

New
Specification



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2019

Centre Number

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Candidate Number

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Mathematics

Assessment Unit AS 2

assessing

Applied Mathematics



[SMT21]

SMT21

WEDNESDAY 22 MAY, MORNING

TIME

1 hour 15 minutes.

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 outside the boxed area on each page, on blank pages or tracing paper.

Complete in black ink only. Questions which require drawing or sketching should be completed using an HB pencil. **Do not write with a gel pen.**

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 down the right-hand side of pages 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 $\ln z \equiv \log_e z$

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24SMT2101

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[Turn over



24SMT2103

[5]

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24SMT2105

- 3 Fig. 2 below shows the velocity–time graph for an athlete running a 100 m race in 11.8 seconds.

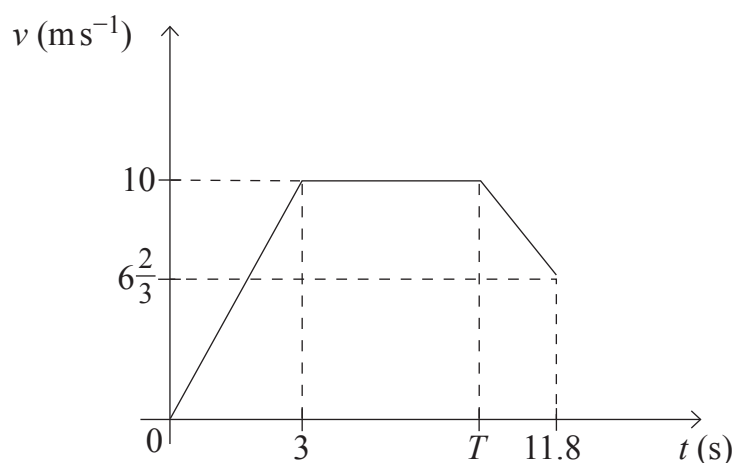


Fig. 2

- (i) Describe the motion of the athlete between $t = 0$ and $t = 3$ [1]

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The athlete starts to decelerate at time T .

- (ii) Find the value of T . [5]

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24SMT2107

- 4 **Fig. 3** below shows two boxes, A and B, connected by a rope passing over a smooth, light, fixed pulley.

Box A is held at rest on a rough horizontal table 5 m from the pulley.

Box B hangs 2.5 m vertically above the floor.

A and B have masses 8 kg and 6 kg respectively.

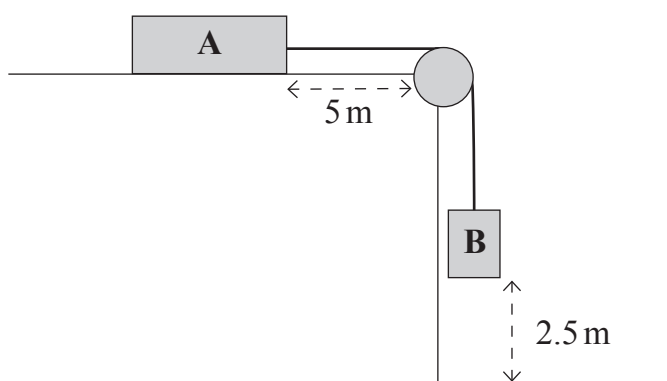
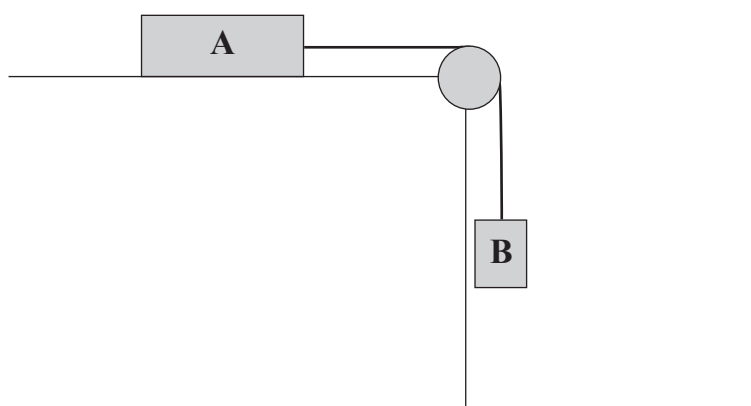


Fig. 3

Box A is released from rest.

- (i) Complete the diagram below showing all the external forces acting on A and B.

[2]



[8]

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24SMT2109

This image shows a full page of primary-ruled paper. It features ten sets of horizontal dotted lines, each set consisting of three dots spaced evenly across the width of the page. These lines are designed to help young learners practice writing letters and words correctly. The background is white, and there are no margins or additional markings on the page.

(iii) Determine whether box A will collide with the pulley.

[4]

This image shows a single sheet of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the paper.

[1]

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SECTION B

Statistics

- 5 (a) Explain the difference between a census and a sample. [2]

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- (b) A market researcher is interested to find out the opinions of nurses living in Northern Ireland.

To get a random sample, he questions women that he meets entering the Royal Victoria Hospital on a Monday morning after 9 am.

