>1000₆</i>

18. (a) 204_4 is not correct because 4 is represented by 10 in base 4.
 (b) 607_5 has two digits bigger than 4.

23. (a) $432_5 = 4 \times 5^2 + 3 \times 5 + 2 \times 1 = 117$
 (b) $101101_2 = 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 1 = 45$
 (c) $92E_{12} = 9 \times 12^2 + 2 \times 12^1 + 11 \times 1 = 1331$

Ex. 3.1B

22. (a)
$$\begin{array}{r|l} 4 & 234 \\ 4 & \underline{58} \quad r = 2 \\ 4 & \underline{14} \quad r = 2 \\ 4 & \underline{3} \quad r = 2 \\ & 0 \quad r = 3 \end{array}$$

$$234 = 3222_4$$

(b)
$$\begin{array}{r|l} 12 & 1876 \\ 12 & \underline{156} \quad r = 4 \\ 12 & \underline{13} \quad r = 0 \\ 12 & \underline{1} \quad r = 1 \\ & 0 \quad r = 1 \end{array}$$

$$1876 = 1104_{12}$$

(c)
$$\begin{array}{r|l} 3 & 303 \\ 3 & \underline{101} \quad r = 0 \\ 3 & \underline{33} \quad r = 2 \\ 3 & \underline{11} \quad r = 0 \\ 3 & \underline{3} \quad r = 2 \\ 3 & \underline{1} \quad r = 0 \\ & 0 \quad r = 1 \end{array}$$

$$303 = 102020_3$$

(d)
$$\begin{array}{r|l} 2 & 22 \\ 2 & \underline{11} \quad r = 0 \\ 2 & \underline{5} \quad r = 1 \\ 2 & \underline{2} \quad r = 1 \\ 2 & \underline{1} \quad r = 0 \\ & 0 \quad r = 1 \end{array}$$

$$22 = 10110_2$$

Extra question:

$$\begin{aligned} 2CDE_{16} &= 2 \times 16^3 + 12 \times 16^2 + 13 \times 16 + 14 \times 1 \\ &= 8192 + 3072 + 208 + 14 \\ &= 11486 \end{aligned}$$

Extra practice questions:

$$98,765,432 = \overline{\overline{XCVIII}} \overline{\overline{DCCLXV}} \overline{CDXXXII}$$

$$\begin{aligned} 12345 &= (3 \times 3600) + 1545 \\ &= (3 \times 3600) + (25 \times 60) + (45 \times 1) \\ &= \blacktriangledown\blacktriangledown\blacktriangledown < < \blacktriangledown\blacktriangledown\blacktriangledown\blacktriangledown\blacktriangledown < < < < \blacktriangledown\blacktriangledown\blacktriangledown\blacktriangledown\blacktriangledown \end{aligned}$$

$$\begin{aligned}
12345 &= (1 \times 7200) + 5145 \\
&= (1 \times 7200) + (14 \times 360) + 105 \\
&= (1 \times 7200) + (14 \times 360) + (5 \times 20) + (5 \times 1) \\
&= \begin{array}{|c|} \hline \bullet \\ \hline \bullet\bullet\bullet\bullet \\ \hline \text{---} \\ \hline \text{---} \\ \hline \end{array}
\end{aligned}$$

$$\begin{aligned} &< < < \blacktriangledown\blacktriangledown < \blacktriangledown\blacktriangledown\blacktriangledown\blacktriangledown\blacktriangledown < < \blacktriangledown\blacktriangledown\blacktriangledown\blacktriangledown \\ &= (32 \times 60^2) + (15 \times 60^1) + (24 \times 60^0) \\ &= 116,124 \end{aligned}$$