1.

(a) The sets A and B are shown on the Venn Diagram in the answer space.
The element y is such that $y \in A$ and $y \notin B$.
On the diagram, write y in the correct region.

(b) $\mathscr{E} = \{x : x \text{ is an integer and } 1 \leqslant x \leqslant 8\}$.
$P = \{x : x > 5\}$.
$Q = \{x : x \leqslant 3\}$.

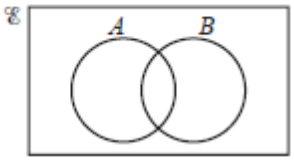
(i) Find the value of $n(P \cup Q)$.

(ii) List the elements of $P' \cap Q'$.

Ans:

(a) y marked in correct region 1 Within A ∩ B′. Not just shading

Answer (a)



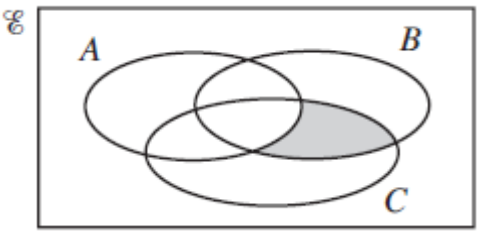
[1]

b)

i) 6 ii) 4,5

2.

(a) Express, in set notation, as simply as possible, the subset shaded in the Venn diagram.



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

(b) It is given that $n(\mathscr{E}) = 40$, $n(P) = 18$, $n(Q) = 20$ and $n(P \cap Q) = 7$.

Find

(i) $n(P \cup Q)$,

(ii) $n(P' \cap Q')$.

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

(ii) .....[1]

Ans:

(a) B ∩ C ∩ A′

(b) (i) 31
(ii) 9

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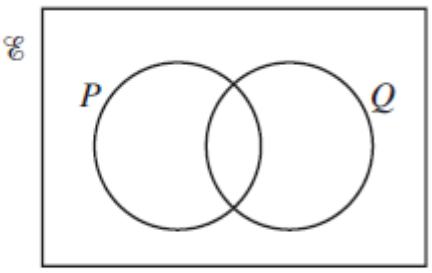
3.

(a) On the Venn diagram shown in the answer space, shade the set $P \cup Q'$.

Answer (a)



[1]

(b) There are 27 children in a class.
Of these children, 19 own a bicycle, 15 own a scooter and 3 own neither a bicycle nor a scooter.
Using a Venn diagram, or otherwise, find the number of children who own a bicycle but not a scooter.

Answer (b) .....[2]

Ans:

a)

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b) 9

4.

(a) $\mathscr{E} = \{1, 2, 3, 4, 5\}$,
$A = \{1, 2, 3\}$,
$B = \{5\}$,
$C = \{3, 4\}$.

List the elements of

(i) $A \cup C$,

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

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

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

(b) A group of 60 children attend an after school club.
Of these, 35 children play football and 29 play hockey.
3 children do not play either football or hockey.

By drawing a Venn diagram, or otherwise, find the number of children who play only hockey.

Answer (b) .....[2]

Ans:

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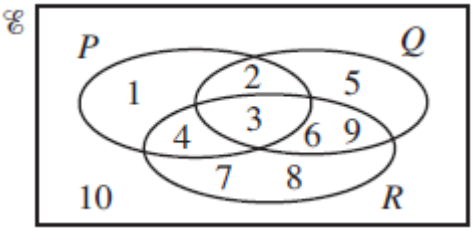
a) i) 1,2,3,4 ii) 1,2 b) 22

5.



The Venn diagram shows the sets $\mathscr{E}$, P, Q and R.

$\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

(a) Find the value of $n(Q \cup R)$.

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

(b) List the elements of the set $P' \cap (Q \cup R)$.

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

(c) One element is chosen at random from $\mathscr{E}$.
Write down the probability that this element belongs to $(P \cap Q) \cup (P \cap R)$.

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

Ans:

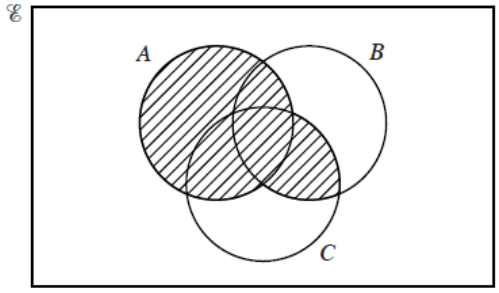
a) 8

b) {5,6,7,8,9}

c) 3/10 or 0.3

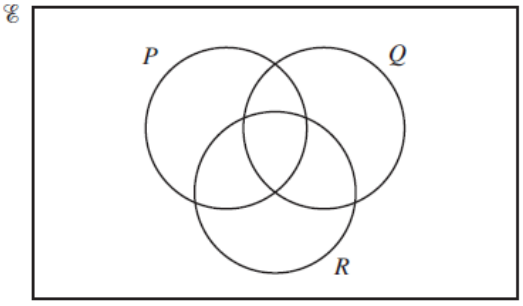
6.

(a) Using set notation, describe the shaded region in the Venn diagram.



Answer ..... [1]

(b) In the Venn diagram, shade the region represented by $P' \cap (Q \cup R)$.



[1]

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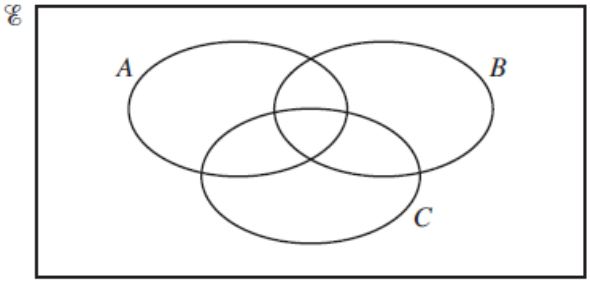
(a) $A \cup (B \cap C)$ oe

Ans: **(b)** Correct region shaded

7.

(a) On the Venn diagram, shade the set $A \cap B \cap C'$



[1]

(b) $\mathscr{E} = \{2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$P = \{x : x \text{ is a prime number}\}$
$Q = \{x : x \geqslant 5\}$

(i) Find the value of $n(P \cap Q)$.

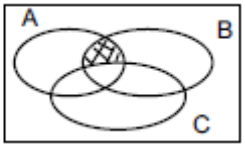
Answer ..... [1]

(ii) List the elements of $P \cup Q'$.

Answer ..... [1]

Ans:

(a)



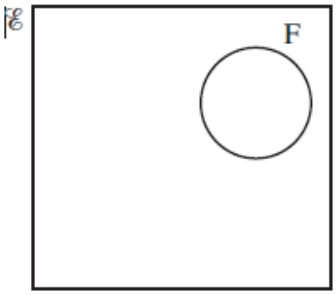
(b) **(i)** 2

(ii) 2, 3, 4, 5, 7

8.

$\mathscr{E} = \{ x : x \text{ is an integer and } x > 5 \}$

P = { x : x is a prime number }
F = { x : x is a multiple of 4 }
S = { x : x is a multiple of 6 }



The Venn diagram shows the Universal set and the set F.

(a) Draw and label the two sets P and S to complete the Venn diagram.

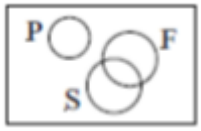
[2]

(b) Write down a possible element y such that y is an even number and $y \in (F \cup S)'$.

Answer $y =$ ..... [1]

Ans:

a)



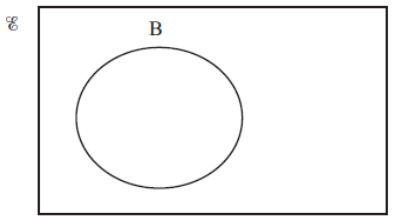
b) 10 or 14 or 22 or 26 etc

9.

The Venn diagram shows the Universal set and the set B.
A and C are two sets such that

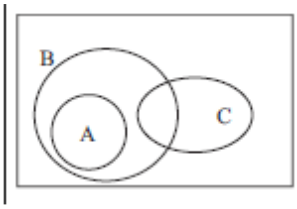
$A \cup B = B$, $A \cap B \neq B$, $A \cap C = \varnothing$ and $B \cap C \neq \varnothing$.

Draw the sets A and C in the Venn diagram.



[2]

Ans:



10.

(a) Given that $A = \{ 1, 2, 3, 4, 5 \}$ and $B = \{ 3, 4, 5, 6, 7 \}$, find $n(A \cup B)$.

Answer ..... [1]

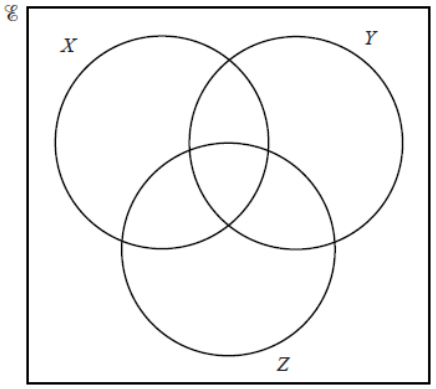
(b) $\mathscr{E} = \{ p, q, r, \ldots \}$

On the Venn diagram, write each of the letters p, q, and r in its appropriate subset, given that

$p \in X \cap Y \cap Z$,

$q \in X' \cap Y' \cap Z'$,

$r \in (X \cup Y)' \cap Z$.



[3]

Ans:

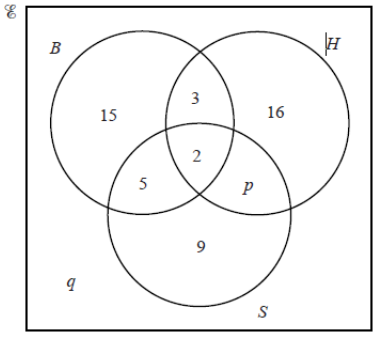
a) 7

b) Correct p, Correct q, Correct r

11.

