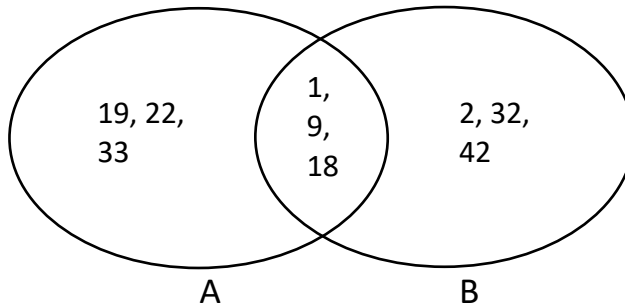


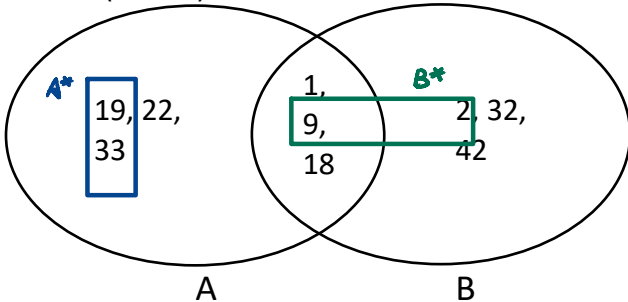
Function Composition: Domain and Range

Here are some vocabularies to know before we dive deep into domain and range of some composite functions:

Suppose there are two sets of numbers, set A and B:

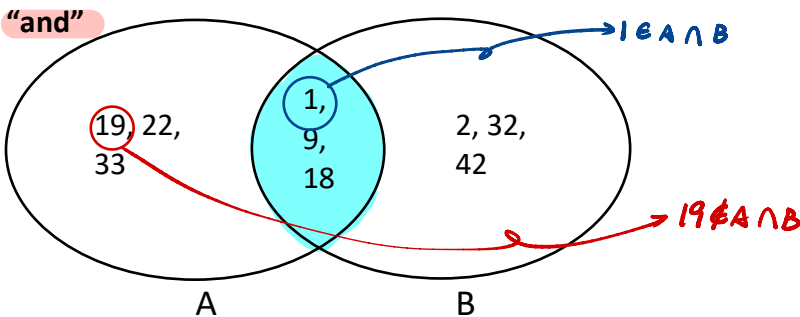


Subset ($A \subset B$): A set of numbers that are contained in a larger set.

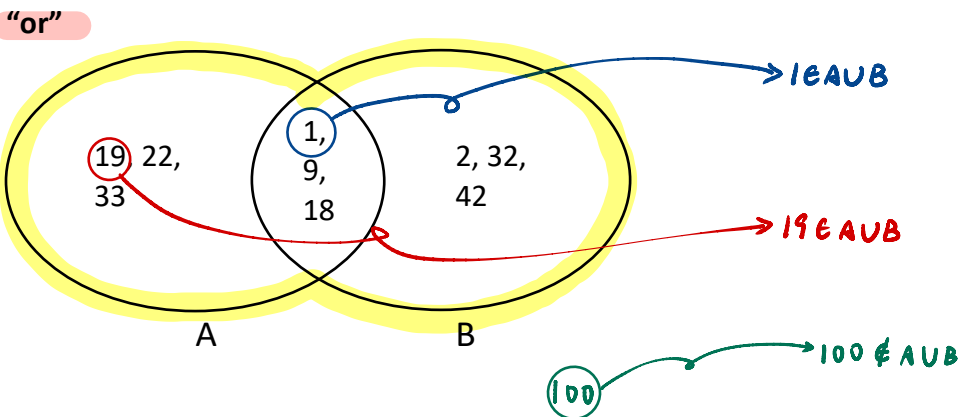


$A^* = \{19, 22, 33\} \subset A$
 "A* = {19, 22, 33} is a subset of A"
 $B^* = \{2, 9, 32, 42\} \subset B \Rightarrow B^* \not\subset A$
 "B* = {2, 9, 32, 42} is a subset of B"

Intersection of sets ($A \cap B$): The intersection of two sets contains **only** the elements that are in **both** sets. –



Union of sets ($A \cup B$): The union of two sets contains **all** the elements contained in **either** set (or **both** sets). –



The big part that we need to **understand** this unit is how domain and range of individual function are changed when they combine (because they may not match perfectly in the middle).

