9 – Sets

Student name: _____ Score: _____

1. List the elements of the following sets.

(a) $A = \{x \mid x \in \mathbb{Z}, -4 < x \leqslant 1\}$

..... [1]

(b) $B = \{\text{prime numbers between 25 and 35}\}$

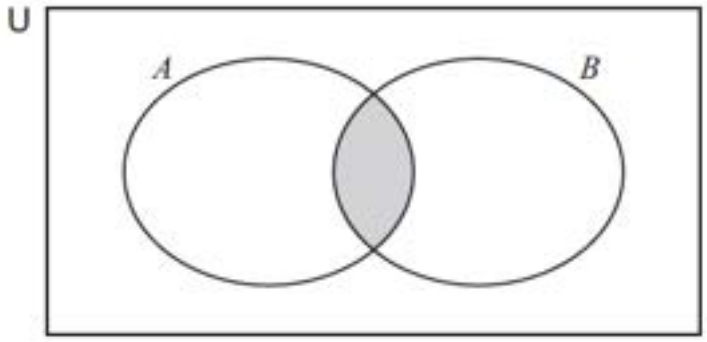
..... [1]

(c) $C = \{x \mid x \in \mathbb{R}, |x| = 4\}$

..... [1]

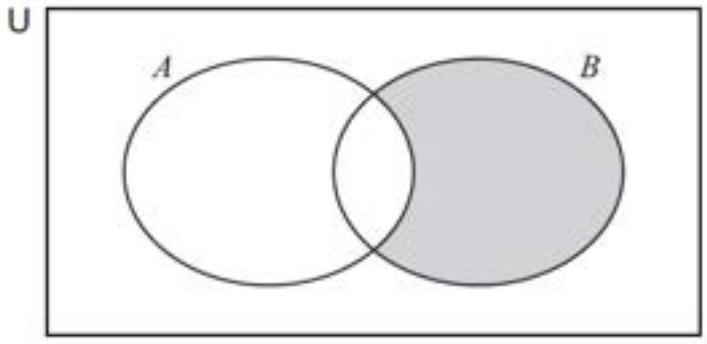
2. Using set notation describe the regions shaded on the Venn diagrams.

(a)



..... [1]

(b)



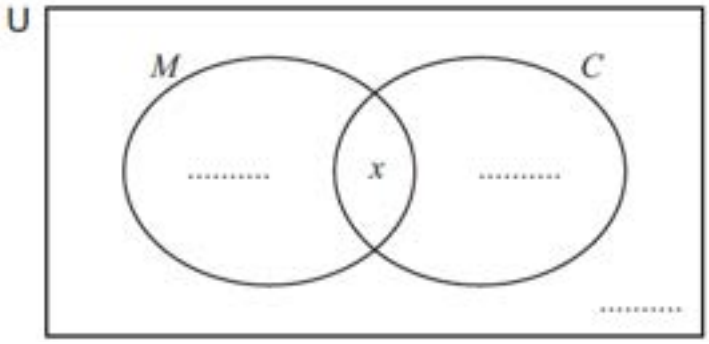
..... [1]

3. All the students in a class of 20 took tests in Mathematics and Chemistry.
The following table shows the results of these two tests.

	Pass	Fail
Mathematics	12	8
Chemistry	11	9

M is the set of students who passed the Mathematics test.
C is the set of students who passed the Chemistry test.
x is the number of students who passed both tests.

(a) Write 3 expressions **in terms of x** to complete the Venn diagram.



[3]

(b) Two pupils failed both Mathematics and Chemistry.

Find the value of x, the number of students who passed both tests.

$x =$ ..... [2]

4. $\mathrm{U} = \{ x \mid 1 \leqslant x \leqslant 16, x \in \mathbb{N} \}$

$A = \{$ factors of 12 $\}$

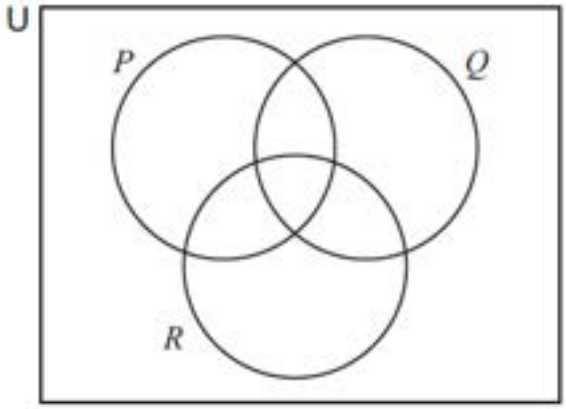
$B = \{$ factors of 16 $\}$

Complete the following.

(a) $A = \{$ ..... $\}$ [1]

(b) $\mathrm{n}(A \cap B') =$ ..... [1]

5.



