

Additional Assessment Materials

Summer 2021

Pearson Edexcel GCE in Mathematics

9MA0 (Applied) (Public release version)

Resource Set 1: Topic 3

Probability

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Additional Assessment Materials, Summer 2021

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**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* Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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*

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(*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*ʹ | *C* ) = 0.64

(*d*) find

(i) the value of *r*

(ii) the value of *s*

**(4)**

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

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**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* ∩ *B*) = 0.13,

 (*a*) find P(*A*′ | *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* ∪ *C* ] ′ )

 **(2)**

 **(Total for Question 4 is 10 marks)**

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

 Given that P(*B*) = *p* ≠ 0 and P(*A*) = 3× 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* | *D*) = 3× *P*(*C*) where P(*C*) ≠ 0.

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

**(1)**

 Given also that

P(*C* ∩ *D*) =  × P(*C*) and P(*C* ′ ∩ *D* ′) = ,

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

**(7)**

**(Total for Question 5 is 11 marks)**

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