Additional Assessment Materials

Summer 2021

Pearson Edexcel GCE in As Mathematics

8MA0_21 (Public release version)

Resource Set 1: Topic 3

Probability

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Additional Assessment Materials, Summer 2021

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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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

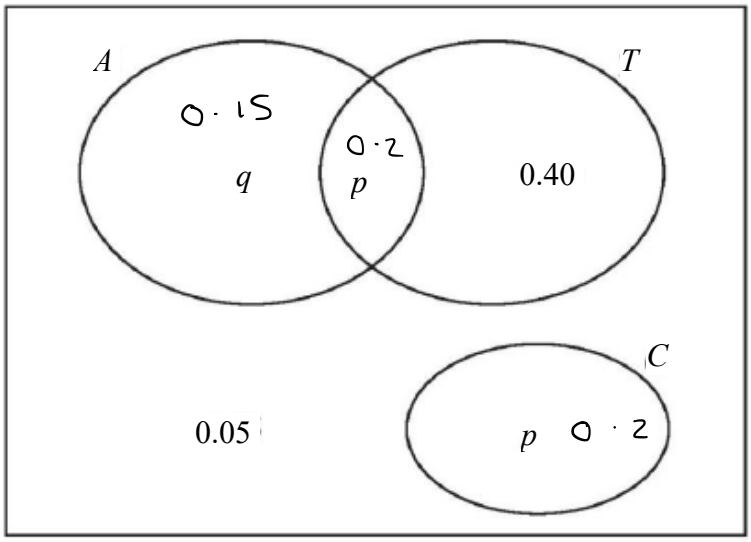
1. The Venn diagram shows the probabilities for students at a college taking part in various sports.

A represents the event that a student takes part in Athletics.

T represents the event that a student takes part in Tennis.

C represents the event that a student takes part in Cricket.

p and q are probabilities.



0.15
0.2
0.2

0.75 − 0.4 − 0.2 = q
q = 0.15

The probability that a student selected at random takes part in Athletics or Tennis is 0.75.

(*a*) Find the value of p.

1 − 0.75 − 0.05 = 0.2

(1)

(*b*) State, giving a reason, whether or not the events A and T are statistically independent. Show your working clearly.

(3)

P(A) × P(T) ≠ P(A ∩ T) to not be independent

0.35 × 0.6 = 0.2

= 0.21

0.21 ≠ 0.2 ∴ not independent

(*c*) Find the probability that a student selected at random does not take part in Athletics or Cricket.

0.40 + 0.05 = 0.45

(1)

(Total for Question 1 is 5 marks)

2. A factory buys 10% of its components from supplier *A*, 30% from supplier *B* and the rest from supplier *C*. It is known that 6% of the components it buys are faulty.

Of the components bought from supplier *A*, 9% are faulty and of the components bought from supplier *B*, 3% are faulty.

(a) Find the percentage of components bought from supplier *C* that are faulty.

A: 10% → 9% → 0.9% of total faulty $6 - 1.8 = 4.2$ **(3)**

B: 30% → 3% → 0.9% of total faulty

C: 60% → 4.2% of total faulty → 7% of C are faulty

A component is selected at random.

(b) Explain why the event "the component was bought from supplier *B*" is not statistically independent from the event "the component is faulty".

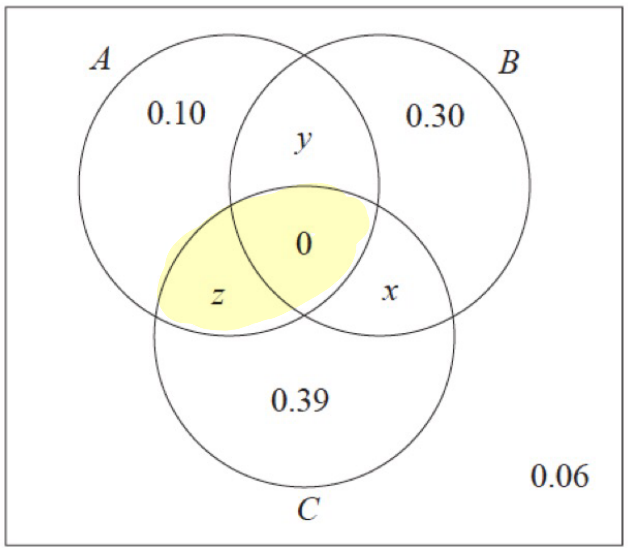
$P(B \cap F) = 0.3 \times 0.03 = 0.09$.

$P(B) \times P(F) = 0.3 \times 0.06 = 0.018$ **(1)**

(Total for Question 2 is 4 marks)

These are not equal so they are not independent.

3. The Venn diagram shows three events, *A*, *B* and *C*, and their associated probabilities.



(1) $1 - 0.06 = 0.94$

$0.1 + 0.3 + 0.39 + y + x + z = 0.94$

$x + y + z = 0.15$

$y + z = 0.15$

$y = 0.15 - z$

(2) Events *B* and *C* are mutually exclusive. $P(B \cup C) = P(B) + P(C)$

(3) Events *A* and *C* are independent. $P(A \cap C) = P(A) \times P(C)$

Showing your working, find the value of *x*, the value of *y* and the value of *z*.

$0.3 + y + x + z + 0.39 = (0.3 + y + x) + (0.39 + z + x)$ **(5)**

$x = 0$

$z = (0.1 + y + z)(0.39 + z)$

$z = 0.039 + 0.1z + 0.39y + yz + 0.39z + z^2$

$z = 0.039 + (0.49 + y)z + z^2 + 0.39y$

$z = 0.039 + (0.49 + 0.15 - z)z + z^2 + 0.39(0.15 - z)$

$z = 0.039 + (0.64 - z)z + z^2 + 0.0585 - 0.39z$

$z = 0.039 + 0.64z + 0.0585 - 0.39z$

(Total for Question 3 is 5 marks)

$0.75z = 0.0975$, $z = 0.13$ $\therefore y = 0.15 - 0.13 = 0.02$

$\therefore x = 0$, $y = 0.02$, $z = 0.13$

4. In a game, a player can score 0, 1, 2, 3 or 4 points each time the game is played.

The random variable S, representing the player's score, has the following probability distribution where a, b and c are constants.

s	0	1	2	3	4
$P(S = s)$	a	b	c	0.1	0.15

$1/12$

The probability of scoring less than 2 points is twice the probability of scoring at least 2 points.

Each game played is independent of previous games played.

John plays the game twice and adds the two scores together to get a total.

Calculate the probability that the total is 6 points.

(6)

(Total for Question 4 is 6 marks)

$a + b + c + 0.1 + 0.15 = 1$

$a + b + c + 0.25 = 1$

(1) $a + b + c = 0.75$

$P(S < 2) = 2P(x \geq 2)$

$a + b = 2(c + 0.1 + 0.15)$

(2) $a + b = 2c + 0.5$

(2) → (1) $2c + 0.5 + c = 0.75$

$3c = 0.25$

$c = \frac{1}{12}$

If total is 6 points

	0	1	2	3	4
0					
1					
2					x
3				x	
4			x		

$2\left(P(S=2) \times P(S=4)\right) + \left(P(S=3)\right)^2$

$2\left(\frac{1}{12} \times 0.15\right) + (0.1)^2$

$2(1/80) + 0.01$

$= \frac{7}{200} = 0.035$

$P(S = 6) = 0.035$