On the Venn diagram write the elements a, b and c in the correct subsets using the following information.

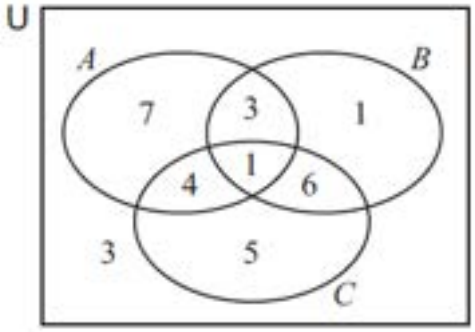
$$a \in (P \cup Q \cup R)'$$

$$b \in P' \cap (Q \cap R)$$

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

[3]

6.



The Venn diagram shows the **number of elements** in each of the sets A, B and C, and $n(U) = 30$.

(a) Find

(i) $n(A)$,

..... [1]

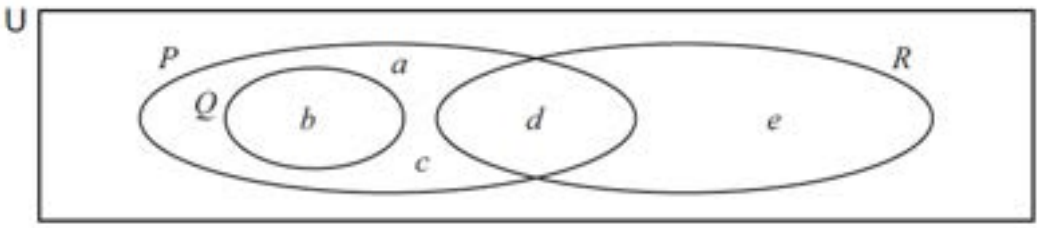
(ii) $n(C \cup B')$.

..... [1]

(b) Shade the region $(A \cap B) \cup C$ on the Venn diagram.

[1]

7.



The Venn diagram shows the sets P, Q and R.

Complete the following statements using set notation.

(a) P …… $R = \{a, b, c, d, e\}$ [1]

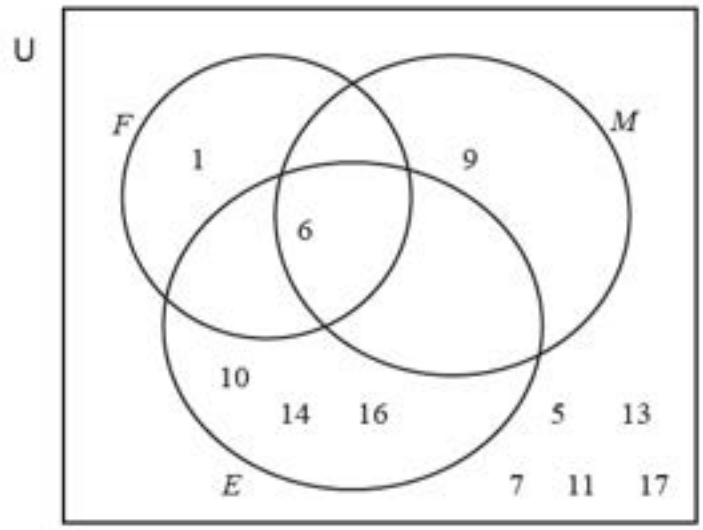
(b) Q …… $R = \varnothing$ [1]

(c) e …… R [1]

(d) P …… $Q = P$ [1]

8. U = {Integers from 1 to 18}
F = {Factors of 12}
M = {Multiples of 3}
E = {Even numbers}

(a) Complete the Venn diagram by putting the numbers 2, 3, 4, 8, 12, 15 and 18 in the correct subsets.



[2]

(b) List the members of

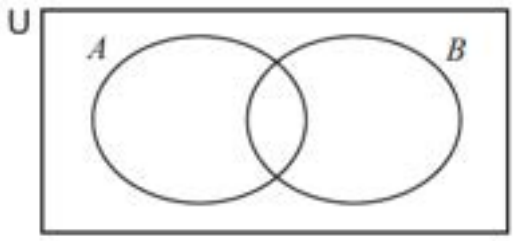
(i) $(E \cup F \cup M)'$,

…… [1]

(ii) $E \cap M' \cap F'$.

…… [1]

9.



(a) $n(U) = 20$, $n(A) = 10$, $n(B) = 7$, $n(A \cup B) = 13$.

Find

(i) $n(A \cup B)'$,

..... [1]

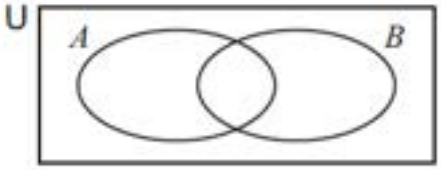
(ii) $n(A \cap B)$.

