Calculus Year 13 (NCEA Level 3)

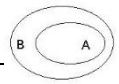
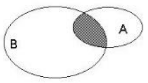
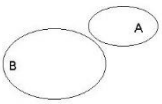
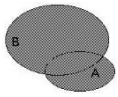
Basic Set Theory and Number Systems of Algebra

Set Theory

A **SET** is a collection of objects. Any of the individual objects is called an **ELEMENT**

$p \in A$ means that *p* is an element of set *A*

A set could be defined as follows: $C = \{x : x \in N, x \langle 5\}$ meaning that set C contains all Natural numbers smaller than 5.

Name	Notation	Description	Venn Diagram
NULL SET	Φ	This is an empty set (it contains no elements)	
SUBSET	$A \subset B$	A is a subset of B means that all elements of A are also elements of B	
INTERSECTION	$A \cap B$	Intersection of A and B means all elements which belong to both A and B	
DISJOINT		A and B are called disjoint if $A \cap B = \Phi$	
UNION	$A \cup B$	Union of A and B means all elements which belong to A alone or to B alone or to both A and B.	

Number systems of Algebra

Natural Numbers $N = \{1,2,3,4,5,\ldots\}$

add zero and negatives:

Integers $I = \{\ldots,-2,-1,0,1,2,\ldots\}$ $N \subset I$

add fractions:

Rational Numbers $Q = \left\{ \frac{a}{b} : a,b \in I, b \neq 0 \right\}$ $I \subset Q$

*add **Irrationals** algebraic numbers e.g. solutions for x of* $\{x^n = a; a \geq 0\}$

transcendental numbers $\{\pi, e, ..\}$

Real Numbers R, the set R is **complete** and **dense** on the number line. $Q \subset R$

To enable $x^b = a : a,b \in R$ *to always have a solution we define*

Complex Numbers (pairs) $C = \{(a,b) : a \in R, b \in R\}$ $R \subset C$