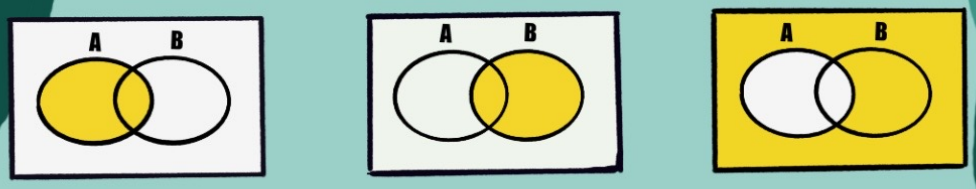
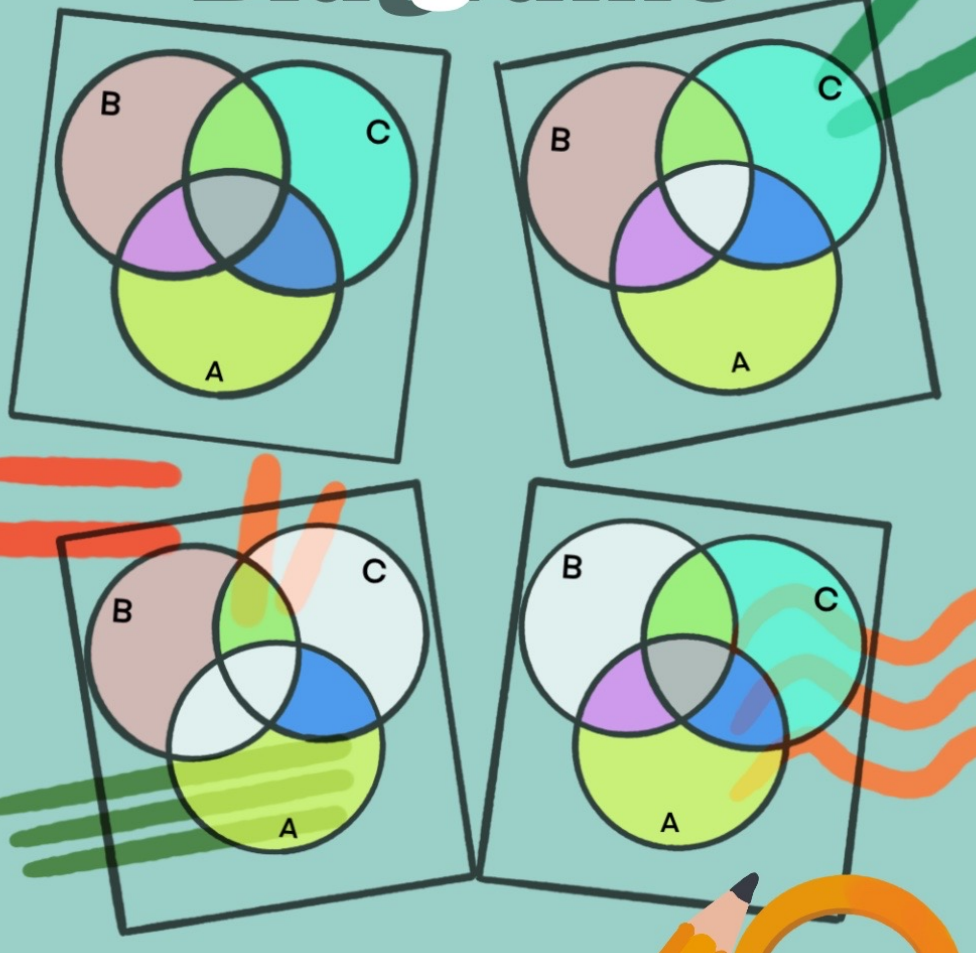
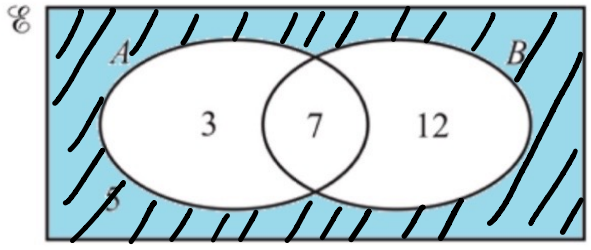
The Maths Society



Sets - Venn Diagrams



Question 1



The Venn diagram shows the numbers of elements in each region.

(a) Find $n(A \cap B')$. [1]

3

(b) An element is chosen at random. [1]

Find the probability that this element is in set B

$\frac{19}{27}$

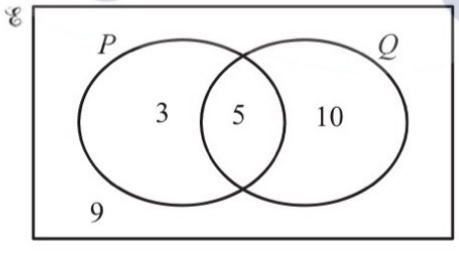
(c) An element is chosen at random from set A. [1]

Find the probability that this element is also a member of set B.

$\frac{7}{10}$

(d) On the Venn diagram, shade the region $(A \cup B)'$. [1]

Question 2



The Venn diagram shows the number of elements in each set.