..... [1]

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

[1]

10. (a)

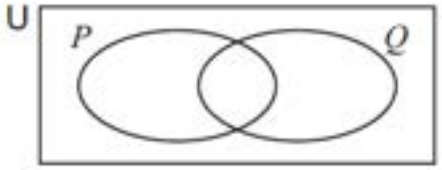


$n(U) = 20$, $n(A \cup B)' = 3$, $n(A) = 11$, $n(B) = 13$.

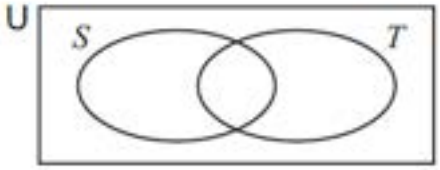
Find $n(A \cap B')$.

..... [2]

(b) On each Venn diagram, shade the region indicated.



$(P \cap Q)'$



$S \cup T'$

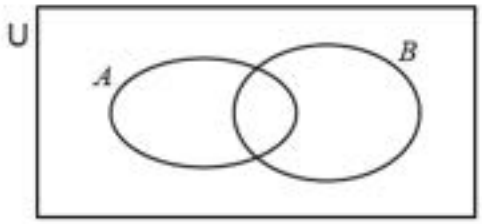
[2]

11. In the Venn diagram, show the sets A, B and C so that

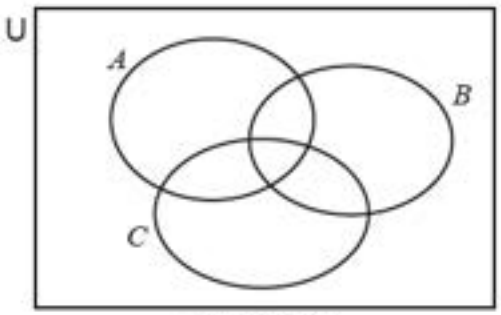
$$A \cup B = A,\ B \cap C = \varnothing \text{ and } A \cap C \neq \varnothing.$$

[3]

12. **(a)** In each diagram, shade the region indicated.



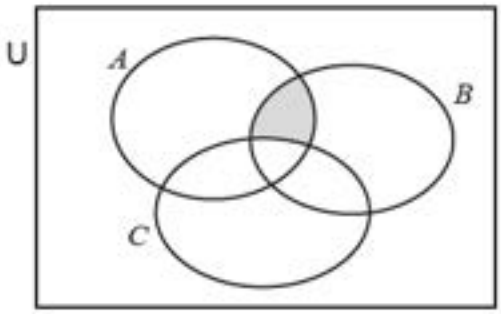
$A \cap B'$



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

[2]

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



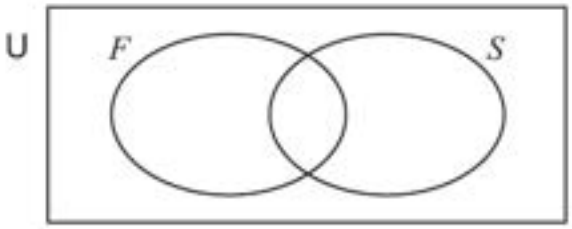
..... [1]

13. Sara records some information about the number of cars in a car park.

U = {cars in the car park}

F = {5-door cars}

S = {silver cars}



You may use the Venn diagram to help you answer the following questions.

(a) $n(\mathsf{U}) = 12$, $n(F) = 7$, $n(F \cap S) = 2$, $n(F \cup S) = 11$.

Find

(i) $n(S)$,

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

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

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

(b) Sara chooses a car from the car park at random.

Find the probability that it is a 5-door car.

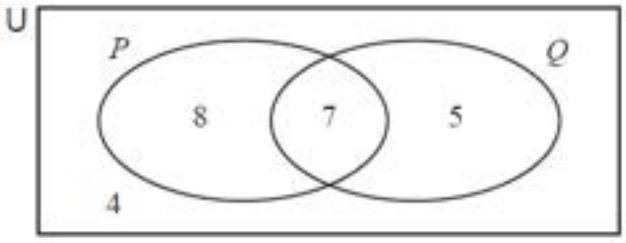
Answer(b) ..... [1]

(c) Sara chooses a silver car at random.

Find the probability that it is a 5-door car.

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

14.



The Venn diagram shows the **number of elements** in each subset.

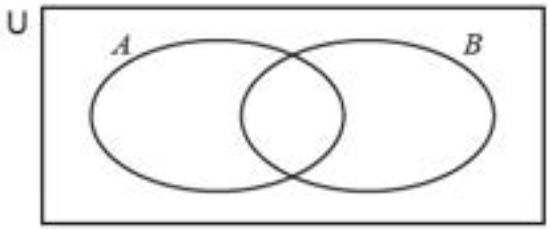
(a) Find $n(P \cup Q)'$.

