

1.– Write down the elements of the following sets:

$$A = \{x \in \mathbb{N} \mid x < 10\}, B = \{x \in \mathbb{Z} \mid x^2 < 11\}, C = \{x \in \mathbb{Q} \mid 2x \in \mathbb{Z}, -2 < x \leq 1\}.$$

2.– For the sets defined in the previous exercise calculate:

$$A \cup B, A \cap B, B \cap C, A \cap B \cap C, \mathbb{N} \setminus A$$

3.– Put $A = \{1, 2, 3\}$, $B = \{3, 4, 5, 7\}$ and consider the correspondences:

$$F_1 = \{(1, 3), (2, 7)\}$$

$$F_2 = \{(1, 3), (2, 4), (3, 3)\}$$

$$F_3 = \{(1, 7), (2, 5), (2, 4), (3, 4)\}$$

Represent each of them using a Venn diagram.

4.– For the previous correspondences indicate the initial set, the final set, the domain and the image set.

5.– For the correspondence F_3 : What are the images of 2? What are the origins of 4?

6.– Which of the correspondences in exercise 3 are functions?

7.– For the functions determined in exercise 6, indicate if they are injective, surjective and/or bijective.

8.– Given $f : \mathbb{R} \rightarrow \mathbb{R}$ defined as $f(x) = 2x + 3$. Indicate if it is bijective. If so, calculate the inverse function.

9.– Given $g : \mathbb{R} \rightarrow \mathbb{R}$ and $h : \mathbb{R} \rightarrow \mathbb{R}$ defined respectively as $g(x) = x + 1$ and $h(x) = x^2 - 1$ compute $(g \circ h)$ and $(h \circ g)$.

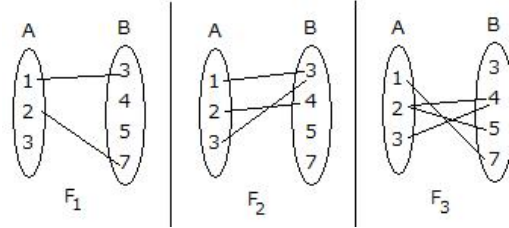
Solutions.

1. $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $B = \{-3, -2, -1, 0, 1, 2, 3\}$, $C = \{-3/2, -1, -1/2, 0, 1/2, 1\}$.

2. $A \cup B = \{-3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A \cap B = \{1, 2, 3\}$, $B \cap C = \{-1, 0, 1\}$.

$A \cap B \cap C = \{1\}$, $\mathbb{N} \setminus A = \{x \in \mathbb{N} \mid x \geq 10\}$.

3.



4. For all correspondences the initial set is $A = \{1, 2, 3\}$ and the final set is $B = \{3, 4, 5, 7\}$.

Domain(F_1) = $\{1, 2\}$, Image set(F_1) = $\{3, 7\}$.

Domain(F_2) = $\{1, 2, 3\}$, Image set(F_2) = $\{3, 4\}$.

Domain = $\{1, 2, 3\}$, Image set(F_3) = $\{4, 5, 7\}$.

5. The images of the 2 are 4, 5. The origins of the 4 are 2, 3.

6. Only F_2 is a function.

7. F_2 is neither injective, nor surjective, nor bijective.

8. It is bijective. $f^{-1}(x) = \frac{x-3}{2}$.

9. $(g \circ h)(x) = x^2$, $(h \circ g)(x) = x^2 + 2x$.