(a) Find $n(P' \cap Q)$. [1]

10

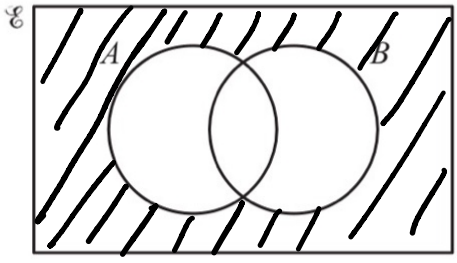
(b) Complete the statement $n(\ldots\ldots) = 17$. [1]

P ∪ Q'

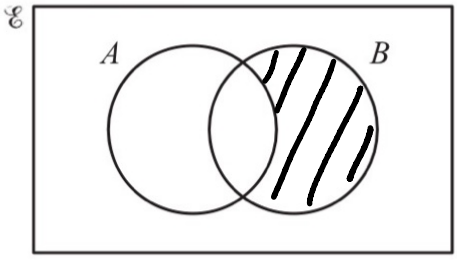
Question 3

[2]

Shade the region required in each Venn diagram.



$(A \cup B)'$



$A' \cap B$

Question 4

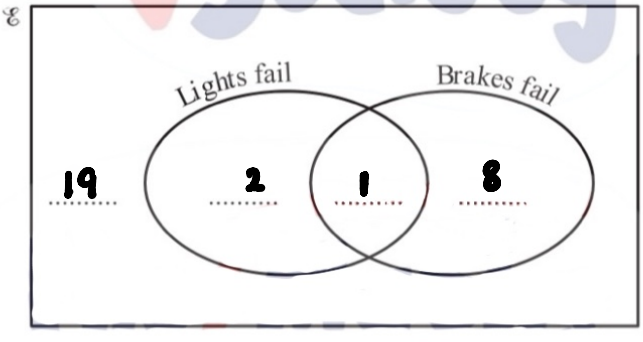
The lights and brakes of 30 bicycles are tested.
The table shows the results.

	Lights	Brakes
Fail test	3	9
Pass test	27	21

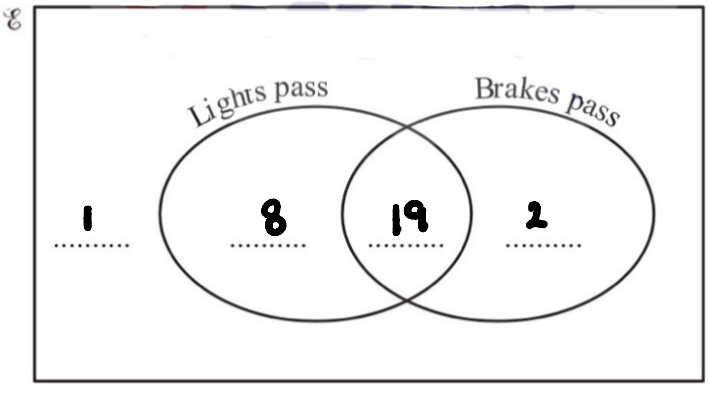
The lights and brakes both failed on one bicycle only.

$\mathscr{E}$ = {30 bicycles}
Complete the Venn diagrams.

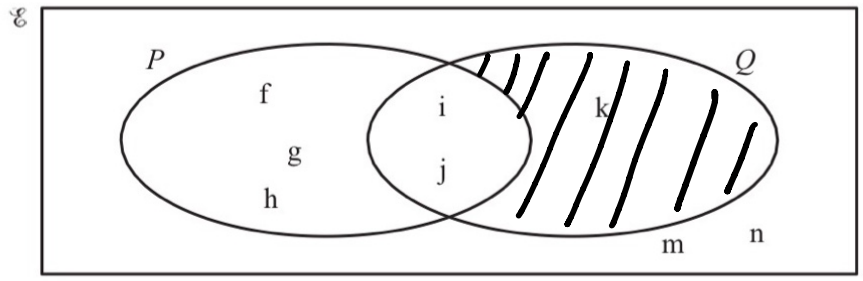
(a) [2]



(b) [2]



Question 5



(a) Use the information in the Venn diagram to complete the following.

(i) $P \cap Q =$ {i,j} [1]

(ii) $P' \cup Q =$ {k,m,n} [1]

(iii) $n(P \cup Q)' =$ 2 [1]

(b) A letter is chosen at random from the set Q.
Find the probability that it is also in the set P.

[1]

2/3

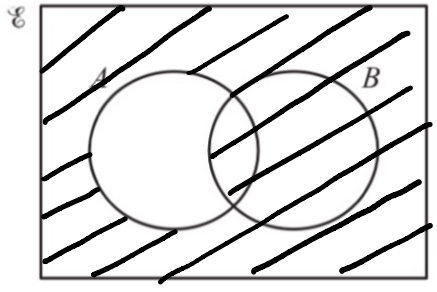
(c) On the Venn diagram shade the region $P' \cap Q$. [1]

(d) Use a set notation symbol to complete the statement.

