

# SETS:

## CIE OBJECTIVES:

E1.2	<p>Use language, notation and Venn diagrams to describe sets and represent relationships between sets.</p> <p>Definition of sets e.g. <math>A = \{x: x \text{ is a natural number}\}</math> <math>B = \{(x,y): y = mx + c\}</math> <math>C = \{x: a \leq x \leq b\}</math> <math>D = \{a, b, c, \dots\}</math></p>	<p>Notation</p> <p>Number of elements in set <math>A</math>      <math>n(A)</math></p> <p>"...is an element of..."      <math>\in</math></p> <p>"...is not an element of..."      <math>\notin</math></p> <p>Complement of set <math>A</math>      <math>A'</math></p> <p>The empty set      <math>\emptyset</math></p> <p>Universal set      <math>\mathcal{U}</math></p> <p><math>A</math> is a subset of <math>B</math>      <math>A \subseteq B</math></p> <p><math>A</math> is a proper subset of <math>B</math>      <math>A \subset B</math></p> <p><math>A</math> is not a subset of <math>B</math>      <math>A \not\subseteq B</math></p> <p><math>A</math> is not a proper subset of <math>B</math>      <math>A \not\subset B</math></p> <p>Union of <math>A</math> and <math>B</math>      <math>A \cup B</math></p> <p>Intersection of <math>A</math> and <math>B</math>      <math>A \cap B</math></p>
------	--	---

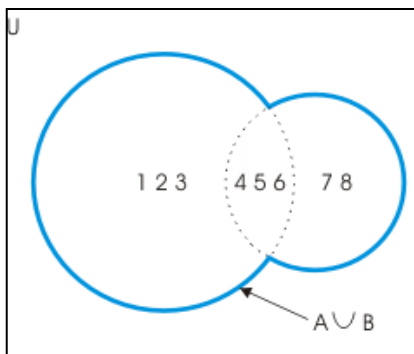
## Mathematical notation for sets

- $\mathcal{U}$  We use  $\mathcal{U}$  to denote the universal set, which is all of the items which can appear in any set.  
This is usually represented by the outside rectangle on the venn diagram.
- $\cap$   $A \cap B$  represents the intersection of sets  $A$  and  $B$ .  
This is all the items which appear in set  $A$  and in set  $B$ .
- $\cup$   $A \cup B$  represents the union of sets  $A$  and  $B$ .  
This is all the items which appear in set  $A$  or in set  $B$  or in both sets.
- $'$  We use  $'$  (the apostrophe) to denote the complement of a set.  
 $A'$  is all the items which are not in set  $A$ .
- $\subset$   $A \subset B$  means that set  $A$  is a subset of set  $B$ .  
This means that every member of set  $A$  also appears in set  $B$ .
- $\emptyset$   $\emptyset$  is the empty set - a set with no items in it.  
For example, if  $A$  is the set of numbers which are both odd and even then  $A = \emptyset$ .

## Study link:

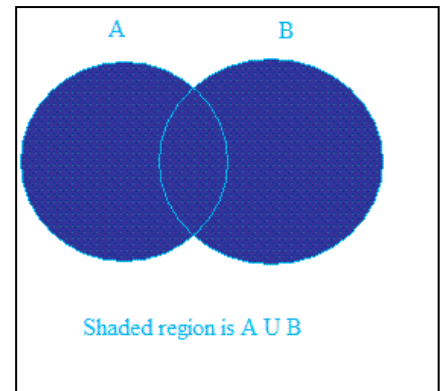
[http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7i1/bk7\\_1i4.htm](http://www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7i1/bk7_1i4.htm)

## Union of Two Sets:

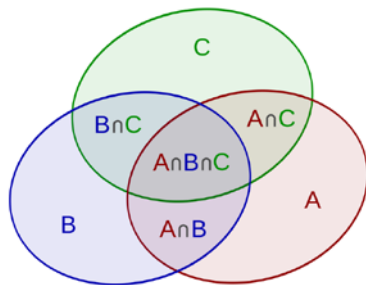


The union of two sets A and B is the set that contains all elements that are in A and B both.

The Venn diagram representing the above statement can be seen below.



