

## Lesson 6

## GCSE Mathematics Set Theory II

### 6.1 Test

#### Question 1

List the elements of the following sets;

(i)  $M = \{\text{The factors of } 50\}$

$$M = \{ \quad , \quad , \quad , \quad , \quad , \quad \}$$

(ii)  $R = \{\text{The factors of } 45\}$

$$R = \{ \quad , \quad , \quad , \quad , \quad , \quad \}$$

(iii)  $M \cap R$

$$M \cap R = \{ \quad , \quad \}$$

[ 6 marks ]

#### Question 2

Explain each of the following symbols;

(i)  $\cap$

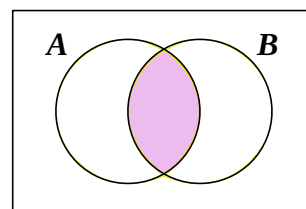
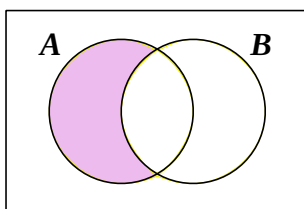
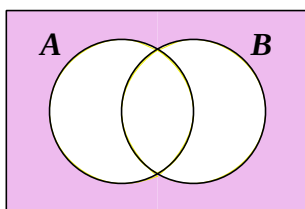
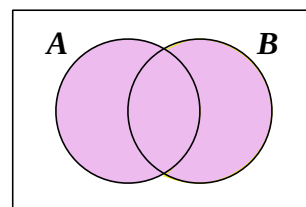
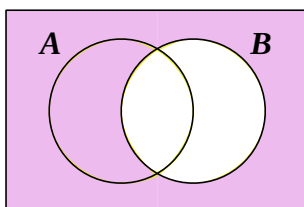
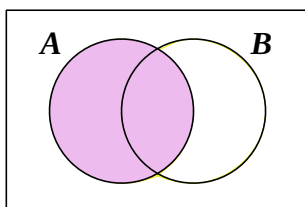
(ii)  $\emptyset$

(iii)  $\in$

[ 6 marks ]

#### Question 3

For each of the Venn diagrams below use set notation to describe the shading.



[ 12 marks ]

**Question 4**

Let  $S = \{\text{The first five square numbers}\}$

Let  $M = \{\text{The first six multiples of 4}\}$

Let  $F = \{\text{The factors of 16}\}$

- (i) List the elements of set  $S$

$S = \{ \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt} \}$

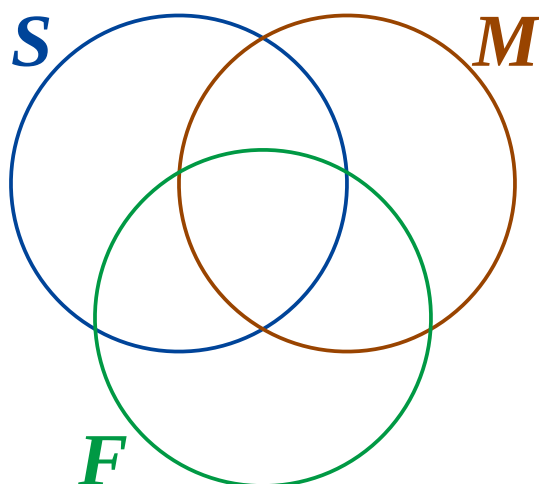
- (ii) List the elements of set  $M$

$M = \{ \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt} \}$

- (iii) List the elements of set  $F$

$F = \{ \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt} \}$

- (iv) Complete the Venn diagram to show the relationship between  $S$ ,  $M$  and  $F$



List all elements, if any, that are in the following intersections,

- (v)  $S \cap F = \{ \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt} \}$

- (vii)  $S \cap M \cap F = \{ \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt} \}$

- (vi)  $F \cap M = \{ \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt}, \rule{1cm}{0.4pt} \}$

- (viii)  $F \cap M \cap S' = \{ \rule{1cm}{0.4pt} \}$

- (ix) What is  $n(S \cup M)$ ?  $\rule{1cm}{0.4pt}$

[ 18 marks ]

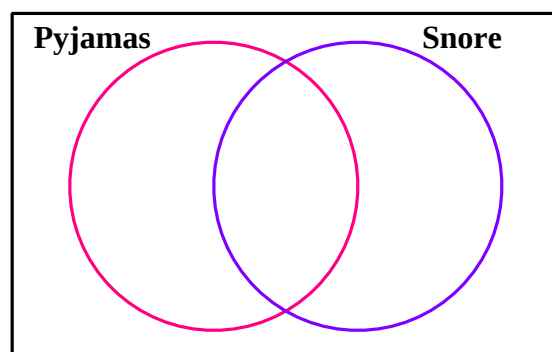
### Question 5

A group of 58 wives were asked if their husbands wore pyjamas in bed. They were also asked if their husbands snored.

