

8.1 Test

Marks Available : 70

Question 1

Here are two descriptions of a set F;

- $F = \{ \text{The factors of } 22 \}$
- $F = \{ 1, 2, 11, 22 \}$

In a similar manner, give another description of the following sets

(i) $T = \{ \text{Earl Grey, Darjeeling, Assam, Lapsang Souchong, ...} \}$

[1 mark]

(ii) $S = \{ \text{The suits in a pack of playing cards} \}$

[1 mark]

(iii) $E = \{ \text{Even numbers} \}$

[1 mark]

(iv) $M = \{ 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, ... \}$

[1 mark]

Question 2

Let $P = \{ \text{Prime Numbers} \}$ i.e. $P = \{ 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, ... \}$

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

(i) $1 \in P$ (vi) $936 \in P$ (ii) $25 \notin P$ (vii) $70.2 \notin P$ (iii) $40 \in P$ (viii) $417^2 \in P$ (iv) $17 \notin P$ (ix) $\sqrt{121} \in P$ (v) $1220 \notin P$ (x) $\pi \in P$

[10 marks]

This next question is going to ask you whether certain numbers are in the sequence 1, 5, 9, 13, 17, 21, or not.

Each term is four more than the term before.

Here is a clever trick that lets you see what the numbers in this sequence can end in.

You write out quite a lot of the sequence but try to arrange it so that a pattern in the endings becomes obvious.

1	5	9	13	17
21	25	29	33	37
41	45	49	53	57
61	65	69	73	77
81	...			

Now try the question:

Question 3

Let $C = \{ \text{The sequence of numbers that begins } 1, 5, 9, 13, 17, 21, \dots \}$

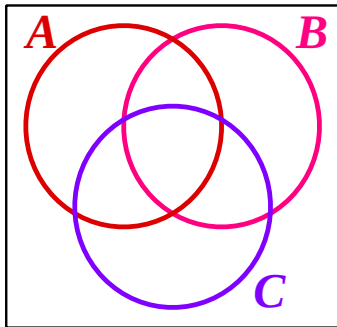
For each of the following, decide if the given statement is TRUE or FALSE.

- | | |
|----------------------|----------------------|
| (i) $13 \in C$ | (vi) $386 \in C$ |
| (ii) $7 \notin C$ | (vii) $89 \in C$ |
| (iii) $22 \in C$ | (viii) $589 \in C$ |
| (iv) $29 \notin C$ | (ix) $101 \in C$ |
| (v) $19 \in C$ | (x) $523 \notin C$ |

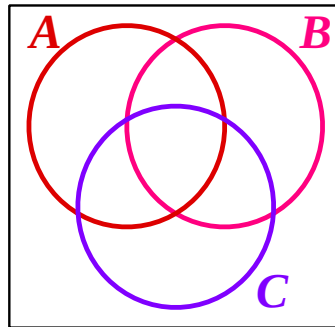
[10 marks]

Question 4

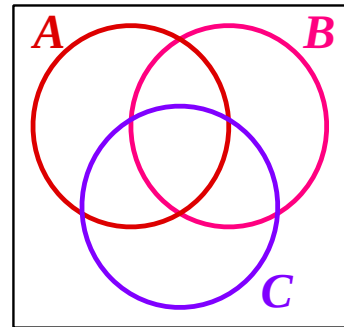
On the Venn Diagrams below, shade the region(s) specified;



