Worksheet 12: Cartesian product, indexed collections, relations

1. Let $A_n = \left[0, \frac{1}{n}\right] \times [0, n]$. Draw the picture representing $\bigcup_{n\in\mathbb{N}} A_n$ and $\bigcap_{n\in\mathbb{N}} A_n$. (Both should be subsets of $\mathbb{R}^2$).

2. Let R be the relation $a \equiv b \mod 3$ on the set $A = \{0, 1, 2, 3, 4, 5\}$. Write this relation as a subset of $A \times A$.

3. Let $A = \{1, 2, 3\}$, and let $B = \{a, b, c, d\}$. Let $R = \{(1, a), (2, b), (2, c), (3, a), (3, d)\}$ - a relation from A to B. Draw a diagram representing this relation.

4. Let $A = \{x, y, z, w\}$ and let $R = \{(x, x), (x, y), (y, z), (w, w), (y, x), (z, y)\}$. Is this relation symmetric? Is it reflexive? is it transitive?

5. Let $A = \{a, b, c, d, e, f\}$ and let $R_1 = \{(a, a), (a, b), (b, e), (c, c), (d, e)\} \subset A \times A$. Find R_2 - the smallest relation containing R_1 that is an equivalence relation. Then find the partition of A into equivalence classes according to R_2.