1. $A = \{a, b\}$
$\{\{a\}, \{b\}\}$ of $R = \{(a, a), (b, b)\}$
$\{\{a, b\}\}$ of $R = \{(a, a), (b, b), (a, b), (b, a)\}$

2. $A = \{a, b, c\}$
$\{\{a\}, \{b\}, \{c\}\}$ of $R = \{(a, a), (b, b), (c, c)\}$
$\{\{a, b\}, \{c\}\}$ of $R = \{(a, a), (b, b), (c, c), (a, b), (b, a)\}$
$\{\{a\}, \{b, c\}\}$ of $R = \{(a, a), (b, b), (c, c), (b, c), (c, b)\}$
$\{\{a, c\}, \{b\}\}$ of $R = \{(a, a), (b, b), (c, c), (a, c), (c, a)\}$
$\{\{a, b, c\}\}$ of $R = \{(a, a), (b, b), (c, c), (a, b), (b, a), (a, c), (c, a), (c, b), (b, c)\}$

3. The four subsets of the partition of $\mathbb{Z}$ resulting from the equivalence relation $\equiv \pmod 4$ are:
$[0] = [4] = [8] = ... = [4a]$ for $a \in \mathbb{Z}$,
$[1] = [5] = [9] = ... = [4b + 1]$ for $b \in \mathbb{Z}$,
$[2] = [6] = [10] = ... = [4c + 2]$ for $c \in \mathbb{Z}$,
$[3] = [7] = [11] = ... = [4d + 3]$ for $d \in \mathbb{Z}$.

4.1. Proposition Suppose P is a partition of set A. The relation $R = \{(x, y) \in A \times A : x, y \in X, (X \in P)\}$ on A is an equivalence relation.
Proof.
For any $x, y \in A$, it follows that $x, y \in X$ for some $X \in P$ by def. of a partition. Thus xRx, meaning R is reflexive, and yRx, meaning R is symmetric. Now suppose xRy and yRz for some $x, y, z \in A$. Then $x, y \in X$ and $y, z \in Y$ for some $X, Y \in P$. Since $y \in X \cap Y$, it follows that $X = Y$ by def. of a partition. Then $x, z \in X$, which implies xRz, and thus R is transitive. Therefore the relation R on A is an equivalence relation. ■

5. $R = \{(x, y) \in \mathbb{Z} \times \mathbb{Z} : x \equiv y \pmod 2\}$.

6. $R = \{(x, y) \in \mathbb{Z} \times \mathbb{Z} : x - y = 0\}$