

PRACTICE 8.2 – Venn Diagrams (Union and Intersection)

* Full, worked solutions can be found in the folder linked on the Course Website ☺

Exercise 8C

- 1 In a group of 38 students, 29 play computer games, 10 play board games and 9 play both.
 - a Draw a Venn diagram to represent this situation.

A student is selected at random.
 - b Find the probability that the student plays neither computer games nor board games.
- 2 In a sports club, 40 members play badminton, 37 members play squash, 21 play both and 7 play neither.
 - a Represent this information in a Venn diagram.
 - b Determine how many people are members of the club.
 - c Determine the probability that a member:
 - i plays badminton
 - ii plays both sports
 - iii plays neither sport
 - iv plays at least one sport.
- 3 A group of 50 people were asked whether they gave their partner a card or a present on their last birthday. The results were: 31 gave a card, 40 gave a present and 25 gave both a card and a present. If one of the people was chosen at random, determine the probability that they gave:
 - a a card or a present
 - b a card but not a present
 - c neither a card nor a present.
- 4 Set A contains letters needed to spell the word PROBABILITY and set B contains the letters needed to spell the word COMPLEMENTARY.
 - a Draw a Venn diagram for the two sets A and B .
 - b What is in the intersection of A and B ?
 - c What is in the union of A and B ?
- 5 If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{2, 4, 6, 8, 10\}$ and $B = \{3, 6, 9\}$, list the members of the following sets:
 - a $A \cap B$
 - b $A \cup B$
 - c A'
 - d $A' \cap B$
 - e $A \cup B'$
 - f $A' \cup B'$
- 6 The universal set U is defined as the set of positive integers less than or equal to 15.

M is the set of integers that are in set U and are multiples of 3.

F is the set of integers that are in set U and are factors of 30.

 - a List the elements of:
 - i M
 - ii F
 - b Place the elements of M and F in the appropriate regions of a Venn diagram.
 - c A number is chosen at random from U . Find the probability that the number is:
 - i both a multiple of 3 and a factor of 30
 - ii neither a multiple of 3 nor a factor of 30.
- 7 In a town, 10% of the population watch the news at 1 pm, 30% of people watch the news at 6 pm and 40% of people watch the news at 9 pm.

It is found that 5% watch at both 6 pm and 9 pm, 4% watch at both 1 pm and 9 pm, 3% watch at 1 pm and 6 pm, and 2% of the people watch all three news shows.

 - a Complete a Venn diagram to show this information. For this Venn diagram, you will need three circles, one for each time the news is on.
 - b Find the probability that a person chosen at random from the town:
 - i watches only the news at 9 pm
 - ii watches only the news at 6 pm
 - iii does not watch the news.

Exercise 8D

- 1 A ten-sided dice, numbered 1 to 10, is rolled. Calculate the probability that:
 - a The number rolled is a prime number.
 - b The number rolled is a prime number or a multiple of 3.
 - c The number rolled is a multiple of 3 or a multiple of 4.
- 2 In a group of 55 tourists, 30 have cameras, 25 are female and 18 are females with cameras. Find the probability that a tourist picked at random from this group is either a camera owner or a female.
- 3 A letter is chosen at random from the 26-letter English alphabet. Find the probability that the letter is:
 - a in the word MATHEMATICS
 - b in the word TRIGONOMETRY
 - c in the word MATHEMATICS **and** in the word TRIGONOMETRY
 - d in the word MATHEMATICS **or** in the word TRIGONOMETRY.
- 4 Arnav goes to the library. The probability that he takes out a fiction book is 0.4, a non-fiction book is 0.3 and both a fiction and a non-fiction book is 0.2.
 - a What is the probability that Arnav takes out a fiction book, a non-fiction book or both?
 - b What is the probability that Arnav does not check out a book?
- 5 If X and Y are two events such that $P(X) = \frac{1}{4}$ and $P(Y) = \frac{1}{8}$ and $P(X \cap Y) = \frac{1}{8}$, find:
 - a $P(X \cup Y)$ b $P(X \cup Y)'$
- 6 If $P(A) = 0.2$ and $P(B) = 0.4$ and $P(A \cup B) = 0.5$, find:
 - a $P(A \cap B)$ b $P(A' \cup B)$
- 7 A and B are two events such that $P(A) = \frac{3}{16}$ and $P(B) = \frac{3}{8}$ and it is known that $P(A \cup B) = 3P(A \cap B)$. Find:
 - a $P(A \cup B)$ b $P(A \cup B)'$ c $P(A \cap B')$