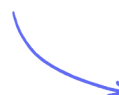


Set Notation & Venn Diagrams

Set Notation & Venn Diagrams

Easy (3 questions)	/9
Medium (6 questions)	/17
Hard (6 questions)	/19
Very Hard (5 questions)	/27
Total Marks	/72

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Easy Questions

1 (a) $\mathcal{E} = \{21, 22, 23, 24, 25, 26, 27, 28, 29, 30\}$

$$A = \{22, 24, 26, 28, 30\}$$

$$B = \{21, 24, 27, 30\}$$

List the members of the set

i) $A \cap B$

[1]

ii) A'

[1]

(2 marks)

(b) $C = \{23, 25, 29\}$

Using set notation, find an expression for C in terms of A and B .

(1 mark)

2 (a) $\mathcal{E} = \{\text{letters of the alphabet}\}$

$$B = \{b, r, a, z, i, l\}$$

$$I = \{i, r, e, l, a, n, d\}$$

List the members of the set

i) $B \cup I$

[1]

ii) $B \cap I'$

[1]

(2 marks)

(b) $K = \{k, e, n, y, a\}$

Cody writes down the statement $B \cap K = \emptyset$

Cody's statement is wrong. Explain why.

(1 mark)

$B = \{b, l, u, e\}$
3 (a) $G = \{g, r, e, y\}$
 $W = \{w, h, i, t, e\}$

List all the members of the set

i) $B \cup G$

[1]

ii) $W \cap G'$

[1]

(2 marks)

(b) Serena writes down the statement $B \cap G \cap W = \emptyset$

Is Serena's statement correct?

You must give a reason for your answer.

[1]

(1 mark)

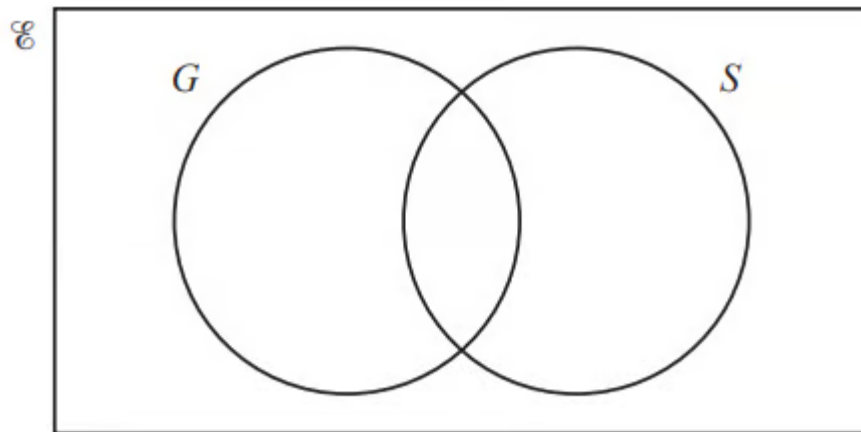
Medium Questions

1 There are 32 students in a class.

5 do not study any languages.

15 study German (G).

18 study Spanish (S).



Complete the Venn diagram to show this information.

(2 marks)

2 (a) x is an integer.

