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Examiners' report

CORE MATHS A (MEI)

H868

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Version 1

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Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers is also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

Paper 1 series overview

The majority of candidates were able to attempt all the questions and so had the opportunity to show what they could achieve.

The average mark for this paper is higher than 2019's paper. However, as they are heavily contextualised questions, it is almost impossible to compare the difficulty of specific content year on year.

The average omission rate this session is lower than the 2019 session. Question 5 (c) (ii) had the highest omission rate and was not attempted by some candidates, although it was Question 6 (a) (ii) which was found to be the most challenging.

Most candidates achieved more than half of the available marks. Conversely, only a few of the candidates scored less than a quarter of the total marks. There were not many candidates who were either inappropriately registered or inadequately prepared for the examination, as evidenced by the absence of single-digit total marks. No evidence was found to suggest that candidates were not given marks due to literacy requirements. Overall, candidates made effective use of the pre-release materials.

Overall, the least successful candidates found the questions' order of difficulty, easiest first, to be 1, 4, 7, 2, 3, 6 and 5. For the most successful the corresponding order was 1, 7, 5, 4, 2, 3 and 6.

Least successful candidates found these items of content the most challenging:

- using standard form (Questions 5 (c) (i) and (ii))
- using and interpreting a linear formula (Questions 7 (b) (i) and (ii))
- using a word formula to generate an appropriate response (Question 6 (a) (ii))
- using a logarithmic chart to solve a problem (Question 5 (b) (ii)).

This group of candidates showed competency when dealing with:

- calculating the cost of a finance-related decision in a context (Questions 1 (c) (i) and (ii))
- using a demand curve to solve a problem (Question 7 (d) (ii))
- interpreting various statistical diagrams (Questions 7 (a) (i), 4 (b) (i) and 4 (a) (i))
- representing 3-D objects in 2-D (Question 2 (c) (i)).

The most successful candidates found these items of content the most challenging:

- using a word formula subject to constraints (Question 6 (a) (ii))
- recognising the shape of a Normal frequency distribution curve (Question 6 (c) (iii))
- interpreting a complex 2-way table (Question 4 (b) (iii))
- calculating with numbers given in standard form (Question 5 (c) (ii)).

Competency was particularly evident when:

- interpreting various statistical diagrams and graphs (Questions 5 (b) (i), 4 (a) (i), 4 (b) (i) and 7 (a) (i))
- performing foreign exchange calculations and costings to make a financial decision (Questions 1 (c) (i), (ii) and (iii))
- evaluating probabilities (Questions 4 (b) (ii) and 5 (a) (i)),
- interpreting and using demand curves (Questions 7 (d) (i) and (ii)).

Overall, there were several questions where some marks could have been lost by truncating or premature rounding. The rubric on the first page does state 'Give your final answers to a degree of accuracy that is appropriate to the context'. Notably, there is an expectation that money (£s) be given correct to two decimal places.

Other instances that may result in mark loss, essentially because of less successful technique as opposed to lack of knowledge and understanding, include:

- incomplete or ambiguous crossing out of work
- incorrect use or omission of units
- digits poorly formed leading to ambiguous working and responses
- failing to read what the question is asking for; a good example of this is Question 3 (c): 'Compare this increase in wages to that of the price of bread over the same time'. To gain the final mark there must be a clear comparison stated.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• laid out responses logically and clearly in Questions 1 (b), 1 (c) (ii), 2 (b), 4 (a) (ii) and 7 (b) (i)/(ii) • showed appropriate units in the working and subsequent final response in Questions 1 (b), 2 (b) and 3 (a) • accurately completed the set of financial calculations in Question 1 (c) • interpreted the wide variety of charts, tables and graphs in Questions 2 (a), 3 (b), 4 (a) (i), 4 (b) (ii), 5 (b) (i), 6 (c) and 7 (a) • calculated probabilities involving equally likely events in Question 5 (a) (i) or relative frequency in Question 4 (b) (ii) • compared a rule against given data in Question 4 (a) (ii) • solved algebraic and worded formulae in Questions 5 (c) (i), 6 (a) (i) and (ii).	• did not consider the particular conditions existing when using the word formula in Question 6 (a) (ii) • showed little understanding of working with numbers (large and small) expressed in standard form in Questions 5 (a) (ii), 5 (b) (ii), 5 (c) (i) and 5 (c) (ii) • were unable to recall what constitutes a normal frequency distribution in Question 6 (c) (iii) • did not interpret the headings of a two-way table in Questions 4 (b) (i) and 4 (b) (iii) • could not critically evaluate the statistical chart in Question 2 (a) • unsuccessfully constructed a complete scale drawing of a 3-D object in Question 2 (c) (ii) • showed a limited understanding of the mathematics underlying indexed prices in Questions 3 (a) and 3 (b).

Question 1 (a)

1 (a) Anika has been given her grandfather's music collection of 31 classic 1980s vinyl records to sell. She finds the online selling price of each record. Her results are summarised in **Fig. 1.1**.

Estimate the value of the whole record collection. Show your calculations; you may find it useful to use the empty cells in **Fig. 1.1**. **[3]**

1(a)

Fig. 1.1

Value, £V	Number of records		
$10 \leqslant V < 50$	15		
$50 \leqslant V < 90$	4		
$90 \leqslant V < 130$	7		
$130 \leqslant V < 170$	5		
Total	31		

This was a positive start for many candidates. The least successful were able to get most of the available marks. A degree of follow-through credit was available, particularly if the interval midranges were incorrect; a common error. However, a few misunderstood what was required and clearly attempted to calculate the mean vinyl record value, thereby losing some credit.

Respond to the question set

The table in Question 1 (a) looks like the one usually used to calculate the mean of a set of grouped data, but the question did not ask candidates to calculate the mean.

Candidates need to look at column headings in a table as they may not be what they expect.

Question 1(b)

(b) One of Anika's friends sold a 1980s vinyl record to a dealer.
The dealer later sold the record for £45.60.
This was a profit of 50% on what the dealer paid Anika's friend.
Anika did a calculation and said that the dealer must have paid her friend £22.80.

Check if Anika was correct. **[4]**

Performance on this question was generally split into two groups: the majority with full credit and a small minority gaining no credit.

There were two valid ways to the solution. The first, using reverse percentages to calculate what Anika's friend should have been paid. The second, using Anika's answer to show that it did not fit the given information. The first was the most popular. In several instances this was then used to show that it fitted the given data as an extra step.

Many candidates had a careless attitude to units of money and money notation in general; examples included £4.5, 4.5, 4.50, £4.50p.

Question 1(c) (i)

(c) Anika receives two offers from online dealers.

