Study unit 3

Activity 3-3

1. *In each of the following cases, describe the set more concisely, firstly using list notation and then using set-builder notation.*

(a) list notation: {0, 2, 4, 6, 8}.

set-builder notation: $\{x \in \mathbb{Z}^{\geq} \mid x$ is an even non-negative integer and $x < 10\}$ (property description)

(b) The roster method: {–11, –9, –7, –5, –3, –1}.

There is more than one way (we give only two) to describe this set using set-builder notation:

$\{x \in \mathbb{Z} \mid x$ is an odd negative integer and $x > -13\}$ (property description)

or, if you prefer:

$\{y \in \mathbb{Z} \mid y$ is odd and $-13 < y < 0\}$ (property description)

(c) The roster method: $\{\ \} = \emptyset$

(because there does not exist an integer that is, at the same time, positive and less than 1).

In set-builder notation:

One possibility is $\{x < 1 \mid x \in \mathbb{Z}^{+}\}$.

(d) Because of the nature of real numbers, ie between any two real numbers a and b one can always find another real number, namely $(a + b)/2$, it is not really possible to represent this set using the roster method. In set-builder notation: $\{x \in \mathbb{R} \mid x > 2\}$.

2. *In each of the following cases, give an unambiguous description in English.*

(a) {–1, 0, 1}:

One possibility is to speak of the set having –1, 0 and 1 as its only elements.

Another is to speak of the set of all integers greater than –2 and less than 2.

(b) $\{ x \in \mathbb{R} \mid 0 < x < 1 \}$: The set of all real numbers greater than 0 and less than 1.

(c) {0}:

Again we can give many descriptions of this set in English:

- The set having 0 as its only element.
- The set of all non-negative integers less than 1.
- The set of all integers greater than -1 and less than 1.
- The set of all integers that are simultaneously not positive and not negative.

(d) $\{\mathbb{Z}\}$: The set containing the set of integers, $\mathbb{Z}$, as its only member.

Does it bother you to have a set like $\mathbb{Z}$ as an element inside another set? Remember that the purpose of a set is just to group together the things we are interested in, and these things may well be sets themselves. If we are interested in the number sets, we may group together as elements not just $\mathbb{Z}$ but also $\mathbb{Z}^+$, $\mathbb{Z}^{\geq}$, $\mathbb{Q}$ and $\mathbb{R}$ to form the set $\{\mathbb{Z}, \mathbb{Z}^+, \mathbb{Z}^{\geq}, \mathbb{Q}, \mathbb{R}\}$, and so on.