



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2023

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--

Mathematics

Assessment Unit AS 2

assessing

Applied Mathematics

MV18

[SMT21]

TUESDAY 30 MAY, AFTERNOON

Time

1 hour 15 minutes, plus your additional time allowance.

Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write on blank pages.

Complete in black ink only. Questions which require drawing or sketching should be completed using an HB pencil.

Candidates must answer **all** questions from sections A and B.

Equal time should be spent on each section. Show clearly the full development of your answers.

Answers without working may not gain full credit.

Answers should be given to three significant figures unless otherwise stated.

You are permitted to use a graphic or scientific calculator in this paper.

Information for Candidates

The total mark for this paper is 70. The total available mark for each section of this paper is 35.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Answers should include diagrams where appropriate and marks may be awarded for them.

Take $g = 9.8 \text{ m s}^{-2}$, unless specified otherwise.

A copy of the **Mathematical Formulae and Tables booklet** is provided.

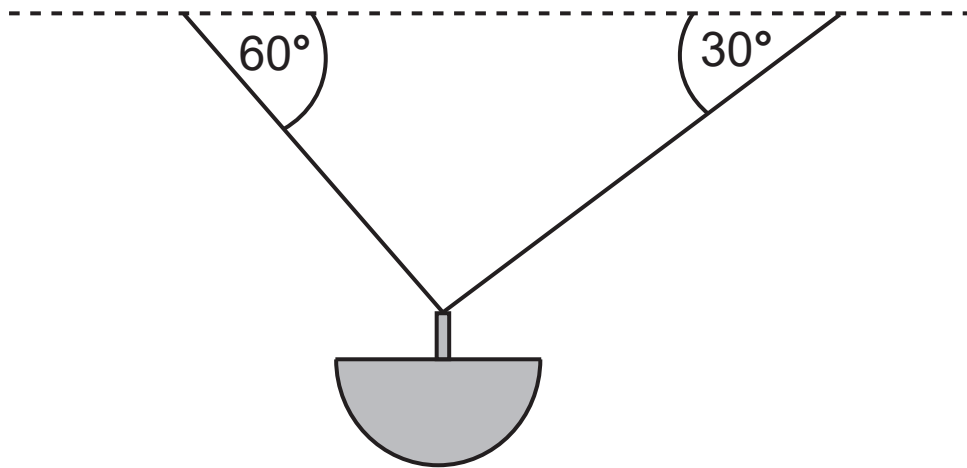
Throughout the paper the logarithmic notation used is $\ln z$ where it is noted that $\ln z \equiv \log_e z$

Blank Page
(Questions continue overleaf)

2 Fig. 1 below shows a hanging basket which is suspended by two strings.

The strings are attached to two fixed points on the same horizontal level.

Fig. 1



The basket hangs in equilibrium with the strings inclined at 60° and 30° to the horizontal.

The mass of the basket is 2 kg.

- (i) By modelling it as a particle, draw a diagram showing all the external forces acting on the hanging basket.
[2 marks]

(iii) State one further assumption you have made in modelling this situation. [1 mark]

3 A car travels along a straight horizontal road.

Its initial velocity is 15 m s^{-1}

For the first 5 seconds of its motion it accelerates uniformly at 2 m s^{-2}

For the next T seconds it travels at a constant velocity of $V\text{ m s}^{-1}$

The car then decelerates uniformly and comes to rest.

The total journey time is 60 seconds.

(i) Sketch a velocity–time graph for the whole journey of the car. [2 marks]

4 **Fig. 2** below shows two small blocks, P and Q, of masses 4 kg and 5 kg respectively.

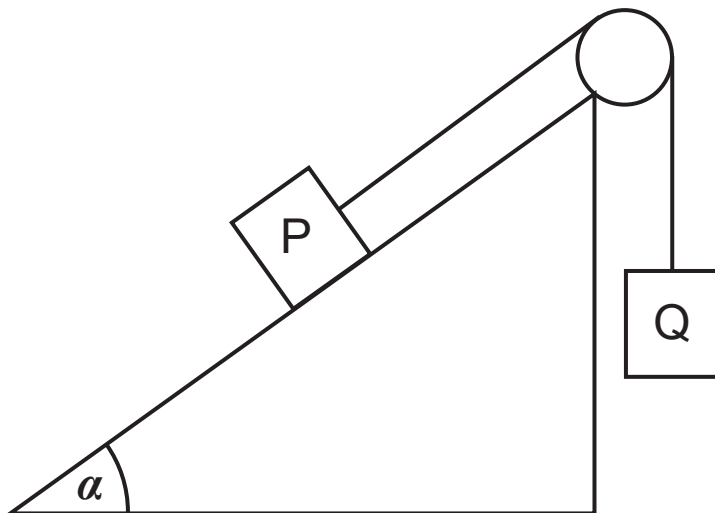
The blocks are connected by a light, inelastic string which passes over a smooth pulley fixed at the top of the plane.