- UK dealer: £1850
  They will collect, so Anika will not have to pay any postage.
- Canadian dealer: 3600 Canadian dollars (CAD)
  Anika's bank will change the CAD into £s at an exchange rate of £0.5579 for 1 CAD. The bank will charge Anika a handling fee of £7.

(i) How much, in £s, will the 3600 CAD be worth to Anika once it is transferred into her bank account? **[2]**

A well answered question, with almost all candidates gaining at least 1 or more marks. The principal error involved omitting the £7 handling fee or, in a few cases, adding it to the converted currency. This suggests some insecurity in the practicalities of currency conversion.

Question 1(c) (ii)

Anika collects some information about the cost of sending the 31 records to Canada.

- A typical vinyl record weighs 135 g.
- Each record is in a sleeve typically weighing 100 g.
- Air freight insurance costs a total of £80.
- The air freight cost of sending a box big enough for all the records is shown in this table.

Weight (kg) up to …	6.0	7.0	8.0	9.0	10.0	11.0	12.0
Cost (£)	108.35	112.75	121.55	130.35	139.35	145.95	152.75

(ii) How much will it cost, including insurance, to air freight the 31 records to Canada? **[4]**

Most candidates were able to gain some marks for this question. The most common error was not recognising that total weight had to be rounded up to read the table of insurance costs.

Question 1(c) (iii)

(iii) Which is the better deal for Anika, the UK or the Canadian dealer?
Justify your decision. **[2]**

Most candidates gained full marks in this question. There was a full follow-through from Questions 1 (c) (i) and (c) (ii). Nevertheless, a few were confused about who made a profit or loss based on the respective outgoings and incomings and were not confident in judging which was the better deal for Anika.

Profit, loss or break even

Some candidates would benefit from further practice on making decisions about profit and loss, such as the example below.

Example

Pat started a small business selling handmade jewellery. £200 was spent on materials and she dedicated 20 hours at an estimated £10 an hour to create a collection of upmarket necklaces and earrings. Pat sold each necklace for £30 and each pair of earrings for £15.

However, the business was not as successful as she had hoped. Only 10 necklaces and 20 pairs of earrings were sold. Pat realised prices charged were too low and did not cover all the costs.

To make matters worse, Pat incurred additional expenses of £50 for packaging and electricity. After some calculation, Pat found that the actual cost per necklace, including time, was £25, and the cost per pair of earrings was £10.

Pat wants to sell the remaining items of jewellery, but wants to avoid incurring further losses, so decides to offer a discount of 30% on the original prices for the remaining necklaces and earrings.

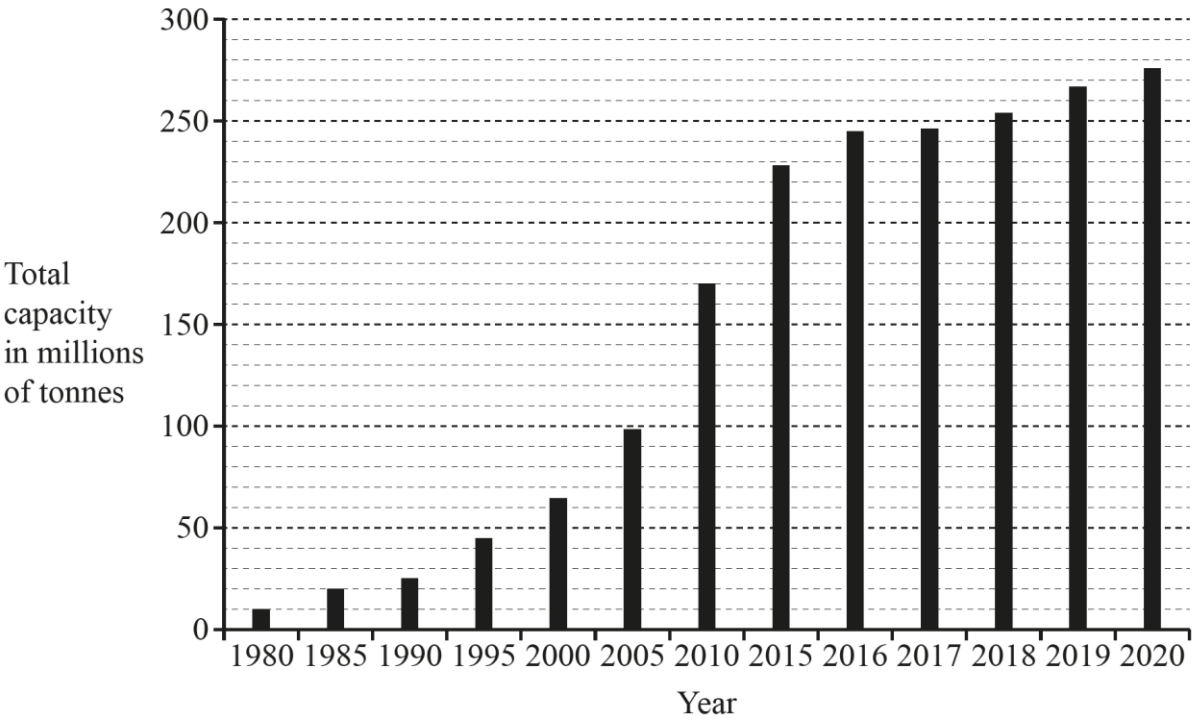
1. How much profit or loss did Pat incur from the initial sale of 10 necklaces and 20 pairs of earrings?
2. What is the revised selling price of the remaining necklaces and earrings after applying the 30% discount?
3. If Pat manages to sell all the remaining items, how much profit or loss will she make in total?

Question 2 (a)

2 This question refers to article A in the pre-release material, 'Containers'. You can find the article on the insert accompanying this paper.

(a) A TV programme shows a vertical line chart in **Fig. 2.1** for total global container capacity for 1980 to 2020. It is misleading.

Fig. 2.1



The chart in **Fig. 2.1** is used on the TV programme to conclude that the growth of global capacity has slowed considerably since 2015.

State **one** feature of the chart which makes this a false conclusion. **[1]**

Many candidates achieved success with this question; with only a few not gaining any marks. Most incorrect responses assumed that there was an error with the *y*-axis; a common response in questions of this type.

Question 2 (b)

(b) Use the information in the box below to check this statement.

"A TEU container can hold over £12 million worth of smart phones."

Show your method and state any assumptions you might make. **[5]**

Typical relevant values are:

- Internal dimensions of a TEU container **in metres** are 5.9 by 2.4 by 2.3.
- The price of a new smart phone is £330.
- Each smart phone is contained in a box. The box measures, **in centimetres**, 15 by 9 by 8.

