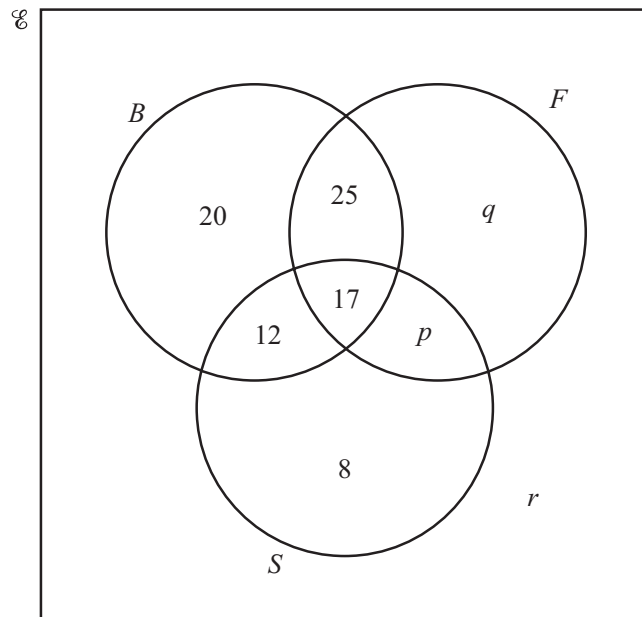


## Sets and Venn Diagrams

1)

In a survey, 100 students are asked if they like basketball ( $B$ ), football ( $F$ ) and swimming ( $S$ ).

The Venn diagram shows the results.



42 students like swimming.

40 students like exactly one sport.

(a) Find the values of  $p$ ,  $q$  and  $r$ . [3]

(b) How many students like

(i) all three sports, [1]

(ii) basketball and swimming but not football? [1]

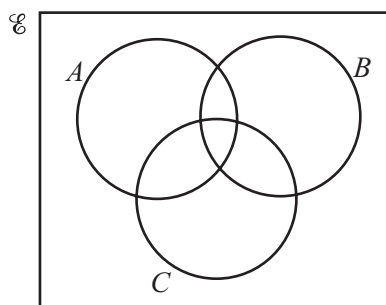
(c) Find

(i)  $n(B')$ , [1]

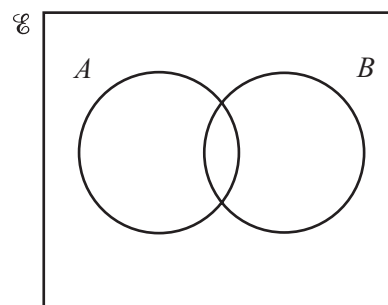
(ii)  $n((B \cup F) \cap S')$ . [1]

2)

Shade the region required in each Venn Diagram.



$$A \cap B \cap C$$

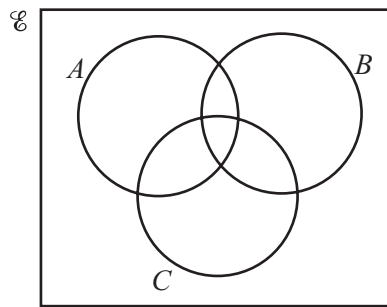


$$A \cup B'$$

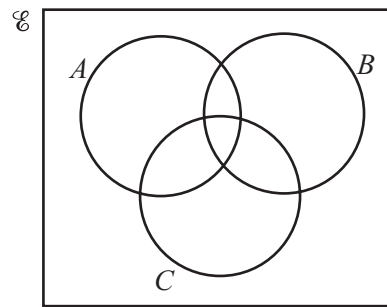
[2]

## Sets and Venn Diagrams

- 3) Shade the region required in each Venn Diagram.



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

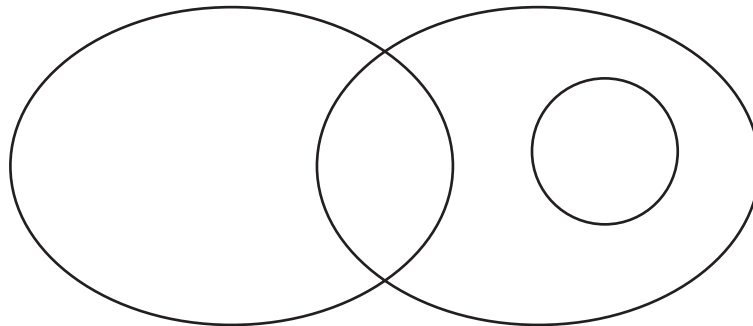


$$A' \cap (B \cup C)$$

- 4)  $Q = \{2, 4, 6, 8, 10\}$  and  $R = \{5, 10, 15, 20\}$ .  
 $15 \in P$ ,  $n(P) = 1$  and  $P \cap Q = \emptyset$ .