P lies on a rough plane inclined to the horizontal at an angle α , where $\sin \alpha = \frac{3}{5}$

Q hangs freely below the pulley with the string taut.

The coefficient of friction between P and the plane is $\frac{1}{4}$

Fig. 2



The system is released from rest.

(i) Find the acceleration of the blocks. [8 marks]

Section B

Statistics

- 5 (i) Explain the difference between the terms population and sample. [2 marks]

In a large holiday resort, 15% of the hotels are five star, 55% are four star and the remaining hotels are three star.

A researcher wishes to estimate the average price of an overnight stay at a hotel in the holiday resort using the prices from a sample of hotels.

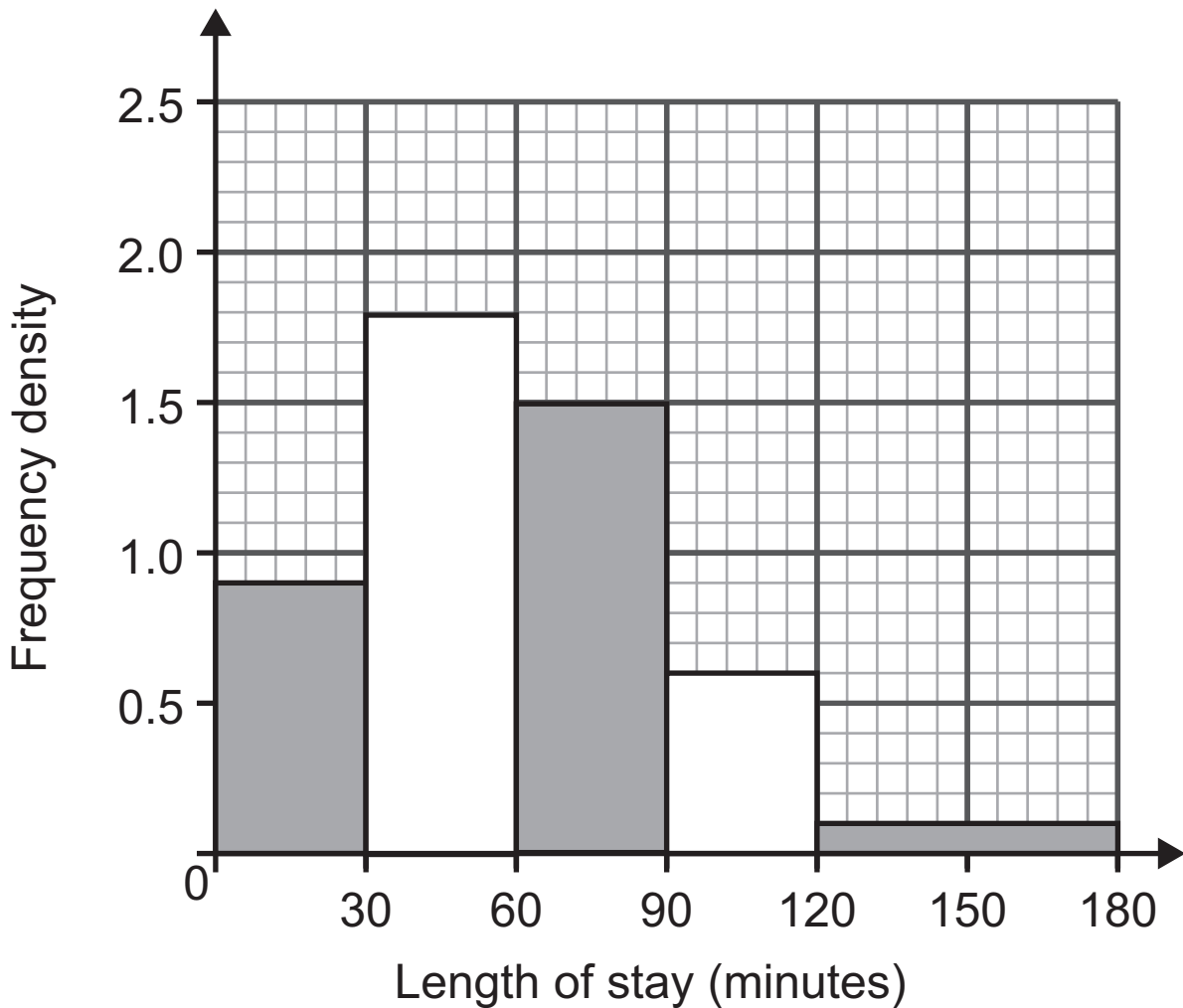
(ii) Explain why a simple random sample may not be appropriate in this context. [2 marks]