Some candidates were given full marks for this question and most scored some marks. The relatively low omission rate was encouraging. Several approaches were possible and worthy of credit. Follow-through credit was available at various stages of the solution.

The first stumbling block, apparent in a small number of cases, was not working in the same volume units for both the phone packages and the container. Although the numbers involved could not be termed every day, some candidates, on getting answers in the billions or even more, restarted their calculations. This was very encouraging. Nevertheless, there were instances of ambiguous or absence of crossing out so the final method employed was difficult to determine.

Some credit was lost by stating irrelevant assumptions for the final part of the question.

Exemplar 1

TEV = 590cm x 240cm x 230cm

590 ÷ 15 = 39 boxes

240 ÷ 9 = 26 boxes ~~26 x 330 = 8580~~

230 ÷ 8 = 28 boxes

39 x 26 x 28 = 28392 28392 x 330 = £9,369,360

The statement is false,

Assumptions:

- All the smartphones are new.
- The smartphones are only stacked on top of eachother.

This is a well-presented and easy to follow response.

The candidate uses the 'fitting in' or 'box-length' approach with some effect.

The first four lines make it clear that the same metric units, in this case centimetres, are used and the first mark is given.

Although 590 ÷ 15 is not 39 the tag 'boxes' makes the meaning clear that the candidate is using box-lengths and so needs to round down. This together with the correct figure for the total number of boxes gains a further two marks.

The correct value calculated from the product of £330 and 28 392 gains a mark.

The final mark for assumptions is not given as 'stacked on top of each other' is not regarded as giving sufficient detail; stacked on top of each other in the same way is deemed sufficient.

Use of common units in measurement calculations

Responses to questions involving different measurements benefit from clear communication of the units of measurement being used. Writing down the units of measure in the workings helps candidates to reflect on what is being worked out and prompts consistency of units in their calculation. An example practice question is provided below.

Example

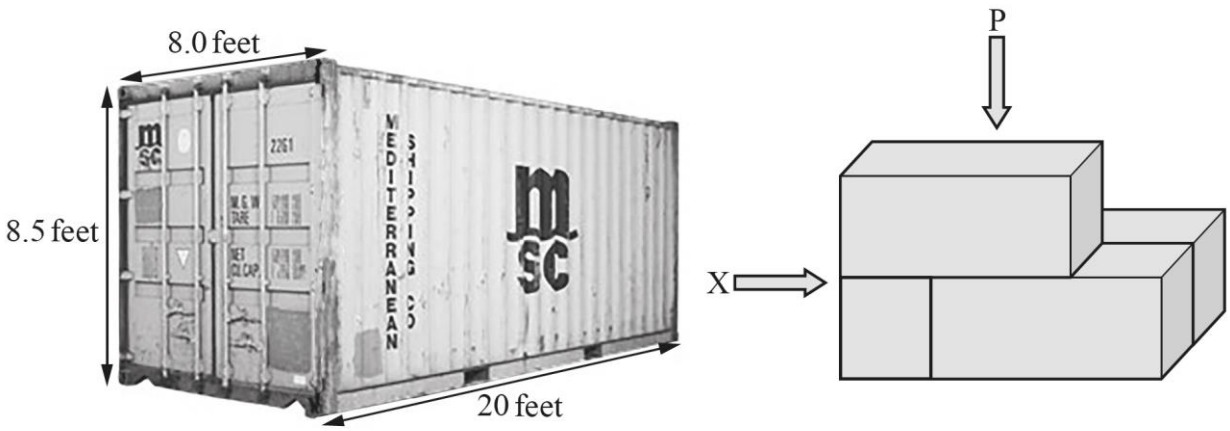
A metal tank is in the shape of a cuboid.
Its inside dimensions are 1.5 m by 500 mm by 20 cm.

How many litres of water can the full tank hold?
(1 litre = 1000 cm^3)

Question 2 (c) (i)

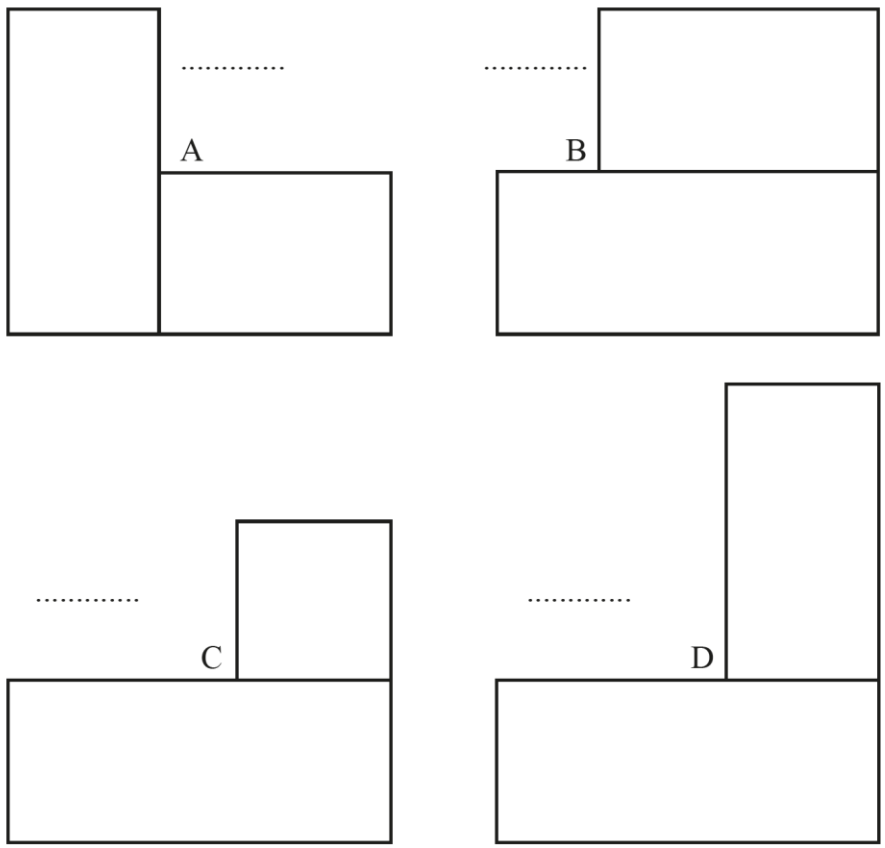
(c) **Fig. 2.2** shows a TEU container and a drawing of an emergency shelter made from 4 of these containers. The dimensions of each of the containers, in feet, is $20 \times 8 \times 8.5$.