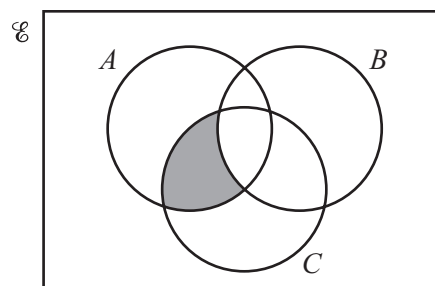
[2]

Label each set and complete the Venn diagram to show this information.



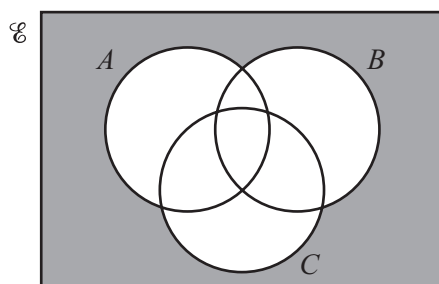
[3]

- 5)

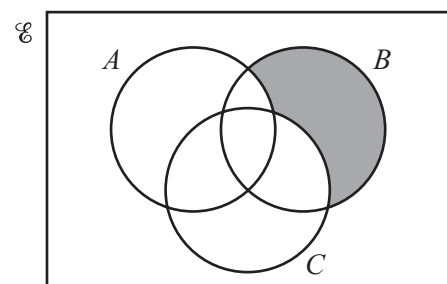


The shaded area in the diagram shows the set  $(A \cap C) \cap B'$ .

Write down the set shown by the shaded area in each diagram below.



.....



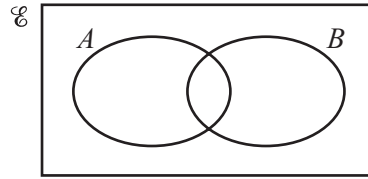
.....

[2]

## Sets and Venn Diagrams

6)

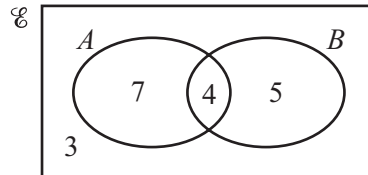
(a)



Shade the region  $A \cap B'$ .

[1]

(b)

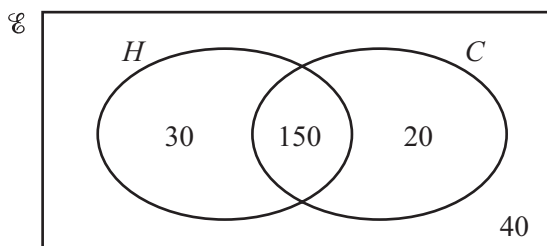


This Venn diagram shows the number of elements in each region.

Write down the value of  $n(A \cup B')$ .

Answer(b)  $n(A \cup B') =$  ..... [1]

7)



$U = \{240 \text{ passengers who arrive on a flight in Cyprus}\}$

$H = \{\text{passengers who are on holiday}\}$

$C = \{\text{passengers who hire a car}\}$

(a) Write down the number of passengers who

(i) are on holiday,

Answer(a)(i) ..... [1]

(ii) hire a car but are not on holiday.

Answer(a)(ii) ..... [1]

(b) Find the value of  $n(H \cup C')$ .

Answer(b) ..... [1]

## Sets and Venn Diagrams

8)

$$\mathcal{U} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

$$E = \{x : x \text{ is an even number}\}$$

$$F = \{2, 5, 7\}$$

$$G = \{x : x^2 - 13x + 36 = 0\}$$

(a) List the elements of set  $E$ .

*Answer(a)*  $E = \{ \quad \quad \quad \} \quad [1]$

(b) Write down  $n(F)$ .

*Answer(b)*  $n(F) = \dots\dots\dots [1]$

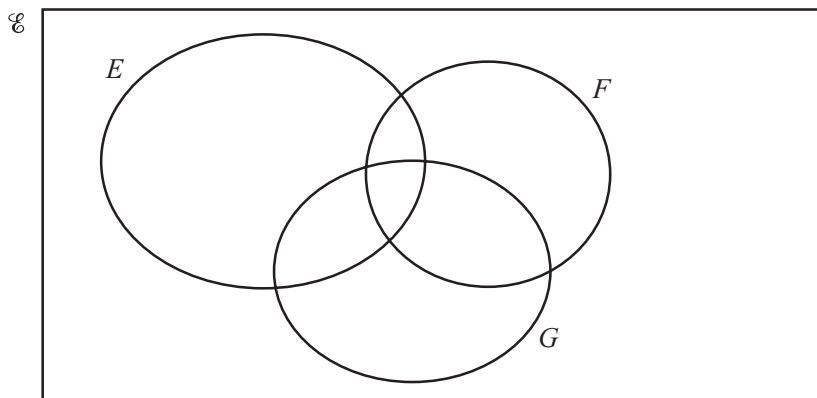
(c) (i) Factorise  $x^2 - 13x + 36$ .

