Foundations 12

Chapter 3 - class notes

Set - a group of things
ex. set of whole numbers $W = \{0, 1, 2, 3 \ldots\}$

universal set - Complete set
ex. Vowels $V = \{A, E, I, O, U, Y\}$

Subset - a set whose elements all belong to another set
ex. vowels is a subset of all the letters in the alphabet (A)
written like ⇒ $V \subset A$ means subset

Complement - all the elements of a universal set that do not belong to a subset.
ex. V' ⇒ would be all the consonents except Y.

Empty set - a set with nothing in it
ex. a set of odd number that can by evenly divided into two parts would be an emply set

disjoint - 2 or more sets with nothing in common.
$O = \{1, 3, 5, 7, 9\}$ $E = \{2, 4, 6, 8\}$

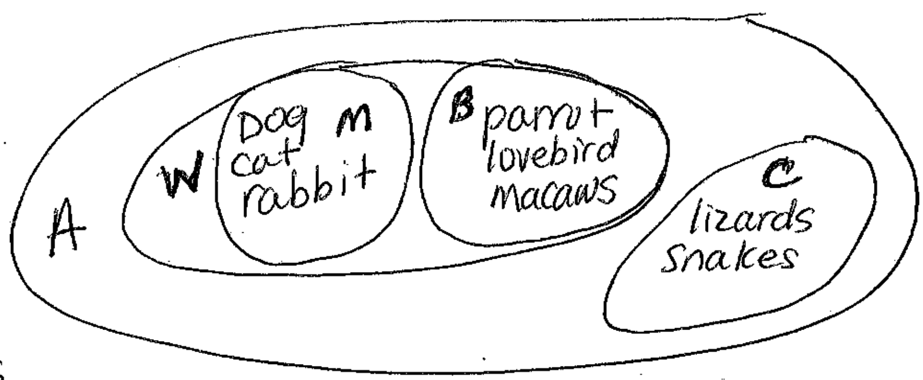
$E = O'$ and they are disjoint sets
& $E' = O$

N = natural numbers $N = \{1, 2, 3, 4 \ldots\}$

W = whole numbers $W = \{0, 1, 2, 3, 4 \ldots\}$

I = integers $I = \{\ldots -2, -1, 0, 1, 2 \ldots\}$

ex A = all animals
W = warm blooded
C = cold blooded
M = mammals
B = Birds



Subsets

$W \subset A$ $W' = C$

$C \subset A$ $C' = W$

$M \subset W$

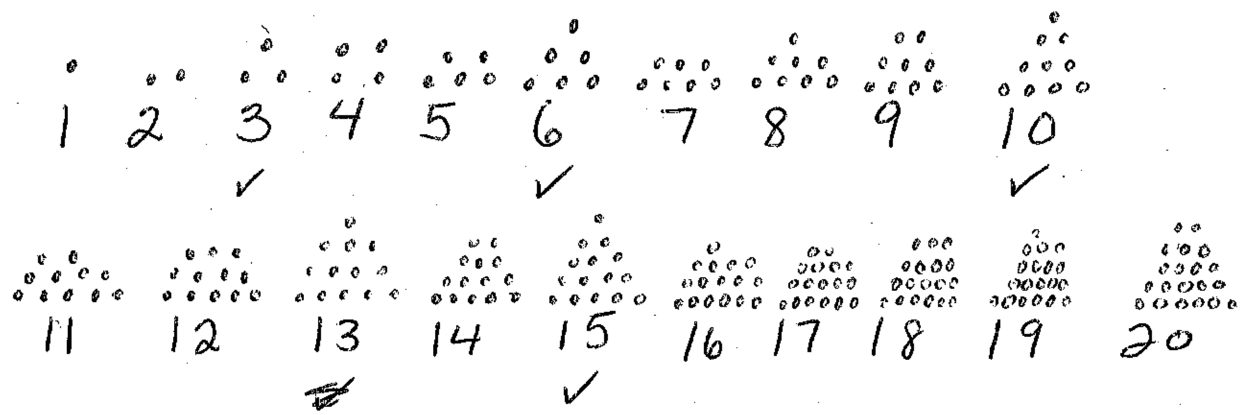
$B \subset W$

mutually exclusive: 2 or more events that cannot happen at the same time.