Give two reasons to explain why this sampling procedure is not satisfactory. [2]

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Outliers are defined to be more than $1.5 \times (Q_3 - Q_1)$ above Q_3 or
more than $1.5 \times (Q_3 - Q_1)$ below Q_1

(ii) Show that £374 is an outlier. [3]

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Further investigations suggested that the weekly income of £374 was recorded incorrectly and should in fact have been £347

Without carrying out any further investigation, state what effect, if any, this change would have on:

(iii) the standard deviation, [1]

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(iv) the interquartile range. [1]

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- (b) The histogram in **Fig. 4** below shows the weekly incomes, in £, of a random sample of households in a neighbourhood.

Histogram showing weekly incomes

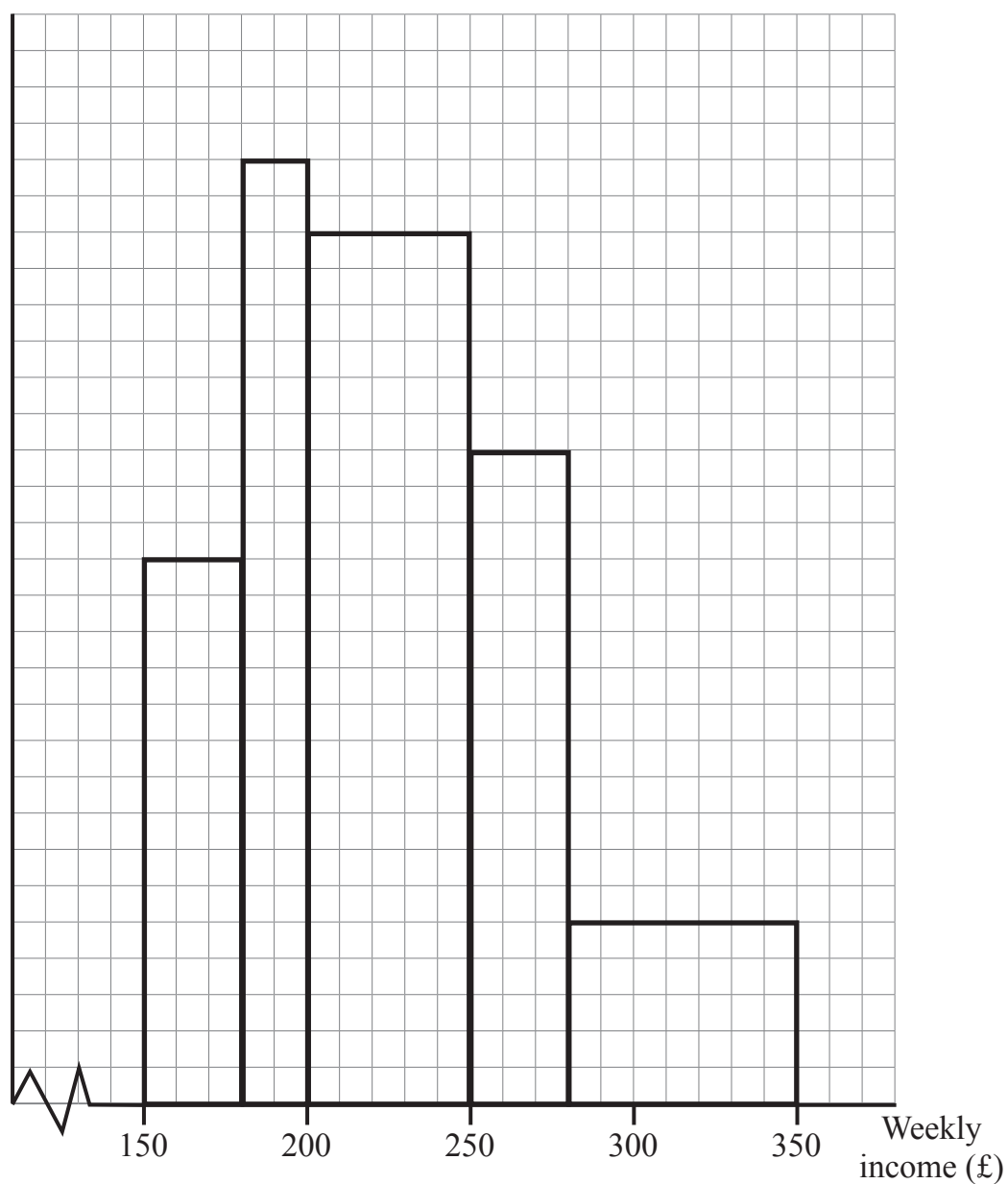


Fig. 4



(i) Complete the table below.

[1]

Weekly incomes (£)	Number of households
150 –	45
180 –	52
200 –	120
250 –	
280 –	35
350 –	0

(ii) Estimate the probability that a household chosen at random received a weekly income of more than £230 [2]

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[1]

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24SMT2119

- 8 A school sports club has 15 members. The probability of any member, chosen at random, being injured throughout the school year is p .

Let X be the random variable “the number of members injured throughout the school year”.

- (i) Find an expression, in terms of p , for $P(X = 1)$ [3]

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It is known that $P(X = 2) = 3P(X = 1)$

- (ii) Prove that $p = 0.3$ [4]

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For Examiner's use only	
Question Number	Marks
1	
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Total Marks	
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Examiner Number

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