1. Explicitly write down all the elements of the set S given by

$$S = \{n \in \mathbb{N} : 2n \leq 8\}.$$

All natural numbers n with the property that $2n$ is less than or equal to 8.

1 ⟹ 2·1=2
2 ⟹ 2·2=4
3 ⟹ 2·3=6
4 ⟹ 2·4=8

$$S = \{1, 2, 3, 4\}$$

2. Take A and B to be the sets given by

$$A = \{-1, 1\} \quad \text{and} \quad B = \{-1, 0, 1\}.$$

Determine whether the following statements are true or false.

a) $A \subseteq B$

True. Every element in A is also an element in B.

b) $B \subseteq A$

False. The number 0 is an element of B that is not an element in A.

3. Take A, B and C to be the sets given by

$$A = \{-1, 1\}, \quad B = \{-1, 0, 1\} \quad \text{and} \quad C = \{0, 1, 5, 6\}.$$

Determine whether the following statements are true or false.

a) $A \subseteq B$

True

b) $B \subseteq A$

False
0 is in B but not in A

c) $C \subseteq A$

False
5 is in C but not in A

d) $B \subseteq C$

False
-1 is in B but not in C

e) $C \subseteq B$

False
5 is in B but not in B

4. Take A and B to be the sets given by

$$A = \{-2, -1, 0, 1, 4\} \quad \text{and} \quad B = \{-1, 0, 1, 3\}.$$

Write out explicitly all elements.

a) $A \cup B$

union

$$A \cup B = \{-2, -1, 0, 1, 3, 4\}$$

b) $B \cap A$

intersection

$$B \cap A = \{-1, 0, 1\}$$

5. Determine the following intersection:

$$\{1\} \cap \{-1, 0\}.$$

empty

$$\emptyset \quad \text{or} \quad \{\ \}$$

6. Take X, Y and Z to be the sets given by

$$X = \{x \in \mathbb{N} \colon x \text{ is even}\}, \quad Y = \{y \in \mathbb{N} \colon y < 21\} \quad \text{and} \quad Z = \{z \in \mathbb{N} \colon z \text{ is a multiple of } 3\}.$$

Determine
$$Z \cap (X \cap Y).$$

① Write out all elemements.
$$X = \{2,4,6,8,10,\ldots\}$$
$$Y = \{1,2,3,4,\ldots,19,20\}$$
$$Z = \{3,6,9,12,\ldots\}$$

② Compute $(X \cap Y)$
$$X \cap Y = \{2,4,6,\ldots 18,20\}$$

③ compute $Z \cap (X \cap Y)$
$$Z \cap (X \cap Y)$$
$$\|$$
$$\{3,6,9,12,15,\ldots\} \cap \{2,4,6,\ldots,18,20\}$$
$$\|$$
$$\boxed{\{6,12,18\}}$$

7. Take A and B to be the sets given by

$$A = \{-2,-1,0,1,2\} \quad \text{and} \quad B = \{-3,-1,0,3\}.$$

Determine the following.

a) $A \setminus B$

all elements in A not in B

$$\boxed{A \setminus B = \{-2,1,2\}}$$

b) $B \setminus A$

all elements in B not in A

$$\boxed{B \setminus A = \{-3,3\}}$$