ex 2

$U = \{$natural numbers from 1 to 20$\}$
$T = \{$triangular numbers from 1 to 20$\}$
$E = \{$even triangular numbers from 1 to 20$\}$

$n(\underset{\uparrow \atop \text{set}}{\ })$ ⇒ number of things in a set



$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$

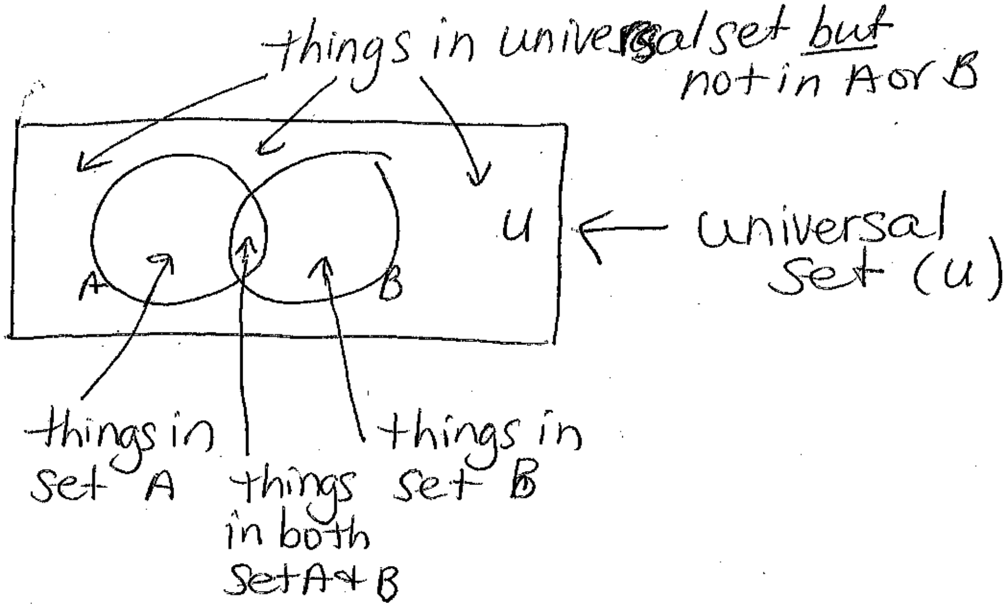
$n(U) = 20$

$T = \{3, 6, 10, 15\}$ $\quad n(T) = 4$

$E = \{6, 10\}$ $\quad n(E) = 2$

$\therefore E \subset T \subset U$ and $E \subset T$ and $T \subset U$

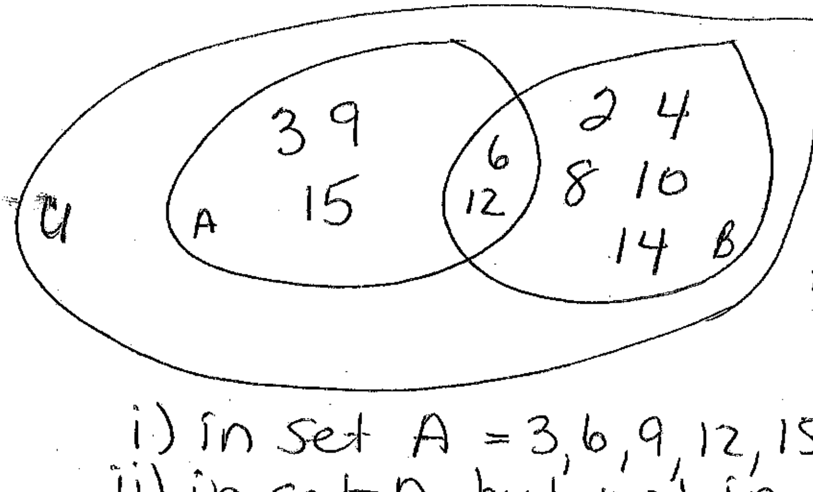
$\boxed{3.2}$



ex $U = \{2, 3, 4, 6, 8, 9, 10, 12, 14, 15\}$

$A = \{3, 6, 9, 12, 15\}$

$B = \{2, 4, 6, 8, 10, 12, 14\}$



TO Draw
find numbers in common 1st!