In a survey, 60 students are asked which of the subjects Biology (B), History (H) and Spanish (S) they are studying.

The Venn diagram shows the results.



27 students study History.

(a) Find the values of p and q.

Answer $p =$ .....

$q =$ .....[1]

(b) Find $n(H')$.

Answer .....[1]

(c) Find $n((B \cup H) \cap S')$.

Answer .....[1]

Ans:

a) **Both p = 6 and q = 4**

b) **33**

c) **34**

12.

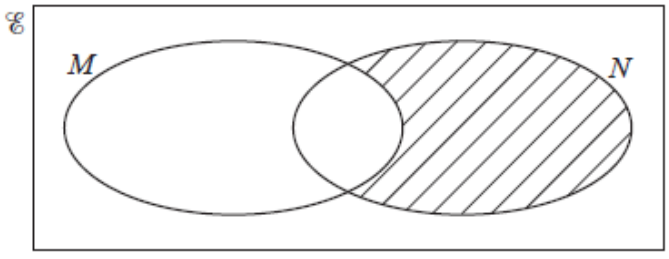
a)

$\mathscr{E}$ = {natural numbers}
P = {factors of 8}
Q = {factors of 12}

List the elements of the set $P \cup Q$.

Answer .....[2]

b)



Use set notation to describe the shaded subset in the Venn diagram.

Answer .....[1]

Ans:

a) **1,2,3,4,6,8,12**

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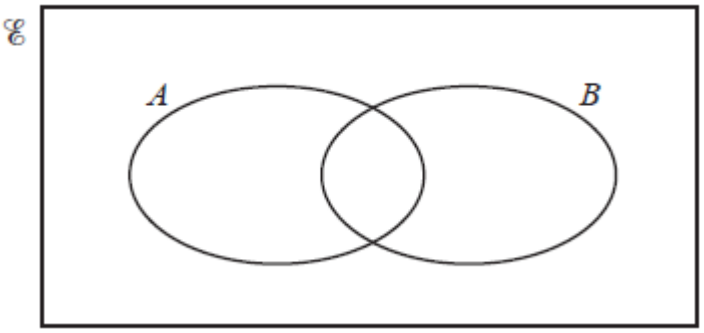
b)

$M' \cap N$

13.

$\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{\text{odd numbers}\}$
$B = \{\text{multiples of 3}\}$

(a) Complete the Venn diagram to illustrate this information.



[1]

(b) Find the value of $\text{n}(A \cup B)$.

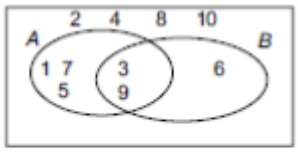
Answer .....[1]

(c) List the elements of the set $A \cap B'$.

Answer .....[1]

Ans:

(a)

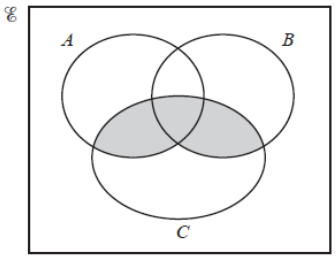


(b) 6

(c) 1, 5, 7.

14.

(a) Express, in set notation, the subset shaded in the diagram.



Answer .....[1]

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(b) $\mathscr{E} = \{a, b, c, d, e, f, g, h\}$

$P = \{a, b, c\}$

$Q = \{b, c, d, e, f\}$

(i) Find $n(P \cup Q)$.

Answer ..... [1]

(ii) List the members of the subset $P' \cap Q$.

Answer ..... [1]

Ans:

(a)	$(A \cup B) \cap C$	
(b)	(i)	6
	(ii)	d, e, f

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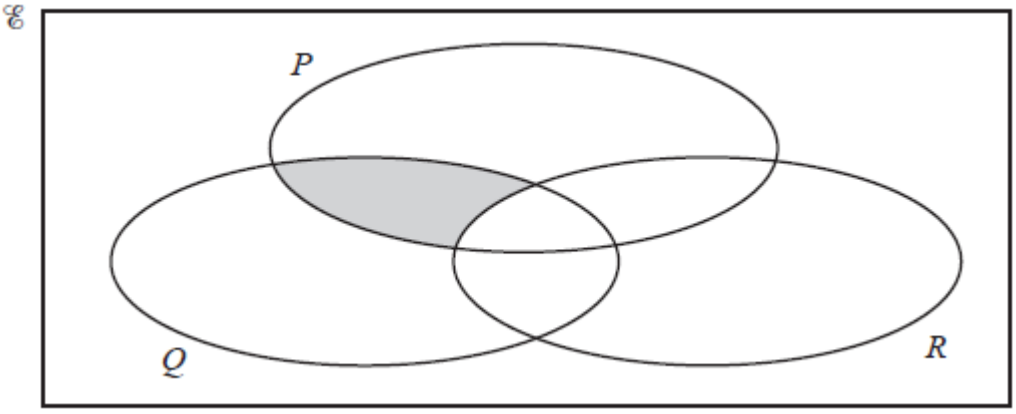
15.

(a) Use set notation to describe the shaded subset in the Venn diagram.

Answer ..... [1]



Sir m.Ali

(b) In a group of students

30 play cricket,
38 play football and
9 play neither cricket nor football.

Find the lowest possible number of students in the group.

Answer ..... [2]

Ans:

(a)	$P \cap Q \cap R'$ oe
(b)	47

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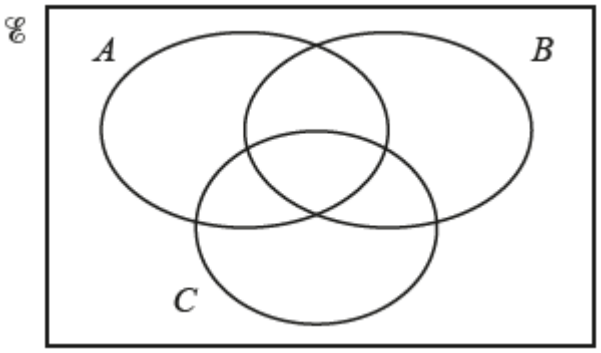
16.

17.

(a) On the Venn diagram, shade the set $C' \cap (A \cup B)$.



Answer ..... [1]

(b) $\mathcal{E} = \{-1, 0, 1, 2, 3, 4, 5, 6\}$

$P = \{-1, 0, 1, 2\}$

$Q = \{x^2 : x \in P\}$

Find n(Q).

Answer ..... [1]

Ans:

(a)	Correct region shaded 
(b)	3

18.

(a) $\mathcal{E} = \{x : x \text{ is an integer and } 2 \leqslant x \leqslant 12\}$
$M = \{x : x \text{ is a multiple of } 3\}$
$P = \{x : x \text{ is a prime number}\}$

(i) $a \in M \cap P$

Find a.

Answer ..... [1]

(ii) Find $(M \cup P)'$.

Answer ..... [1]

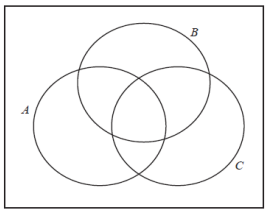
(b) In a survey, 90 people were asked "Do you own a car?" and "Do you own a bicycle?".
A total of 27 people said they owned a bicycle.
Of these, 13 owned **only** a bicycle.
11 people owned neither a car nor a bicycle.

By drawing a Venn diagram, or otherwise, find how many people said that they owned a car.

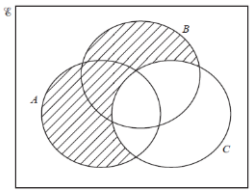
Answer ..... [2]

(c) The Venn diagrams show a Universal set, $\mathscr{E}$, and subsets A, B and C.

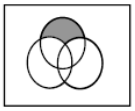
(i) Shade the set $(A \cup C)' \cap B$.



(ii) Express in set notation the subset shaded in this diagram.



Answer ..... [1]

Ans: **(a)** **(i)** 3 **(ii)** {4, 8, 10} **(b)** 66 (c) (i)  (ii) $C' \cap (A \cup B)$ oe

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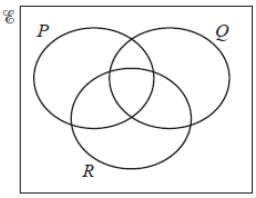
19.

(a) On the Venn diagram, shade the set $P' \cap (Q \cup R)$.



[1]

(b) A group of 40 children are asked what pets they own.
Of these children, 13 own a cat, 5 own both a cat and a dog and 15 own neither a cat nor a dog.

Using a Venn diagram, or otherwise, find the number of children who own a dog, but not a cat.

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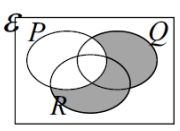
Answer ..... [2]

Ans: (a) 

(b) | 12

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20.

(a) $\mathscr{E} = \{x: x \text{ is an integer and } 5 \leqslant x \leqslant 15\}$

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

$B = \{x : x \text{ is a factor of } 60\}$

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

(i) Find $\mathrm{n}(A \cap B \cap C)$.

Answer ..... [1]

(ii) Find $(A \cup B)'$.

Answer ..... [1]

(iii) A number, r, is chosen at random from $\mathscr{E}$.

Find the probability that $r \in A \cap B$.

Answer ..... [1]

(iv) Given that $D \subset B$ and $D \subset C$, find D.

Answer ..... [1]

(b) An activity camp offers 3 sports: tennis, cricket and volleyball.
One day, 50 children took part in these sports.