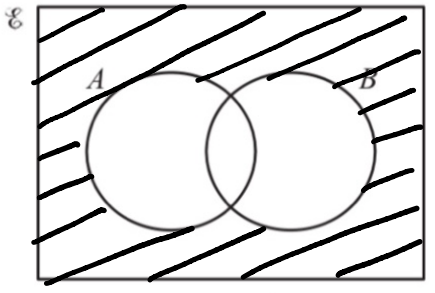
{f, g, h} ∈ P [1]

Question 6

Shade the required region on each Venn diagram. [2]



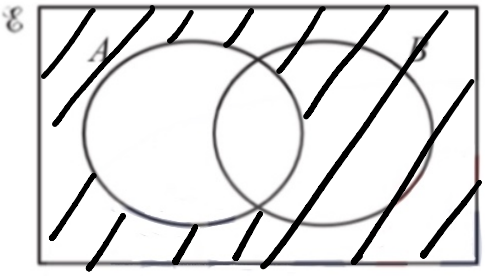
$A' \cup B$



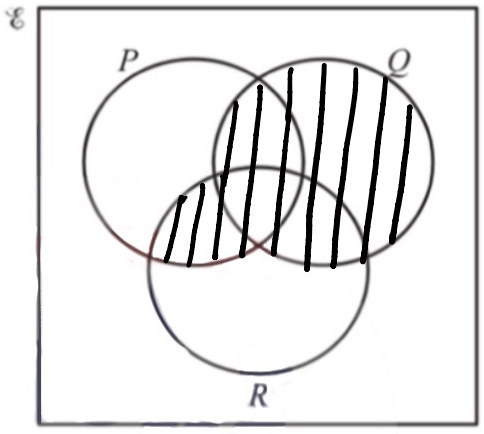
$A' \cap B'$

Question 7

Shade the required region in each of the Venn diagrams.



A′



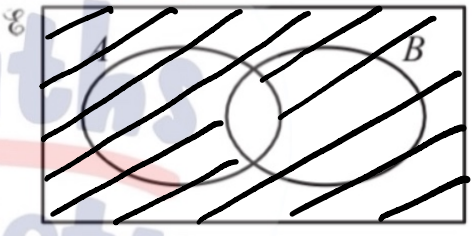
$(P \cap R) \cup Q$

[2]

Question 8

Shade the required region on each Venn diagram

$A \cup B'$

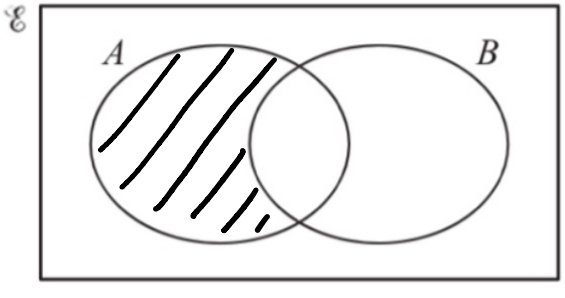


$(A \cap B)'$

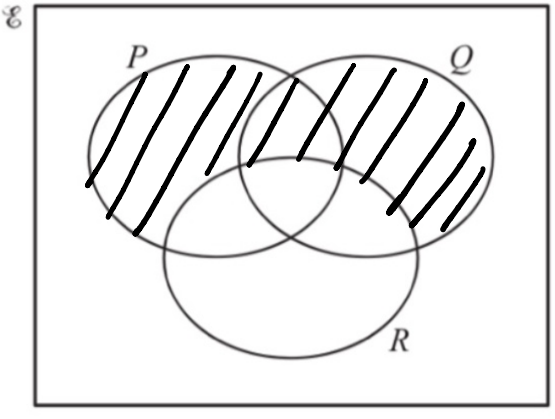
[2]

Question 9

Shade the required region on each Venn diagram.



$A \cap B'$



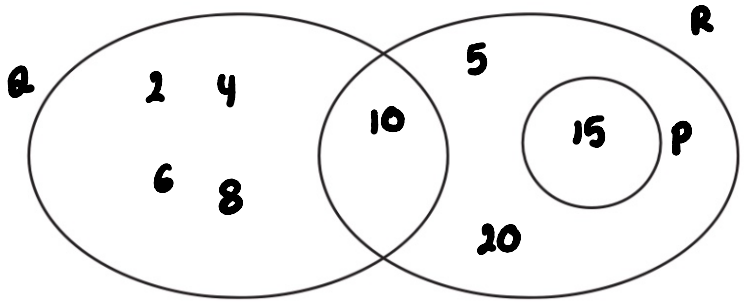
$(P \cup Q) \cap R'$

[2]

Question 1

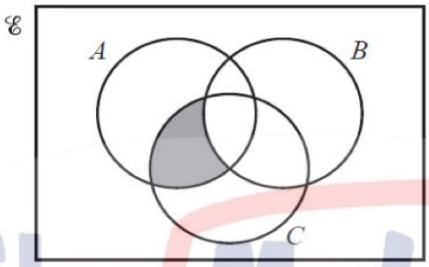
$Q = \{2, 4, 6, 8, 10\}$ and $R = \{5, 10, 15, 20\}$.
$15 \in P$, $n(P) = 1$ and $P \cap Q = \emptyset$.