Fig. 2.2



(i) Tick the correct view, A, B, C or D, looking sideways in the direction along X. **[1]**

2(c)(i)

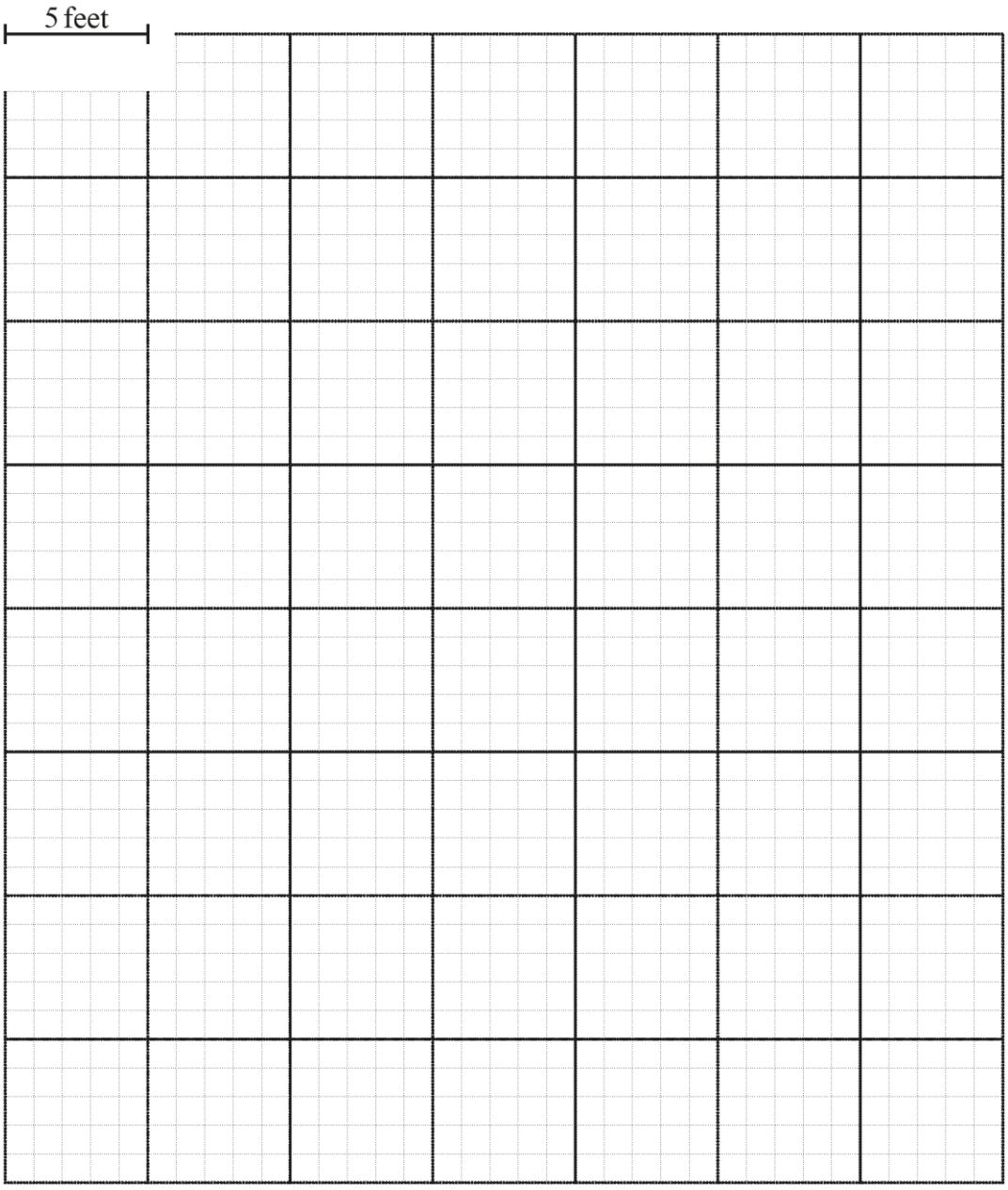


A well answered question, which was accessible to almost all candidates. Drawing B was by far the most common incorrect choice.

Question 2 (c) (ii)

(ii) Make a scale drawing of the plan (looking down, along direction P) on this grid. Remember lengths are given in feet. **[3]**

2(c)(ii)



Only a few candidates gained full marks but most scored some marks. A small number only drew the correct outline with no internal edges; some marks were given for this.

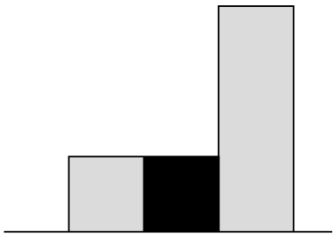
Plans and elevations

Some candidates would benefit from further practice of working with 2D representations of 3D objects, such as the example below.

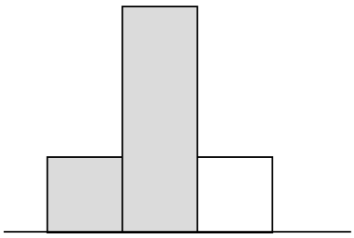
Example

Some cuboids measure 5 cm by 5 cm by 15 cm, 5 cm by 5 cm by 5 cm and 5 cm by 5 cm by 10 cm. Each size cuboid is a different colour.

These views show **four** such cuboids joined together to make a solid.



Front view



Side view

Draw, to scale, at least one possible plan view.

Question 3 (a)

3 Bread prices are used by historians investigating living conditions in the past.

The table shows the indexed mean bread prices in London every ten years since 1600.

- The mean price in 1600, 0.74 p in today's currency, has index value 100.
- All the indexed prices have been calculated for the equivalent of an 800 gram, uncut loaf.

Year	Index	Year	Index	Year	Index	Year	Index	Year	Index
1600	100	1700	129	1800	351	1900	129	2000	9434
1610	104	1710	228	1810	328	1910	147	2010	16308
1620	83	1720	127	1820	234	1920	299	2020	14556
1630	124	1730	122	1830	261	1930	211		
1640	97	1740	174	1840	249	1940	199		
1650	236	1750	117	1850	169	1950	311		
1660	179	1760	126	1860	219	1960	674		
1670	137	1770	149	1870	199	1970	1213		
1680	132	1780	174	1880	174	1980	4987		
1690	117	1790	166	1890	149	1990	8760		

(a) What would have been the price of an 800 gram loaf of bread in 1700?
Give your answer in today's currency, correct to **2** sf. **[2]**

While some candidates gained full marks, the remaining candidates were split evenly into those who gained no credit or those who gained partial credit. The cause of the latter was often the result of omitting monetary units or using the wrong ones, for example £0.95 or 95 rather than 0.95p.

Question 3 (b)

(b) Describe **two** important features about how the price of bread varied from 1600 to 2020. **[2]**

Most candidates were given full marks for this question but it was more challenging for the less able candidates. In common with past questions of this type, many candidates did not think in terms of general trends but concentrated on particular values by decade. This did not always gain credit. A noticeable proportion gave economic or social reasons such as inflation, social conditions etc., rather than how the price of bread varied.

