What is a function?

\[ f(x) = x + 4 \]

Function composition \( f \circ g \)

\[ x \rightarrow g(x) \rightarrow f(g(x)) \rightarrow f(g(x)) \]
Tomatoes → Blender → Tomato Juice

Peaches → Blender → Peach Juice

Will it blend?

\[ f(x) = \frac{1}{x} \]

\[ 5 \rightarrow \frac{1}{x} \rightarrow \frac{1}{15} \]
* Function is a way of consistently assigning output to input

- Domain is the set of possible inputs (What can I put in?)
- Range: "" "" possible outputs (What can I get out?)

Domain & range = instruction for the box

domain: \( \{ \) what goes \( \} \)

range: \( \) what comes out
f(x) = \frac{1}{x - 5}

\text{Domain: } x - 5 \neq 0 \Rightarrow x > 5 \text{ or } x < 5

\text{Subset of Real #s}

\text{Range: } x - 5 \neq 0

f(30) = \frac{1}{30 - 5} = \frac{1}{25}

\lim_{{x \to \infty}} \frac{1}{x - 5} = 0

f(6) = \sqrt{6 - 5} = 1

f(14) = \sqrt{14 - 5} = \sqrt{9} = 3

f(5, 0) = \frac{1}{\sqrt{0.01}} = \frac{1}{0.1} = 10
\[ f \left( \sqrt[10000]{5,00001} \right) = \frac{1}{\sqrt[10000]{5,00001}} = \frac{1}{\sqrt[10000]{100}} = 100 \]

Range: \((0, \infty)\)

\[ f(x) = \frac{1}{\sqrt{x-5}} \]

\[ 5^2 = 25 \]
\[ (-5)^2 = 25 \]

Range: \((0, \infty)\)
\[ f(4) \approx 3 \]

\[ f(x) = g(x) \approx 0, 2 \]

\[ f(0) = 0 \]
\[ f(1) = 1 \]
\[ f(2) = 2^2 = 4 \]
\[ f(3) = 9 \]

Graphs:
\[ f(x) = x^2 \]

Range: \([0, \infty)\)

Formally, a set of points such that:

\[ \{(x, f(x)) \mid x \in \text{domain of } f\} \]
\[ f(\theta) = \text{horizontal distance of crane arm tip angle from the middle of the street} \]

\[ \text{Range} (\theta) \]

\[ [-30, 30] \]

\[ f(\theta) = 30 \sin(\theta) \]

\[ [-30, 30] \]