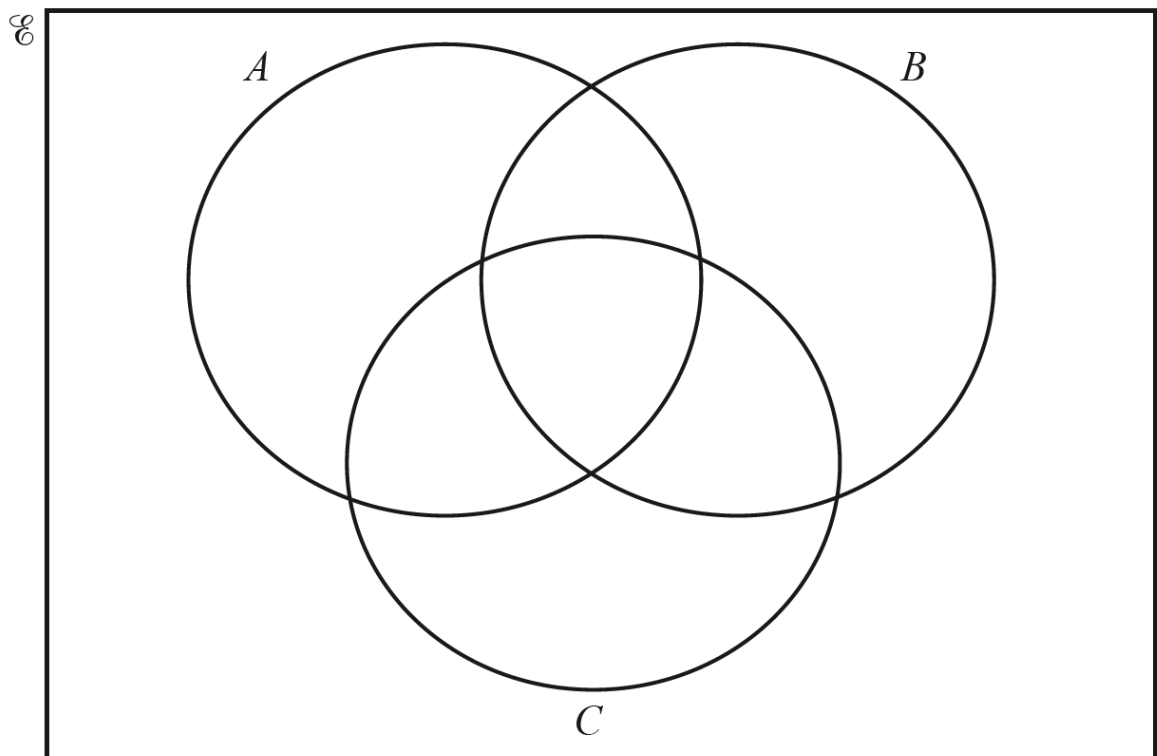
$$E = \{x : 41 \leq x \leq 50\}$$

$$A = \{x : x \text{ is an odd number}\}$$

$$B = \{x : x \text{ is a multiple of 3}\}$$

$$C = \{x : x \text{ is a prime number}\}$$

Complete the Venn diagram to show this information.



(3 marks)

(b) List the elements of

i) $A \cap C$,

[1]

ii) $(B \cup C)'$.

[1]

(2 marks)

(c) Find $n(A \cap B \cap C)$.

(1 mark)

3 (a) $\mathcal{E} = \{\text{students in a school}\}$

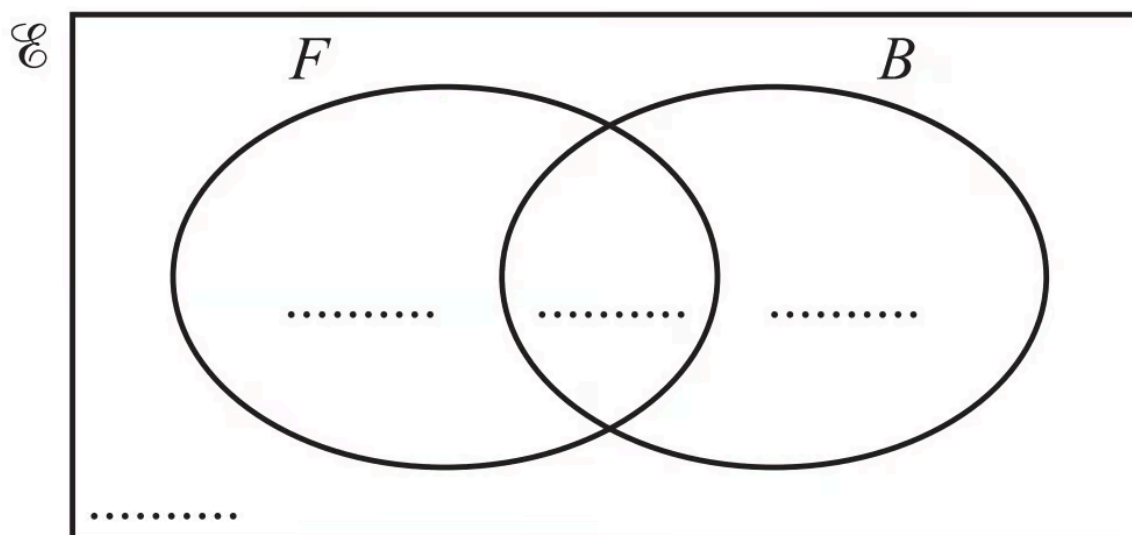
$F = \{\text{students who play football}\}$

$B = \{\text{students who play baseball}\}$

There are 240 students in the school.

- 120 students play football
- 40 students play baseball
- 90 students play football but not baseball.

Complete the Venn diagram to show this information.