Question 3 (c)

(c) In 1920 the typical wage in London was £4.56 per week.
In 1970 this had risen to £20.77. This was an increase of just over $4\frac{1}{2}$ times.

Compare this increase in wages to that of the price of bread over the same time. **[3]**

This question produced a wide range of responses, with most achieving some marks. There were several different acceptable routes to the solution. As might have been expected, the less able candidates found this item challenging but many did score some marks.

Most candidates used the indexes to calculate the actual bread prices with mixed success. Most problems originated in the careless use of monetary units. This generally resulted in prices two orders of magnitude too large. There was little evidence that this triggered any checking by candidates. Comparing using solely the index numbers was only seen with more successful candidates who could confidently interpret and use indexes.

Several candidates did not complete the request to 'compare' wage and bread price increases.

Percentage change

Percentage change questions can arise in a variety of contexts, including index numbers. It is useful for candidates to explore the link between percentage change and 'times bigger'; see examples below.

Examples

Doubling £3 to £6 is a percentage change of what?

What percentage change will increase the size of something $4\frac{1}{2}$ times?

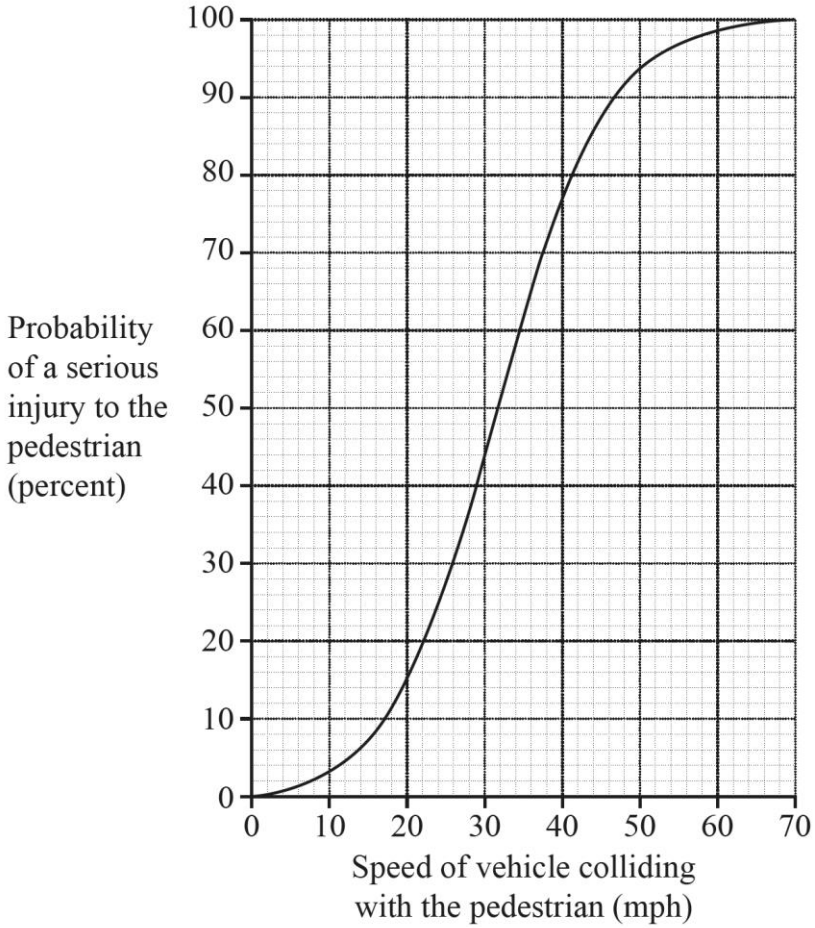
Since the 1980s the price of cinema tickets has increased by 1700%.
By how many times have cinema tickets prices increased since the 1980s?

Question 4 (a) (i)

4 This question refers to article B in the pre-release material, "Pedestrian accidents". You can find the article on the insert accompanying this paper.

(a) **Fig. 4.1** illustrates the probability of serious injury to pedestrians involved in road accidents with vehicles travelling at different speeds.

Fig. 4.1



(i) At what collision speed is the probability of a serious pedestrian injury 60%? **[1]**

This was a question that virtually all candidates answered successfully. The most common error was to read the axes the wrong way round.

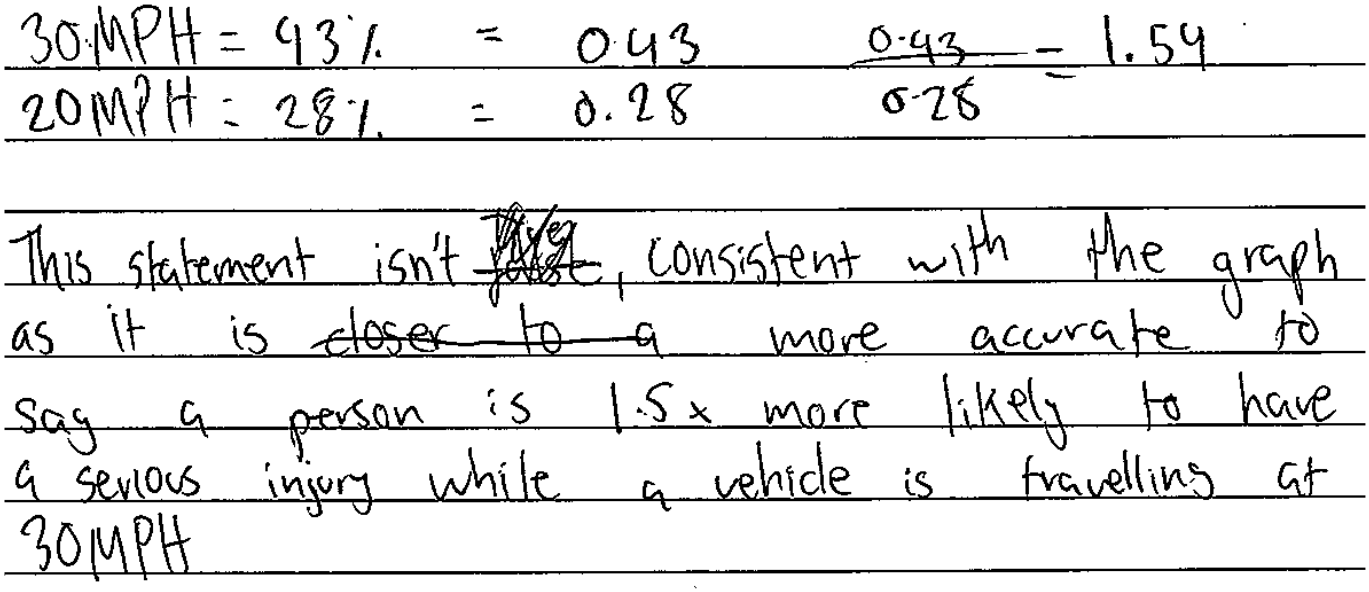
Question 4 (a) (ii)

(ii) It has been suggested that in an accident in which the vehicle is travelling at 30 mph, the pedestrian is 3 times as likely to have a serious injury as in one with a vehicle speed of 20 mph.

