



4.4.2.2 Sets

1) Why would a list be a better data structure for a deck of cards than a set?

[1 mark]

2) Explain the difference between a subset and a proper subset?

[1 mark]

3) **Figure 1** contains a list of different sets.

Figure 1

$S1 = \{a, b\}$	$S4 = \{a, ab\}$
$S2 = \{a, b, c\}$	$S5 = \{a, b, c\}$
$S3 = \{0, 1, 2\}$	$S6 = \{c\}$

a) What is a set?

[2 marks]

b) State the name of a set listed in **Figure 1** that has the same cardinality as set S2.

[1 mark]

c) State the name of a set listed in **Figure 1** that is a subset of set S2 but not a proper subset of S2.

[1 mark]

d) Describe how set S6 could be created using the difference set operation together with two of the other sets listed in **Figure 1**.

[1 mark]

e) What is the Cartesian product of sets S1 and S6?

[1 mark]

f) A regular expression is a way of describing a set. Write down two different regular expressions that describe the set S4.

[2 marks]





- 4) **Figure 2** shows four sets **R**, **S**, **T** and **U**. Three dots (...) means the remaining members of the set follow the same pattern as the previous members of the set..

Figure 2

$$R = \{a, b\}$$

$$S = \{a, abb, abbbb, abbbbbbb, \dots\}$$

$$T = \{bb, bbbb, bbbbbbb, \dots\}$$

$$U = \{c, d, bb, b\}$$

- a) What is meant by the cardinality of a set? [1 mark]

- b) Explain what is wrong with the statement:

‘The only subsets of **R** are the sets $\{a\}$, $\{b\}$ and $\{a, b\}$ ’..

[1 mark]

- c) How many members are there in the set formed by the intersection of **R** and **U**? [1 mark]

- d) The language defined by a regular expression can be represented as a set.

Explain the functionality of the `|` (vertical bar) metacharacter when it is used in a regular expression.

[1 mark]

The members of the set **V** are strings that match the regular expression `a?b+`

Set **W** is formed by the union of sets **S** and **T**.

Set **X** is formed by the set operation **V – W**.

- e) Write a regular expression that would match with all the members of the set **W**. [2 marks]

- f) Write a regular expression that would match with all the members of the set **X**. [2 marks]