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



[3]

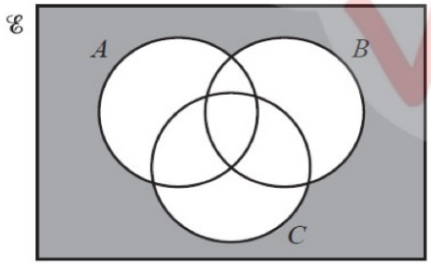
Question 2



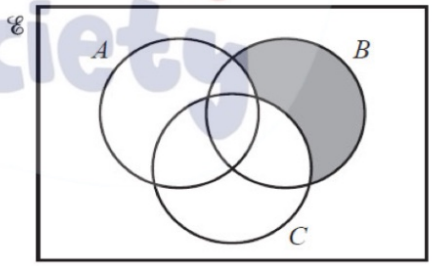
The shaded area in the diagram shows the set $(A \cap C) \cap B'$.

[2]

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



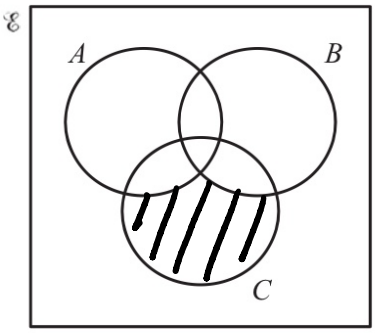
(AUBUC)'



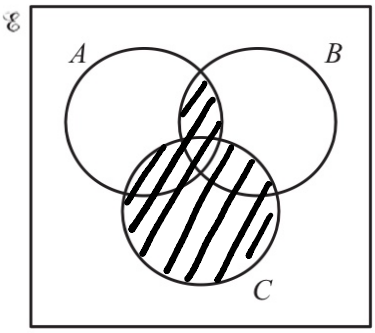
A'nC'nB

Question 3

Shade the required regions in the Venn diagrams below.



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

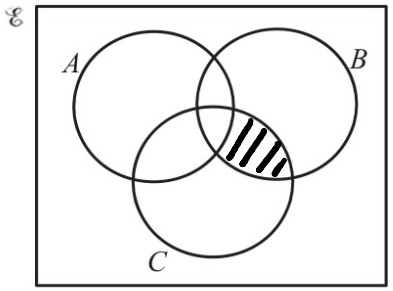


$(A \cap B) \cup C$

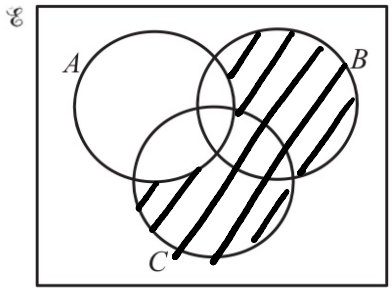
[2]

Question 4

Shade the region required in each Venn Diagram.



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



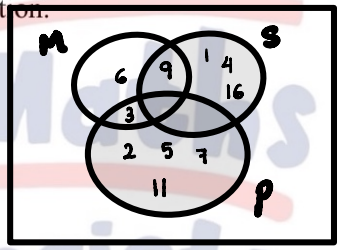
$A' \cap (B \cup C)$

[2]

Question 5

$\mathcal{E} = \{1,2,3,4,5,6,7,9,11,16\}$ $P = \{2,3,5,7,11\}$ $S = \{1,4,9,16\}$ $M = \{3,6,9\}$

(a) Draw a Venn diagram to show this information. [2]



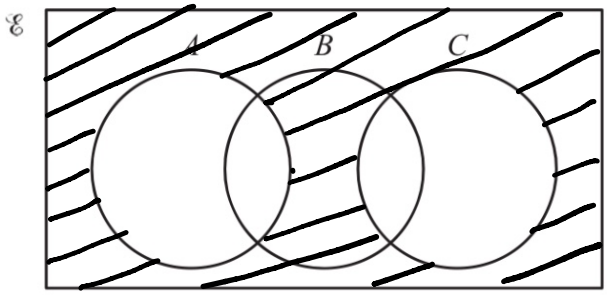
(b) Write down the value of n($M' \cap P$). [1]

4

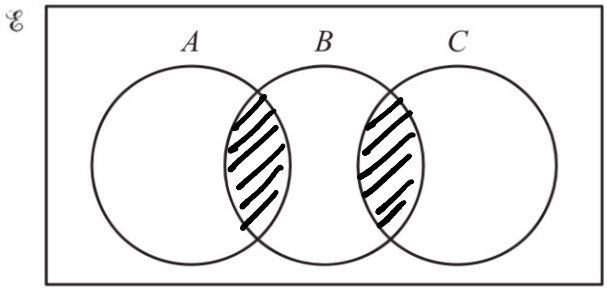
Question 6

On the Venn diagrams shade the regions

(a) $A' \cap C'$, [1]

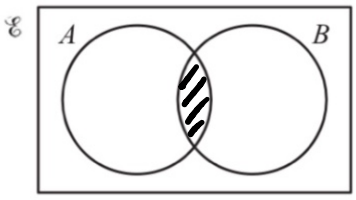


(b) $(A \cup C) \cap B$. [1]



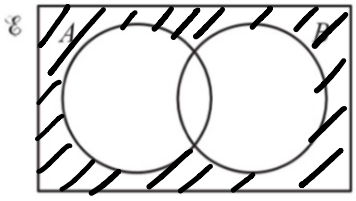
Question 7

(a) Shade the region $A \cap B$.



