sets of ~~sets~~... order pairs

$A = \{1, 2, 3\}$ $B = \{g, f, s\}$

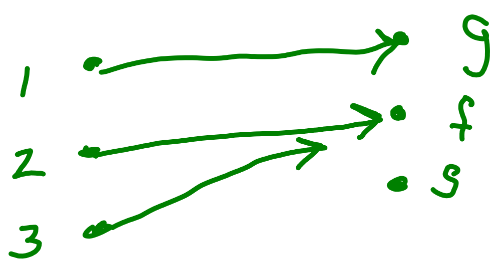
$A \times B = \{(1, g), (1, f), (1, S), (2, g), (2, f), (2, S), (3, g), (3, f), (3, S)\}$

function $\{(1, g), (2, f), (3, f)\}$

size of sets

specify functions

- ordered pairs $\{(1,g), (2,f), (3,f)\}$
- pictures



notice not every element of range automatically

- rule $f : \mathbb{R} \to \mathbb{R}, \quad f(x) = x^2$

from/to, domain/range, arrow notation

$f : \mathbb{R} \to \mathbb{R}$, $f(x) = x^2$

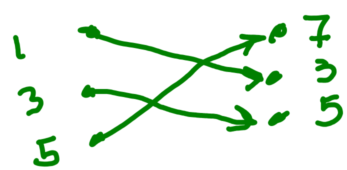
is f 1-1? No, $f(2) = f(-2) = 4$

is f onto? No, no elt of domain that f takes to negative reals

$g : \mathbb{R} \to \mathbb{R}$, $g(x) = x + 1$ 1-1 ✓ yes

onto ✓ all values have pre-image

$h : \{1, 3, 5\} \to \{3, 5, 7\}$, $h(x) = x + 2$ 1-1 ✓ onto ✓



$c : \mathbb{N} \to 2\mathbb{N}$, $c(n) = 2n$

c 1-1 ✓

c onto ✓

find 1-1 & onto from $\mathbb{N} - \mathbb{R}$

one-to-one, onto, etc.

done!

sums, products

big sum: $1+2+3+\cdots+97+98+99+100$

means same: $\sum_{i=1}^{i=100} i$

$$\sum_{i=1}^{10} 3+i = \sum_{i=1}^{10} 3 + \sum_{i=1}^{10} i$$

$$\sum_{i=1}^{17} 3i^2 = 3\sum_{i=1}^{17} i^2$$

$$\sum_{i=1}^{1000} i-3 = \sum_{i=0}^{999} i-2$$

$$1\times 2\times 3\times 4\times\cdots\times 9\times 10 = \prod_{i=1}^{10} i$$

$$\prod_{i=1}^{1000} i \cdot \prod_{i=1}^{1000} \frac{2}{i} = \prod_{i=1}^{1000} \frac{2i}{i} = \prod_{i=1}^{1000} 2 = 2^{1000}$$

manipulating sums and products

done

propositional logic

statement → T, F

variables → stand for statements

- statements, variables

- operators and, or, not, implies

not $\neg$, and $\wedge$

negates T, F

p	$\neg p$
T	F
F	T

and - binary

p	q	$p \wedge q$
F	F	F
F	T	F
T	F	F
T	T	T

or $\vee$, implies $\Rightarrow$

↳ different, from: "eat your or no dessert!"

∴ OR – inclusive

p	q	$p \vee q$
F	F	F
F	T	T
T	F	T
T	T	T

not XOR!

"if it rains tomorrow, I will wear sneakers"

$\overbrace{\text{it rains tomorrow}}^{r}$, $\underbrace{\text{sneakers}}_{s}$

$r \wedge s$ ✓

$r \wedge \neg s$ ✗

$\neg r \wedge \neg s$ ✓

$\neg r \wedge s$

if p, then q

eg.