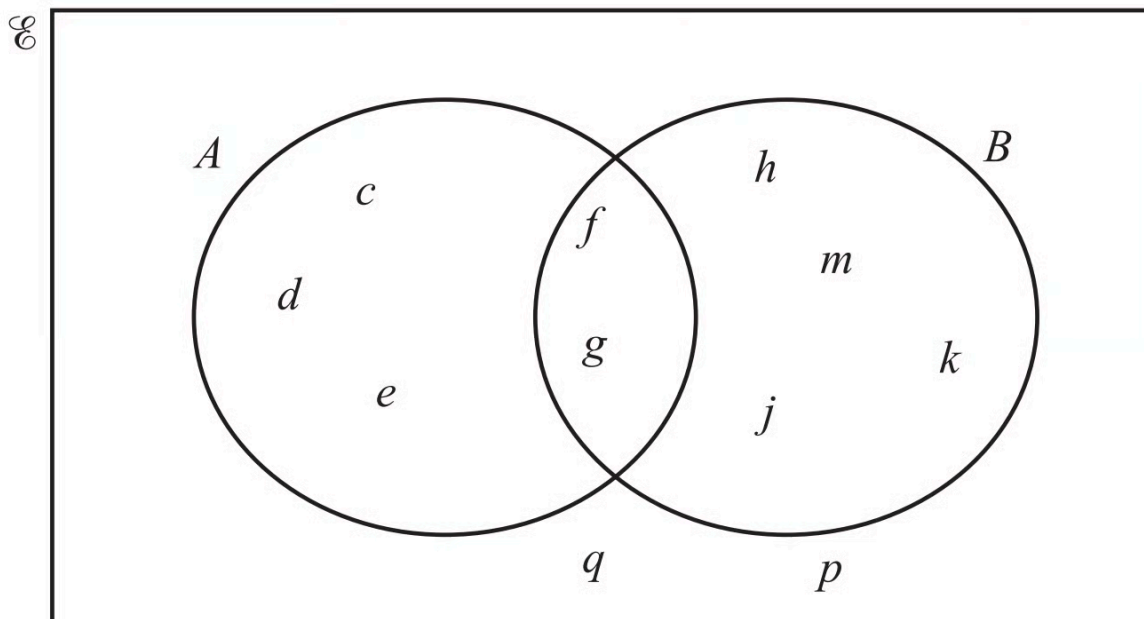


(2 marks)

(b) Find $n(F' \cap B')$.

(1 mark)

4



Use set notation to complete the statements.

i) $d \dots A$

[1]

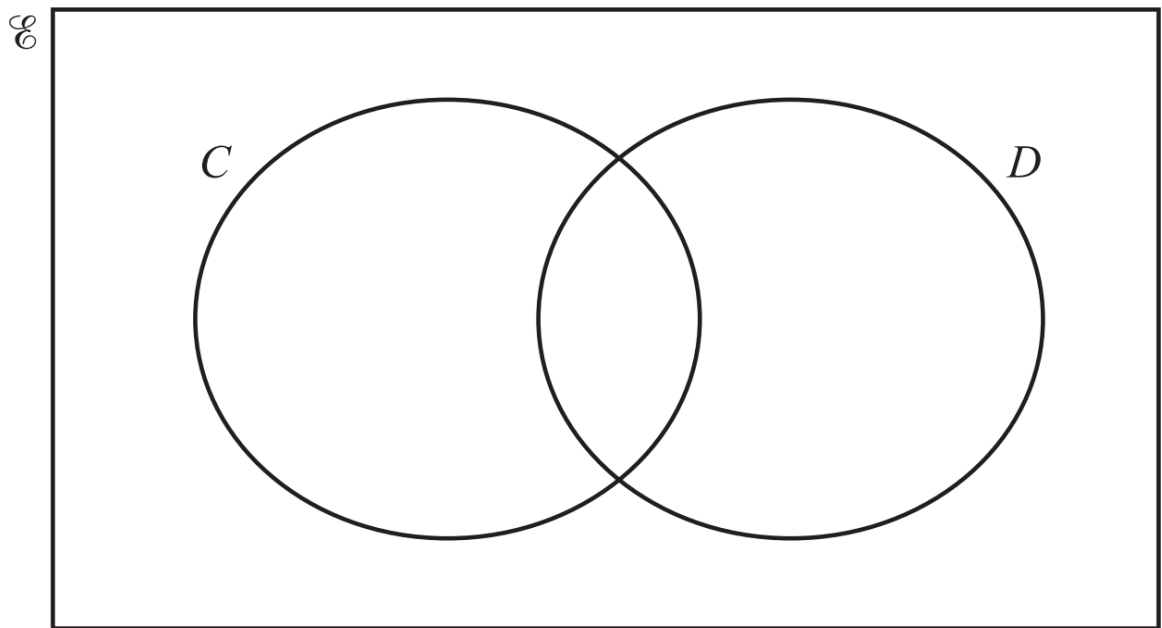
ii) $\{f, g\} = \dots$

[1]

iii) Complete the statement.

