

Solutions

Each answer shows the steps, then the **result**.

2.1

- $P \cup Q = \{2, 4, 6, 8, 12\}$
- $P \cap Q = \{4, 8\}$
- $Q - P = \{12\}$

2.2

- $47 \rightarrow 7$, $12 \rightarrow 2$, $57 \rightarrow 7$, $30 \rightarrow 0$, $92 \rightarrow 2$
- chains in slots **2** and **7**

2.3

- $47 \rightarrow 7$, $12 \rightarrow 2$, $30 \rightarrow 0$
- 57: 7 taken, slot **8**
- 92: 2 taken, slot **3**

2.4

- $\frac{5}{10} = \mathbf{0.5}$

3.1 C

- a set holds distinct values only

3.2 A

- two keys, one slot

3.3 B

- no search through the keys is needed

3.4

(a)

- $10023 \bmod 11 = 2$: slot **2**
- $10034 \bmod 11 = 2$: taken, slot **3**
- $10045 \bmod 11 = 2$: 2 and 3 taken, slot **4**
- $10001 \bmod 11 = 2$: 2, 3, 4 taken, slot **5**

(b)

- slots **2, 3, 4**

(c)

- if the ID had been inserted, it would have gone into the first empty slot on its probe path
- so reaching an empty slot means it is not in the table

(d)

- 11 slots cannot hold 2000 keys with probing; with chaining, chains would be about 180 long, so searches are slow
- a size giving a load factor well below 1, such as 4001 slots (a prime about twice the number of books)