*Answer(c)(i)*  $\dots\dots\dots [2]$

(ii) Using your answer to **part (c)(i)**, solve  $x^2 - 13x + 36 = 0$  to find the two elements of  $G$ .

*Answer(c)(ii)*  $x = \dots\dots\dots$  or  $x = \dots\dots\dots [1]$

(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)  $F \cap G = \dots\dots\dots [1]$

(ii)  $7 \dots\dots E \quad [1]$

(iii)  $n(E \dots\dots F) = 6 \quad [1]$

## Sets and Venn Diagrams

9)

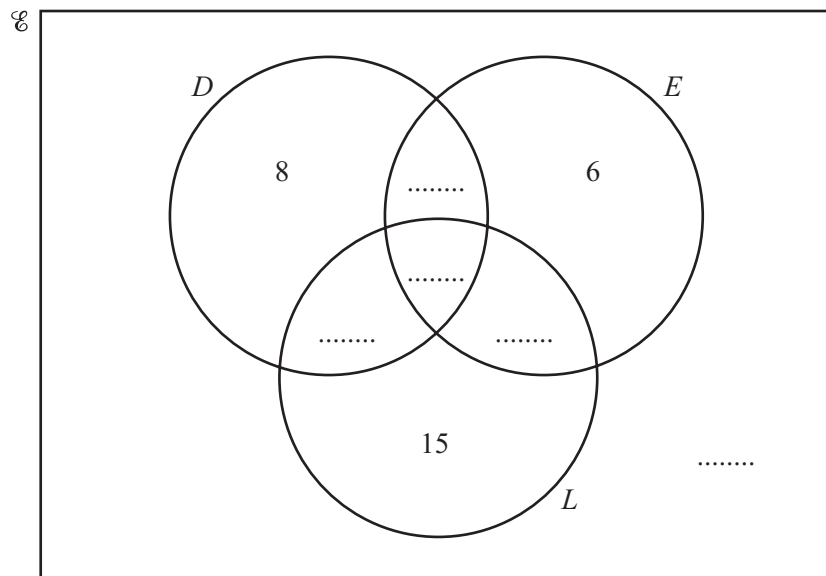
In a survey of 60 cars, 25 use diesel, 20 use liquid hydrogen and 22 use electricity.

No cars use all three fuels and 14 cars use both diesel and electricity.

There are 8 cars which use diesel only, 15 cars which use liquid hydrogen only and 6 cars which use electricity only.

In the Venn diagram below

$\mathcal{C} = \{\text{cars in the survey}\},$   
 $D = \{\text{cars which use diesel}\},$   
 $L = \{\text{cars which use liquid hydrogen}\},$   
 $E = \{\text{cars which use electricity}\}.$



(a) Use the information above to fill in the five missing numbers in the Venn diagram.

[4]

(b) Find the number of cars which use diesel but not electricity.

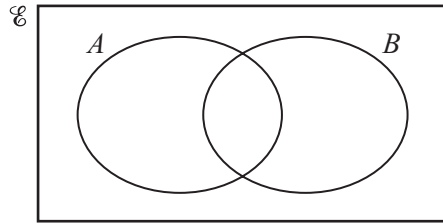
Answer(b) ..... [1]

(c) Find  $n(D' \cap (E \cup L))$ .

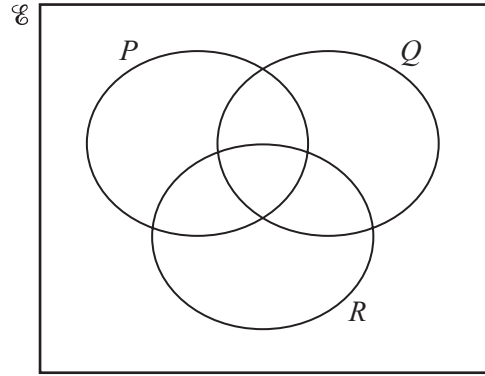
Answer(c) ..... [1]

## Sets and Venn Diagrams

- 10) Shade the required region on each Venn diagram.



