



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]

- Because sets are unordered // because the cards have an order;
-

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

[1 mark]

- A set is a subset of itself but not a proper subset of itself // There will be at least one value in a set that is not in a proper subset of that set, that does not have to be the case for a subset;
-

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]

- A set is an unordered collection of values;
- with no duplicates;

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

[1 mark]

- S3 // S5;

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]

- S5;





- 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]

- The difference between set S5 and S1 / $S5 - S1$
// the difference between set S2 and S1 / $S2 - S1$;

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

[1 mark]

- $\{(a, c), (b, c)\}$
// $\{(c, a), (b, c)\}$;

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

[2 marks]

- $a \mid ab$;
- $ab^?$;

-
- 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]

- The number of members/elements of a set;

- b) Explain what is wrong with the statement:

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

[1 mark]

- The empty set is also a subset of R;





c) How many members are there in the set formed by the intersection of **R** and **U**?

[1 mark]

- 1

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]

- It means either the element immediately before or the element immediately after // alternation;

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]

- $a(bb)^*|(bb)^+ // a|a?(bb)^+ // (a|bb)(bb)^*$

f) Write a regular expression that would match with all the members of the set **X**.

[2 marks]

- $(ab|b)(bb)^* // a?b(bb)^*$

