



SHENTON  
COLLEGE

# Year 11 Mathematics Methods AEMAM Term 1 2022

## Test 1 Counting and Probability

**Calculator Free**

*Formula Sheet Allowed*

**Student Name:** \_\_\_\_\_

**Teacher:** Cheshire Feutrill Loh McRae

**Time Allowed:** 30 minutes

Calculator Free	/32
Calculator Assumed	/22
Total	/54

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.

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

a) Evaluate  $\binom{10}{2} \times \binom{8}{6}$ .

b) Given  $\binom{n}{a} = \binom{n}{b}$ , where  $a \neq b$ ,

i) explain why  $a + b = n$ , with reference to Pascal's Triangle.

ii) hence or otherwise, determine the value of  $h$ .

$$\binom{25}{2h} - \binom{25}{h-2} = 0$$

**Question 2** [7 marks: 1, 1, 1, 1, 1, 2]

Given

- The universal set,  $U = \{x: x \in \mathbb{Z}, 1 \leq x \leq 20\}$ , where  $\mathbb{Z}$  denotes the set of all integers
- Set  $M = \{x: x \text{ is a multiple of } 6\}$
- Set  $L = \{x: x \text{ is a factor of } 72\}$

a) Using set notation, list the elements of

i)  $L$ .

ii)  $M$ .

b)

i) Determine  $n(M \cap L')$ .

ii) Hence, explain the relation between set  $M$  and set  $L$ .

c) If a number is chosen randomly from  $U$ , determine:

i)  $P(\overline{M \cup L})$ .

ii)  $P(M|L)$ .

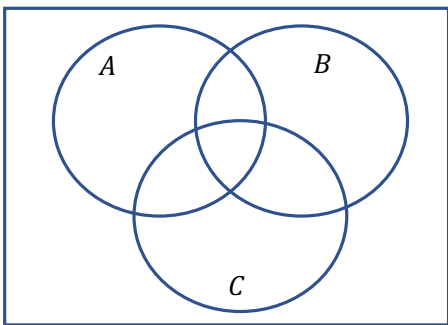
**Question 3** [3 marks]

Given  $P(B|A) = \frac{1}{3}$   $P(B|A') = \frac{3}{4}$  and  $P(A) = \frac{3}{5}$

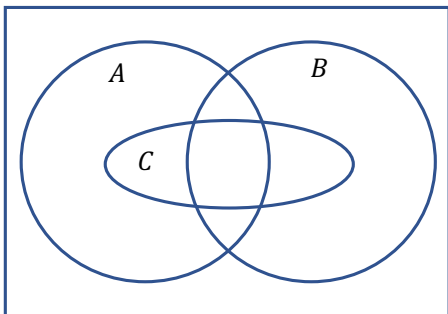
Determine  $P(B')$ .

**Question 4** [4 marks: 1, 2, 1]

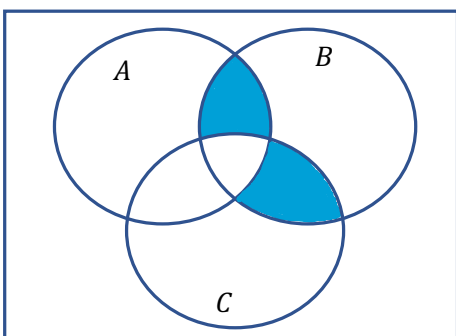
a) Shade  $A \cup \bar{B} \cap C$ .



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



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



**Question 5** [6 marks: 4, 2]

In the Game of Untouchable, a player has two spins of a spinner with two colours, red and black. The first person to spin two successive different colours (red followed by black or vice versa) wins the game. In the instruction manual, it is stated that the probability of spinning 2 successive reds from the spinner is  $\frac{1}{9}$ .

a) Determine the probability of spinning two successive different colours.

b) James was given the game as a Christmas present. Without reading the instruction manual, he claims that the chance of him winning the game with his first two spins is 50/50. Do you agree with his statement? Justify your answer with appropriate calculations.

**Question 6** [7 marks: 3, 2, 2]

a) Expand  $\left(1 + \frac{x}{4}\right)^4$ .

b) Hence, show that  $\left(1 + \frac{x}{4}\right)^4 - \left(1 - \frac{x}{4}\right)^4 = 2x + \frac{x^3}{8}$ .

c) Determine the exact value of  $(1.25)^4 - (0.75)^4$ .

***End of Calculator Free Section***



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## Test 1 Counting and Probability

**Calculator Assumed**

*Formula Sheet, ClassPad and Calculator Allowed*

**Student Name:** \_\_\_\_\_

**Teacher:** Cheshire Feutrill Loh McRae

**Time Allowed:** 20 minutes

Calculator Assumed:	/22
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*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.*

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**Question 7** [5 marks: 1, 2, 2]

A team of 6 players is to be selected from 10 volleyball players of whom 7 are from Group Shen and 3 are from Group Ton. If the selection of the team is made at random, determine

a) the number of ways the team can be selected.

b) the number of ways the team can be selected if we must have equal number of players from Group Shen and Group Ton.

c) the probability that at most two players from Group Ton are in the team.

**Question 8** [8 marks: 4, 2, 2]

In the Faculty of Ancient Languages in the University of Neverland, 85% of the students learn Coptic ( $C$ ), 40% learn Gothic ( $G$ ) and 20% learn Pali ( $P$ ). 32% of the students learn Coptic and Gothic, 13% learn Coptic and Pali and 10% learn Gothic and Pali. All the students learn at least one of these three ancient languages.

a) Determine the percentages of students learning all three languages.

b) If the number of enrolments in the faculty is 467, determine the number of students who study exactly two ancient languages.

c) Determine the probability of a student studying Pali, given that the student did not study Coptic.

**Question 9** [9 marks: 4, 2, 3]

Pink Panther Sports Company sells two brands of soccer ball, Ike and Didas. At the start of 2021, the store had 600 Ike soccer balls and 400 Didas soccer balls in stock. At the end of 2021, the store found that 80 of the soccer balls had not been sold. The store also found that the number of Ike soccer balls not sold was 20.

a) Determine the probability of a Didas ball not sold in 2021.

b) Of the soccer balls not sold, determine the probability of a ball being brand Ike.

c) Is the sale of a soccer ball independent of the brand? Justify your answer.

*End of Calculator Assumed Section*