[1]

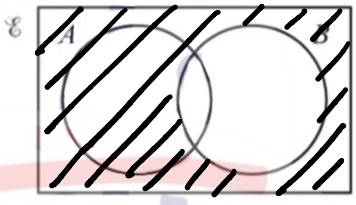
(b) Shade the region $(A \cup B)'$.



[1]

(c) Shade the complement of set B.

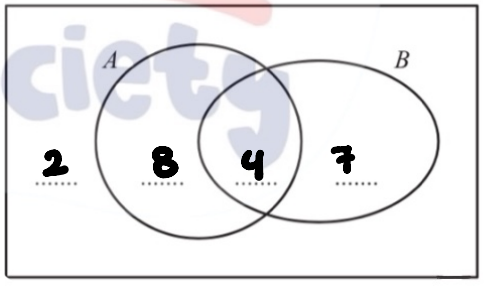
B'



[1]

Question 8

$n(\mathcal{E}) = 21$, $n(A \cup B) = 19$, $n(A \cap B') = 8$ and $n(A) = 12$.
Complete the Venn diagram to show this information.

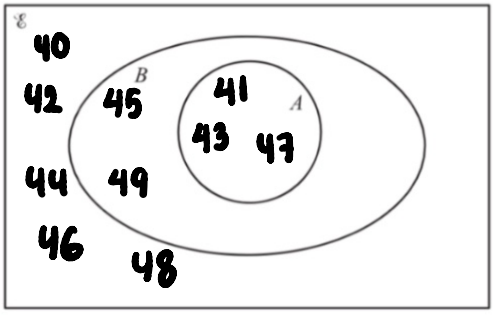


Question 9

$\mathcal{E}$ = {40, 41, 42, 43, 44, 45, 46, 47, 48, 49}
A = {prime numbers}
B = {odd numbers}

(a) Place the 10 numbers in the correct places on the Venn diagram. [2]

A = [41, 43, 47]



[1]

(b) State the value of $n(B \cap A')$.

2

Question 1

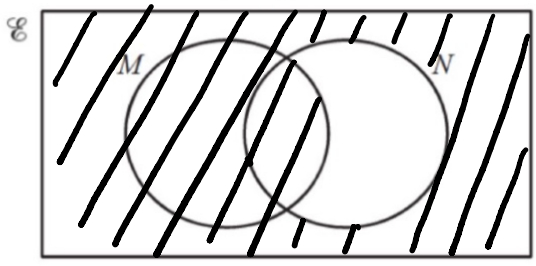
(a) $Q = \{1, 2, 3, 4, 5, 6\}$

Write down a set P where $P \subset Q$. [1]

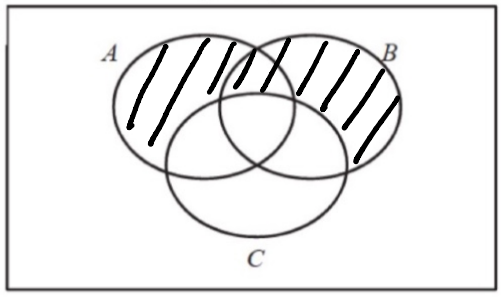
$P = \{4, 5\}$

(b) Shade these regions in the Venn diagrams.

$M \cup N'$

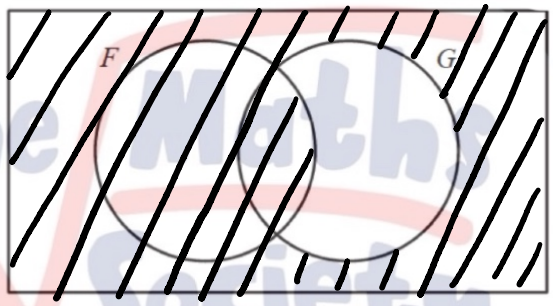


$(A \cup B) \cap C'$



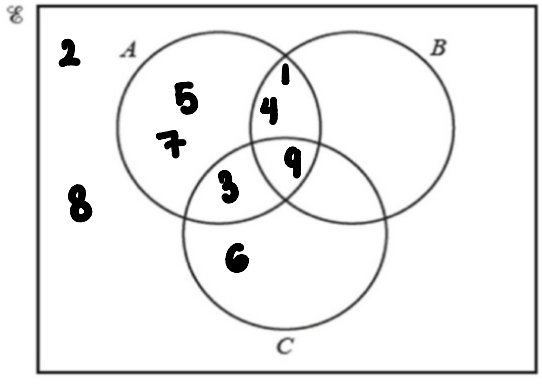
Question 2

(a) In this Venn diagram, shade the region $F \cup G'$. [2]



(b) $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ [1]
$A = \{x: x \text{ is an odd number}\}$
$B = \{x: x \text{ is a square number}\}$
$C = \{x: x \text{ is a multiple of 3}\}$

(i) Write all the elements of $\mathscr{E}$ in the Venn diagram below. [2]



(ii) Another number is included in the set $\mathscr{E}$. even square ÷3 [1]
This number is in the region $A' \cap B \cap C$.

Write down a possible value for this number.

