

1. Give an example of a set A with $\mathbb{Q} \subset A \subset \mathbb{R}$.

Solution: One example is something sneaky like $A = \mathbb{Q} \cup \{\sqrt{2}\}$.

2. Give an example of sets A and B with $A \subseteq B$ and $A \in B$.

Solution: For example $A = \{1\}$ and $B = \{1, \{1\}\}$.

3. If $A = \{1, 2, 3, 4, 5\}$ and $B = \{3, 4, 5, 6, 7\}$:

- (a) Find $A \cap B$.

Solution: $A \cap B = \{3, 4, 5\}$

- (b) Find $A \cup B$.

Solution: $A \cup B = \{1, 2, 3, 4, 5, 6, 7\}$

- (c) Find an expression involving A , B and some of \cap , \cup , $-$ and complement to denote the elements in either A or B but not both.

Solution: One way is $(A \cup B) - (A \cap B)$. Another way is $\overline{(A \cap B) \cup (\overline{A \cup B})}$.

4. Give examples of sets of integers A and B with $A \cap B = \{1, 2\}$ and $|\mathbb{Z} - (A \cup B)| = 1$.

Solution: For example we could have $A = \{1, 2, 3, 4, \dots\}$ and $B = \{1, 2, -1, -2, -3, -4, \dots\}$.

5. Find $\mathcal{P}(A)$ for $A = \{1, 2, 3\}$.

Solution: We have $\mathcal{P}(A) = \{\{\}, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{1, 3\}, \{2, 3\}, \{1, 2, 3\}\}$

6. Find $\mathcal{P}(A)$ for $A = \{0, \{0, 1\}\}$.

Solution: We have $\mathcal{P}(A) = \{\{\}, \{0\}, \{\{0, 1\}\}, \{0, \{0, 1\}\}\}$