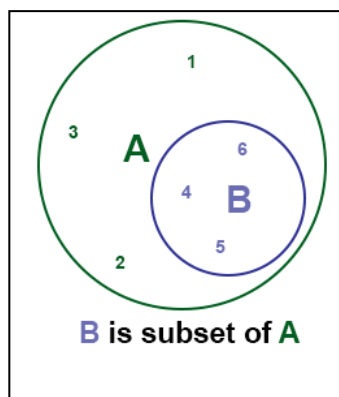
## Intersection of Two Sets:



If A and B are two sets, then the the intersection of A and B is the set of all elements that are common to both A and B. That is,

The venn diagram representing the above statement can be seen below.

## Sub Sets:

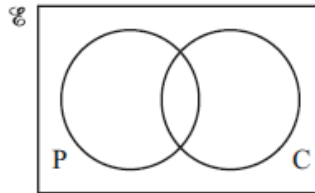


A set A is a **subset** of a set B, or equivalently B is a superset of A, if all elements of A are also elements of B.

# IGCSE past paper questions:

## May/June 2004-Paper-4

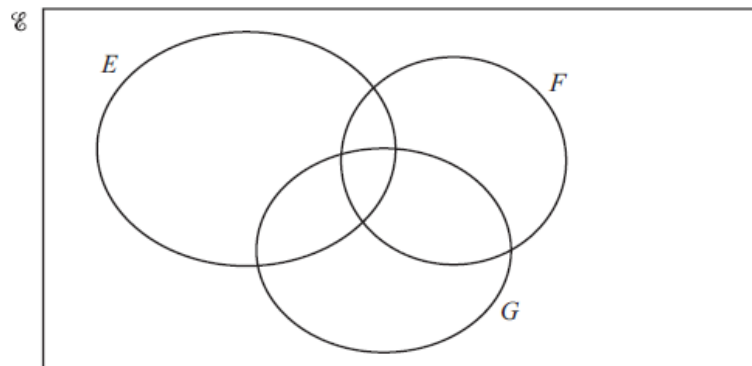
- 7 (a) There are 30 students in a class.  
20 study Physics, 15 study Chemistry and 3 study neither Physics nor Chemistry.



- (i) Copy and complete the Venn diagram to show this information. [2]
- (ii) Find the number of students who study both Physics and Chemistry. [1]
- (iii) A student is chosen at random. Find the probability that the student studies Physics but not Chemistry. [2]
- 

## May/June 2012-Paper-42

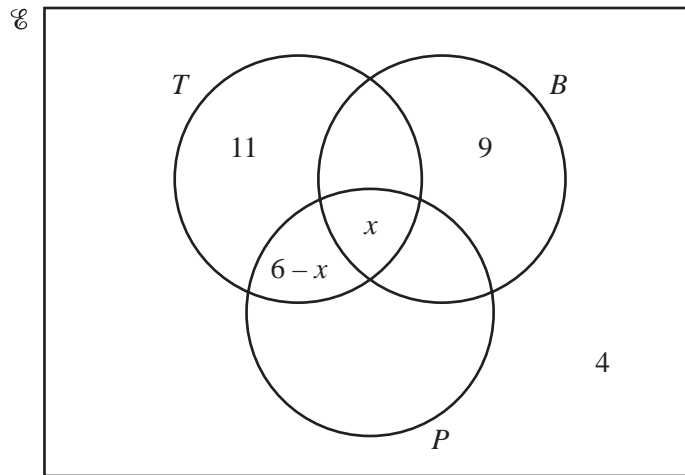
- (d) Write all the elements of  $\mathcal{U}$  in their correct place in the Venn diagram.



- [2]
- (e) Use set notation to complete the following statements.
- (i)  $F \cap G = \dots\dots$  [1]
- (ii)  $\overline{F} \cap \overline{G} = \dots\dots E$  [1]
- (iii)  $n(E \cap \overline{F}) = 6$  [1]

## May/June 2012-Paper-41

4



In the Venn diagram,  $\mathcal{E} = \{\text{children in a nursery}\}$

$B = \{\text{children who received a book for their birthday}\}$

$T = \{\text{children who received a toy for their birthday}\}$

$P = \{\text{children who received a puzzle for their birthday}\}$

$x$  children received a book and a toy and a puzzle.

6 children received a toy and a puzzle.

- (a) 4 children received a book and a toy.  
5 children received a book and a puzzle.  
7 children received a puzzle but not a book and not a toy.

Complete the Venn diagram above.

[3]

- (b) There are 40 children in the nursery.

Using the Venn diagram, write down and solve an equation in  $x$ .

Answer(b)

[3]

---