A+B = (6, 12)

i) in set A = 3, 6, 9, 12, 15
ii) in set A but not in B = 3, 9, 15
iii) in set B = 3, 6, 9, 12, 15
iv) in set B but not in A = 2, 4, 8, 10, 14
v) in set A and set B = 6, 12
vi) in set A or set B = 2, 3, 4, 6, 8, 9, 12, 14, 15
vii) in A' = 2, 8, 4, 10, 14

3.3 Intersection & Union

($\cap$) **Intersection** = elements in common

ex. $A = \{1, 2, 3\}$ $B = \{2, 3, 4\}$

$A \cap B = \{2, 3\}$

($\cup$) **Union** = set of all elements in 2 or more sets

ex. A & B above

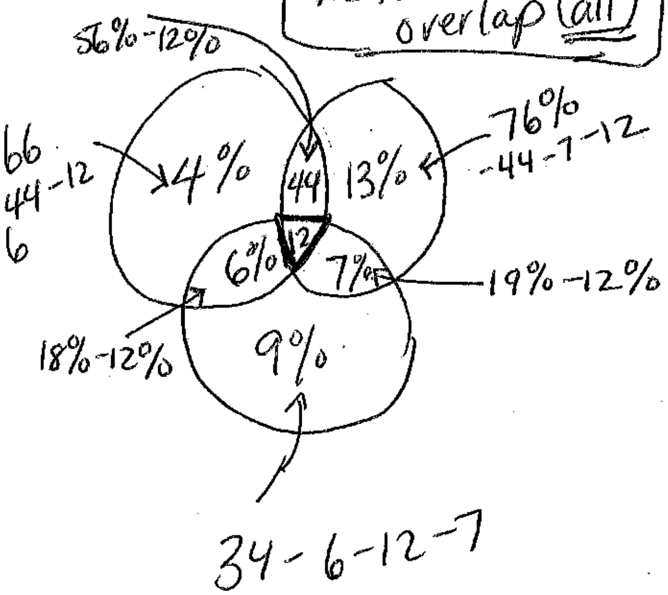
$A \cup B = \{1, 2, 3, 4\}$

3.4 Application (How students talk to friends)

C = cell phone - called
T = texted
S = social networking site

START
center out
*Start w/ overlap (all)

66% cell phone
76% texted
34% social network
56% cell & text
19% text & social network
18% cell & social network
12% all three



Internet search:

You want to find out information about an actor but you cant remember his name.