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

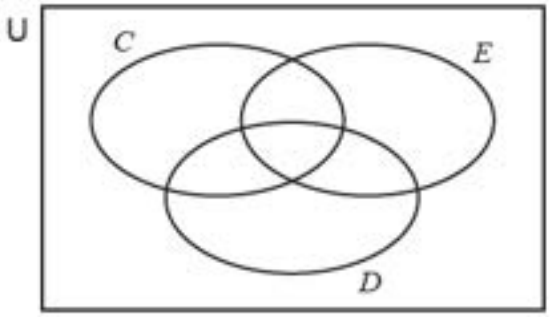
(b) Shade the region $P \cap Q'$. [1]

15. On each Venn diagram, shade the region indicated.

$(A \cup B)'$



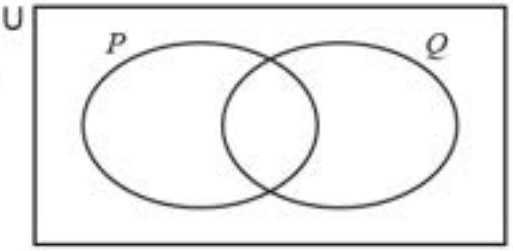
$(C \cup D) \cap E'$



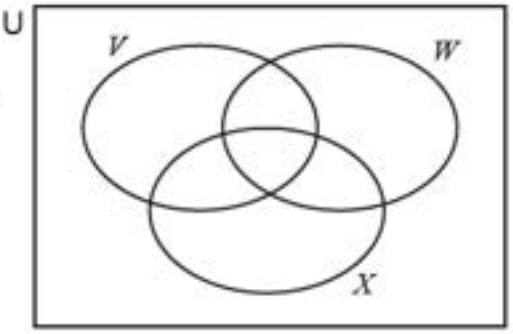
[2]

16. On each Venn diagram, shade the area indicated.

$(P \cap Q)'$

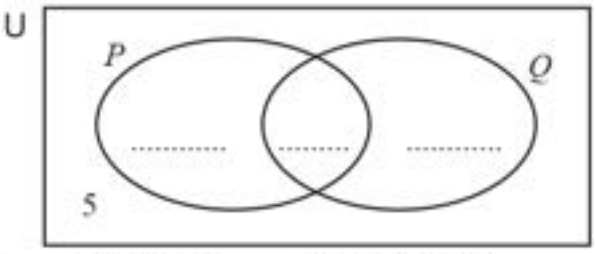


$W \cap V' \cap X'$



[2]

17.



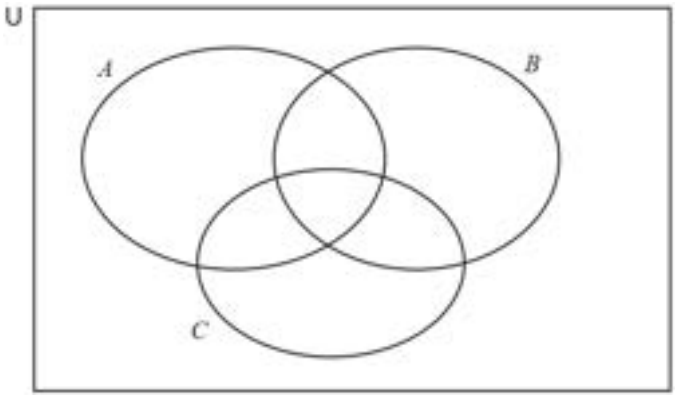
$n(U) = 25$ $n(P) = 10$ $n(Q) = 17$ $n(P \cup Q)' = 5$

Complete the Venn diagram.

[2]

18. U = {integers from 1 to 12}
A = {1, 2, 4, 5, 12}
B = {2, 3, 4, 6, 10}
C = {1, 2, 8, 9, 10}

(a) Complete the Venn Diagram.

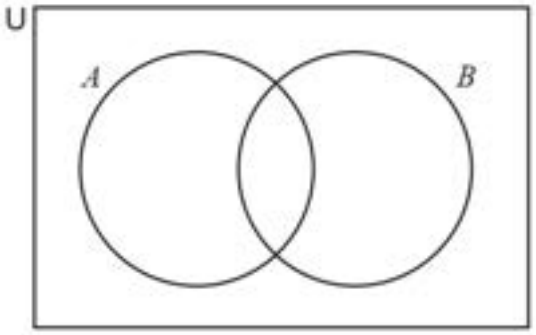


[2]

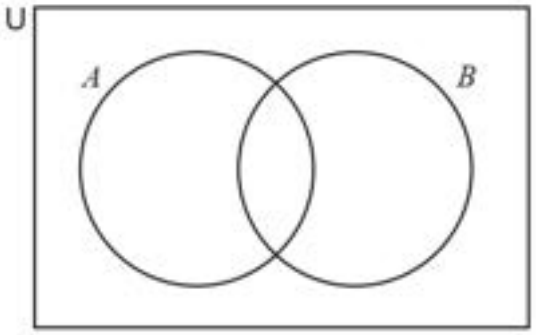
(b) Find $n(A \cap (B \cup C)')$.