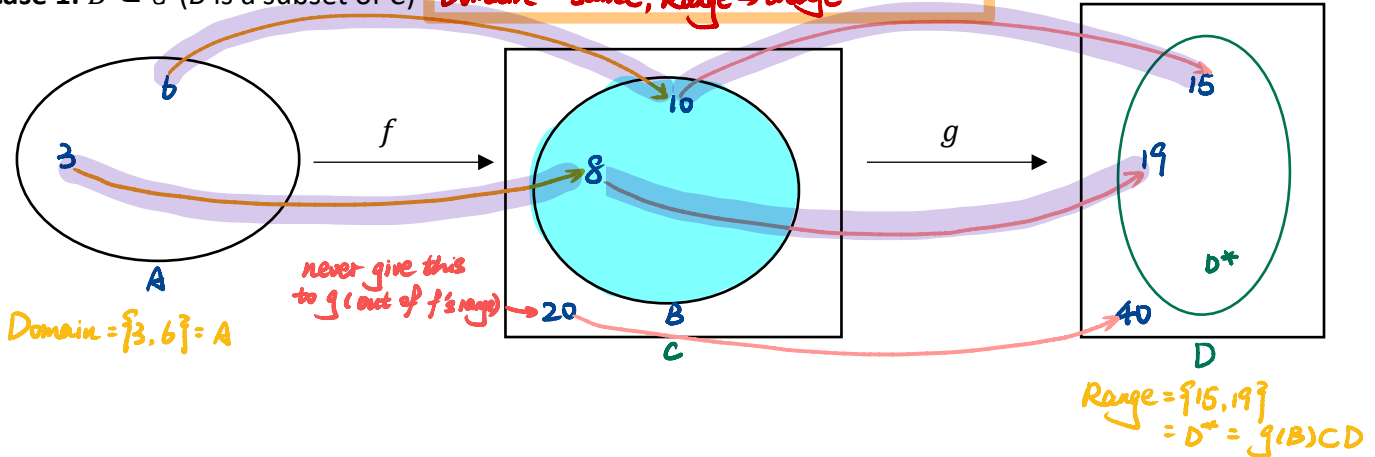
** We want to find a domain & range that works for both f and g*

Consider the functions:

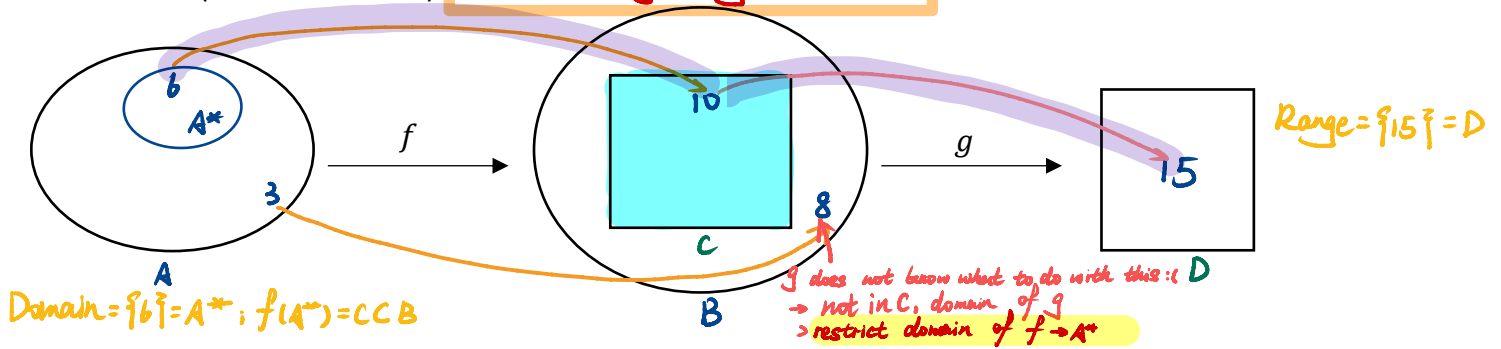
$$f: A \rightarrow B \text{ and } g: C \rightarrow D$$

