Definition

Let $f : A \to B$.

1. We say that f is **injective** or **one-to-one** if

$$\forall x, y \in A, f(x) = f(y) \implies x = y,$$

or equivalently,

$$\forall x, y \in A, x \neq y \implies f(x) \neq f(y).$$

"No point in B is hit more than once"

2. We say that f is **surjective** or **onto** if

$$\forall y \in B, \exists x \in A, f(x) = y.$$

"Every point in B is hit at least once"

3. We say that f is **bijective** or **invertible** if it is both injective and surjective.
"Every point in B is hit exactly once"

If $A = B$ finite then bijections are also called **permutations**.