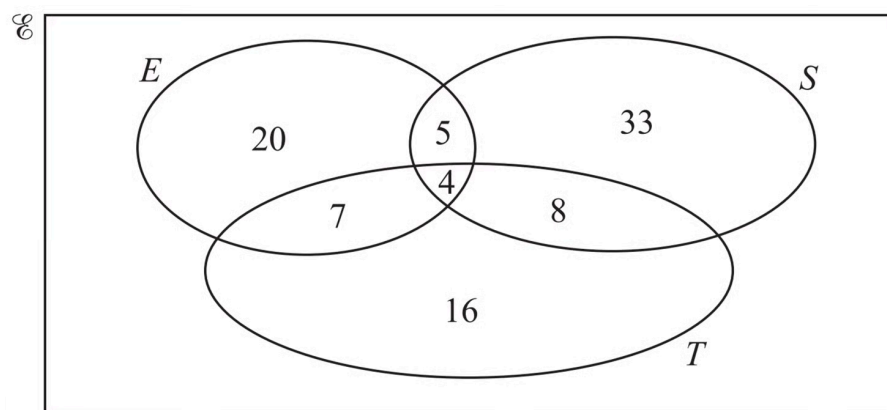
$n(\dots) = 6$ [1]
(3 marks)

- 5 In the Venn diagram below, shade $C \cap D'$.



(1 mark)

- 6 The number of members of a leisure centre using the exercise machines (E), the swimming pool (S) and the tennis courts (T) is shown on the Venn diagram.



- i) Find the number of members using only the tennis courts.

[1]

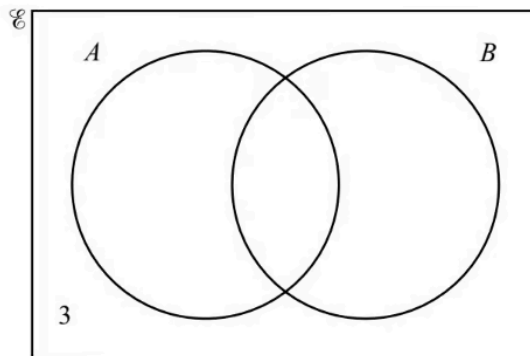
- ii) Find the number of members using the swimming pool.

[1]

(2 marks)

Hard Questions

1 (a)



$n(\mathcal{E}) = 20$, $n(A \cup B)' = 3$, $n(A) = 10$ and $n(B) = 13$.
The Venn diagram shows some of this information.

Find

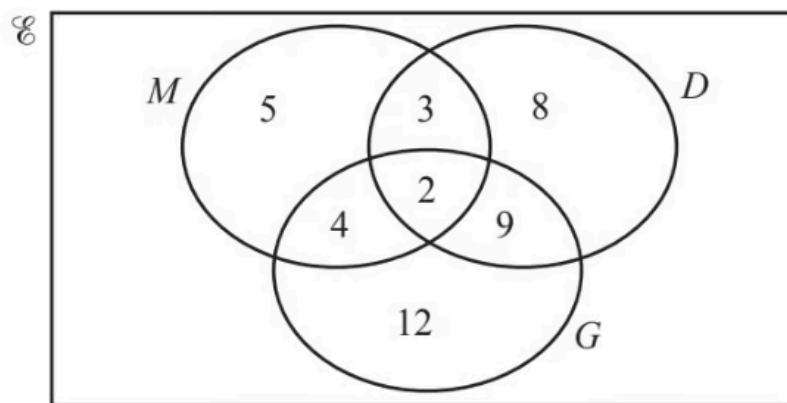
$$n(A \cap B)$$

(2 marks)

(b) $n(A' \cap B)$.

(1 mark)

2 (a)



The Venn diagram above shows information about the number of students who study Music (M), Drama (D) and Geography (G).

i) How many students study Music?

[1]

ii) How many students study exactly two subjects?

[1]

(2 marks)

(b) In the Venn diagram above, shade $M \cap D'$.

