Rules From graders and tutors

- There are still some people whose work looks like a rough draft. If the grader can't understand you, they assume you are wrong.

- It seems like people are starting hubs too late. The material is shifting harder, you should start current (and future) hubs earlier than you had in the past.

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Last time, A collection of sets indexed by a set I is a set $A_i$ for each $i \in I$.

What does this mean?

$I$ is a set of labels! Each $i \in I$ is just a label. What we care about is the collection of sets $A_i$, which happen to be labelled by elements $i \in I$.

E.g. Suppose I care about the sets $\mathbb{N}, \mathbb{Z}, \mathbb{Q}, \mathbb{R}$.

Then I might choose to label them $A_1 = \mathbb{N}, A_2 = \mathbb{Z}, A_3 = \mathbb{Q}, A_4 = \mathbb{R}$.

Then the collection is $\{\mathbb{N}, \mathbb{Z}, \mathbb{Q}, \mathbb{R}\} = \{A_i : i \in \{1, 2, 3, 4\}\}$.

This is overly complex for just 4 sets. But sometimes we have a large number, or infinitely many, sets that
We care about that are naturally labelled by some infinite set. For example:

- \{ (\alpha, \frac{1}{n^2}) : n \in \mathbb{N} \}
- \{ (n, n+1) : n \in \mathbb{Z} \}

**Notation** For an indexed collection

\{A_n : n \in \mathbb{N}\}

we write:

\[ \bigcap_{n=1}^{\infty} A_n = \bigcap_{n \in \mathbb{N}} A_n \]

\[ \bigcup_{n=1}^{\infty} A_n = \bigcup_{n \in \mathbb{N}} A_n \]

Similarly, for an index set \( \mathbb{Z}_{\geq 0} \), we use \( \bigcap_{n=0}^{\infty} \), \( \bigcup_{n=0}^{\infty} \), and for an index set \( \mathbb{Z} \), we use \( \bigcap_{n=-\infty}^{\infty} \), \( \bigcup_{n=-\infty}^{\infty} \)

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Worksheet time!