..... [1]

19. Shade the given sets in each of these diagrams.



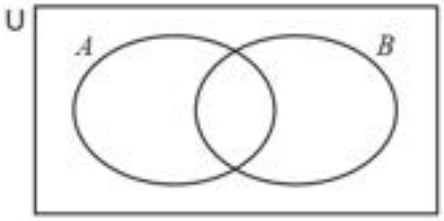
$A' \cap B$



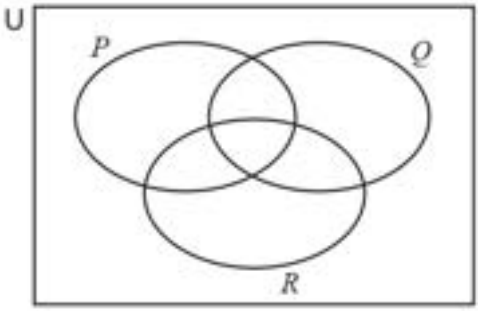
$(A' \cup B')'$

[2]

20. In each Venn diagram, shade the region indicated.



$(A \cup B)'$

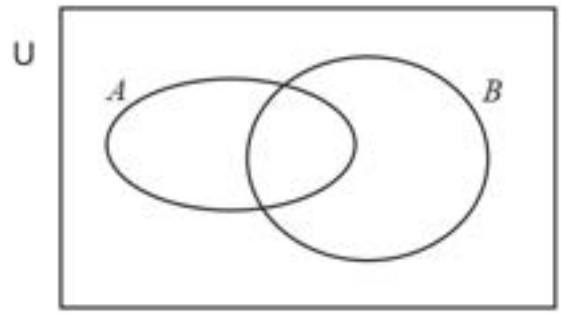


$(P \cup Q) \cap R$

[2]

21. Shade the region indicated in each of these Venn diagrams.

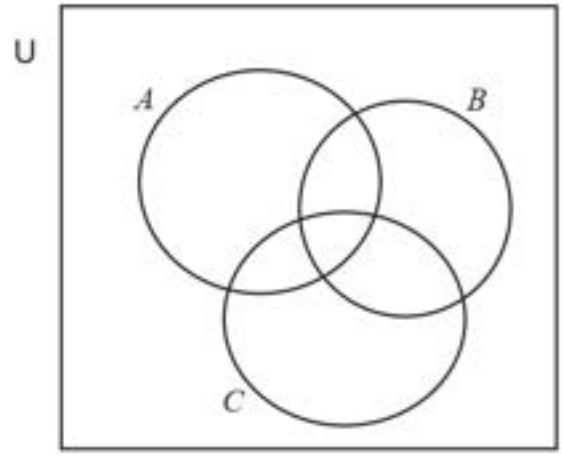
(a)



$A' \cap B'$

[1]

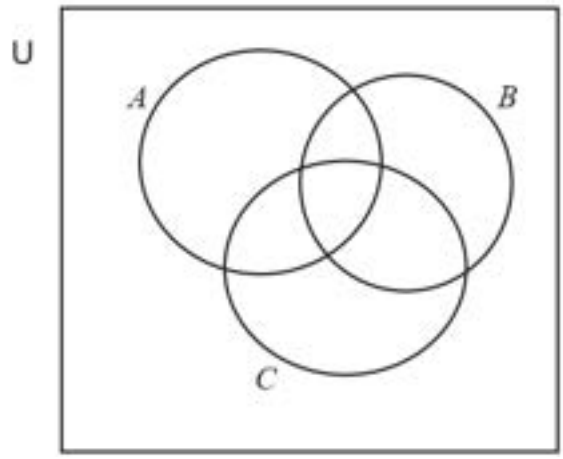
(b)



$A \cup (B \cap C)$

[1]

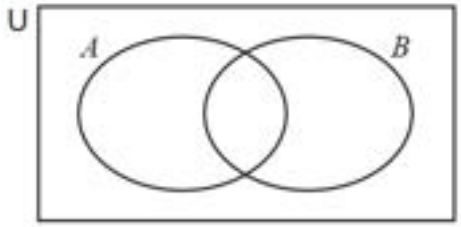
(c)



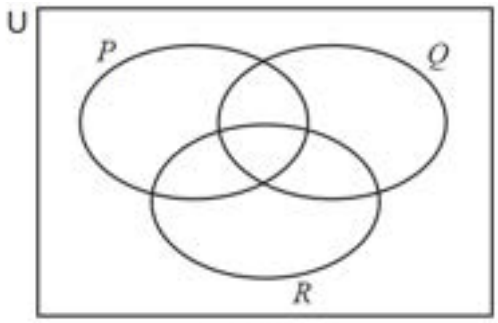
$A \cap B \cap C'$

[1]

22. In each Venn diagram, shade the region indicated.



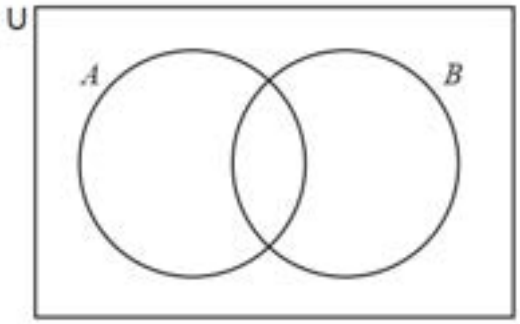
$(A \cup B)'$



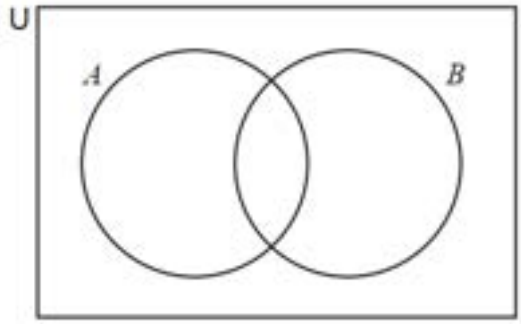
$(P \cup Q) \cap R$

[2]

23. Shade the given sets in each of these diagrams.



$A' \cap B$

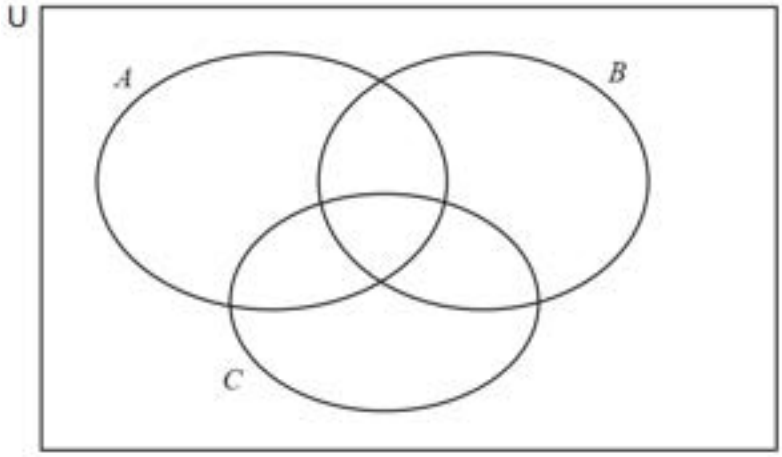


$(A' \cup B')'$

[2]

24. U = {integers from 1 to 12}
A = {1, 2, 4, 5, 12}
B = {2, 3, 4, 6, 10}
C = {1, 2, 8, 9, 10}

(a) Complete the Venn Diagram.

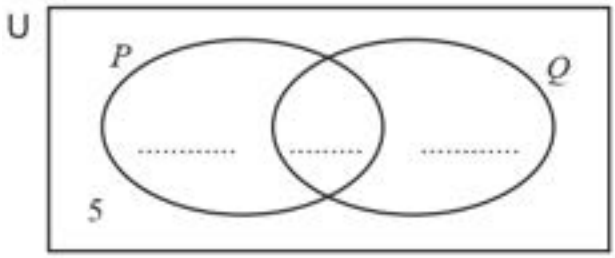


[2]

(b) Find $n(A \cap (B \cup C)')$.

..... [1]

25.

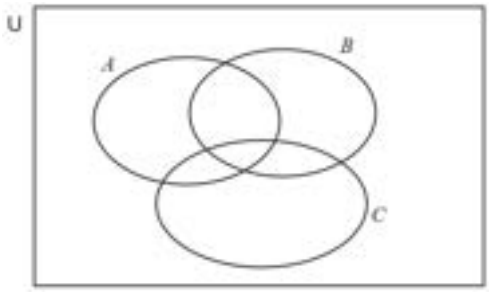


$n(U) = 25$ $n(P) = 10$ $n(Q) = 17$ $n(P \cup Q)' = 5$

Complete the Venn diagram.