(1 mark)

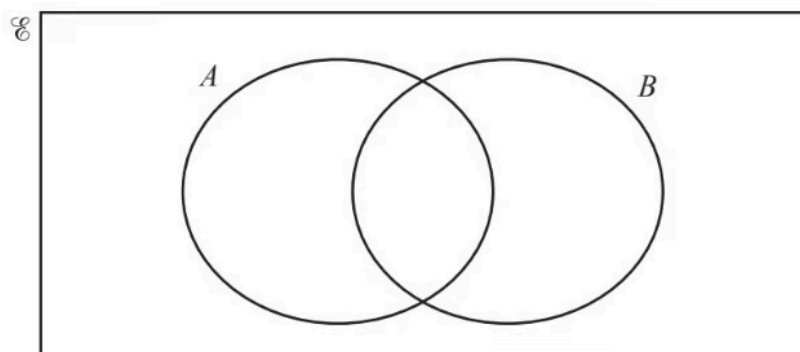
3 (a) $\mathcal{E} = \{x : x \text{ is an integer and } 1 \leq x \leq 10\}$

$A = \{x : x \text{ is even}\}$

$4 \in A \cap B$

$n(A \cap B) = 1$

$(A \cup B)' = \{1, 7, 9\}$



Complete the Venn diagram using this information.

(4 marks)

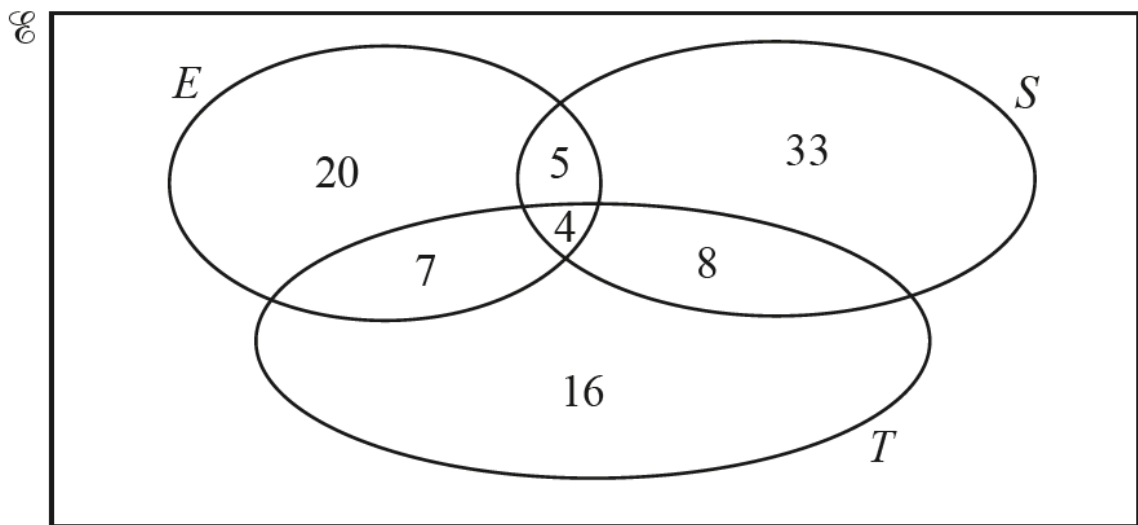
(b) Use your Venn diagram to complete the statement.

$B = \{.....\}$

(1 mark)

4 The number of members of a leisure centre using the exercise machines (E), the

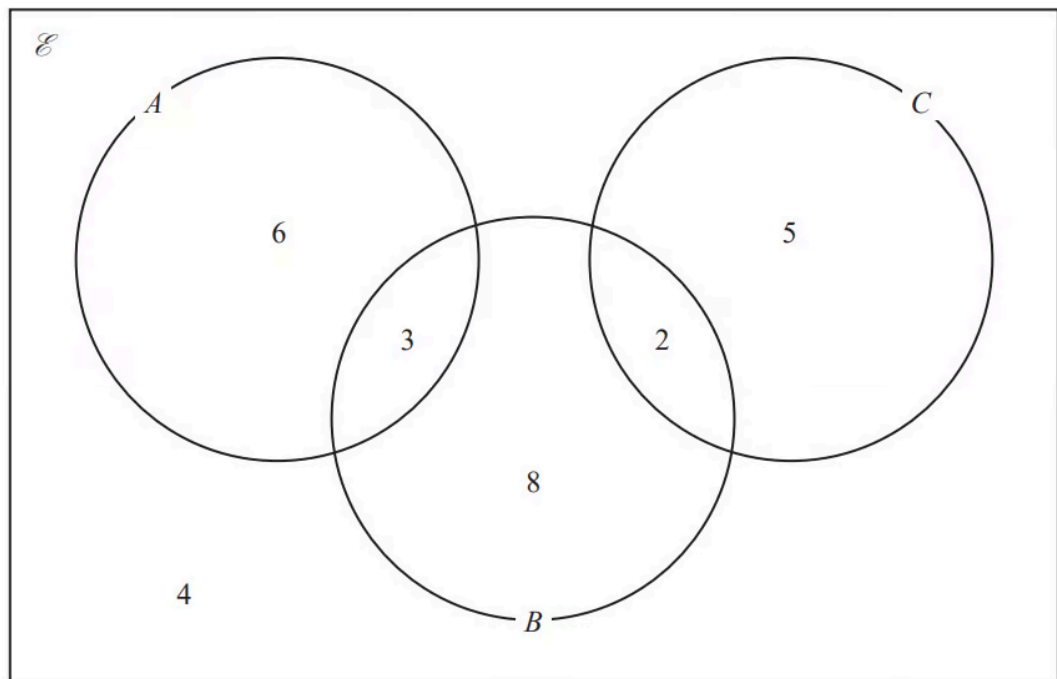
swimming pool (S) and the tennis courts (T) is shown on the Venn diagram.