Is this suggestion consistent with the data used for the graph in **Fig. 4.1**? **[4]**

Most candidates gained at least half the marks available for this question. A few had difficulties interpreting the graph in Fig. 4.1 to accurately determine the respective probabilities. Candidates' probabilities and their resulting ratio were followed through, allowing them the chance to gain marks for making a judgement.

Exemplar 2



In this response the candidate initially misreads the chart in Fig. 4.1. They are therefore unable to get the first 2 marks. However, some marks are available for following these figures through. The candidate's two probabilities give, for them, a correct factor of 1.54. This follow-through gains a mark. An additional mark is given by the clearly stated comments comparing the figure of 1.54 with the suggested figure of '3 times'.

Question 4 (b) (i)

(b) In Bristol, pedestrian road accident records before and after installation of 20 mph zones in seven regions were analysed. **Fig. 4.2** shows the results for one of these regions.

(i) Complete the cells in **Fig. 4.2** for the mean annual number of injuries after the 20 mph speed limit was imposed. **[2]**

4(b)(i)

Fig. 4.2

Type of injury	72 months before the 20 mph speed limit imposed		36 months after the 20 mph speed limit imposed	
	Number of injuries	Mean annual number of injuries	Number of injuries	Mean annual number of injuries
Serious	243	40.5	109	.....
Slight	1849	308.2	753	.....
Total	2092	348.7	862	287.3

A well answered question. Only a few candidates were unable to get full marks.

Question 4 (b) (ii)

(ii) Data in **Fig. 4.2** show that if there was an accident **before** the 20 mph speed limit was imposed the probability that it was serious was 0.116 correct to 3 dp.

Show that the corresponding probability was 0.126 **after** the 20 mph speed limit was imposed. **[2]**

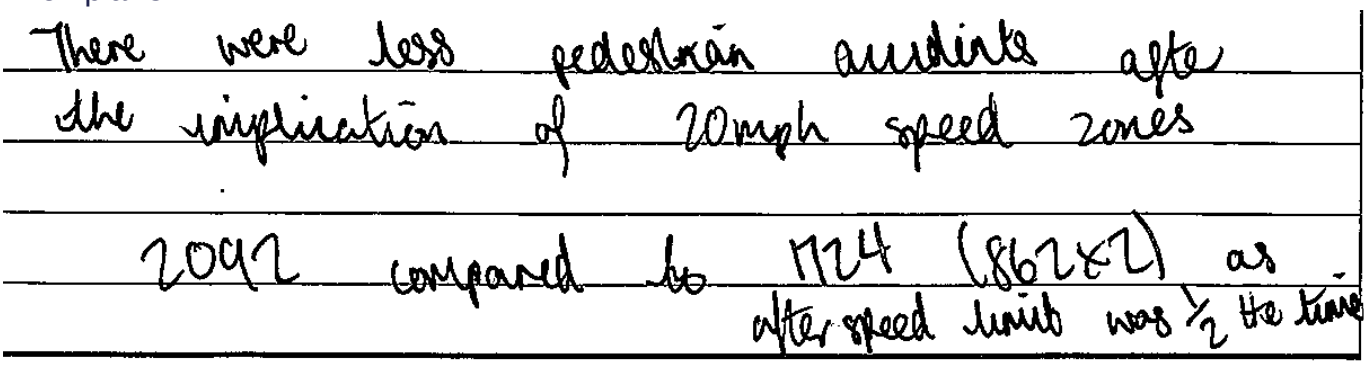
Most candidates were successful, but the question was not attempted by some candidates. This question had one of the highest omit rates in the paper. From the incorrect responses, a few thought an involved probability calculation was expected. A strong hint to use Fig. 4.2 was given in the instructions.

Question 4 (b) (iii)

(iii) Make **one** comparison, supported by numbers, for pedestrian accidents before and after the installation of the 20 mph speed zones. **[1]**

Many candidates found this question a challenge. They did not realise the crucial difference between the different time periods; 72 months and 36 months for each experimental period. Very few candidates applied the appropriate scale factor. Most of those who gained marks used the 'mean number of injuries' or their difference from the table to make a comparison.

Exemplar 3



Many candidates incorrectly compared the injury figures for 72 months with those for 36 months; choosing not to use the mean annual number of injuries for each case.

This response adjusts for the two different time periods and gains full marks. It is direct and easy to read.

Question 5 (a) (i)

5 This question refers to article C in the pre-release material, "Passwords". You can find the article on the insert accompanying this paper.

(a) Using only the 26 upper case letters, 308 915 776 different 6-letter passwords are possible.

(i) What is the probability of guessing correctly, on first try, a 6-letter password made from the 26 upper case letters? Give your answer as a fraction. **[1]**

Overall, many candidates were successful in this question. A common error was to multiply the correct answer by 6, possibly because it was a 6-lettered password.

Question 5 (a) (ii)