(iii) Suggest a more appropriate method of sampling. [1 mark]

- 6 On two successive Saturdays, the lengths of stay by vehicles at a shopping centre car park were recorded.

The histogram in **Fig. 3** below shows the length of stay, in minutes, by 150 vehicles on the first Saturday.

Fig. 3

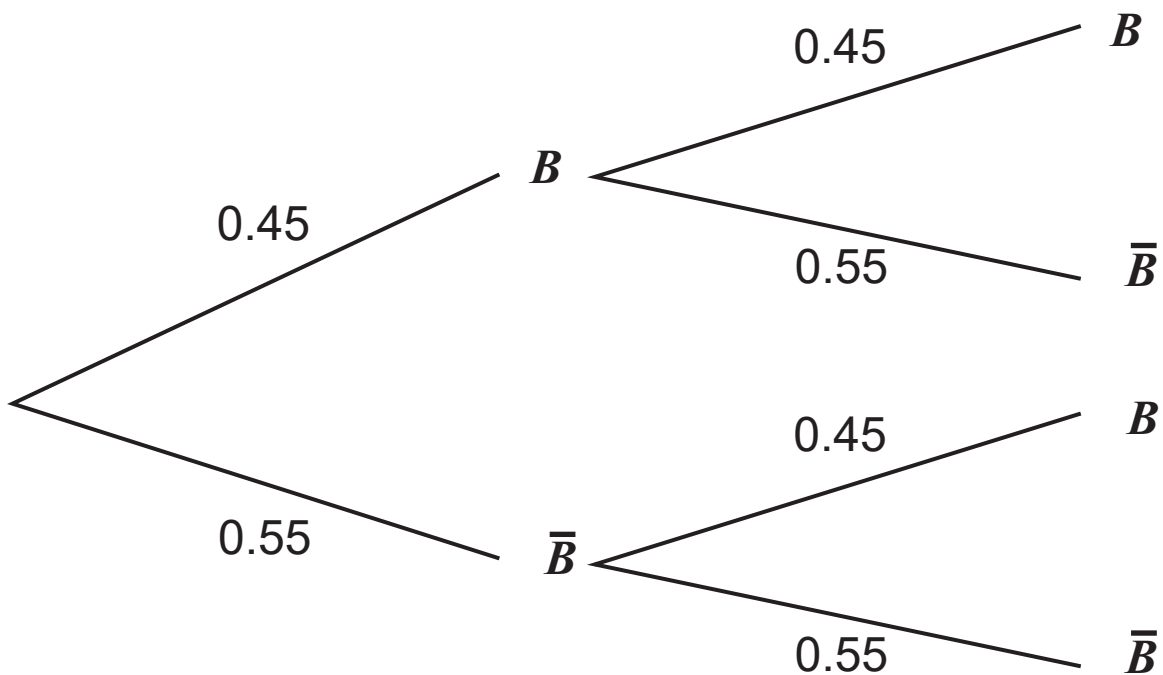


(i) Show that the mean length of stay is exactly 1 hour.
[3 marks]

- 7 From past experience, an estate agent estimates that the probability of a client making an offer to buy a property after a viewing is 0.45

The tree diagram in **Fig. 4** below shows the possible outcomes after two clients have viewed a property, where B is the event that a client makes an offer to buy the property.

Fig. 4



Using the probability distribution you identified in part (ii), calculate the probability that:

(iii) exactly 10 offers will be received; [3 marks]

(ii) Show that X and Y are not exhaustive events.
[1 mark]

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

Examiner Number

Permission to reproduce all copyright material has been applied for.
 In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.