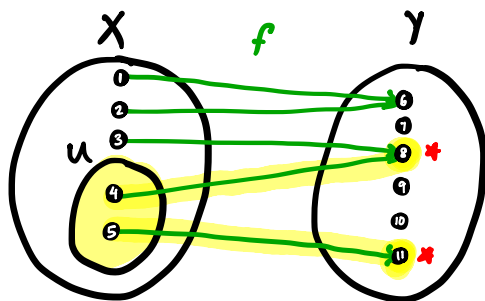


$$f: X \rightarrow Y$$

* knowing both definitions for image and both definitions for preimage is useful!

Image: a subset of codomain * where you're going

$$f[U] = \{ \underbrace{f(x)}_{\substack{\text{all the possible} \\ \text{values you} \\ \text{can get}}} \mid \underbrace{x \in U}_{\substack{\text{given inputs} \\ \text{from } U}} \} = \{ \underbrace{y \in Y}_{\substack{\text{elements} \\ \text{of the} \\ \text{codomain}}} \mid \underbrace{\exists x \in U, y = f(x)}_{\substack{\text{which have a corresponding} \\ \text{input from } U}} \}$$

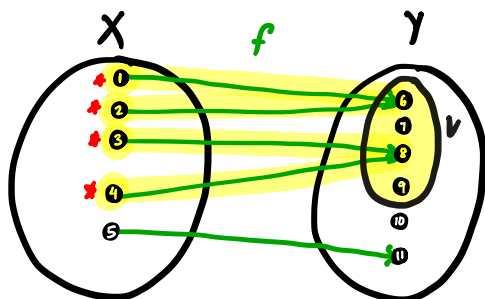


$$* f[U] = \{ 8, 9, 10 \}$$

* image of U under f =
everything you can reach "
in codomain from U

Preimage: a subset of domain * where you came from

$$f^{-1}[V] = \{ \underbrace{x \in X}_{\substack{\text{elements} \\ \text{of the} \\ \text{domain}}} \mid \underbrace{f(x) \in V}_{\substack{\text{whose value} \\ \text{is in } V}} \} = \{ \underbrace{x \in X}_{\substack{\text{elements} \\ \text{of the} \\ \text{domain}}} \mid \underbrace{\exists y \in V, f(x) = y}_{\substack{\text{for which there is} \\ \text{a corresponding} \\ \text{element in } V \text{ mapped} \\ \text{to via } f}} \}$$



$$* f^{-1}[V] = \{ 0, 1, 2, 3, 4 \}$$

* preimage of V under f =
everything in the domain "
that could get you to V