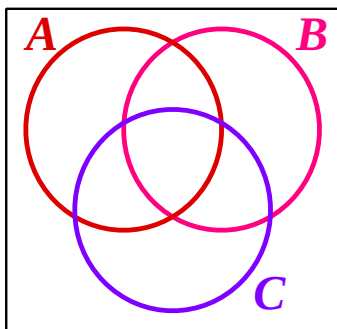
Shade : A



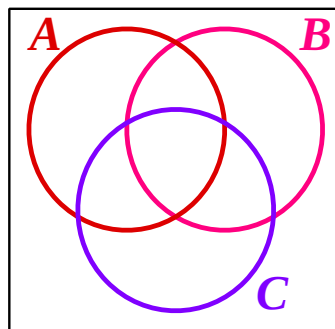
Shade : $A \cap B$



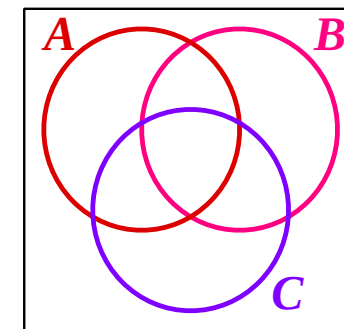
Shade : $A \cap B \cap C$



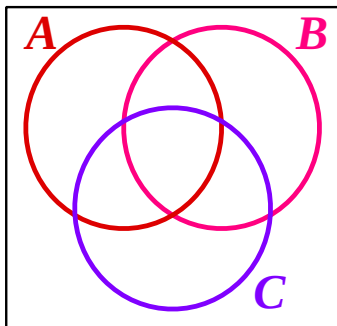
Shade : B



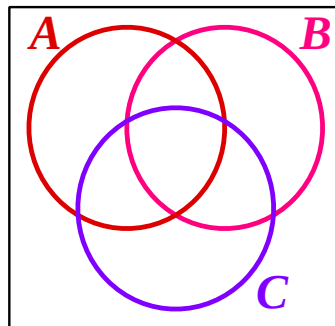
Shade : $B \cap C$



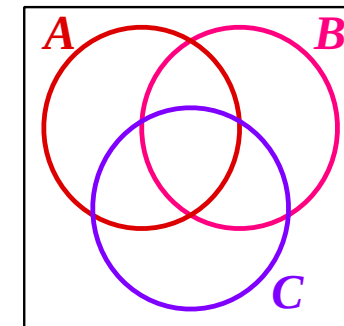
Shade : $B \cap C \cap A'$



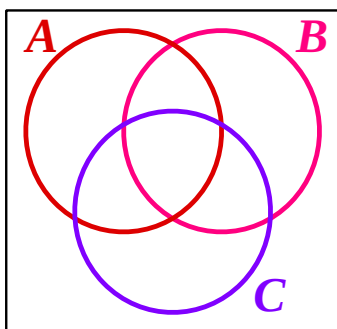
Shade : $A \cap C$



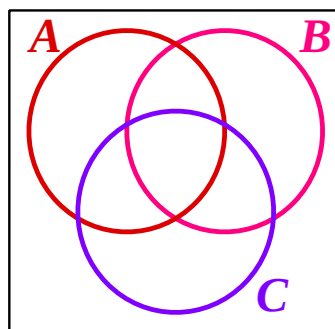
Shade : $A \cap C \cap B$



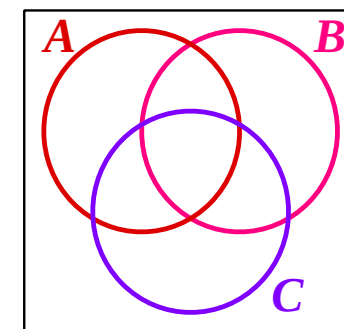
Shade : $(A \cap C \cap B)'$



Shade : C'



Shade : $C' \cap B$



Shade : $C' \cap B \cap A'$

[12 marks]

Question 5

Let $F = \{ \text{Factors of 6} \}$
 $P = \{ \text{Primes less than 10} \}$
 $T = \{ \text{The first four triangular numbers} \}$

(a) List the elements of sets F , P and T below,

$F = \{ \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}} \}$

[1 mark]

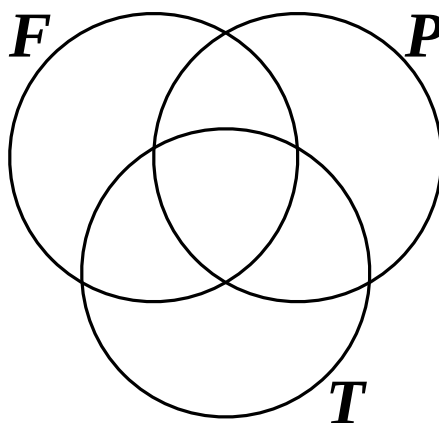
$P = \{ \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}} \}$

[1 mark]

$T = \{ \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}} \}$

[1 mark]

(b) Show the relationship between F , P and T on a Venn Diagram.



[5 marks]

(c) List all elements, that are in the following intersections.

(i) $F \cap P = \{ \underline{\hspace{1cm}}, \underline{\hspace{1cm}} \}$

[1 mark]

(ii) $F \cap T = \{ \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}} \}$

[1 mark]

(iii) $P \cap T = \{ \underline{\hspace{1cm}} \}$

[1 mark]

(iv) $F \cap P \cap T = \{ \underline{\hspace{1cm}} \}$

[1 mark]

(v) $F \cap P \cap T' = \{ \underline{\hspace{1cm}} \}$

[1 mark]

(vi) $F \cap P' \cap T = \{ \underline{\hspace{1cm}}, \underline{\hspace{1cm}} \}$

[1 mark]

(vii) What does the statement $F' \cap P \cap T = \emptyset$ tell you ?