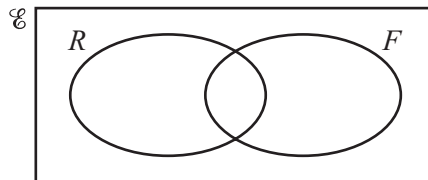
$$A \cap B'$$



$$(P \cup Q) \cap R'$$

[2]

- 11)



In the Venn diagram,  $\mathcal{E} = \{\text{students in a survey}\}$ ,  $R = \{\text{students who like rugby}\}$  and  $F = \{\text{students who like football}\}$ .

$$n(\mathcal{E}) = 20$$

$$n(R \cup F) = 17$$

$$n(R) = 13$$

$$n(F) = 11$$

(a) Find

(i)  $n(R \cap F)$ ,

Answer(a)(i) ..... [1]

(ii)  $n(R' \cap F)$ .

Answer(a)(ii) ..... [1]

(b) A student who likes rugby is chosen at random.

Find the probability that this student also likes football.

Answer(b) ..... [1]

## Sets and Venn Diagrams

12)

90 students are asked which school clubs they attend.

$D = \{\text{students who attend drama club}\}$

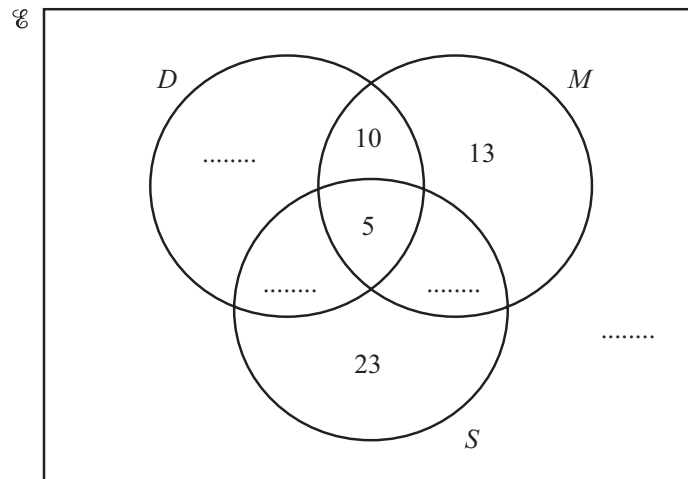
$M = \{\text{students who attend music club}\}$

$S = \{\text{students who attend sports club}\}$

39 students attend music club.

26 students attend **exactly two** clubs.

35 students attend drama club.



(a) Write the four missing values in the Venn diagram.

[4]

(b) How many students attend

(i) all three clubs,

Answer(b)(i) ..... [1]

(ii) one club only?

Answer(b)(ii) ..... [1]

(c) Find

(i)  $n(D \cap M)$ ,

Answer(c)(i) ..... [1]

(ii)  $n((D \cap M) \cap S')$ .

Answer(c)(ii) ..... [1]

## Sets and Venn Diagrams

13)

(a)  $\mathcal{U} = \{25 \text{ students in a class}\}$

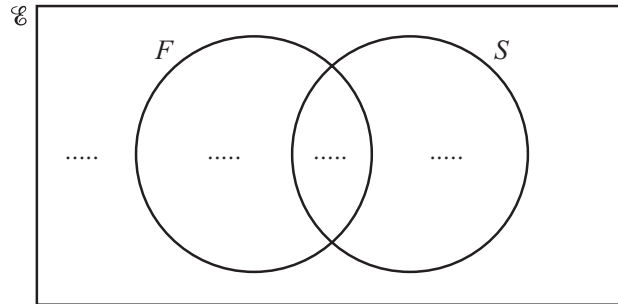
$F = \{\text{students who study French}\}$

$S = \{\text{students who study Spanish}\}$

16 students study French and 18 students study Spanish.

2 students study neither of these.

(i) Complete the Venn diagram to show this information.



(ii) Find  $n(F')$ .

[2]

Answer(a)(ii) ..... [1]

(iii) Find  $n(F \cap S)'$ .

Answer(a)(iii) ..... [1]

(iv) One student is chosen at random.

Find the probability that this student studies both French and Spanish.

Answer(a)(iv) ..... [1]

(v) Two students are chosen at random without replacement.

Find the probability that they both study only Spanish.

Answer(a)(v) ..... [2]



## Sets and Venn Diagrams

- (b)** In another class the students all study at least one language from French, German and Spanish.

No student studies all three languages.

The set of students who study German is a proper subset of the set of students who study French.

4 students study both French and German.

12 students study Spanish but not French.

9 students study French but not Spanish.

A total of 16 students study French.

- (i)** Draw a Venn diagram to represent this information.

[4]

- (ii)** Find the total number of students in this class.

*Answer(b)(ii)* ..... [1]