Find $n(T \cap (E \cup S))$.

(1 mark)

5 (a) The Venn diagram shows a universal set $\mathcal{E}$ and three sets A , B and C .



6, 3, 8, 2, 5 and 4 represent the **numbers** of elements.

Find

$$n(A \cup B)$$

(1 mark)

(b) $n(A \cap B)$

(1 mark)

(c) $n(B \cap C')$

(1 mark)

(d) $n(A' \cup B' \cup C')$

(1 mark)

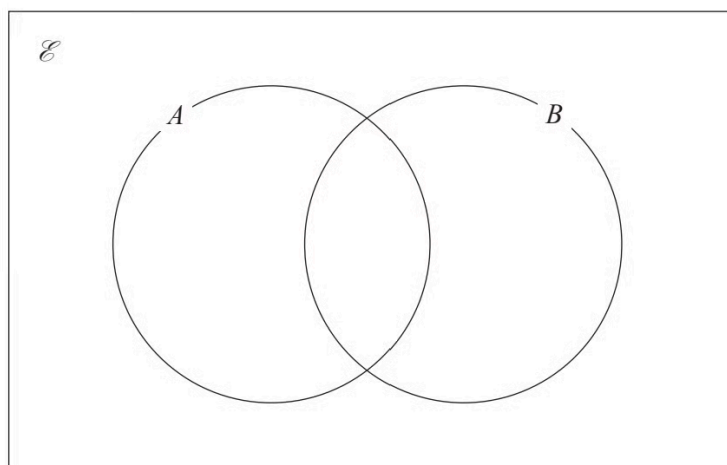
6 $\mathcal{E} = \{4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}$

$$A \cap B = \{5, 10, 15\}$$

$$B' = \{7, 8, 9, 11, 12, 13, 14\}$$

$$A' = \{4, 6, 7, 8, 14\}$$

Complete the Venn diagram for this information.



(3 marks)

Very Hard Questions

- 1 (a) This year, 40 students have each travelled by one or more of plane (P), train (T) or boat (B).

7 have travelled only by plane.

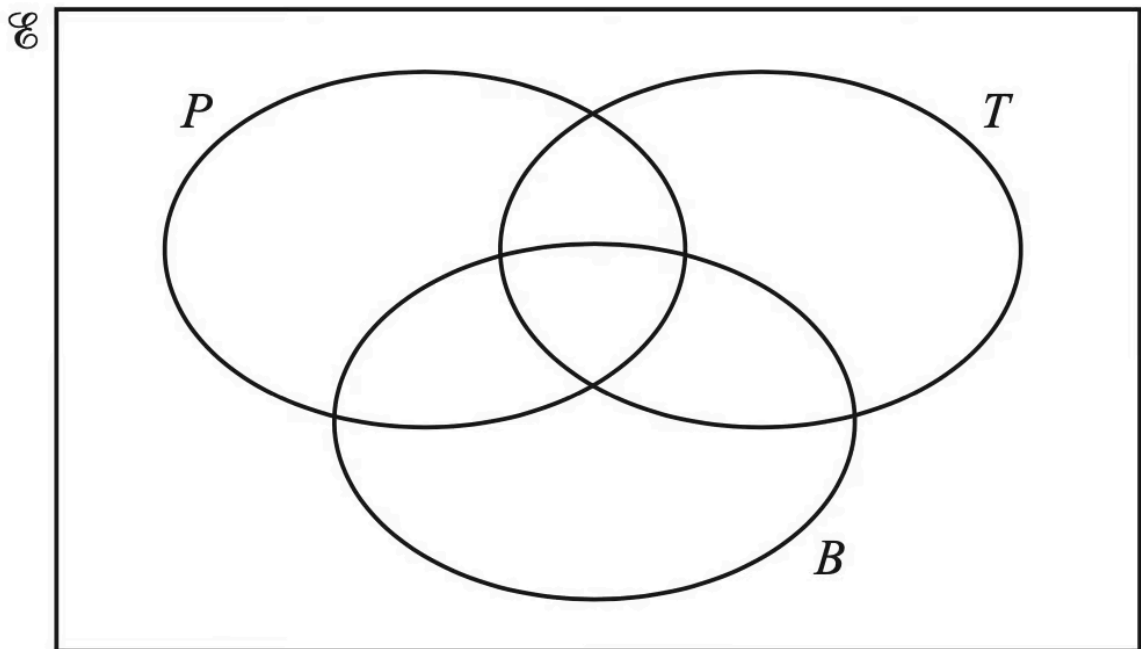
11 have travelled only by train.