19 children played tennis, 34 children played cricket and 23 children played volleyball.
2 children played all three sports.
5 children played tennis and cricket.
10 children played tennis and volleyball.

By drawing a Venn diagram, or otherwise, find the number of children who played

(i) tennis and cricket but not volleyball,

Answer ..... [1]

(ii) cricket and volleyball but not tennis,

Answer ..... [1]

(iii) cricket only.

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Answer ..... [1]

Ans: (a) (i) | 0 or none (ii) | 7, 8, 11, 13, 14

(iii) | $\frac{3}{11}$ or 0.27 or better (iv) | 5 (b) (i) | 3 (ii) | 11 (iii) | 18

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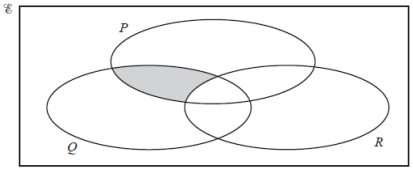
21.

(a) Use set notation to describe the shaded subset in the Venn diagram.



Answer ..... [1]

(b) In a group of students

30 play cricket,
38 play football and
9 play neither cricket nor football.

Find the lowest possible number of students in the group.

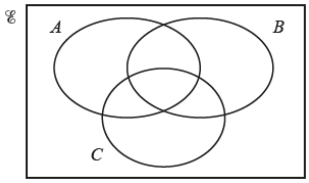
Answer ..... [2]

Ans: (a) | $P \cap Q \cap R'$ oe

(b) | 47

22.

(a) On the Venn diagram, shade the set $C' \cap (A \cup B)$.



[1]

(b) $\mathscr{E} = \{-1, 0, 1, 2, 3, 4, 5, 6\}$

$P = \{-1, 0, 1, 2\}$

$Q = \{x^2 : x \in P\}$

Find n(Q).

Answer ..... [1]

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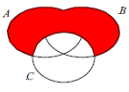
Ans:

(a)	Correct region shaded	1
(b)	3	1



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23.

(a) $\mathscr{E} = \{ x : x \text{ is an integer, } 40 \leqslant x \leqslant 50 \}$

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

$Q = \{ x : x \text{ is a multiple of } 6 \}$

(i) Find $n(P)$.

Answer ..... [1]

(ii) List the members of Q.

Answer ..... [1]

(b) In a group of 25 people,
11 people own both a bicycle and a skateboard,
6 people own neither a bicycle nor a skateboard,
n people own a bicycle.

Find the smallest and the largest possible values of n.

Answer smallest ..... [1]

largest ..... [1]

Ans:

(a)	(i)	3
	(ii)	42, 48
(b)		smallest = 11 largest = 19

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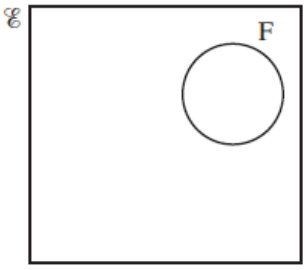
24.

$\mathscr{E} = \{ x : x \text{ is an integer and } x > 5 \}$

P = $\{ x : x \text{ is a prime number} \}$
F = $\{ x : x \text{ is a multiple of } 4 \}$
S = $\{ x : x \text{ is a multiple of } 6 \}$

The Venn diagram shows the Universal set and the set F.



(a) Draw and label the two sets P and S to complete the Venn diagram.

[2]

(b) Write down a possible element y such that y is an even number and $y \in (\text{F} \cup \text{S})'$.

Answer $y =$ ..... [1]

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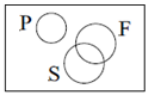
(a)



Ans: (b) 10 or 14 or 22 or 26 etc

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25.

$\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16\}$
$A = \{x : x \text{ is a multiple of } 3\}$
$B = \{x : x \text{ is a factor of } 24\}$
$C = \{x : x \text{ is an odd number}\}$

(i) Find

(a) $n(B)$,

[1]

(b) $(A \cup B \cup C)'$.

[1]

(ii) A number, k, is chosen at random from $\mathscr{E}$.

Find the probability that $k \in A \cap B$.

[2]

Ans: (i) (a) 7

(b) {10, 14, 16}

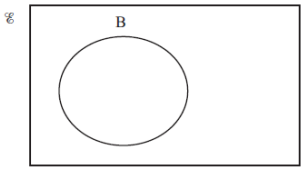
(ii) $\frac{3}{16}$

26.

The Venn diagram shows the Universal set and the set B.
A and C are two sets such that

$A \cup B = B$, $A \cap B \neq B$, $A \cap C = \varnothing$ and $B \cap C \neq \varnothing$.

Draw the sets A and C in the Venn diagram.



[2]

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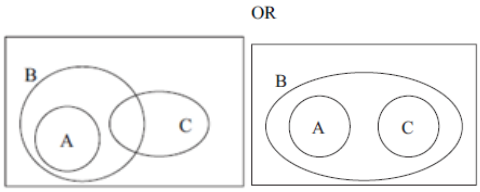
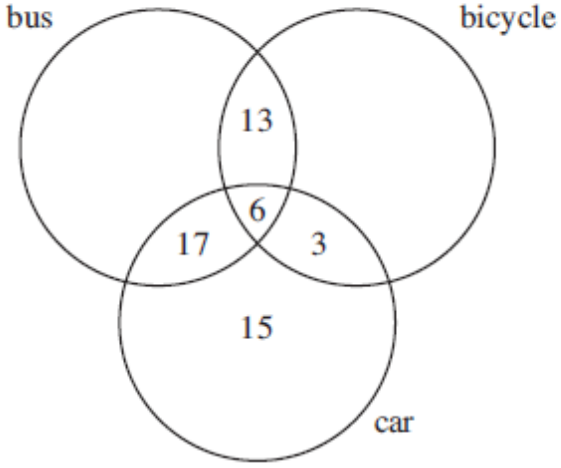
Ans:



\

27.

The Venn diagram shows the three means of transport used by a group of workers during a week.



(i) How many used both a bus and a car but not a bicycle? [1]

(ii) Twice as many **only** used a bicycle as **only** used a bus.
There were 78 workers in the group.

How many used a bus **only**? [2]

Ans: **(i)** 17 **(ii)** $78 - 54$ soi
$x = 8$

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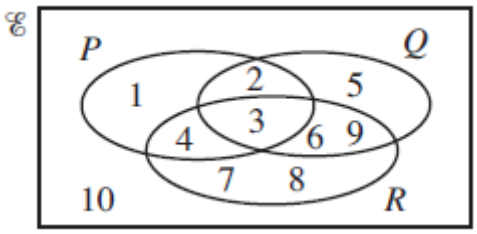
28.

The Venn diagram shows the sets $\mathscr{E}$, P, Q and R.

$\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$



(a) Find the value of $n(Q \cup R)$.

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

(b) List the elements of the set $P' \cap (Q \cup R)$.

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

(c) One element is chosen at random from $\mathscr{E}$.
Write down the probability that this element belongs to $(P \cap Q) \cup (P \cap R)$.

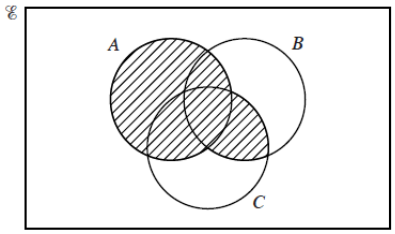
Answer (c) .....[1]

Ans:

(a)	8
(b)	{5, 6, 7, 8, 9}
(c)	$\frac{3}{10}$ or 0.3

29.

(a) Using set notation, describe the shaded region in the Venn diagram.



Answer ..... [1]

(b) In the Venn diagram, shade the region represented by $P' \cap (Q \cup R)$.

Answer ..... [1]

Ans:

(a)	$A \cup (B \cap C)$ oe	1
(b)	Correct region shaded	1

30.

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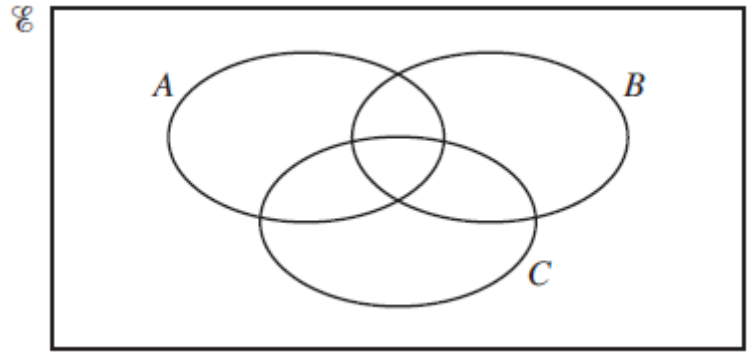
(a) On the Venn diagram, shade the set $A \cap B \cap C'$.



[1]

(b) $\mathscr{E} = \{2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$P = \{x : x \text{ is a prime number}\}$
$Q = \{x : x \geqslant 5\}$

(i) Find the value of $\text{n}(P \cap Q)$.

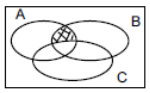
Answer ..... [1]

(ii) List the elements of $P \cup Q'$.

Answer ..... [1]

S-2011,qp-12,Q-12

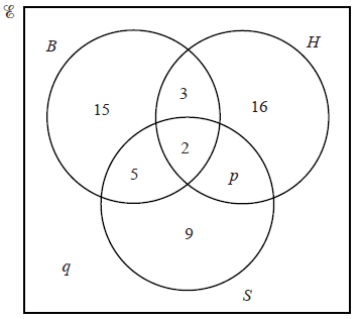
Ans:

(a)			1
(b)	(i)	2	1
	(ii)	2, 3, 4, 5, 7	1

31.

In a survey, 60 students are asked which of the subjects Biology (B), History (H) and Spanish (S) they are studying.

The Venn diagram shows the results.



27 students study History.

(a) Find the values of p and q.

Answer $p =$ .....

$q =$ ..... [1]

(b) Find $\text{n}(H')$.

Answer ..... [1]

(c) Find $\text{n}(B \cup H) \cap S')$.

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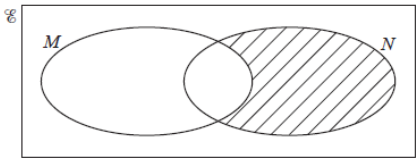
Answer .....[1]

(a) Both $p = 6$ and $q = 4$

(b) 33 or f.t. 29 + their q (provided q has a value)

Ans: **(c)** 34

32.



Use set notation to describe the shaded subset in the Venn diagram.

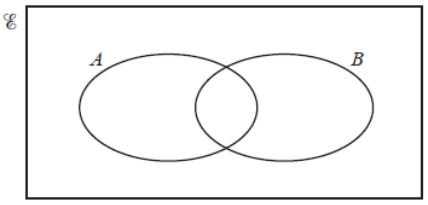
Answer .....[1]

Ans: $M \cap N$

33.

$\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{\text{odd numbers}\}$
$B = \{\text{multiples of 3}\}$

(a) Complete the Venn diagram to illustrate this information.



Answer .....[1]

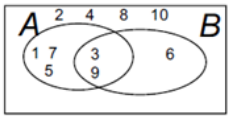
(b) Find the value of $n(A \cup B)$.

Answer .....[1]

(c) List the elements of the set $A \cap B'$.

Answer .....[1]

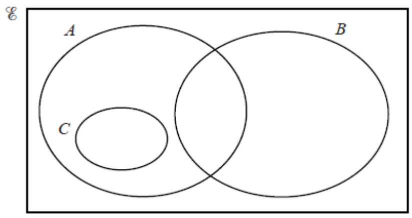
Ans: **(a)**



(b) | 6 **(c)** | 1, 5, 7.

34.

(a) The sets A, B and C are shown in the Venn diagram.



$\mathscr{E} = \{ x : x \text{ is an integer, } 1 \leqslant x \leqslant 18 \}$
$A = \{ x : x \text{ is an even number} \}$
$B = \{ x : x \text{ is a multiple of } 5 \}$

(i) Find $n(A \cup B)$.

Answer ....[1]

(ii) **(a)** Given that $A \cap B' \cap C' = \{2, 6, 14, 18\}$, list the members of C.

Answer ....[1]

(ii) **(a)** Given that $A \cap B' \cap C' = \{2, 6, 14, 18\}$, list the members of C.

Answer ....[1]

(b) Describe the set C in words.

Answer $C = \{ x : x$ is .... } [1]

(b) A school offers piano lessons and flute lessons to a group of 50 children.

Of these children, 28 attend piano lessons
17 attend flute lessons
12 attend neither piano lessons nor flute lessons.

By drawing a Venn diagram, or otherwise, find the number of children who attend only the piano lessons.

Answer .... [2]

Ans: **(a) (i)** | 11 **(ii) (a)** | 4, 8, 12, 16 **(ii) (b)** | x is a multiple of 4 **(b)** | 21

35.

(a) $\mathscr{E} = \{ x : x \text{ is an integer, } 2 \leqslant x \leqslant 14 \}$
$A = \{ x : x \text{ is a prime number} \}$
$B = \{ x : x \text{ is a multiple of } 3 \}$

(i) List the members of $(A \cup B)'$.

Answer ..... [1]

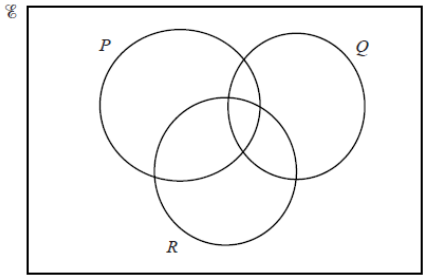
(ii) Find $\text{n}(A \cap B)$.

Answer ..... [1]

(iii) Given that $C \subset A$, $\text{n}(C) = 3$ and $B \cap C = \varnothing$, list the members of a possible set C.

Answer ..... [1]

(b) On the Venn diagram, shade the set $(P \cup R) \cap Q'$.



Answer ..... [1]

(c) A group of 80 people attended a recreation centre on one day.
Of these people, 48 used the gym
31 used the swimming pool
17 used neither the gym nor the swimming pool.

By drawing a Venn diagram, or otherwise, find the number of people who used both the gym and the swimming pool.

Answer ..... [2]

Ans: **(a)** **(i)** | 4, 8, 10, 14 **(ii)** | 1 **(iii)** | 3 out of {2, 5, 7, 11, 13} **(b)** | Correct shading **(c)** | 16

36.

(a) Given that $A = \{ 1, 2, 3, 4, 5 \}$ and $B = \{ 3, 4, 5, 6, 7 \}$, find $n(A \cup B)$.

Answer ..... [1]

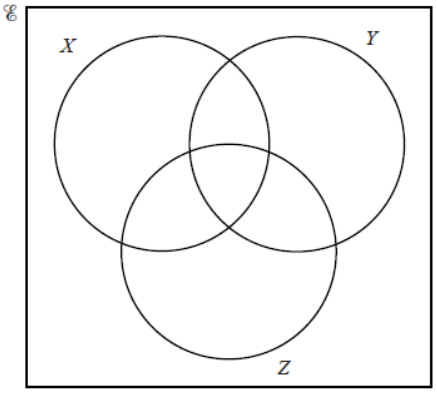
(b) $\mathscr{E} = \{ p, q, r, \ldots \}$

On the Venn diagram, write each of the letters p, q, and r in its appropriate subset, given that

$p \in X \cap Y \cap Z$,

$q \in X' \cap Y' \cap Z'$,

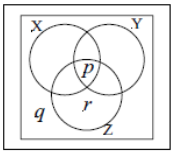
$r \in (X \cup Y)' \cap Z$.



[3]

Ans:

(a)	7	1
(b)	correct p	1
	correct q	1
	correct r	1



37.

$\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16\}$
$A = \{x : x \text{ is a multiple of } 3\}$
$B = \{x : x \text{ is a factor of } 24\}$
$C = \{x : x \text{ is an odd number}\}$

(i) Find

(a) $n(B)$,

[1]

(b) $(A \cup B \cup C)'$.

[1]

(ii) A number, k, is chosen at random from $\mathscr{E}$.

Find the probability that $k \in A \cap B$.

[2]

Ans: **(i)** **(a)** 7

(b) {10, 14, 16}

(ii) $\frac{3}{16}$

38.

(a) Using set notation, describe the shaded region in the Venn diagram.

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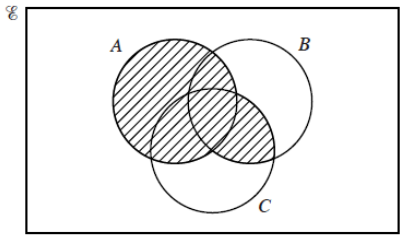
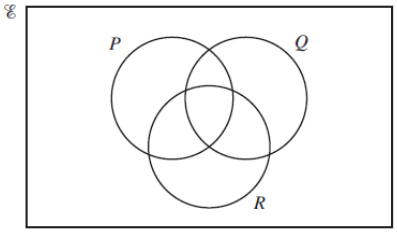


Answer ..... [1]

(b) In the Venn diagram, shade the region represented by $P' \cap (Q \cup R)$.



[1]

Ans:

(a)	$A \cup (B \cap C)$ oe	1
(b)	Correct region shaded	1

39.

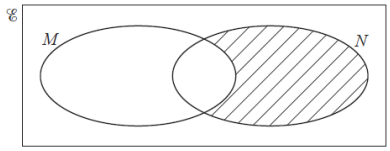
i)

$\mathscr{E}$ = {natural numbers}
P = {factors of 8}
Q = {factors of 12}

List the elements of the set $P \cup Q$.

Answer ..... [2]

ii)



Use set notation to describe the shaded subset in the Venn diagram.

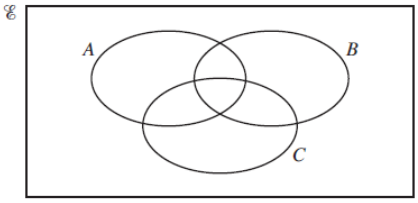
Answer ..... [1]

1, 2, 3,4,6,8,12

Ans: $M' \cap N$

40.

(a) On the Venn diagram, shade the set $A \cap B \cap C'$



[1]

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(b) $\mathscr{E} = \{2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$P = \{x : x \text{ is a prime number}\}$
$Q = \{x : x \geqslant 5\}$

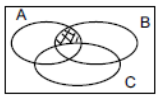
(i) Find the value of $n(P \cap Q)$.

Answer ..... [1]

(ii) List the elements of $P \cup Q'$.

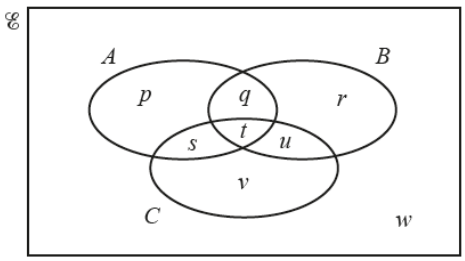
Answer ..... [1]

Ans:

(a)			1
(b)	(i)	2	1
	(ii)	2, 3, 4, 5, 7	1

41.

The Venn diagram shows the sets A, B and C.



List the elements of

(a) $A \cup B$,

Answer ..... [1]

(b) $B' \cap C$.

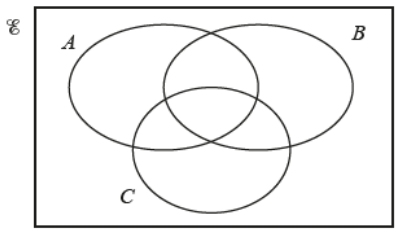
Answer ..... [1]

Ans:

(a)	p, q, r, s, t, u	1
(b)	s, v	1

42.

(a) On the Venn diagram, shade the set $B \cap (A \cup C)'$



[1]

(b) $\mathscr{E} = \{ 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 \}$

$W = \{ x : x \text{ is a multiple of } 2 \}$

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

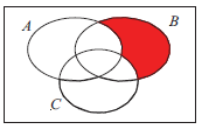
(i) Find $n(W \cup H)$.

Answer ..... [1]

(ii) List the members of $W \cap H'$.

Answer ..... [1]

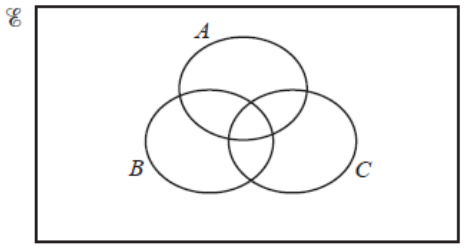
Ans;

(a)			1
(b)	(i)	6	1
	(ii)	10, 14, 16	1

43.

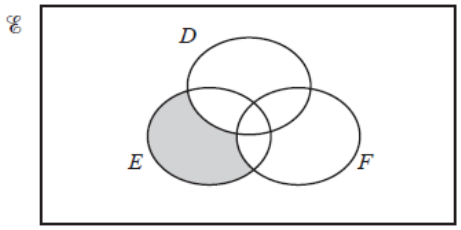
(a) Shade the subset $(A \cap B) \cup C$.

Answer



[1]

(b) Use set notation to describe the subset shaded in the diagram.



Answer ..... [1]

(c) $\mathscr{E} = \{ 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \}$
$P = \{ x : x \text{ is an odd number} \}$
$Q = \{ x : x \text{ is a square number} \}$

(i) Write the members of $\mathscr{E}$ in the correct regions on the Venn diagram.

Answer

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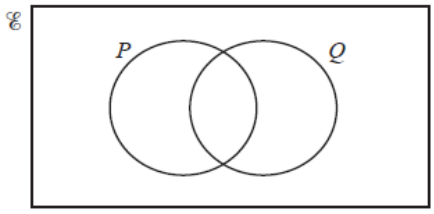


[2]

(ii) State $n(Q')$.

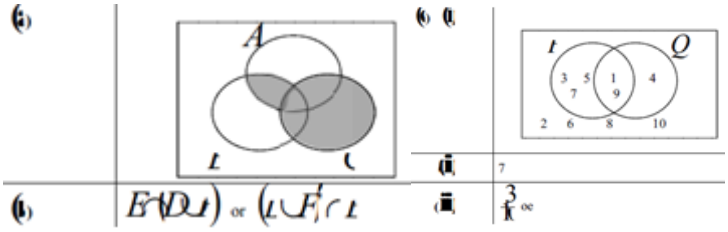
Answer ..... [1]

(iii) A number, m, is chosen at random from $\mathscr{E}$.

Find the probability that m is a member of $P \cap Q'$.

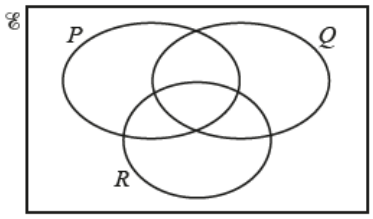
Answer ..... [2]

Ans:



44.

(a) In the Venn diagram, shade the region which represents the subset $(P \cup Q)' \cap R$.



[1]

(b) $\mathscr{E} = \{ x : x \text{ is an integer and } 22 \leqslant x \leqslant 33 \}$
$E = \{ x : x \text{ is an even number} \}$
$T = \{ x : x \text{ is a multiple of } 3 \}$
$F = \{ x : x \text{ is a multiple of } 4 \}$

(i) List the members of $T \cap F$.

Answer ..... [1]

(ii) Find $n(E \cup T)$.

Answer ..... [1]

(iii) Given that $y \in F' \cap E$, find one possible value of y.

Answer y = ... [1]

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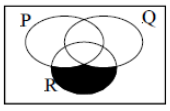
Ans:

(a)			1
(b)	(i)	24	1
	(ii)	8	1
	(iii)	22 or 26 or 30	1

45.

$\mathscr{E} = \{ 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 \}$
$A = \{ x : x \text{ is a prime number} \}$
$B = \{ x : x \text{ is an even number} \}$
$C = \{ x : x \text{ is a multiple of } 5 \}$

(i) List the members of the subsets

(a) $B \cap C$,

Answer ..... [1]

(b) $(A \cup B \cup C)'$,

Answer ..... [1]

(c) $A \cap B'$.

Answer ..... [1]

(ii) A number q is chosen at random from $\mathscr{E}$.

Find the probability that $q \in A \cap B'$.

Answer ..... [1]

Ans:

(i)	(a) 10	
	(b) 9	
	(c) 3,5,7,11	
(ii)	$\frac{4}{11}$ oe isw	

46.

(a) $\mathscr{E} = \{ 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96 \}$

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

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

(i) Find $n(P \cup Q)$.

Answer ..... [1]

(ii) Given that $y \in \mathscr{E}$ and that y is a prime number, write down the value of y.

Answer ..... [1]

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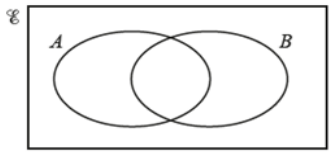
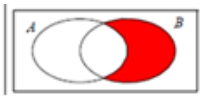
(b) In the Venn diagram, shade the region represented by $A' \cap B$.



Answer ..... [1]

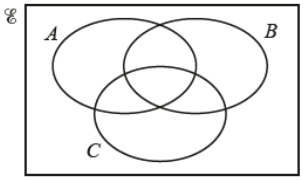
Ans: (a) (i) | 9 (ii) | 89

(b)



47.

(a) In the Venn diagram, shade the region which represents the subset $(A \cap B') \cup C$.



[1]

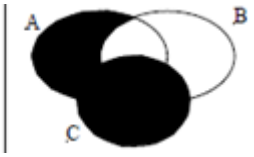
(b) In a group of 36 students,

23 study Spanish,
17 study French,
4 study neither Spanish nor French.

By drawing a Venn diagram, or otherwise, find the number of students who study both Spanish and French.

Answer ..... [2]

Ans: (a)



(b) | 8

48.

(a) In a sports club 24 members play basketball (B),
28 play cricket (C),
16 play football (F),
9 play basketball and cricket,
11 play cricket and football and
6 play basketball and football.

Five members play all three games and **eight** members play none of these games.

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

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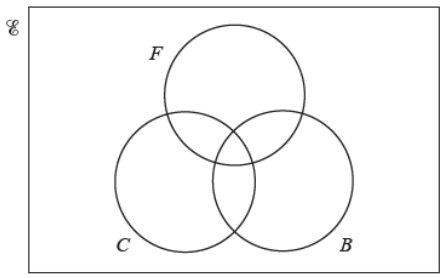
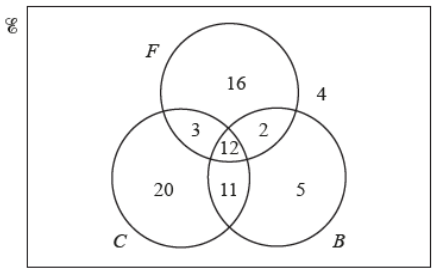


[2]

(ii) Hence work out the **total** number of members in the club.

Answer ..... [1]

(b) In another sports club, the number of members playing basketball (B), cricket (C) and football (F) are shown in the Venn diagram below.



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

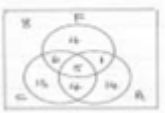
Answer ..... [1]

(ii) Find $n((F \cup C) \cap B')$.

Answer ..... [1]

Ans:

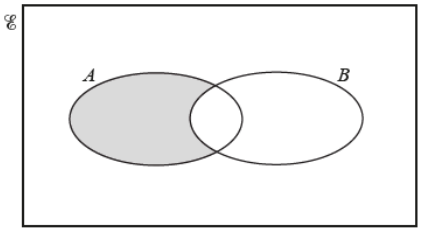
(a)(i) Correct Venn diagram



a)(ii) 55 (b)(i) 40 b)(ii) 39

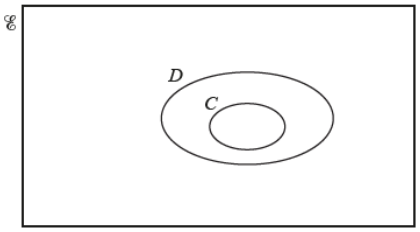
49.

(a) Use set notation to describe the shaded set in the Venn diagram.



Answer ..... [1]

(b) Use set notation to complete the statement about sets C and D.



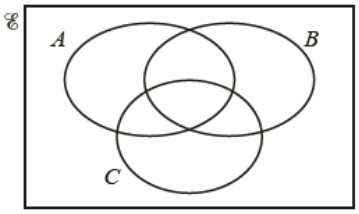
Answer C ..... D [1]

Ans:

(a)	$A \cap B'$ oe
(b)	$\subset$

50.

(a) In the Venn diagram, shade the region which represents the subset $A' \cap B \cap C$.



[1]

(b) $P = \{ 1, 4 \}$
$Q = \{ -1, 1, 2 \}$
$R = \left\{ \frac{x}{y} : x \in P, y \in Q \right\}$

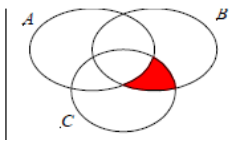
(i) Find $n(P \cup Q)$.

Answer ..... [1]

(ii) List the members of R.

Answer ..... [2]

Ans:

(a)	
(b)(i)	4
(b)(ii)	$\frac{1}{-1}, \frac{1}{1}, \frac{1}{2}, \frac{4}{-1}, \frac{4}{1}, \frac{4}{2}$ oe and isw

51.

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(a) $\mathscr{E} = \{x : x \text{ is an integer and } 10 \leqslant x \leqslant 20\}$

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

$B = \{x : x \text{ is a multiple of } 5\}$

(i) Find $\text{n}(A \cap B)$.

Answer ..... [1]

(ii) Find $A' \cup B$.

Answer ..... [1]

(iii) A number, r, is chosen at random from $\mathscr{E}$.

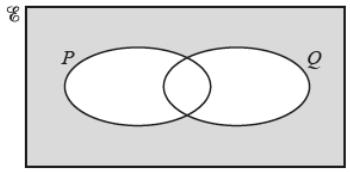
Find the probability that $r \in A \cup B$.

Answer ..... [1]

Ans: (a)(i) | 1 (a)(ii) | 10, 12, 14, 15, 16, 18, 20 (a)(iii) | $\frac{7}{11}$ oe (b)(i) | 8

52.

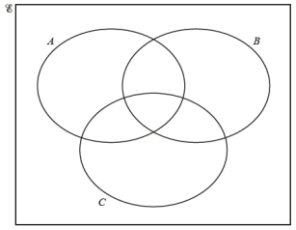
(a) Use set notation to describe the shaded region in the Venn diagram.



Answer ..... [1]

(b) $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
$A = \{x : x \text{ is a factor of } 12\}$
$B = \{x : x \text{ is a multiple of } 2\}$
$C = \{x : x \text{ is a square number}\}$

(i) Show this information on the Venn diagram below.



[2]

(ii) Find $\text{n}(A \cap B)$.

Answer ..... [1]

(iii) Find $\text{n}(A \cap (B \cup C)')$.

Answer ..... [1]

(iv) One subset in the Venn diagram in **part (b)(i)** has no elements.

Use set notation to describe this subset.

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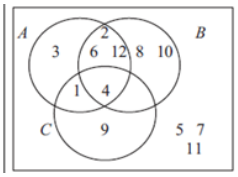
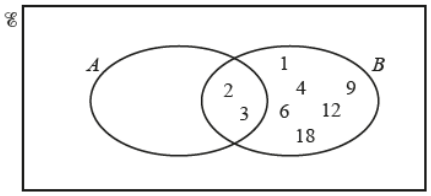
Answer ..... [1]

Ans: 1(a) | $(P \cup Q)'$ or $P' \cap Q'$ (b)(i) 

b)(ii) | 4 b)(iii) | 1 b)(iv) | $A' \cap B \cap C$

53.

$\mathscr{E} = \{x : x \text{ is an integer } 1 \leqslant x \leqslant 18\}$
$A = \{x : x \text{ is a prime number}\}$
$B = \{1, 2, 3, 4, 6, 9, 12, 18\}$



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

[1]

(ii) Complete the description of the set B.

Answer $B = \{ x : x \text{ is a factor of } \ldots\ldots \}$ [1]

(iii) Find $n(A \cup B)$.

Answer ..... [1]

(iv) List the elements of $A' \cap B$.

Answer ..... [1]

Ans:)(i) | Correctly completed Venn diagram)(ii) | 36 (iii) | 13 (iv) | 1, 4, 6, 9, 12, 18

54.

$\mathscr{E} = \{ 0, 1, 2, 3, 4, 5, 6 \}$
$P = \{ x : x = 0, 1, 2 \}$
$Q = \{ y : y = 0, 2 \}$

(a) List the members of $P \cap Q$.

Answer ..... [1]

(b) Find $n(P' \cup Q)$.

Answer ..... [1]

(c) $R = \{ z : z = 2x + y, x \in P, y \in Q \}$

List the members of R.

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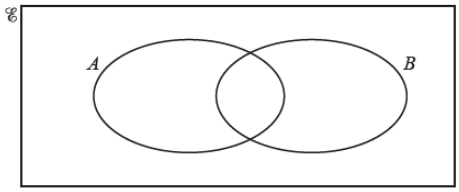
Answer ..... [2]

Ans: (a) | 0, 2 (b) | 6 (c) | 0, 2, 4, 6

55.

(a) $\mathscr{E} = \{x : x \text{ is an integer } 1 \leqslant x \leqslant 10\}$
$A = \{x : x \text{ is a factor of } 20\}$
$B = \{x : x \text{ is a multiple of } 4\}$

(i) Complete the Venn diagram.



[2]

(ii) State $n(A \cup B)$.

Answer ..... [1]

(iii) Describe in words the set $A \cap B'$.

Answer ..... [1]

(b) 30 people are asked what type of fruit they like.
Of these people,

- 5 say they like both oranges and bananas
- 12 say they like oranges
- 8 say they like neither oranges nor bananas.

(i) By drawing a Venn diagram, or otherwise, find the number of people who like bananas but not oranges.

Answer ..... [2]

(ii) Two of the 30 people are selected at random.

Find the probability that they both like oranges but not bananas.

Answer ..... [2]

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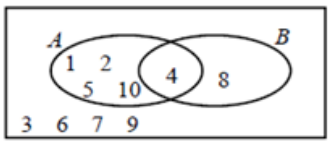
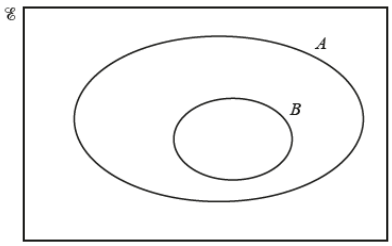
Ans: a)(i)



ı)(ii) | 6)(iii) | Factors of 10 oe b)(i) | 10

56.

(a) On the Venn diagram, shade the region represented by $B' \cap A$.

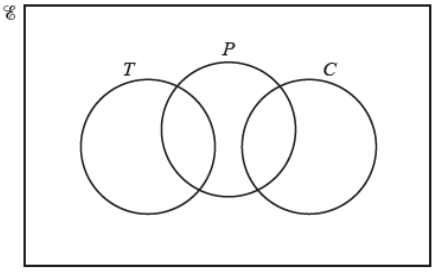


[1]

(b) Here is some information about 100 people who visit a café.

32 drink coffee (C)
40 drink tea (T)
50 eat a pastry (P)
18 drink coffee and eat a pastry
21 drink tea and eat a pastry

(i) Complete the Venn diagram to show this information for the 100 people.

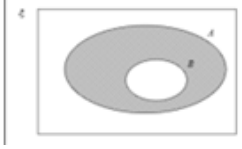


[2]

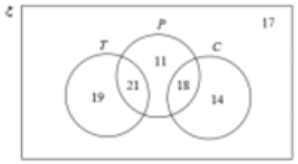
(ii) Find $n(T \cup P \cup C)'$.

[1]

Ans: a) Correct region shaded



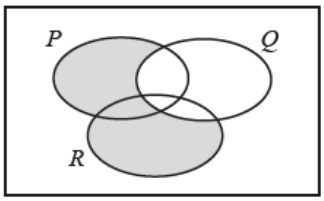
(b)(i) Correct Venn diagram.



(b)(ii) | 17

57.

Use set notation to describe the shaded region in the Venn diagram.



..... [1]

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(b) $\mathscr{E} = \{x : x \text{ is a positive number}\}$
$A = \{x : 9 < x < 10\}$
$B = \{x : x \text{ is an irrational number}\}$

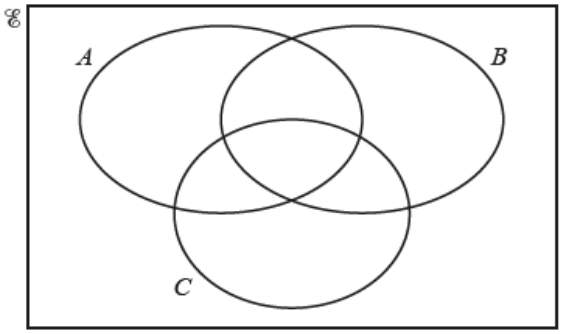
Write down an element of $A \cap B$.

..... [2]

Ans: $\frac{27}{40}$ or equivalent fraction

58.

(a) In the Venn diagram, shade the region which represents $C \cap (A \cup B)'$.



[1]

(b) $\mathscr{E} = \{ a, b, c, d, e, f, g, h, i, j \}$
$T = \{ b, d, f, h, j \}$
$V = \{ a, b, d, g, h, i\}$

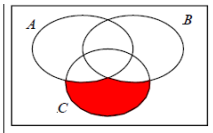
(i) List the members of $T \cap V'$.

..... [1]

(ii) Find $n(T \cup V)$.

..... [1]

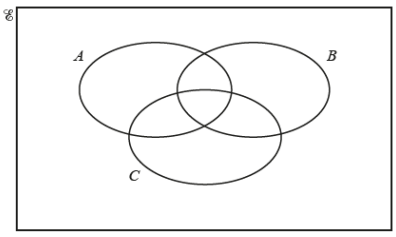
Ans:

i(a)		1
b)(i)	f and j	1
b)(ii)	8	1

59.

$\mathscr{E} = \{x : x \text{ is an integer } 1 \leqslant x \leqslant 16\}$
$A = \{x : x \text{ is an even number}\}$
$B = \{x : x \text{ is a square number}\}$
$C = \{x : x \text{ is a factor of } 100\}$

(i) Complete the Venn diagram.



[3]

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

..... [1]

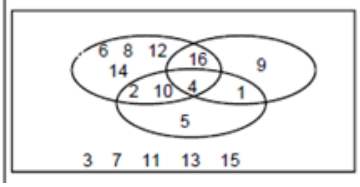
(iii) $p \in A \cap C$

Write down all the possible values of p.

..... [1]

Ans:

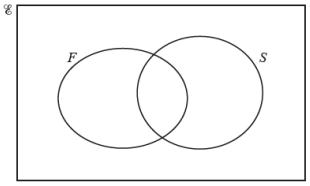
(a)(i) Correctly completed Venn diagram



(a)(ii)	10
(a)(iii)	2, 4, 10

60.

(a) $\mathscr{E} = \{ x : x \text{ is an integer and } 1 \leqslant x \leqslant 10 \}$
$F = \{ x : x \text{ is a factor of } 24 \}$
$S = \{ x : x \text{ is a square number} \}$



(i) Complete the Venn diagram.

[2]

(ii) Find $n(F \cup S)'$.

..... [1]

(b) In the Venn diagram, shade the region represented by $P \cap Q \cap R'$.

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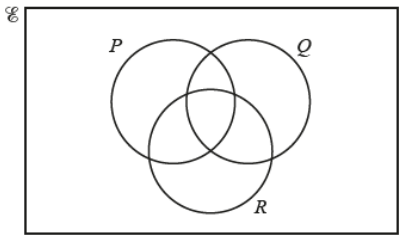
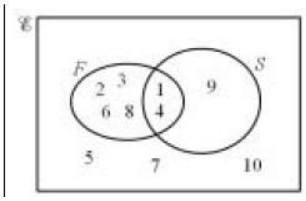


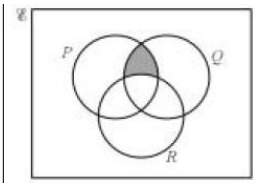
[1]

Ans: (a)(i)



(a)(ii) | 3

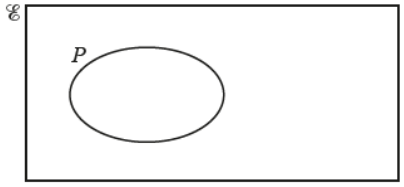
5(b)



61.

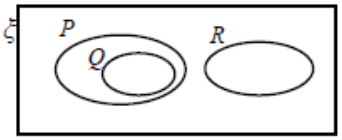
$Q \subset P$
$P \cap R = \varnothing$

Complete the Venn diagram to show sets Q and R.



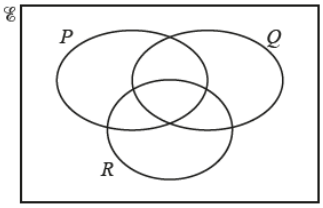
[2]

Ans:



62.

(a)



In the Venn diagram, shade the subset $(P \cup Q) \cap R'$.

[1]

(b) In a group of 42 people,

- 30 people speak Spanish
- 20 people speak French.

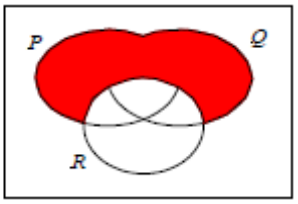
(i) Find the smallest possible number of people who speak both Spanish and French.

..... [1]

(ii) Find the largest possible number of people who speak neither Spanish nor French.

..... [1]

Ans: (a)



b)(i) | 8 b)(ii) | 12

63.

(a) $P = \{ 1, 2, 3, 4, 5, 6, 7, 8 \}$

$Q = \{ 1, 3, 5, 7, 9, 11 \}$

Find $n(P \cup Q)$.

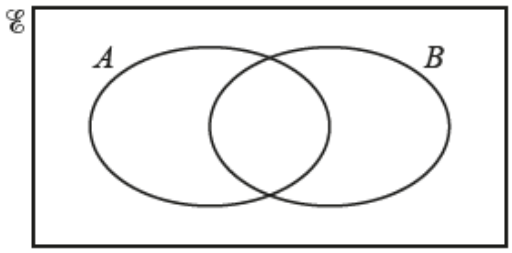
..... [1]

(b) $p \in A \cap B$

$q \in (A \cup B)'$

$r \in A \cap B'$

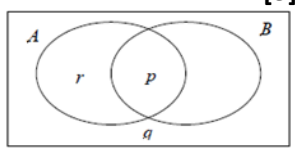
On the Venn diagram below, write each of the letters p, q and r in its appropriate subset.



[3]

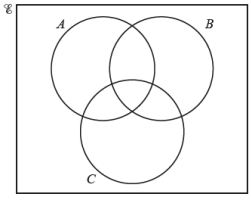
Ans: (a) | 10 or $n(P \cup Q) = 10$ cao

(b)



64.

(a) Shade the subset $A' \cap B \cap C$.



[1]

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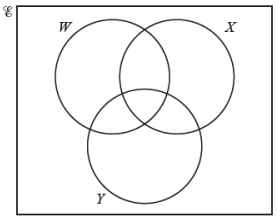
(b) $\mathscr{E} = \{ A, C, E, G, H, J, N, R, T, Z \}$
$W = \{ x : x \text{ has rotational symmetry of order 2} \}$
$X = \{ x : x \text{ has line symmetry} \}$
$Y = \{ R, A, N, G, E \}$

(i) Complete the Venn diagram.



[3]

(ii) List the elements of $X \cap (W \cup Y)'$.

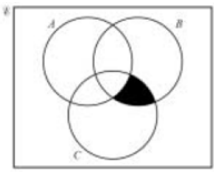
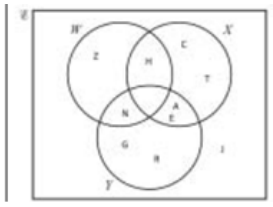
..... [1]

(iii) Find $n(W \cup X \cup Y)'$.

..... [1]

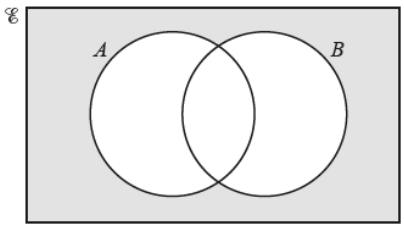
(iv) Using set notation, complete this statement.

..... $= \varnothing$ **[1]**

Ans: (b)(i)   (b)(ii) | C, T (b)(iii) | 1 (b)(iv) | $W \cap X \cap Y$ oe

65.

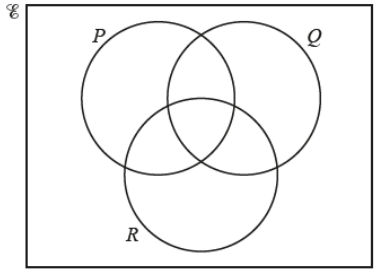
(a) Use set notation to describe the subset shaded in the Venn diagram.



..... [1]

(b) $\mathscr{E} = \{ 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 \}$
$P = \{ x : x \text{ is a factor of } 36 \}$
$Q = \{ x : x \text{ is a multiple of } 4 \}$
$R = \{ x : 3 \leqslant x \leqslant 6 \}$

(i) Complete the Venn diagram.



[3]

(ii) List the elements of $P \cap (Q \cup R)'$.

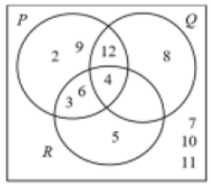
..... [1]

(iii) Find $n(P \cup Q)$.

..... [1]

(iv) Use set notation to complete the statement.

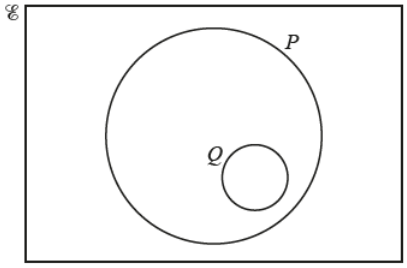
..... $= \varnothing$ [1]

Ans: (a) | $(A \cup B)'$ oe | (b)(i) 

(b)(ii) | 2, 9 (b)(iii) | 7 (b)(iv) | $P' \cap Q \cap R$ oe

66.

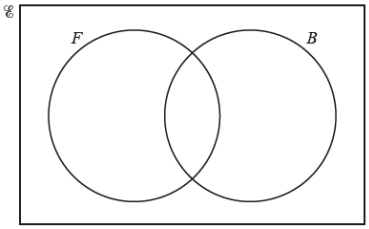
(a) In the Venn diagram, shade the region represented by $P \cap Q'$.



[1]

(b) A club has 32 members.
14 of the members are female and 18 of the members are male.
5 of the females have black hair.
6 of the males have black hair.

$\mathscr{E}$ = {members of the club}
F = {females}
B = {members with black hair}

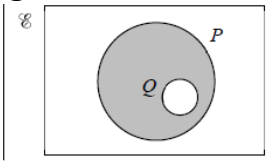


Complete the Venn diagram to show this information.

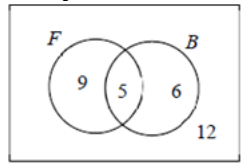
[2]

Ans:

(a)



(b)



67.

(a) $\mathscr{E} = \{a, b, c, d, e, f, g, h, i, j\}$
$P = \{a, e, i\}$
$Q = \{f, g, h, i, j\}$
$R = \{c, d, e, f, g\}$

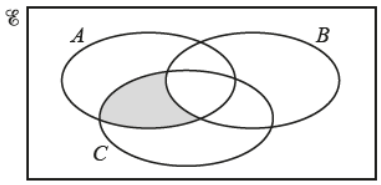
(i) Find $P \cup Q$.

..... [1]

(ii) Find $n(P' \cap (Q \cup R))$.

..... [1]

(b)



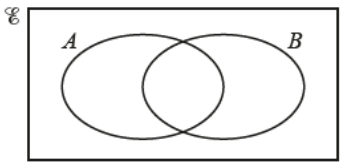
Use set notation to describe the shaded subset in the Venn diagram.

..... [1]

Ans: (a)(i) | $\{a, e, f, g, h, i, j\}$ (a)(ii) | 6
(b) | $A \cap C \cap B'$ oe

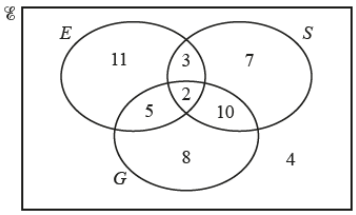
68.

(a) In the Venn diagram, shade the region represented by $A \cap B$



[1]

(b) This Venn diagram shows information about the number of students who study English (E), Spanish (S) and German (G).

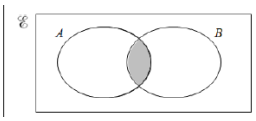


(i) Find the number of students who study English and German but not Spanish.

..... [1]

(ii) Find $n(G \cup S)'$

..... [1]

Ans: (a) 

b)(i) | 5 (b)(ii) | 15

69.

(a) $\mathscr{E} = \{x : x \text{ is an integer } 10 \leqslant x \leqslant 40\}$
$P = \{x : x \text{ is a multiple of } 6\}$
$Q = \{x : x \text{ is a square number}\}$

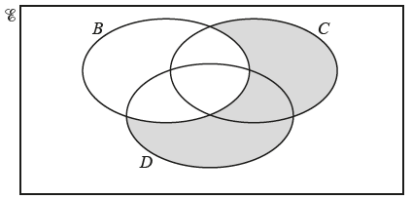
(i) Write down the elements of $P \cup Q$.

..... [1]

(ii) Find $n(P' \cap Q)$.

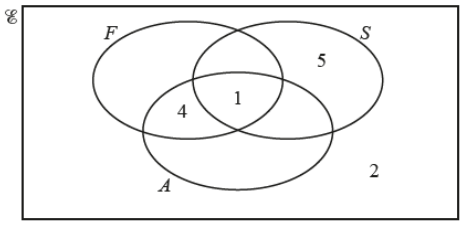
..... [1]

(b) Use set notation to describe the shaded region in the Venn diagram.



..... [1]

(c) In a college, students can study French (F), Spanish (S) and Arabic (A).
A group of 25 students are asked which languages they study.
Some of the results are shown in the Venn diagram.



(i) All students who study both Arabic and Spanish also study French.
7 students study French only.
8 students study Arabic.

Use this information to complete the Venn diagram.

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[2]

(ii) Two of the 25 students are selected at random.

Find the probability that they both study Spanish only.

..... [2]

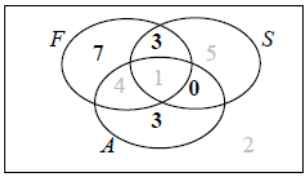
(iii) Three of the students are selected at random from those who study French.

Find the probability that only one of them also studies Arabic.

..... [3]

Ans: (a)(i) | 12, 16, 18, 24, 25, 30, 36 (a)(ii) | 2 4(b) | $(D \cup C) \cap B'$ oe

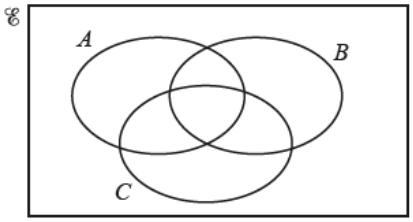
(c)(i) | Venn diagram completed correctly



(c)(ii) | $\frac{1}{30}$ oe c)(iii) | $\frac{45}{91}$ oe nfww

70.

(a) In the Venn diagram, shade the region represented by $(A \cap B') \cup (B \cap C')$.



[1]

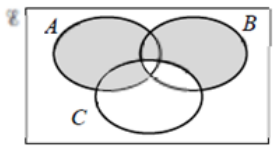
(b) One morning 50 people visit a library.

- 35 of them borrow a book.
- 12 of them use a computer.
- 8 of them do not borrow a book and do not use a computer.

Using a Venn diagram, or otherwise, find the number of people who use a computer but do not borrow a book.

..... [2]

Ans: (a) | Correct shading



(b) | 7

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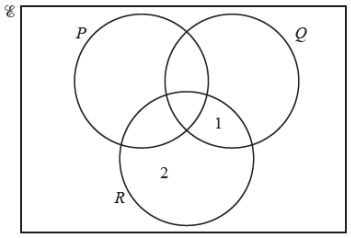
71.

$\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
$P = \{x : x \text{ is a multiple of } 3\}$
$Q = \{x : x \text{ is an odd number}\}$
$R = \{x : x \text{ is a factor of } 24\}$

(i) Complete the Venn diagram.



[3]

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

..... [1]

(iii) List the elements of $(P \cup R) \cap Q$.

..... [1]

(iv) Describe, in words, the type of number represented by $P \cap R \cap Q'$.

.....

..... [1]

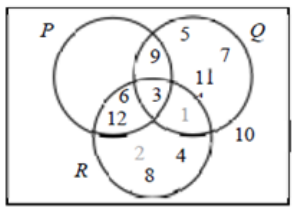
(v) A number, m, is chosen at random from the elements of R.

Find the probability that m is a multiple of 3.

..... [2]

Ans:

a)(i)



(a)(ii)	5
a)(iii)	1, 3, 9
a)(iv)	Multiples of 6 oe
(a)(v)	$\frac{3}{7}$ oe

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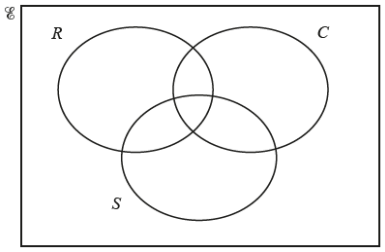
72.

(a) In a sports club of 40 members:

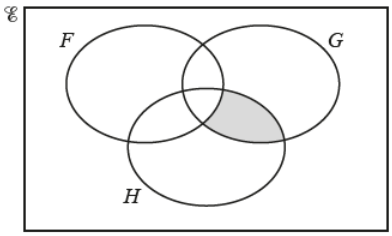
- 22 members run (R)
- 24 cycle (C)
- 14 sail (S)
- 3 cycle and sail but do not run
- 9 run and cycle but do not sail
- 5 run and sail but do not cycle
- 6 run only.

Complete the Venn diagram.



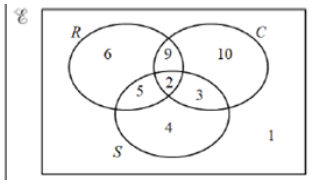
[3]

(b) Use set notation to describe the shaded subset in the Venn diagram.



..... [1]

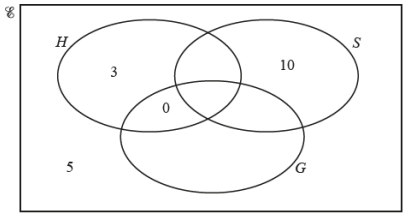
Ans: (a)



(b) $G \cap H \cap F'$ oe

73.

A shop sells hats (H), scarves (S) and gloves (G).
A group of 40 people are asked which items they buy in the shop.
Some of the results are shown in the Venn diagram.



(a) 2 people buy all three items.
Those people that buy both a hat and a scarf also buy gloves.
4 people buy exactly two items.

Use this information to complete the Venn diagram.

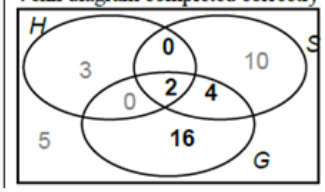
[2]

(b) Work out $n(S \cap (H \cup G)')$.

..... [1]

Ans:

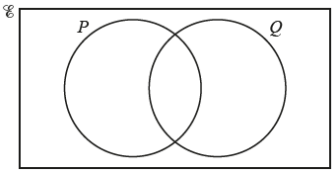
(a) Venn diagram completed correctly



(b) 10 cao

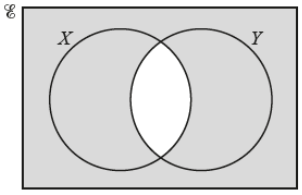
74.

(a) In the Venn diagram, shade the region represented by $P \cup Q$.



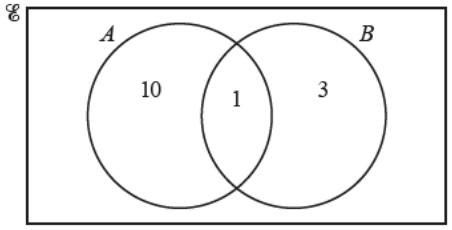
[1]

(b) Use set notation to describe the shaded region in the Venn diagram.



..... [1]

(c) $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{x : x \text{ is a factor of } 40\}$
$B = \{x : x \text{ is an odd number}\}$



(i) Complete the Venn diagram.

[2]

(ii) List the elements of $A' \cap B$

..... [1]

(iii) One element of $\mathscr{E}$ is chosen at random.

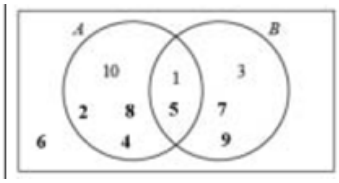
Find the probability that this element is in $A \cap B$.

..... [1]

Ans:

a) 

b) $(X \cap Y)'$ oe

(c)(i) 

(c)(ii) 3 7 9

(c)(iii) $\frac{2}{10}$ oe

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