

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

$$A = \{1, 2, 3, 4, 6, 12\}$$

$$B = \{\text{odd integers}\}$$

$$C = \{5, 6, 8\}$$

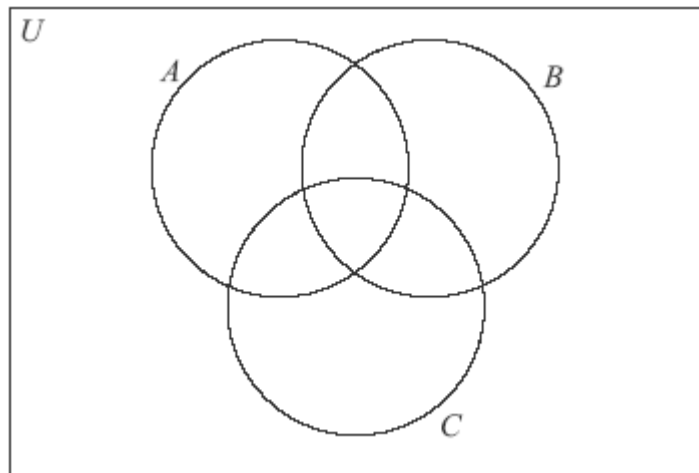
- (a) Write down the number of elements in $A \cap C$.

(1)

- (b) List the elements of B .

(1)

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



(4)

(Total 6 marks)

2. In a particular school, students must choose at least one of three optional subjects: art, psychology or history.

Consider the following propositions

a : I choose art,

p : I choose psychology,

h : I choose history.

- (a) Write, in words, the compound proposition

$$\neg h \Rightarrow (p \vee a).$$

(3)

- (b) Complete the truth table for $\neg a \Rightarrow p$.

a	p	$\neg a$	$\neg a \Rightarrow p$
T	T	F	
T	F	F	
F	T	T	
F	F	T	

(1)

- (c) State whether $\neg a \Rightarrow p$ is a tautology, a contradiction **or** neither. Justify your answer.

(2)

(Total 6 marks)

3. 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)

4. Some of the customers in each café were given survey forms to complete to find out if they were satisfied with the standard of service they received.

	Pete's Eats	Alan's Diner	Sarah's Snackbar	Total
Dissatisfied	16	8	16	40
Satisfied	26	20	34	80
Total	42	28	50	120

One of the survey forms was chosen at random, find the probability that

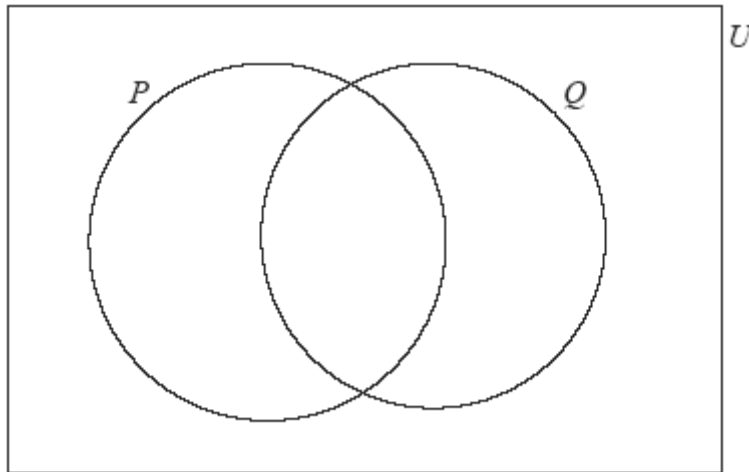
(a) the form showed "Dissatisfied"; (2)

(b) the form showed "Satisfied" and was completed at Sarah's Snackbar; (2)

(c) the form showed "Dissatisfied", given that it was completed at Alan's Diner. (2)

5. The sets P , Q and U are defined as

$U = \{\text{Real Numbers}\}$, $P = \{\text{Positive Numbers}\}$ and $Q = \{\text{Rational Numbers}\}$.

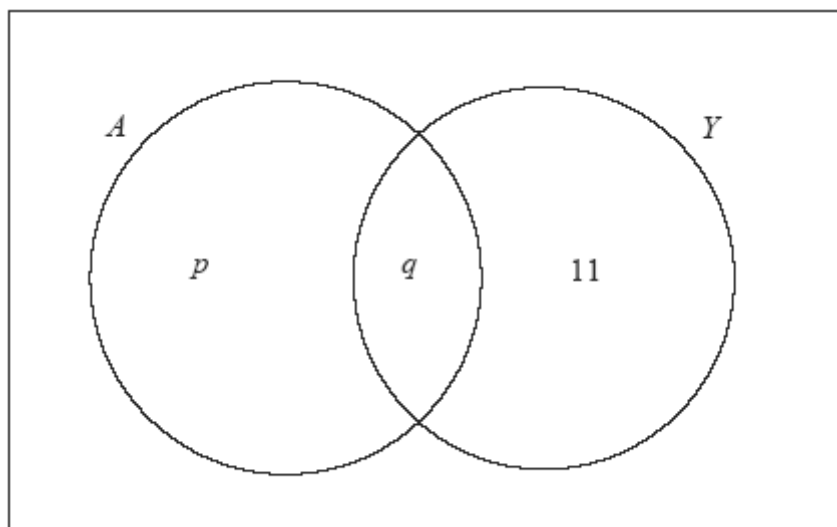


Write down in the correct region on the Venn diagram the numbers

$\frac{22}{7}$, 5×10^{-2} , $\sin(60^\circ)$, 0 , $\sqrt[3]{-8}$, $-\pi$

(Total 6 marks)

6. A fitness club has 60 members. 35 of the members attend the club's aerobics course (A) and 28 members attend the club's yoga course (Y). 17 members attend both courses. A Venn diagram is used to illustrate this situation.



- (a) Write down the value of q .

(1)

(b) Find the value of p . (2)

(c) Calculate the number of members of the fitness club who attend neither the aerobics course (A) nor the yoga course (Y). (2)

(d) Shade, on your Venn diagram, $A' \cap Y$. (1)
(Total 6 marks)

7. In a research project on the relation between the gender of 150 science students at college and their degree subject, the following set of data is collected.

		Degree Subject		
		Biology	Physics	Chemistry
Gender	Male	40	16	35
	Female	15	24	20

Find the probability that a student chosen at random

(a) is male; (2)

(b) is either male or studies Chemistry; (2)

(c) studies Physics, given that the student is male. (2)
(Total 6 marks)

8. (a) Complete the truth table shown below.

p	q	$p \wedge q$	$p \vee (p \wedge q)$	$(p \vee (p \wedge q)) \Rightarrow p$
T	T			
T	F			
F	T			
F	F			

(3)

- (b) State whether the compound proposition $(p \vee (p \wedge q)) \Rightarrow p$ is a contradiction, a tautology or neither.

(1)

Consider the following propositions.

p : Feng finishes his homework
 q : Feng goes to the football match

- (c) Write in symbolic form the following proposition.

If Feng does not go to the football match then Feng finishes his homework.

(2)

(Total 6 marks)