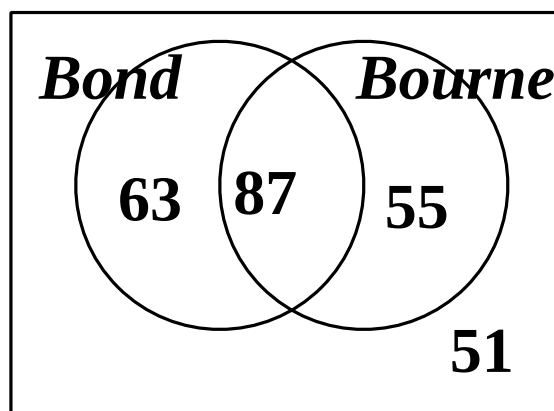
[1 mark]

Question 6



All the members of a film club were asked if they liked James **Bond** films.
They were also asked if they liked Jason **Bourne** films.

The Venn Diagram provides a summary of their replies.



- (i) How many members of the film club replied ?[1 mark]
- (ii) How many pupils liked James **Bond** only ?[1 mark]
- (iii) How many pupils liked James **Bond** ?[1 mark]
- (iv) How many pupils don't like James **Bond** ?[1 mark]
- (v) How many pupils like James **Bond** or Jason **Bourne** but not both ?[1 mark]

Question 7

In this question, we are only working with the positive integers, $\{1, 2, 3, 4, 5, 6, 7, \dots\}$

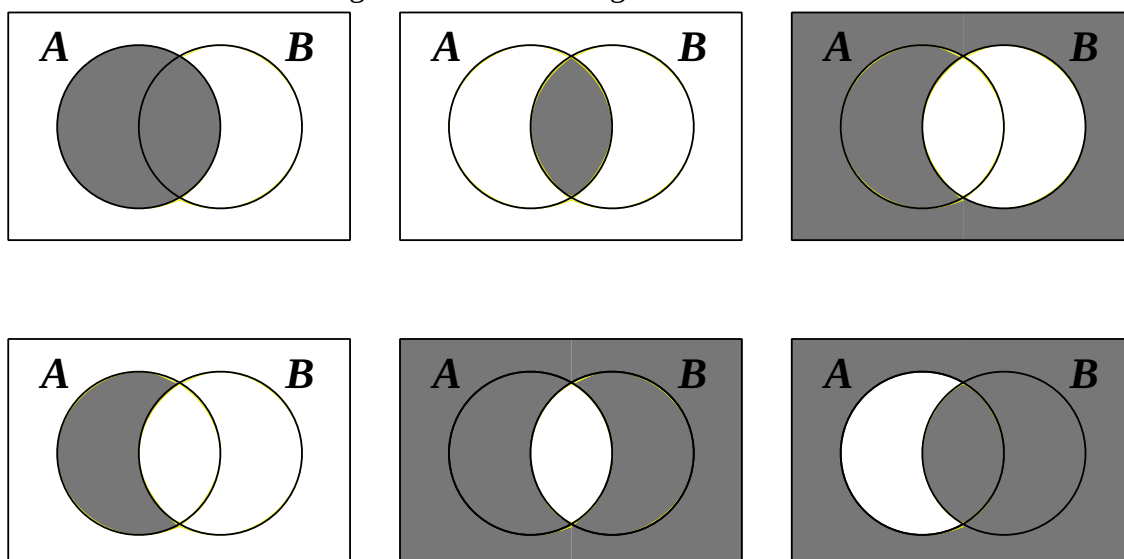
Let the set O be the set $\{ \text{Odd numbers} \}$ and set P be the set $\{ \text{Prime numbers} \}$.

List the six numbers less than 30 that are in $O \cap P'$

[2 marks]

Question 8

Below each Venn diagram describe the region shaded.



[6 marks]

Question 9

If $A = \{ \text{The multiples of 2} \}$ and $B = \{ \text{The multiples of 5} \}$
then describe, with a single set theory symbol, the set $A \cap B$

[2 marks]

Question 10

Let A be the set $\{ \text{Positive integer powers of 2} \}$

and B be the set $\{ \text{Positive integer powers of 3} \}$

Set A can be described like this : $A = \{ 2^1, 2^2, 2^3, 2^4, \dots \}$

(i) Describe set B in a similar manner.

[2 marks]

(ii) Let C be the set $\{ \text{Positive integer powers of 6} \}$.

Is set C to be found within the set $(A \cup B)$?

[2 marks]

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Teachers may obtain detailed worked solutions to the exercises by email from mhh@shrewsbury.org.uk