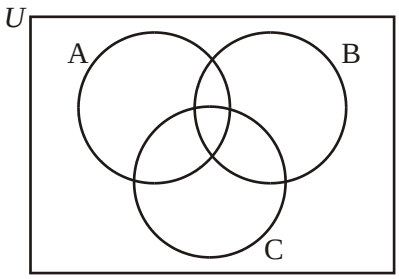
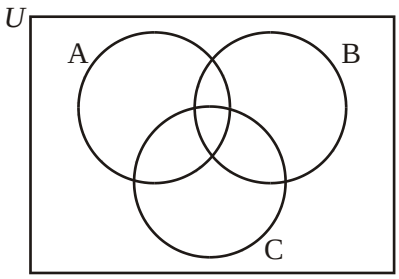
1. Shade the given region on the corresponding Venn Diagram.

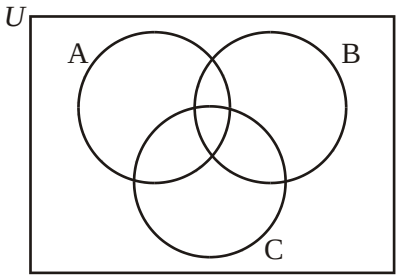
(a) $A \cap B$



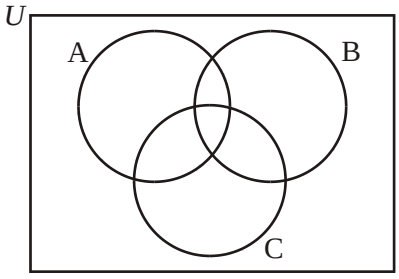
(b) $C \cup B$



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



(d) $A \cap C'$



(Total 8 marks)

2. The universal set U is defined as the set of positive integers less than 10. The subsets A and B are defined as:

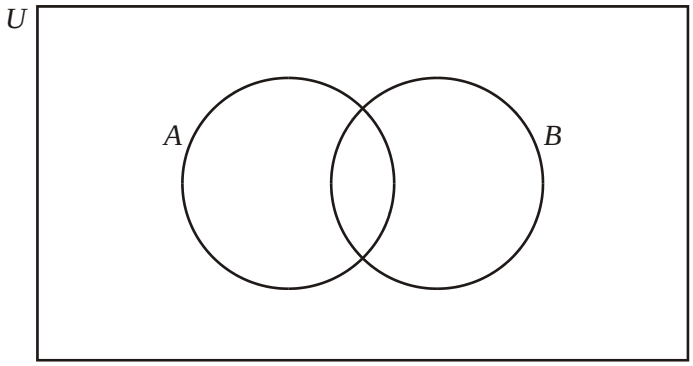
A = {integers that are multiples of 3}
B = {integers that are factors of 30}

(a) List the elements of

(i) A;

(ii) B.

(b) Place the elements of A and B in the appropriate region in the Venn diagram below.



(Total 4 marks)

3. The universal set U is the set of integers from 1 to 20 inclusive.

A and B are subsets of U where:
A is the set of even numbers between 7 and 17.
B is the set of multiples of 3.

List the elements of the following sets:

(a) A;

(1)

(b) B;

(1)

(c) $A \cup B$;

(2)

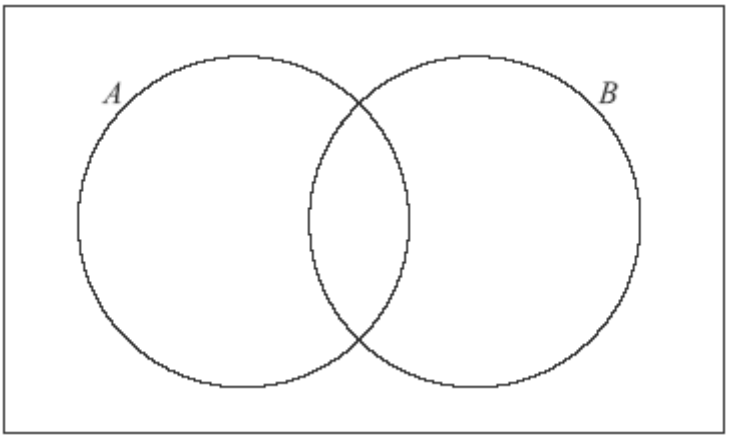
(d) $A \cap B'$.

(2)
(Total 6 marks)

4. A group of 30 students were asked about their favourite topping for toast.

18 liked peanut butter (A)
10 liked jam (B)
6 liked neither

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



(2)

(b) Find the number of students who like both peanut butter and jam.