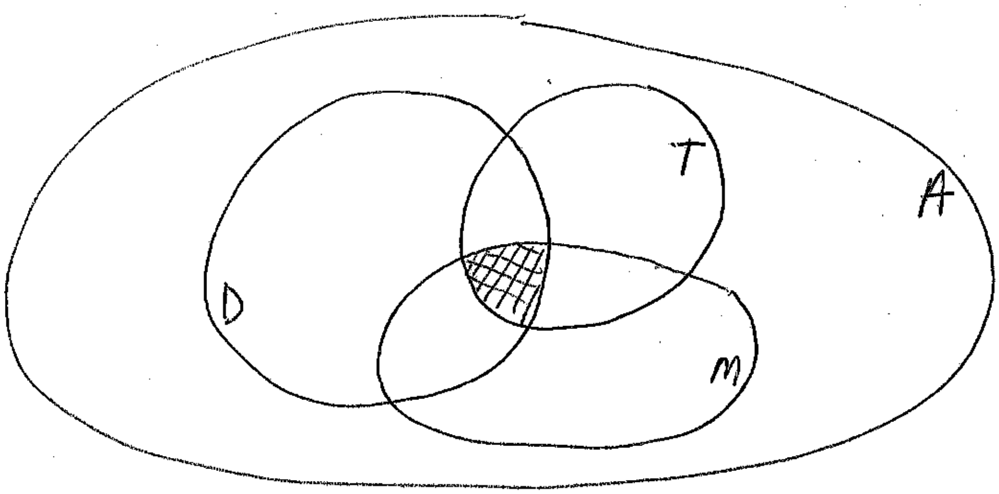
Start → actor(A) ⇒ way too many results

(D) male, dark hair, young ⇒ still too many

(M) drama TV series

(T) 1980's

The diagram would look like this



$D \cap T \cap M = \{$ male actor with dark hair, young on a TV drama in the 1980's $\}$

3.5 Conditional Statements + Converse

<u>conditional statement</u>: if-then statement

if ____ ⇐ hypothesis
then ____ ⇐ conclusion.

<u>Truth table</u> - table of all possibilities

<u>converse</u> - a conditional statement (if-then) where hypothesis + conclusion switch places. ($\Leftrightarrow$)

$p \Leftrightarrow q$ means if p then q <u>and</u> if q then p

<u>counter example</u> - one that disproves the hypothesis.

<u>ex!</u> If I swim in the ocean, I am swimming in salt water.

hypothesis - swim in ocean (p)
conclusion - in salt water (q)

<u>Ask</u> - are there any Oceans which are <u>not</u> salt water? No → so $p \to q$

Converse: q to p ?

<u>Ask</u> swim in salt water does this mean you are in the ocean

* counter example ⇒ salt water pool.

So q does not lead to p.

ex 2

p = colour blind $\qquad$ q = can't tell difference between colours.

does $p \Rightarrow q$ and $q \Rightarrow p$?

Yes - it can go both ways so $p \Leftrightarrow q$
or biconditional

Truth Table

p	q	$p \Rightarrow q$
T	T	T
F	F	T

3.6 Inverse + Contrapositive

inverse → if ___ not, then ___ not
(reverse of hypothesis + conclusion)

Contrapositive → converse then inverse
→ Switch hypothesis + conclusion then not them.

ex inverse — if you live in Nanaimo, then you live in BC
→ if you dont live in Nanaimo, then you dont live in BC

*this inverse is untrue.

Contrapositive
→ if you dont live in BC, then you dont live in Nanaimo.

this contrapositive is true

ex 2 $\boxed{\text{using equations}}$

If a number is a multiple of 10, then it is a multiple of 5.

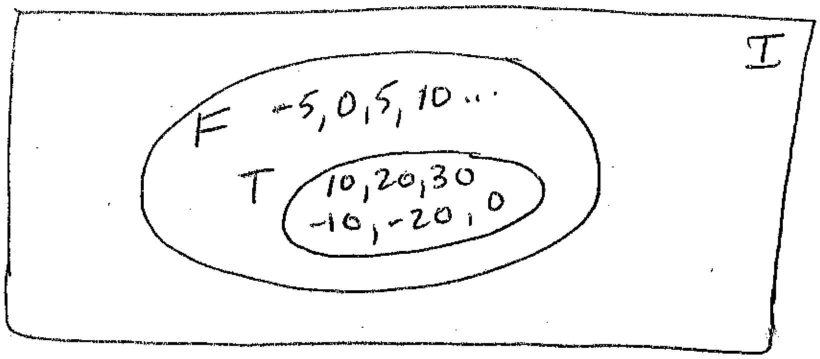
n = a number (a multiple of 10)
$= 10x$

<u>if</u> $n = 10x \Rightarrow$ <u>then</u> $n = 5(2x)$
so a multiple of 5

$\boxed{\text{Contrapositive statement:}}$

If a number is not a multiple of 5, then it is not a multiple of 10
* since 10 has a factor of 5, then this is true too

<u>ex</u> 12 is not a multiple of 5 so also not a multiple of 10



$I = \{\text{all integers}\}$

$F = \{\text{mult. of } 5\}$

$T = \{\text{mult. of } 10\}$

$\therefore$ to be a multiple of 10 – it must be a muliple of 5.