Set a collection of distinct objects without order.

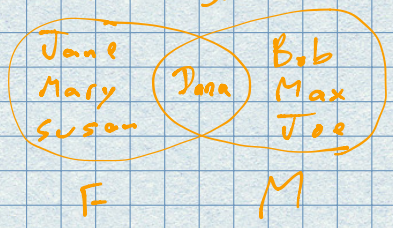
none
one
many

unique
no duplicate

anything

F = {Mary, Susan, Dana, Jane}  M = {Bob, Joe, Max, Dana}

Venn Diagram




Set Equality Inclusion

A = B
F ≠ M

Jane ∈ F
"∈" "in"
Max ∉ F

Subsets

"⊂" or "⊆"
{Jane, Mary} ⊂ F
all elements are here

"⊂" is "proper subset"
if A ⊂ B → A ≠ B
"⊆" means subset

A ⊆ B ⟺ A ⊂ B or A = B

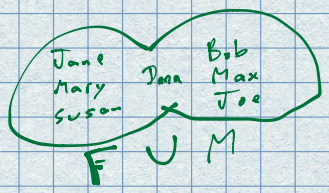
{Jane} ∈ F  {Jane} ⊂ F

~~Jane ⊂ F~~

set of what?

Union
{Jane} ∪ {Mary, Susan, Dana} = F

{Jane} ∪ {Jane} = {Jane}



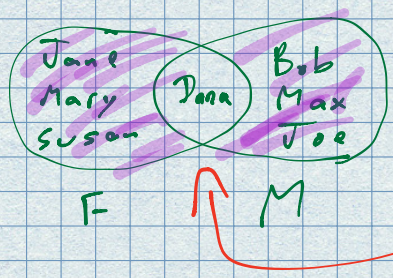

N := {1, 2, 3, ....} (natural #'s)  $N_0$ := N ∪ {0}

integers
Z = {..., -2, -1, 0, 1, 2, ....}

Q = {p/q : p ∈ Z, q ∈ N}

## Intersection
common elements

$F \cap M = \{Dana\}$ "And"




$F \cap \{Bob, Joe\} = \{\}$

empty set
null set
$\emptyset := \{\}$

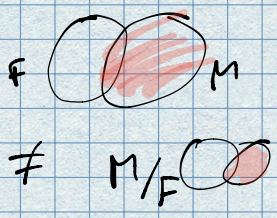
$A \cap B = \emptyset$ disjoint — if A is even, B is odd, or both null.

$\emptyset \subset F$ vacuously true "all aliens love green pizza" TRUE B/C Aliens don't exist

$\emptyset \in F$ False

Traction
$F \setminus M$ is F less all M elements

$\Leftrightarrow A \cap B = \emptyset$
disjoint




$\neq$ $M/F$

## Powerset: is a set function

$P(A) := 2^A := \{B : B \subseteq A\}$

$1 \notin A$
$\{1\} \subset A$

$A = \{1,2,3\}$

$2^A = \{\emptyset, \{1\}, \{2\}, \{3\}, \{1,3\}, \{1,2\}, \{2,3\}, A\}$

## Set Size or cardinality

$|A| = 3$ count # of elements ; give #

$|F \cup M| = 7 \neq |F| + |M| = 8$
$= |F| + |M| - |F \cap M|$

$|2^A| = 8$

$|2^F| =$

Prove $|2^A| = 2^{|A|}$

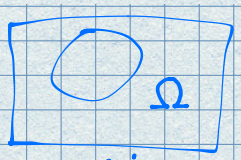
$2 \cdot 2 \cdot 2$

N/Y N/Y N/Y

1 2 3

Special Set
called the "universe"
"sample space" or "source of discourse"

$\Omega$ (capture Omega



entire world

$\Omega := F \cup M$
$F \subseteq \Omega$
$M \subseteq \Omega$
$Joe \subseteq \Omega$

Draw a name at random what's the probability of it being female?

$\frac{4}{7}$ ← female elements / ← all elements

$\frac{|F|}{|\Omega|}$

Elements of $\Omega$ are called $\omega$ (lowercase) $\omega \in \Omega$

Coin Flips

$\Omega = \{H, T\}$

$P(\{H\}) = \frac{|\{H\}|}{|\Omega|}$