(2)

(c) Find the probability that a randomly chosen student from the group likes peanut butter, given that they like jam.

(2)
(Total 6 marks)

5. Consider the universal set $U = \{x \in \mathbb{N} \mid 3 < x < 13\}$, and the subsets $A = \{\text{multiples of } 3\}$ and $B = \{4, 6, 12\}$.

(a) List the elements of the following sets.

(i) A

(ii) $A \cap B'$

(2)

(b) Write down one element of $(A \cup B)'$.

(2)

(c) One of the statements in the table below is false. Indicate with an **X** which statement is false. Give a reason for your answer.

$n(A \cup B) = 4$	
$15 \in A'$	
$A \subset A \cup B$	

(2)
(Total 6 marks)

6. U is the set of all the **positive** integers less than or equal to 12.
A, B and C are subsets of U.

$A = \{1, 2, 3, 4, 6,12\}$
$B = \{\text{odd integers}\}$
$C = \{5, 6, 8\}$

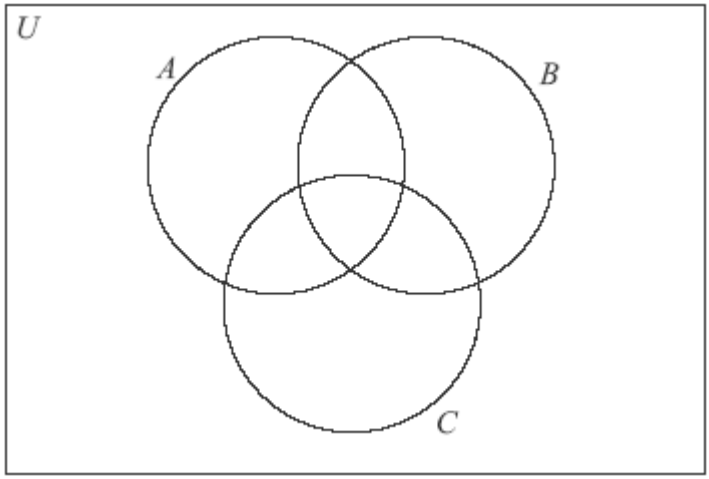
(a) Write down the number of elements in $A \cap C$.

(1)

(b) List the elements of B.

(1)

(c) Complete the following Venn diagram with **all** the elements of U.



(4)
(Total 6 marks)

7. A group of 30 children are surveyed to find out which of the three sports cricket (C), basketball (B) or volleyball (V) they play. The results are as follows:

3 children do not play any of these sports
2 children play all three sports
6 play volleyball and basketball
3 play cricket and basketball
6 play cricket and volleyball
16 play basketball
12 play volleyball.

(a) Draw a Venn diagram to illustrate the relationship between the three sports played.

(1)

(b) On your Venn diagram indicate the number of children that belong to each region.

(3)

(c) How many children play only cricket?

(2)
(Total 6 marks)

8. One day the number of customers at three cafés, "Alan's Diner" (A), "Sarah's Snackbar" (S) and "Pete's Eats" (P) was recorded and are given below.

17 were customers of Pete's Eats only
27 were customers of Sarah's Snackbar only
15 were customers of Alan's Diner only
10 were customers of Pete's Eats **and** Sarah's Snackbar **but not** Alan's Diner
8 were customers of Pete's Eats **and** Alan's Diner **but not** Sarah's Snackbar

(a) Draw a Venn Diagram, using sets labelled A, S and P, that shows this information.

(3)

There were 48 customers of Pete's Eats that day.

(b) Calculate the number of people who were customers of all three cafés.

(2)

There were 50 customers of Sarah's Snackbar that day.

(c) Calculate the total number of people who were customers of Alan's Diner.

(3)

(d) Write down the number of customers of Alan's Diner that were also customers of Pete's Eats.

(1)

(e) Find $n[(S \cup P) \cap A']$.

(2)
(Total 11 marks)

9. A poll was taken of the leisure time activities of 90 students.

60 students watch TV (T), 60 students read (R), 70 students go to the cinema (C).
26 students watch TV, read **and** go to the cinema.
20 students watch TV and go to the cinema only.
18 students read and go to the cinema only.
10 students read and watch TV only.

(a) Draw a Venn diagram to illustrate the above information.