Here is a summary of their answers :

- ◇ 33 said their husbands wore pyjamas in bed.
- ◇ 26 said their husbands snored.
- ◇ 18 said their husbands both wore pyjamas and snored.

( i ) Complete the Venn Diagram to clarify the wives' replies :



( ii ) How many husbands neither wore pyjamas nor snored ?

[ 6 marks ]

### Question 6

In a class of children, B is the set of boys and M is the set of those who like maths.

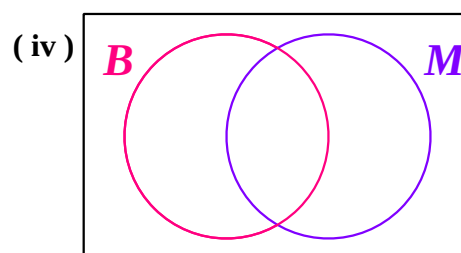
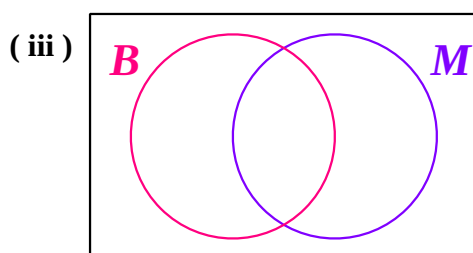
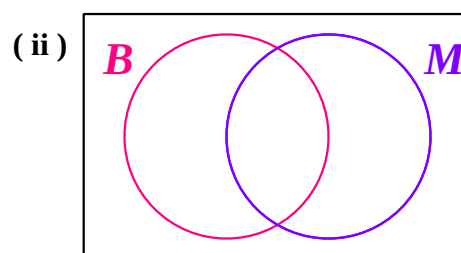
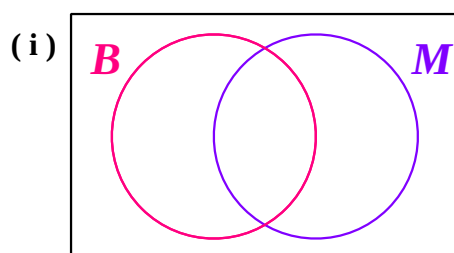
Shade the part that represents:

On ( i ) boys who like maths.

On ( ii ) boys who dislike maths.

On ( iii ) girls who like maths.

On ( iv ) girls who do not like maths.



[ 8 marks ]

**Question 7**

Set  $M = \{\text{Names of months in a year}\}$

What is  $n\{\text{Names of months in a year}\}$  ?

[ 2 marks ]

**Question 8**

TRUE or FALSE ?

- ( i )  $n\{\text{factors } 9\} = 3$
- ( ii )  $n\{\text{factors of } 23\} = 3$
- ( iii )  $n\{\text{factors of a prime number}\} = 1$
- ( iv )  $n\{\text{factors of square number}\} = 3$
- ( v )  $n\{\text{common factors of } 15 \text{ and } 20\} = 3$

[ 10 marks ]

**Question 9**

In this question,

$F = \{\text{Flying objects}\}$

$P = \{\text{Types of pig}\}$

- ( i ) Describe the set  $F \cap P$  in words.
- ( ii ) If  $F \cap P = \emptyset$ , describe what this means.

[ 4 marks ]

**Question 10**

In this question, consider all the positive integers.

Within this consideration,  $E = \{\text{Even numbers}\}$

$O = \{\text{Odd numbers}\}$

Describe in words the set  $E \cup O$

[ 2 marks ]

**Question 11**

Let :  $A$  be the set of numbers in the infinite sequence 1, 9, 25, 49, 81, ...  
 $B$  be the set of numbers in the infinite sequence 4, 16, 36, 64, 100, ...

- ( i ) List the some members of the set  $A \cup B$
- ( ii ) What is the special name given to the set  $A \cup B$  ?
- ( iii ) Describe  $A \cap B$

[ 6 marks ]

**Question 12**

In a class of 30 pupils,

- ◇ 19 say they like haggis.
- ◇ 11 say they like neeps.
- ◇ 5 say they do not like either haggis nor neeps.

- ( i ) Draw a two hoop Venn Diagram to clarify what the pupils say.

- ( ii ) How many of the pupils like both haggis and neeps ?

[ 6 marks ]

### Question 13

Let  $T = \{\text{Triangular numbers}\}$

Let  $M = \{\text{Multiples of 3}\}$

(a) List the elements of;

(i) set  $T$

(ii) set  $M$

(b) For each of the following, decide if the given statement is TRUE or FALSE.

(i)  $10 \in T$

(vi)  $9 \notin T \cup M$

(ii)  $3693 \notin M$

(vii)  $2 \in M'$

(iii)  $6 \in T \cap M$

(viii)  $T \cap M' = \emptyset$

(iv)  $n(T) = 8$

(ix)  $n(T \cap M) > 36$

(v)  $2 \notin M \cup T$

(x)  $T \cap \{\text{Prime numbers}\}' = \emptyset$

[ 14 marks ]