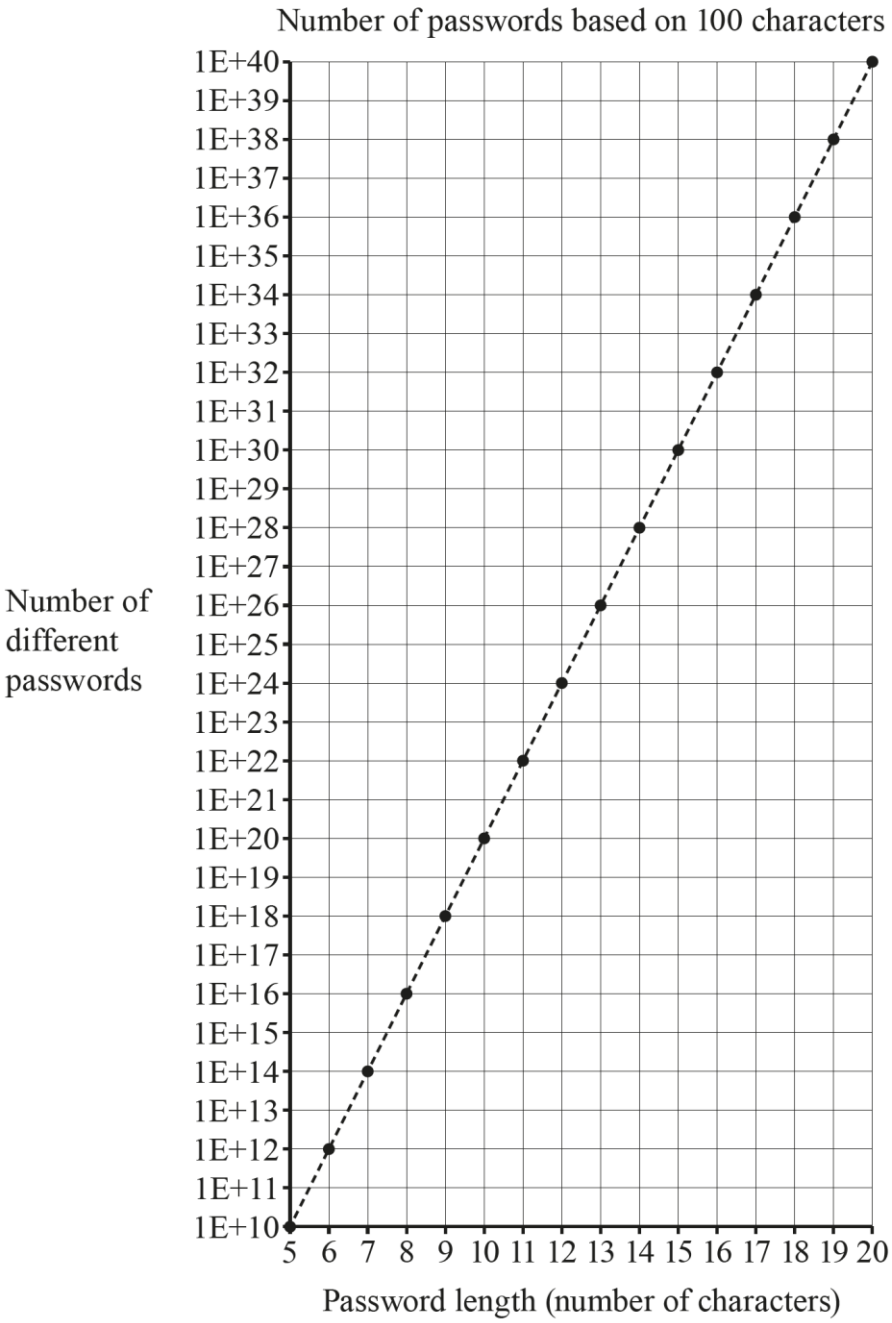
(ii) When the number 308 915 776 is written in standard form, correct to 1 significant figure, the answer is 3×10^n.

Write down the value of n. **[1]**

Only a few candidates found this question too challenging. The most common error involved miscounting the number of digits in the given large number when converting to standard form.

Question 5 (b) (i)

(b) A typical PC keyboard can produce 100 different characters.
The graph shows the number of passwords of different lengths which can be made from 100 characters.



(i) How many different 9-character passwords can be made from 100 characters?
Give your answer in standard form. **[1]**

Most candidates were successful in this question. Calculator/spreadsheet notation for standard form, 1E+18, was acceptable. For some, handling numbers in standard form solely on a calculator was a challenge.

Question 5 (b) (ii)

(ii) What password length will give a million times more different passwords than your answer to **part (b)(i)**? **[2]**

Many candidates gained full marks for this question although some did not gain any marks. The question was particularly challenging for the least successful candidates.

Question 5 (c) (i)

(c) An approximate rule for calculating the time it takes the latest super-computer to generate and test x passwords is

$8 \times 10^{-19} \times x$ years.

(i) Use this rule and the graph opposite to calculate how many years it would take to generate and test all the 20-character passwords based on 100 different characters. Give your answer in standard form. **[2]**

This question was difficult for most candidates, with a few not attempting it and some not getting any marks. This may well have been due to its algebraic appearance. The question has a high level of demand and was aimed at the most successful candidates.

Question 5 (c) (ii)

(ii) How many times more is your answer to **part (c)(i)** than the age of the Universe? The age of the Universe is 13.8 billion years. (A billion is 10^9.) **[1]**

This question had the highest omission rate in the paper, with many candidates not scoring the mark. Many candidates who had used a scientific calculator to give calculator format responses in other questions appeared to find this question difficult.

Standard form notation

It is beneficial for candidates to have experienced using standard form in spreadsheet format, such as the example below.

Example

Here is a screen dump of a spreadsheet.

Columns A and B contain numbers in standard form.

Columns C, D and E contain formulae that have been copied down from C1, D1 and E1 to C3, D3 and E3 respectively.

	A	B	C	D	E
1	4.00E+08	2.00E-05	2.00E+13	8.00E+03	5.00E-14
2	8.00E-05	4.00E-05	2.00E+00	3.20E-09	5.00E-01
3	2.00E+05	5.00E-07	4.00E+11	1.00E-01	2.50E-12
4					

Find the formulae in each of C2, D2 and E2.

Use a calculator to check your answers.

Question 6 (a) (i)

6 This question refers to article D in the pre-release material, "Using indicators". You can find the article on the insert accompanying this paper.

(a) The educational opportunity indicator is the mean of these two indicators:

- Expected years of school attendance indicator.
- Expected years of schooling available indicator.

Fig. 6.1 shows the set global values and the actual values of these features for Australia.

Fig. 6.1

Feature	Set global feature values		Feature value for Australia
	minimum	maximum	
Expected years of school attendance	0	15	12.7
Expected years of schooling available	0	18	22.0

(i) Calculate the expected years of school attendance indicator for Australia. **[2]**

Most candidates gained full marks with only a few not gaining any marks. Forming the arithmetic expression for the indicator was rarely problematic, but many responses were incorrectly rounded or in some cases simply truncated.

Question 6 (a) (ii)

(ii) Calculate the expected years of schooling available indicator for Australia. **[1]**

This question was omitted by some candidates and only a few were successful. Many candidates did not realise that this was an instance of the indicator being capped at 1 (specific reference was made to this in the pre-release material).

Question 6 (a) (iii)

(iii) The indicator for educational opportunity is the mean of the expected years of school attendance indicator and the expected years schooling available indicator.

Calculate the indicator for educational opportunity for Australia. **[1]**

Full marks were gained by many candidates. There was a full follow-through based on responses to Questions 6 (a) (i) and 6 (a) (ii). Most errors involved arithmetic slips in finding the mean of these two indicators. This question had one of the highest omit rates on the paper.