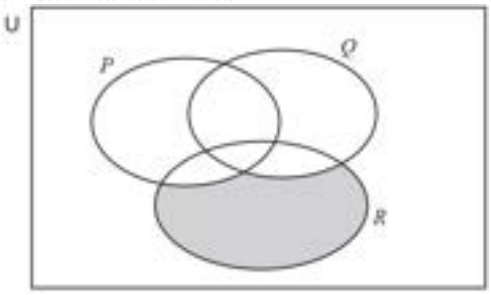
[2]

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



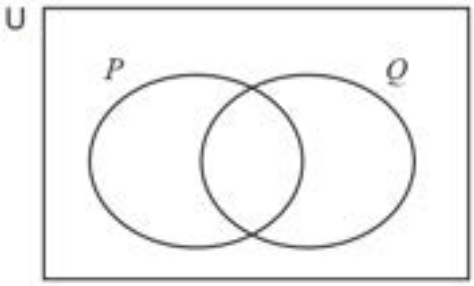
[1]

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



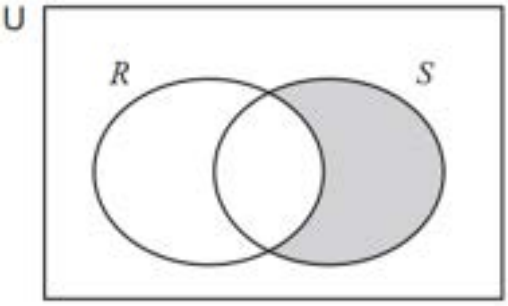
..... [1]

27. **(a)** Shade $P \cup Q$.



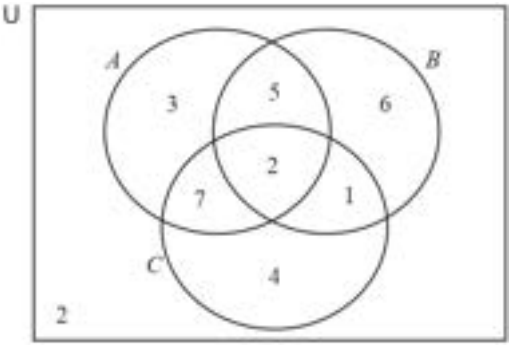
[1]

(b) Describe the shaded area using set notation.



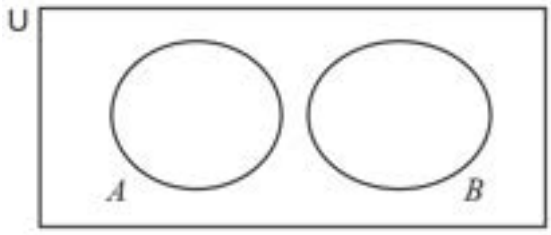
..... [1]

(c) The Venn diagram shows the number of elements in each subset.



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

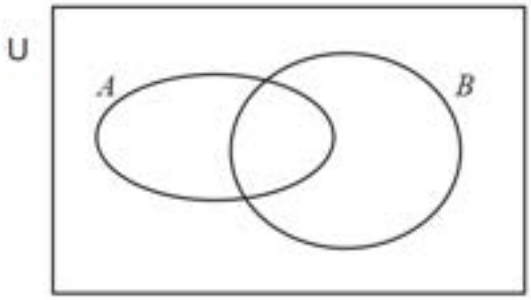
28. On the Venn diagram, shade $A \cup B$.



[1]

29. Shade the region indicated in each of these Venn diagrams.

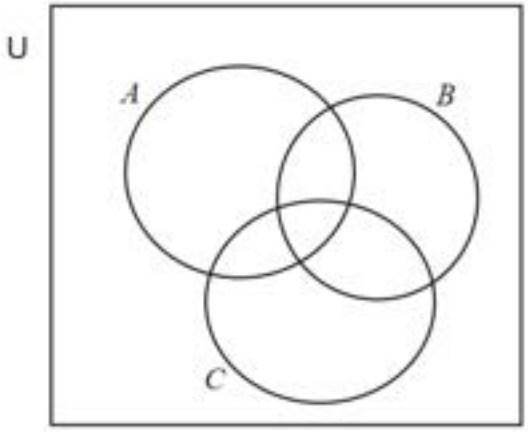
(a)



$A' \cap B'$

[1]

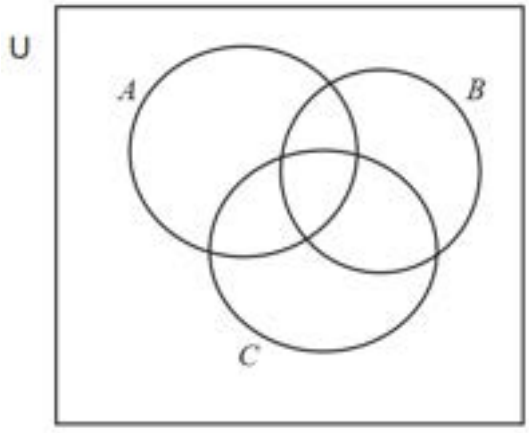
(b)



$A \cup (B \cap C)$

[1]