36

Question 3

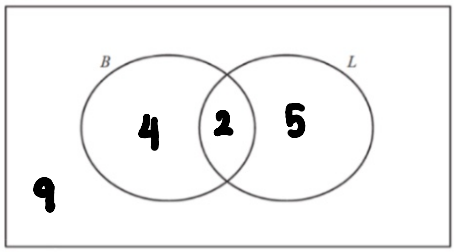
(a) A total of 20 trucks were tested at a checkpoint.

- 6 trucks failed the test for brakes (B)
- 7 trucks failed the test for lights (L)
- 9 trucks passed the tests for both brakes and lights.

$6-x+x+7-x=11$

$13-x=11$

$2=x$



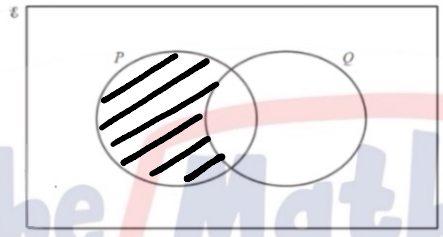
(i) Complete the Venn diagram.

[2]

(ii) Find $n(B' \cap L')$. 9

[1]

(b) In the Venn diagram below, shade the region $(P \cup Q) \cap Q'$



Question 4

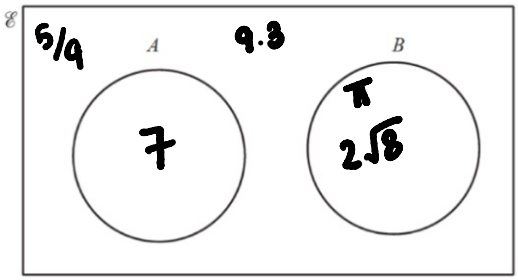
(a) $\mathscr{E} = \left\{7,\ 9.3,\ \pi,\ \frac{5}{9},\ 2\sqrt{8}\right\}$

A = {integers}

B = {irrational numbers}

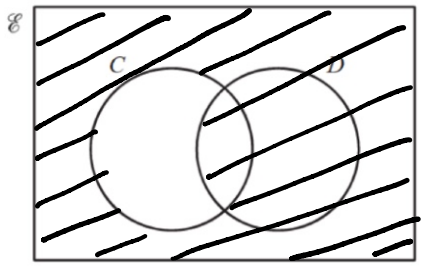
[1]

write all the elements of $\mathscr{E}$ in their correct place on the Venn diagram.

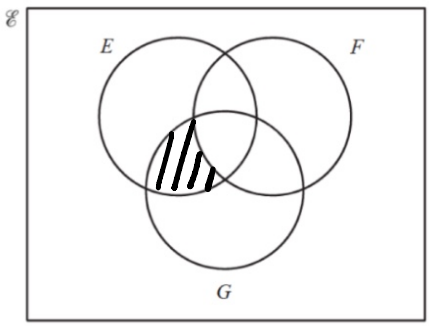


(b) Shade the region in each of the Venn diagrams below.

[2]



$C' \cup D$



$E \cap F' \cap G$

[2]

Question 5

(a) $\mathscr{E} = \{x: 2 \leqslant x \leqslant 16, x \text{ is an integer}\}$
$M = \{\text{even numbers}\}$ = 2, 4, 6, 8, 10, 12, 14, 16
$P = \{\text{prime numbers}\}$ = 3, 5, 7, 11, 13

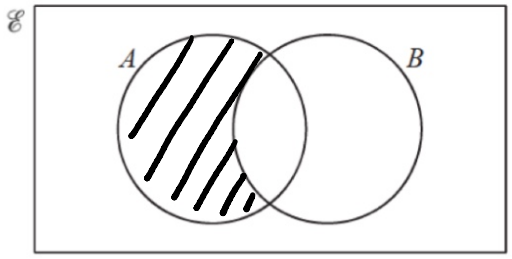
(i) Find n(M). [1]

8

(ii) Write down the set $(P \cup M)'$. [1]

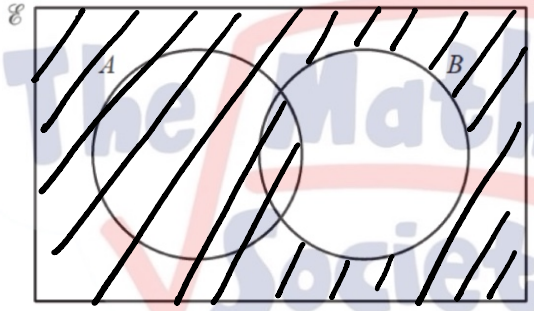
{ 9, 15 }

(b) On the Venn diagram, shade $A \cap B'$.



[1]

Question 6

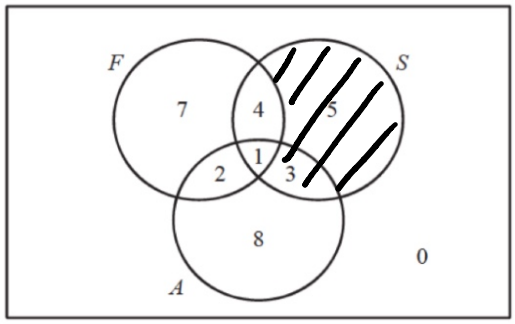


[1]

In the Venn diagram shade the region $A \cup B'$.

Question 7

The Venn diagram shows the number of students who study French (F), Spanish (S) and Arabic (A).



