Year 11 Mathematics Methods
AEMAM Term 1 2023

Test 1   Counting and Probability

Calculator Free   *Formula Sheet Allowed*

SHENTON
C O L L E G E

Student Name: _____

| **Teacher (circle):** | Cheshire | Coveney | McKenna | McRae | Moore | Munro |

Time Allowed: 25 minutes

| Calculator Free: | /27 |

*Attempt **all** questions.*
*All necessary working and reasoning must be shown for **full marks**.*
Marks may not be awarded for untidy or poorly arranged work.

Question 1.   **[3 marks]**

(a) Evaluate:

(i) $\dfrac{11!}{9!}$ (ii) $^7C_3$ (iii) $\dbinom{n}{k} \div \dbinom{n}{n-k}$

Question 2.   **[2, 1 = 3 marks]**

(a) Two events A and B are such that $A \cap B = \emptyset$.
   (i) Draw a Venn diagram to show the relationship between A and B and shade the region representing $A \cup B$.
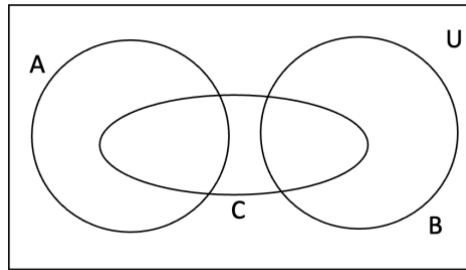

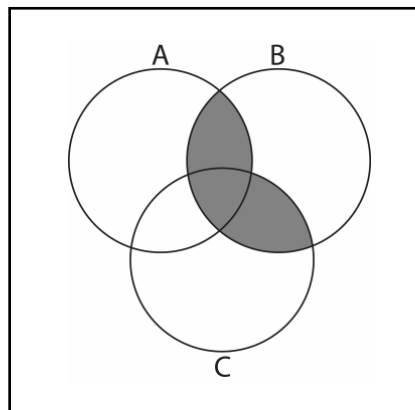   (ii) Describe the relationship between the events A and B.

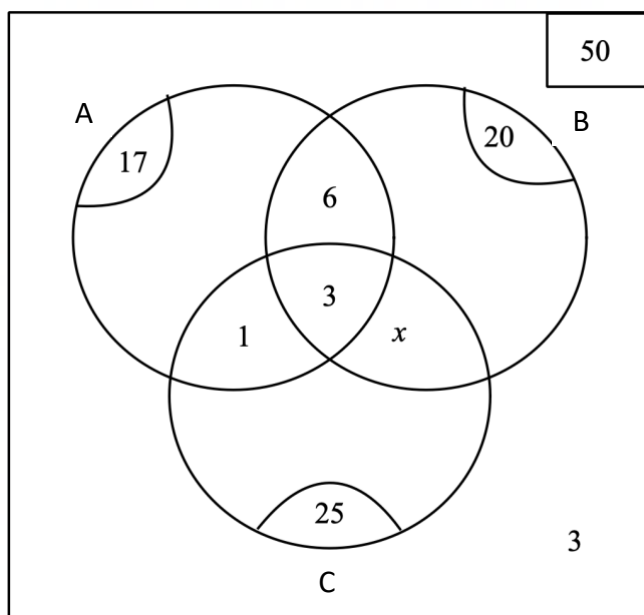**Question 3.**   **[1, 1, 3 = 5 marks]**

(a) Shade the region of the Venn diagram below that represents $C \cap \overline{(A \cup B)}$.

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

(c) Determine the value of x in the Venn diagram below

Question 4.   **[2, 1, 3, 2 = 8 marks]**

Events A and B are such that $P(A) = 0.6$, $P(B) = 0.5$ and $P(A' \cap B) = 0.4$

	A	**A'**	**TOTAL**
B			
B'			
TOTAL			

(a) Complete a two-way table based on the information above.

(b) Explain why the events A' and B' must be mutually exclusive.

(c) Determine

    (i) $P(\bar{A} \cup \bar{B})$

    (ii) $P((\overline{A \cap B})|A)$

(d) Determine if the events A and B are independent, supporting your answer with appropriate calculations.

Question 5.   **[1, 1, 1 = 3 marks]**

Let U denote the group of all students who visited Europe over the school holidays. If:

- I represents the set of students that visited Italy,
- E represents the set of students that visited England
- G represents the set of students that visited Germany

describe in words, which students are represented by the following sets.

a) $I \cup E \cup G$

b) $\overline{I \cap E \cap G}$

c) $(E \cup G) \cap I'$

Question 6.   **[1, 2, 2 = 5 marks]**

(a) State the five terms in row 4 of Pascal's triangle.

(b) Expand $(a - b)^4$

(c) Determine the coefficient of x^4 in the expansion of $\left(4 - \dfrac{x}{2}\right)^7$

Student Name: _____

| **Teacher:** | Cheshire | Coveney | McKenna | McRae | Moore | Munro |

Time Allowed: 20 minutes | Calculator Assumed: /22

*Attempt **all** questions.*
*All necessary working and reasoning must be shown for **full marks**.*
Marks may not be awarded for untidy or poorly arranged work.

Question 8. **[1, 2, 1, 3 = 7 marks]**

Shen-Car insurance company collected data on two different driver age groups who had made an insurance claim over a 1-year period. Some of the data is shown in the table below.

AGE OF DRIVER:	17-25	26-40	TOTAL
CLAIM	220		370
NO CLAIM		450	
TOTAL			1000

(a) Complete the table
(b) How many drivers did not make a claim?

(c) What is the probability a randomly selected driver:
    (i)   Is aged 26-40 and didn't make a claim.

    (ii)   Is aged 17-25 or made a claim.

(d) Determine the proportion of drivers aged 17-25 who made a claim during the year.

Question 9.   **[1, 1, 1, 3, 2, 2 = 10 marks]**

A committee of 7 people is being selected from senior members at a local sports club consisting of 7 frisbee players, 8 roller derby players and 5 lacrosse players.

   (a) In how many ways can the 7 people be selected if:
      (i)   There are no restrictions

      (ii)   Only roller derby players are selected

      (iii)   No roller derby players are selected

      (iv)   At least 2 representatives from each sport are selected.

   (b) Two roller derby players, Ruby Bruiseday and Drew Bash 'emore find out that exactly 4 roller derby players have been selected for the committee. Calculate the probability:

      (i) Ruby has been selected

      (ii) Only one of them has been selected

Question 10.   **[5 marks: 1, 2, 2]**

Classified documents at the nation's leading intelligence agency *SP135* are protected by four different anti-hack programs (referred to as A, B, and C for security reasons). Each program has the following chance of being hacked:

$$P(A) = 0.3 \quad P(B) = 0.15 \quad P(C) = 0.1$$

Determine the probability that during a cyber-attack:
    (a) All programs will be hacked.

    (b) At least one of the programs will be hacked.

    (c) Exactly two of the programs will be hacked.

End of Calculator Assumed Section