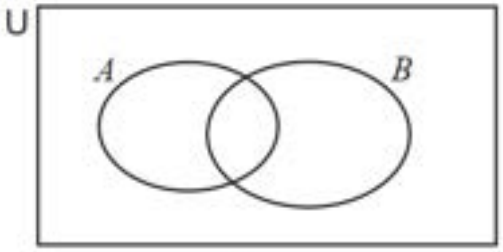
(c)



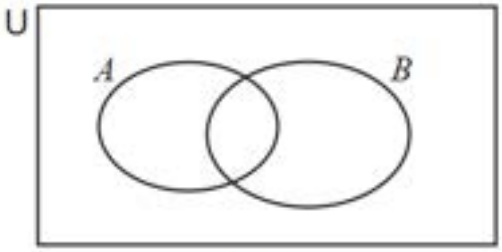
$A \cap B \cap C'$

[1]

30. **(a)** In each Venn diagram, shade the given set.

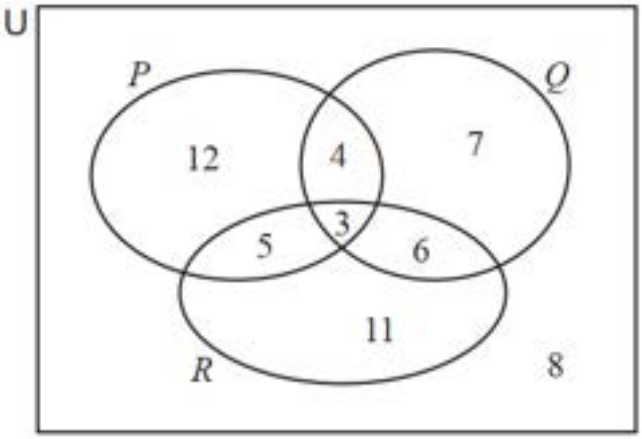


$A \cup B$



$(A \cap B)'$

(b) In this Venn diagram, the number of elements in each of the subsets is shown.



[2]

Find.

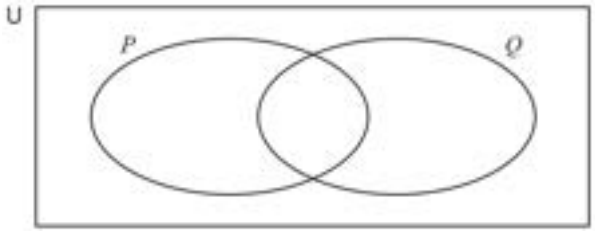
(i) $n(P \cup (Q \cap R))$

..... [1]

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

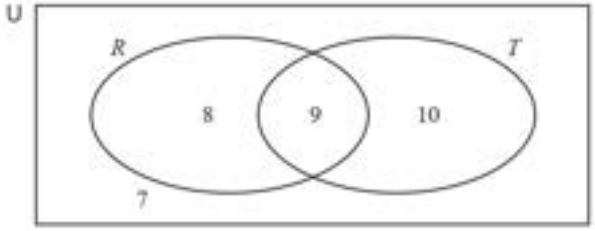
..... [1]

31. **(a)** Shade the region $(P \cup Q)'$.



[1]

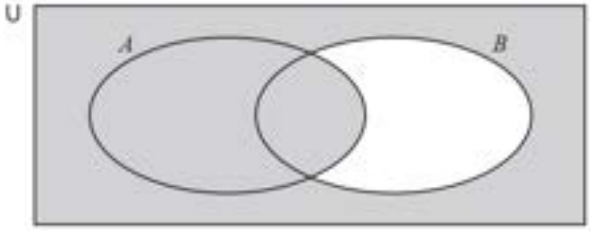
(b) The Venn diagram shows the number of elements in each region.



Find $n(R \cap T')$.

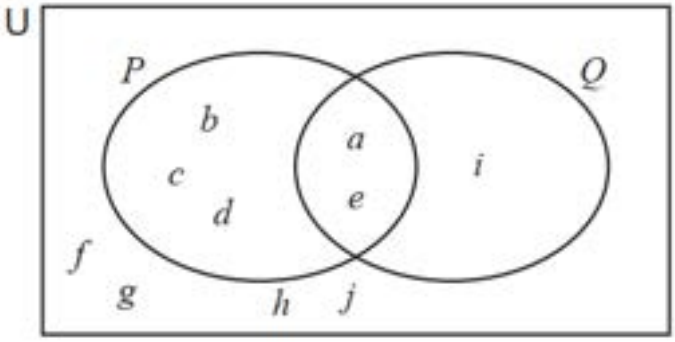
..... [1]

(c) Use set notation to describe the shaded region.



..... [1]

32.



$U = \{a, b, c, d, e, f, g, h, i, j\}$

Complete each statement.

(a) $(P \cup Q)' = \{.....\}$ [1]

(b) $\{a, e\} = P.....Q$ [1]

(c) $n(P' \cup Q) = ...$ [1]