(a) Find n $(A \cup (F \cap S))$. [1]

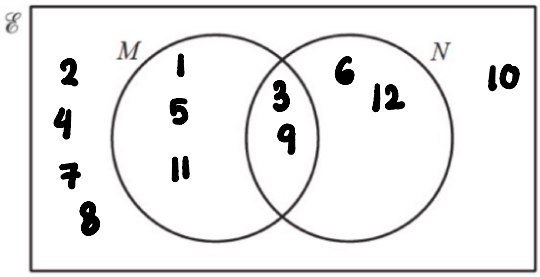
14

(b) On the Venn diagram, shade the region F'nS. [1]

Question 8

(a) You may use this Venn diagram to help you answer **part (a)**.

$\mathscr{E} = \{x : 1 \leqslant x \leqslant 12, x \text{ is an integer}\}$
$M = \{\text{odd numbers}\}$
$N = \{\text{multiples of } 3\}$



(i) Find n(N). [1]

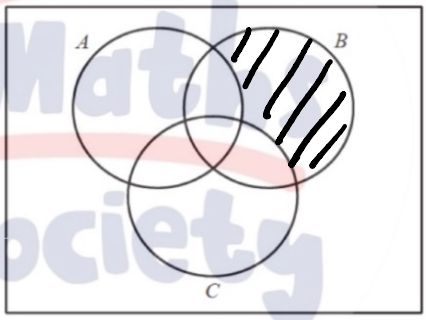
(ii) Write down the set $M \cap N$. [1]

$\{3, 9\}$

(iii) Write down a set P where $P \subset M$. [1]

$P = \{3\}$

(b) Shade $(A \cup C) \cap B'$ in the Venn diagram below.



[1]

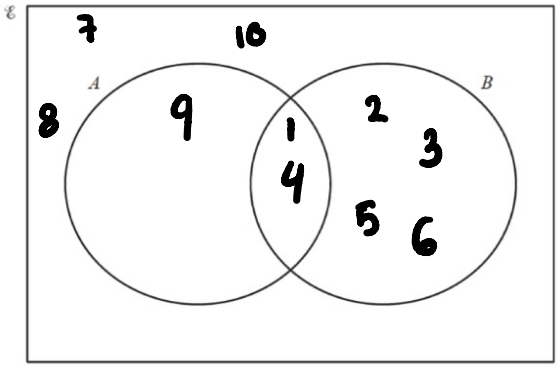
Question 1

$\mathscr{E} = \{x : 1 \leqslant x \leqslant 10, \text{ where } x \text{ is an integer}\}$

$A = \{\text{square numbers}\}$ 1, 4, 9

$B = \{1, 2, 3, 4, 5, 6\}$ [2]

(a) Write all the elements of $\mathscr{E}$ in their correct place in the Venn diagram.



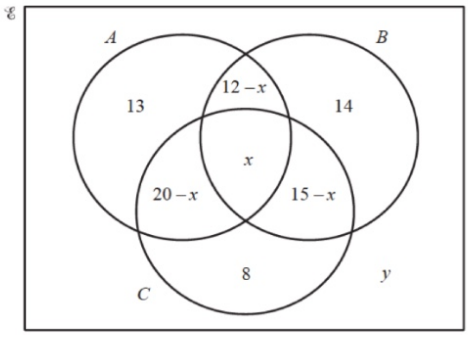
(b) List the elements of $(A \cup B)'$. [1]

$\{7, 8, 10\}$

(c) Find n($A \cap B'$). [1]

1

Question 2



The Venn diagram shows the number of elements in sets A, B and C.

(a) $n(A \cup B \cup C) = 74$

Find x. [2]

$82 - 2x = 74$

$-2x = -8$

$x = 4$

(b) $n(\mathscr{E}) = 100$

Find y. [1]

$y = 100 - 74$

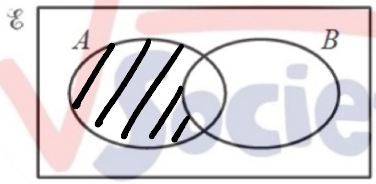
$= 26$

(c) Find the value of $n((A \cup B)' \cap C)$. [1]

8

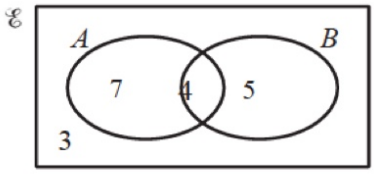
Question 3

(a)



Shade the region $A \cap B'$. [1]

(b)



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

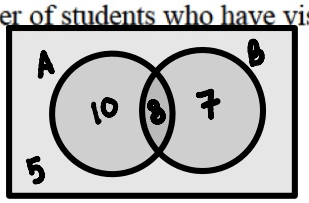
Write down the value of $n(A \cup B')$. [1]

14

Question 4

In a group of 30 students, 18 have visited Australia, 15 have visited Botswana and 5 have not visited either country.