9 have travelled only by boat.

$$n(P \cap T) = 8$$

$$n(B \cap T) = 3$$

$$n(B \cap P) = 6$$



Complete the Venn diagram.

(3 marks)

- (b) Find $n((P \cup B)')$.

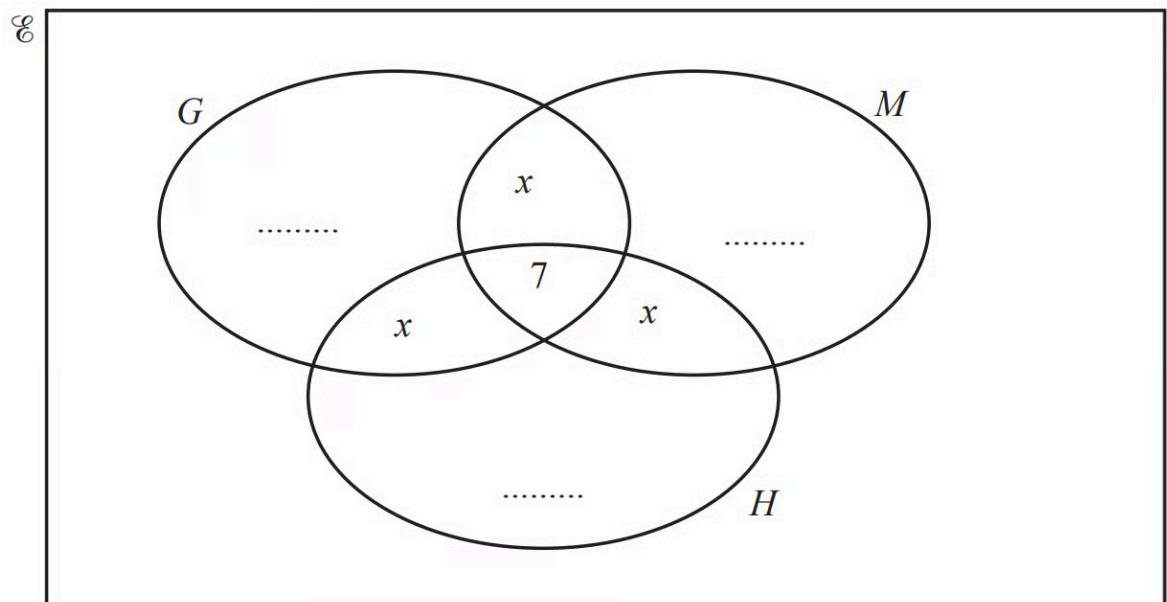
(1 mark)

- (c) Use set notation to complete the statement.

$$(P U T U B)' = \dots\dots\dots$$

(1 mark)

- The Venn diagram below is to be used to show this information.



- [2]

- [2]

(b) i) Use set notation to complete this statement.

$$(G \cup M \cup H)' = \dots\dots\dots [1]$$

ii) Find $n(G \cap (M \cup H))$.

[1]

(2 marks)

3 (a) Some students in a school were asked the following question.

“Do you have a dog (D), a cat (C) or a rabbit (R)?”