Question 6 (b) (i)

(b) The United Nations (UN) publish a spreadsheet giving the indicators for educational opportunity for 189 countries. A student wants to find the mean and median educational opportunity indicators for the countries in the spreadsheet.
The student inserts rows 192 and 193 into the UN spreadsheet, as shown in **Fig. 6.2**.

Fig. 6.2

	A	B
1	**Country**	**2019**
2	Afghanistan	0.414
3	Albania	0.746
188	Yemen	0.350
189	Zambia	0.557
190	Zimbabwe	0.587
191		
192	mean	11.282
193	median	0.682

(i) Which of their results, in cells B192 and B193, obviously wrong and why? **[2]**

Although many candidates gained some marks, only some were fully successful. The most common error was to assume the judgement was to be based on the five values shown in Fig. 6.2, with no reference to the fact that the indicator must be between 0 and 1 (specific reference was made to this in the pre-release material).

Question 6 (b) (ii)

(ii) **Fig. 6.3** shows the coding the student uses to find the mean and median of the indicators for educational opportunity for the 189 countries.

Fig. 6.3

191		
192	mean	=AVERAGE(B1:B190)
193	median	=MEDIAN(B2:B190)

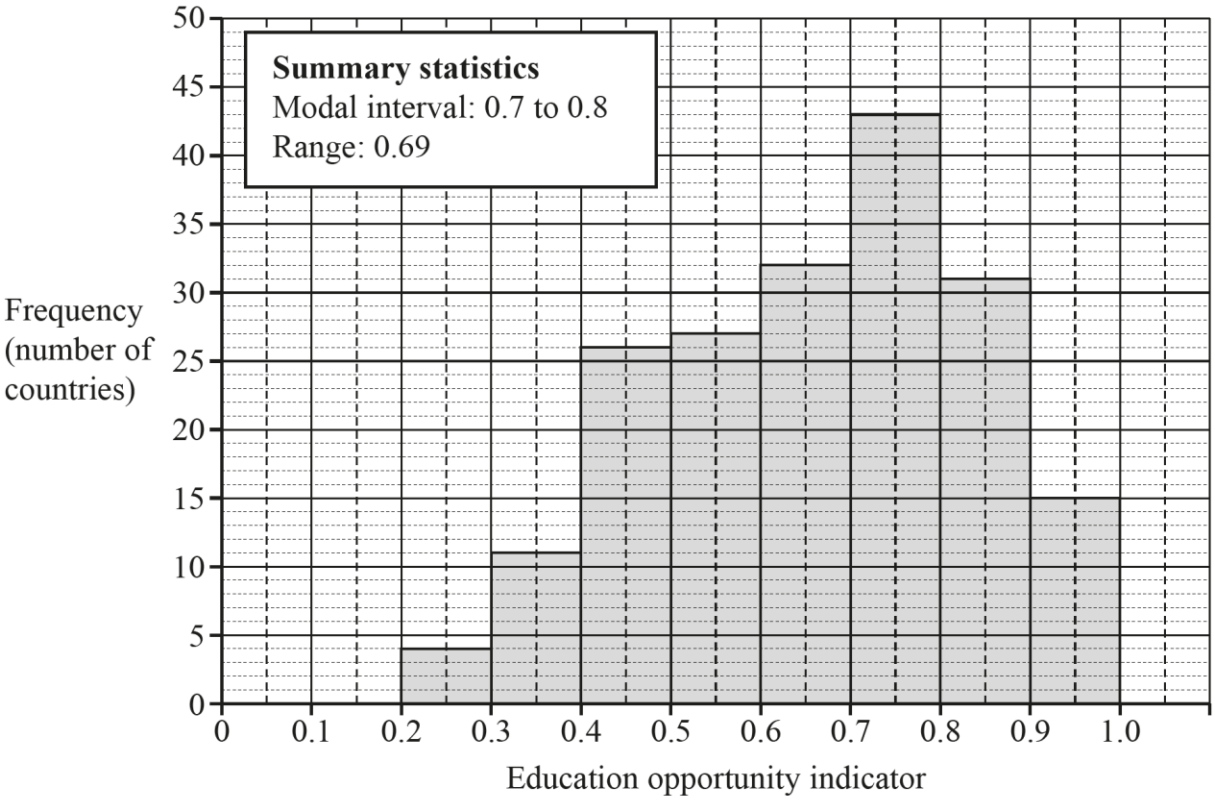
The student has made a mistake, write the corrected coding below. **[1]**

Most candidates were successful with this question. Although most realised that the range, B1:B190, should have been B2:B190, marks were lost by omitting the = or changing AVERAGE to MEAN. Alternative valid formulae such as '=SUM(B2:B190)/189' were worthy of credit too.

Question 6 (c) (i)

(c) The grouped frequency chart in **Fig. 6.4** shows the education opportunity indicators for the 189 countries, together with some summary statistics.

Fig. 6.4



(i) 31 countries have an education opportunity indicator 0.8 or more but less than 0.9.

How many countries have an education opportunity indicator of 0.8 or more? **[1]**

This was a well answered question; many candidates were successful. Errors usually arose from candidates' confusion as to the start and finish of intervals. Although, a worked example was given in the instructions to clarify this.

Question 6 (c) (ii)

(ii) How many countries have an education opportunity indicator less than 0.4? **[1]**

Most candidates found this question accessible and were successful.

Question 6 (c) (iii)

(iii) Give one reason for stating that education opportunity indicators are not Normally distributed. **[1]**

Only a few candidates were successful with this question. Some candidates did not attempt it. Most incorrect responses cited inequalities in educational opportunities rather than commenting on the actual shape of the grouped frequency chart.

Question 7 (a) (i)

7 A company has a large number of vending machines selling 5 different snacks.
One of them is a low-fat bar but it does not sell as well as the other snacks.

The company want to know whether the poor sales of the low-fat bar are because of its price or because customers just don't like it.

As a test they reduce the price of the low-fat bar by various amounts in some of their vending machines. The results are shown below.

(a) (i) What is the percentage of low-fat bar sales at the original price? **[1]**

This question was accessible to almost all candidates. Incorrect responses did not follow any discernible pattern, but generally seemed to involve adding the results from two or three bars.

Question 7 (a) (ii)

(ii) Find the increase in the percentage of low-fat bar sales at a price of £1.30 compared to at a price of £2. **[1]**

Most candidates were successful in this question. Rather than finding the increase in the percentage of low-fat bars, unsuccessful attempts were made to calculate the percentage increase in sales between £2 and £1.30 low-fat bars.

Question 7 (b) (i)

(b) The results are plotted on a scatter diagram and a line of best fit is drawn by eye.
It has the equation $s = 31 - 10p$, where
s is the percentage of low-fat bars sold and
p is the price, in £, of low-fat bars.

(i) