Additional Assessment Materials

Summer 2021

Pearson Edexcel GCE in Mathematics
9MA0 (Applied) (Public release version)

Resource Set 1: Topic 3
Probability

# General guidance to Additional Assessment Materials for use in 2021

Context
- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an optional part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose
- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

1   The Venn diagram shows the probabilities associated with four events, A, B, C and D
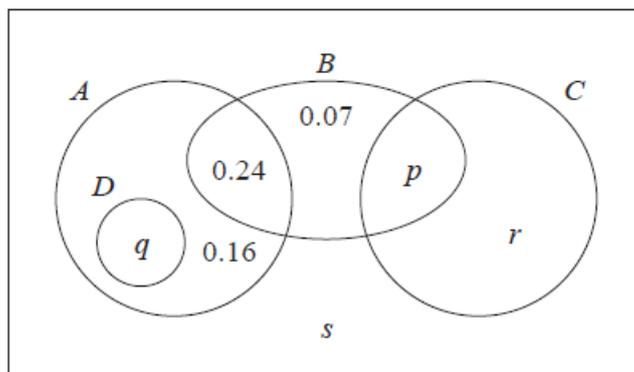
(a)   Write down any pair of mutually exclusive events from A, B, C and D

(1)

Given that $P(B) = 0.4$

(b)   find the value of p

(1)

Given also that A and B are independent

(c)   find the value of q

(2)

Given further that $P\,(\,B' \mid C\,) = 0.64$

(d)   find

     (i) the value of r

     (ii) the value of s

(4)
(Total for Question 1 is 8 marks)

2. Three Bags, *A*, *B* and *C*, each contain 1 red marble and some green marbles.

   Bag *A* contains 1 red marble and 9 green marbles only
   Bag *B* contains 1 red marble and 4 green marbles only
   Bag *C* contains 1 red marble and 2 green marbles only

Sasha selects at random one marble from Bag *A*.
If he selects a red marble, he stops selecting.
If the marble is green, he continues by selecting at random one marble from Bag *B*.
If he selects a red marble, he stops selecting.
If the marble is green, he continues by selecting at random one marble from Bag *C*.

(*a*) Draw a tree diagram to represent this information.

(2)

(*b*) Find the probability that Sasha selects 3 green marbles.

(2)

(*c*) Find the probability that Sasha selects at least 1 marble of each colour.

(2)

(*d*) Given that Sasha selects a red marble, find the probability that he selects it from Bag *B*.

(2)

(Total for Question 1 is 8 marks)

3. A company maintains machines. It has two types of contract, a service contract and a repair contract. The company classes its customers as new customers or existing customers. The table gives information about the company's customers.

	Service contract	Repair contract
New customer	65	82
Existing customer	231	262

The company is going to survey its customers. It plans to take a sample of 100 of its customers, stratified by customer type and contract type.

(a) Work out how many new customers with repair contracts should be sampled.

(2)

The company has developed a test for a certain fault in the machines it services. The test sometimes gives incorrect results.

The company collects information from a sample of randomly selected machines.

- 2% of the machines have the fault
- 70% of the machines with the fault test positive for the fault
- 10% of the machines without the fault test positive for the fault.

A machine is selected at random from the sample of the machines, and tests positive for the fault.

(b) (i) Calculate the probability that the machine has the fault.

(4)

   (ii) Comment on the usefulness of the company's test. Give a reason for your answer.

(1)

When the company services the machines, it checks two components, α and β, for wear and tear and replaces these if needed.

Event A is that component α needs to be replaced.
Event B is that component β needs to be replaced.

The probability that component α needs to be replaced is 0.35.
The probability that component β needs to be replaced is 0.55.
The probability that neither component needs to be replaced is 0.28.

(c) Show that events A and B are not independent.

(2)

(d) Find the probability that component α or component β needs to be replaced, but not both.

(2)

(Total for Question 3 is 11 marks)

4. Given that $P(A) = 0.35$, $P(B) = 0.45$ and $P(A \cap B) = 0.13$,

(*a*) find $P(A' \mid B')$,

(2)

(*b*) explain why the events A and B are not independent.

(1)

The event C has $P(C) = 0.20$.

The events A and C are mutually exclusive and the events B and C are statistically independent.

(*c*) Draw a Venn diagram to illustrate the events A, B and C, giving the probabilities for each region.

(5)

(*d*) Find $P([B \cup C]')$

(2)

(Total for Question 4 is 10 marks)

---

5. (i) Two events A and B are mutually exclusive.

Given that $P(B) = p \neq 0$ and $P(A) = 3 \times P(B)$,

(a) draw a Venn diagram to illustrate this information,

(b) find the possible values of $P(B)$.

(3)

(ii) Two events C and D are such that $P(C \mid D) = 3 \times P(C)$ where $P(C) \neq 0$.

(a) Explain whether or not events C and D could be independent events.

(1)

Given also that

$$P(C \cap D) = \frac{1}{2} \times P(C) \text{ and } P(C' \cap D') = \frac{7}{10},$$

(b) find $P(C)$, showing your working clearly.

(7)

(Total for Question 5 is 11 marks)