Where $B \neq C$

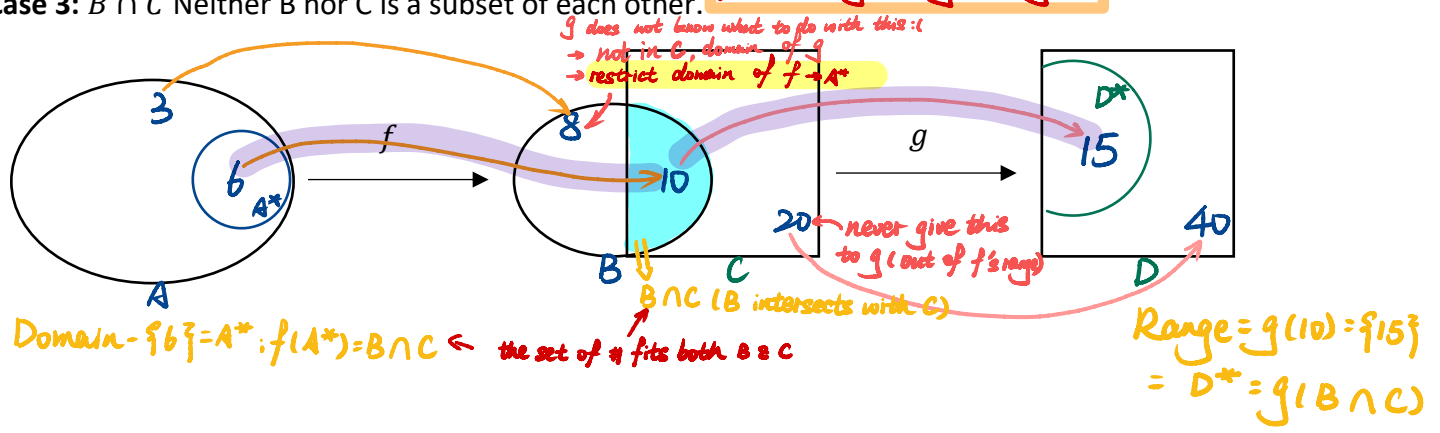
Case 1: $B \subset C$ (B is a subset of C) *Domain → same; Range → change*



Case 2: $C \subset B$ (C is a subset of B) *Domain → change; Range → same*



Case 3: $B \cap C$ Neither B nor C is a subset of each other. *Domain → change; Range → change*



Questions:

- If $f = \{(2, 8), (4, 17), (6, 20), (11, 23), (12, 28)\}$ and $g = \{(8, 30), (20, 31), (17, 24), (23, 18), (28, 34), (29, 35), (42, 53)\}$, determine domain and range of $g \circ f$:

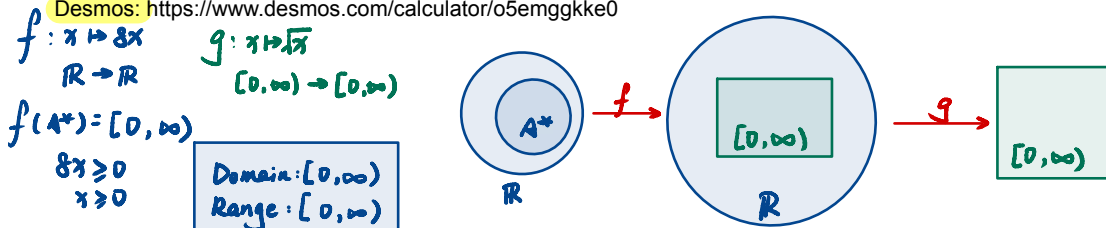
- If $f = \{(3, 9), (4, 11), (6, 13), (10, 15), (19, 26)\}$ and $g = \{(9, 14), (13, 38), (26, 37)\}$, determine domain and range of $g \circ f$:

- If $g = \{(1, 3), (2, 7), (4, 12), (6, 19), (9, 27)\}$ and $f = \{(3, 31), (5, 34), (11, 13), (12, 24), (27, 36)\}$, determine domain and range of $f \circ g$:

Extra Practice:

- If $f(x) = 8x$ and $g(x) = \sqrt{x}$, determine domain and range of $g \circ f$: **Case 2**

Desmos: <https://www.desmos.com/calculator/o5emggkke0>



- If $f(x) = (x - 2)^2$ and $g(x) = \sqrt{4 - x}$, determine domain and range of $g \circ f$: **Case 3**

Desmos: <https://www.desmos.com/calculator/dxaug0550a>

