

## 1.10 Sets

A *set* is a collection of objects which are called *elements*.

Write

$$s \in S \text{ if } s \text{ is an element of the set } S.$$

- The *empty set*  $\emptyset$  is the set with no elements.
- A *subset*  $T$  of a set  $S$  is a set  $T$  such that if  $t \in T$  then  $t \in S$ .

Write

$$T \subseteq S \text{ if } T \text{ is a subset of } S, \text{ and}$$

$$T = S \text{ if the set } T \text{ is equal to the set } S.$$

Let  $S$  and  $T$  be sets.

- The *union of  $S$  and  $T$*  is the set  $S \cup T$  of all  $u$  such that  $u \in S$  or  $u \in T$ ,

$$S \cup T = \{u \mid u \in S \text{ or } u \in T\}.$$

- The *intersection of  $S$  and  $T$*  is the set  $S \cap T$  of all  $u$  such that  $u \in S$  and  $u \in T$ ,

$$S \cap T = \{u \mid u \in S \text{ and } u \in T\}.$$

- The *product  $S$  and  $T$*  is the set  $S \times T$  of all ordered pairs  $(s, t)$  where  $s \in S$  and  $t \in T$ ,

$$S \times T = \{(s, t) \mid s \in S \text{ and } t \in T\}.$$

The sets  $S$  and  $T$  are *disjoint* if  $S \cap T = \emptyset$ .

The set  $S$  is a *proper subset* of  $T$  if  $S \subseteq T$  and  $S \neq T$ .