(b) Calculate how many students

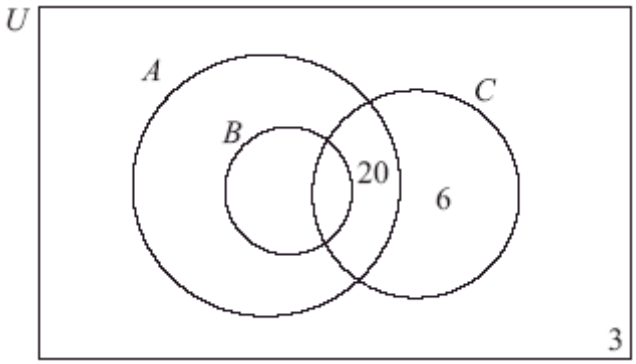
(i) only watch TV;

(ii) only go to the cinema.

(Total 8 marks)

10. The Venn diagram below represents the students studying Mathematics (A), Further Mathematics (B) and Physics (C) in a school.

50 students study Mathematics
38 study Physics
20 study Mathematics and Physics but not Further Mathematics
10 study Further Mathematics but not Physics
12 study Further Mathematics and Physics
6 study Physics but not Mathematics
3 study none of these three subjects.



(a) Copy and complete the Venn diagram **on your answer paper**.

(3)

(b) Write down the number of students who study Mathematics but not Further Mathematics.

(1)

(c) Write down the total number of students in the school.

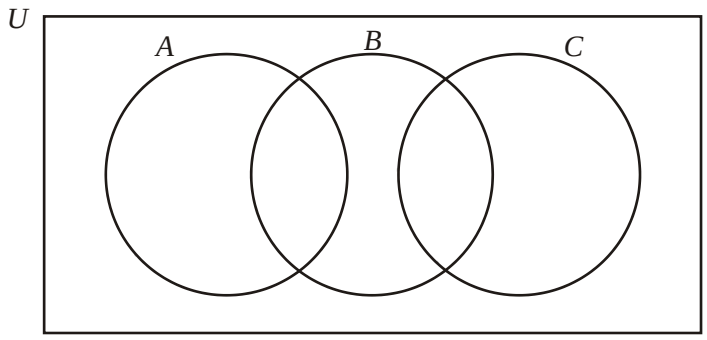
(1)

(d) Write down $n(B \cup C)$.

(2)

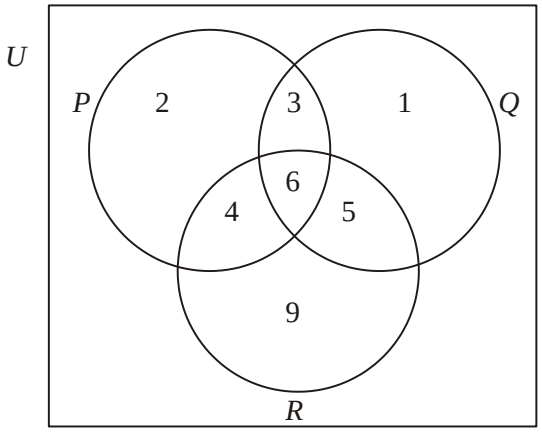
(Total 7 marks)

11. (a) Shade $(A \cup B) \cap C'$ on the diagram below.



(2)

(b) In the Venn diagram below, the number of elements in each region is given.
Find $n((P \cap Q) \cup R)$.



(2)

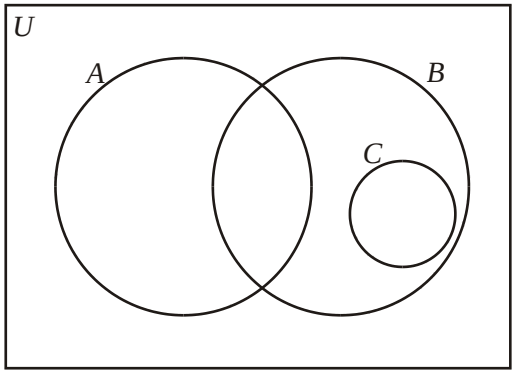
(c) U is the set of positive integers, $\mathbb{Z}^+$.
E is the set of even numbers.
M is the set of multiples of 3.

(i) List the first six elements of the set M.

(ii) List the first six elements of the set $E' \cap M$.

(2)
(Total 6 marks)

12. The following Venn Diagram shows the sets U, A, B and C.



State whether the following statements are true or false for the information illustrated in the Venn Diagram.

(a) $A \cap C = \varnothing$

(b) $C \cup B = C$

(c) $C \subset (A \cup B)$

(d) $A \subset C'$

(Total 8 marks)

13. A committee U has three sub-committees: research R, finance F and purchasing P. No member belongs to both finance and purchasing sub-committees. Some members belong to both research and purchasing committees. All members of the finance sub-committee also belong to the research sub-committee.

Draw a Venn diagram, showing the relationship between the sets U, R, F and P.

(Total 4 marks)