Work out the number of students who have visited Australia but not Botswana. [2]



Question 5

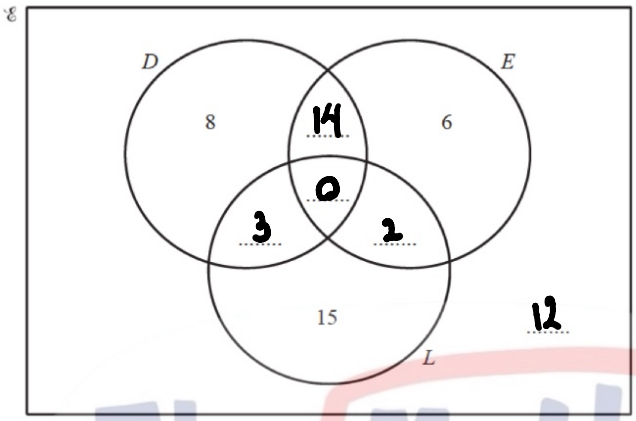
In a survey of 60 cars, 25 use diesel, 20 use liquid hydrogen and 22 use electricity.

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

$\mathscr{E}$ = {cars in the survey},
D = {cars which use diesel},
L = {cars which use liquid hydrogen},
E = {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. [1]

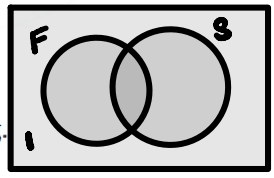
11

(c) Find n($D' \cap (E \cup L)$). [1]

23

Question 6

In a group of 24 students, 21 like football and 15 like swimming.
One student does **not** like football and does **not** like swimming.
Find the number of students who like **both** football and swimming. [2]



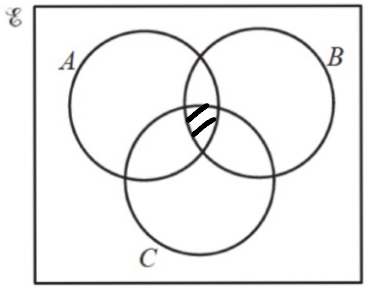
$21 - x + x + 15 - x = 23$

$-x = 23 - 36$

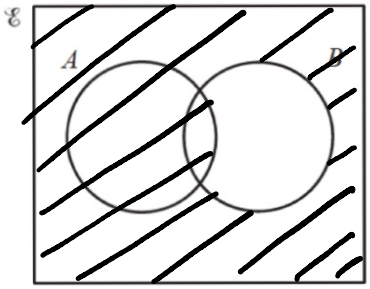
$x = 13$

Question 7

Shade the region required in each Venn Diagram. [2]



$A \cap B \cap C$



$A \cup B'$

Question 8

A and B are sets.
Write the following sets in their simplest form.

(a) $A \cap A'$. [1]

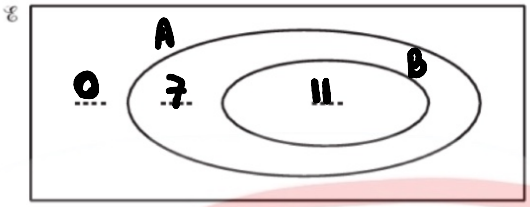
(b) $A \cup A'$. [1]

(c) $(A \cap B) \cup (A \cap B')$. [1]

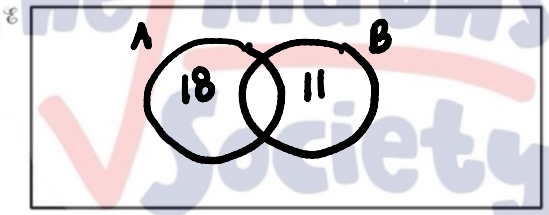
Question 9

$n(A) = 18$, $n(B) = 11$ and $n(A \cup B)' = 0$.

(a) Label the Venn diagram to show the sets A and B where $n(A \cup B) = 18$.
Write down the number of elements in each region.



(b) Draw another Venn diagram to show the sets A and B where $n(A \cup B) = 29$.
Write down the number of elements in each region. [2]



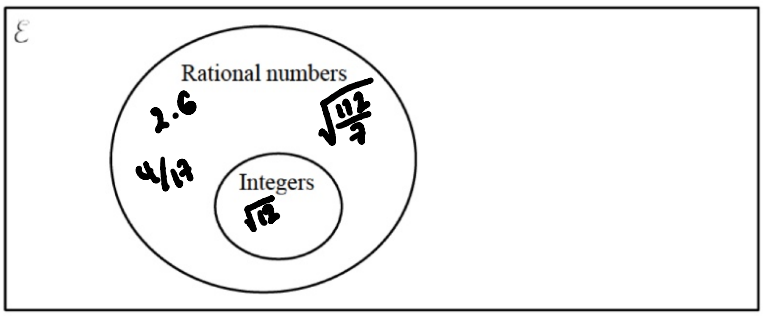
[2]

Question 10

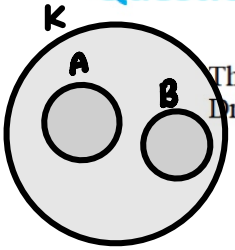
Write each of these four numbers in the correct place in the Venn Diagram below.

$$2.6, \quad \frac{4}{17}, \quad \sqrt{12}, \quad \sqrt{\frac{112}{7}}$$

[4]



Question 11



Three sets A, B and K are such that $A \subset K$, $B \subset K$ and $A \cap B = \emptyset$.
Draw a Venn diagram to show this information.

[2]