Of these students

28 have a dog

18 have a cat

20 have a rabbit

8 have both a cat and a rabbit

9 have both a dog and a rabbit

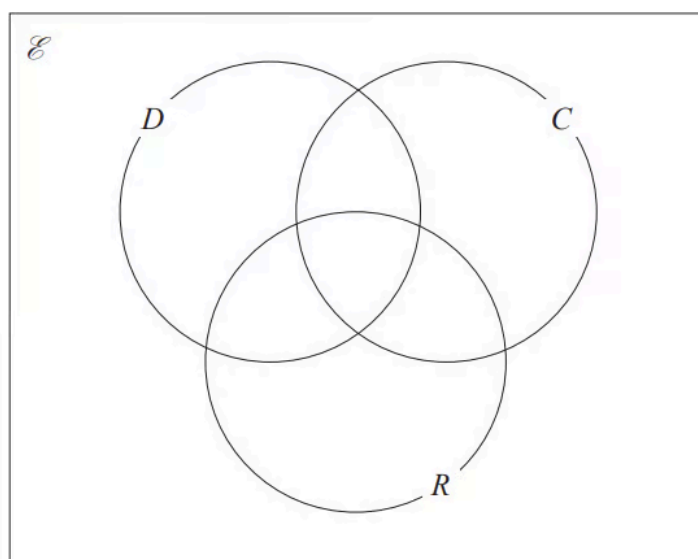
x have both a dog and a cat

6 have a dog, a cat and a rabbit

5 have not got a dog or a cat or a rabbit

Using this information, complete the Venn diagram to show the number of students in each appropriate subset.

Give the numbers in terms of x where necessary.



(3 marks)

(b) Given that a total of 50 students answered the question,

work out the value of x .

$x = \dots\dots\dots$

(2 marks)

(c) Find $n(C' \cap D')$

(1 mark)

4 (a) Some students were asked the following question.

“Which of the subjects Russian (R), French (F) and German (G) do you study?”

Of these students

4 study all three of Russian, French and German

10 study Russian and French

13 study French and German

6 study Russian and German

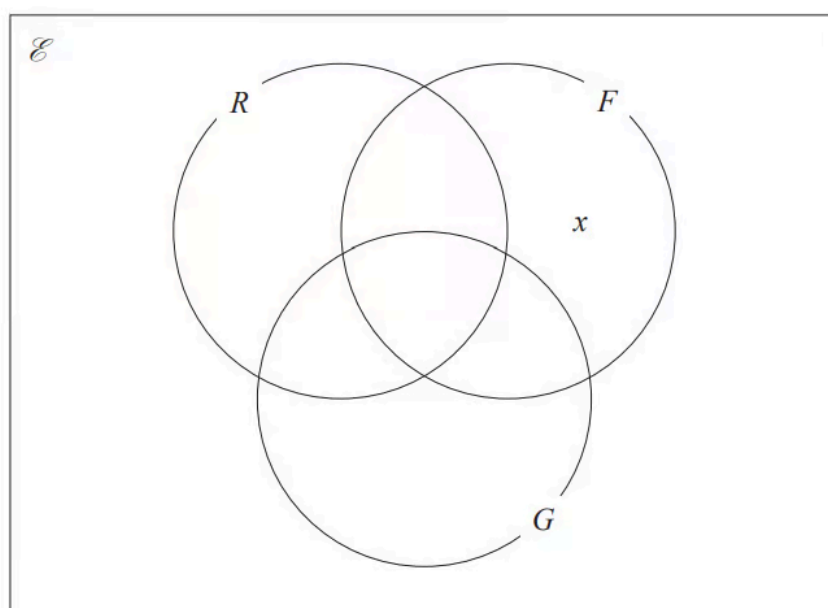
24 study German

11 study none of the three subjects

the number who study Russian only is twice the number who study French only.

Let x be the number of students who study French only.

Show all this information on the Venn diagram, giving the number of students in each appropriate subset, in terms of x where necessary.



(3 marks)

- (b) Given that the number of students who were asked the question was 80, work out the number of these students that study Russian.

(3 marks)

5 (a) A and B are two sets.

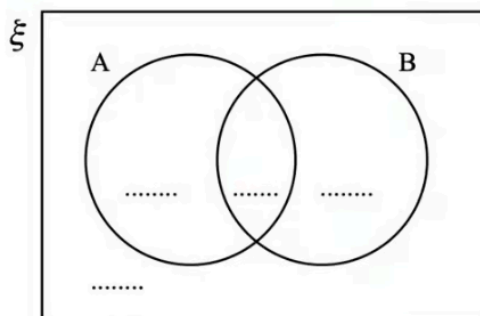
$$n(\xi) = 37$$

$$n(A) = 22$$

$$n(A \cap B) = 12$$

$$n(A \cup B) = 30$$

Complete the Venn diagram to show the **number of elements** in each region.



(2 marks)

(b) Find

(i) $n(A \cap B')$

[1]

(ii) $n(A' \cup B')$

[1]

(2 marks)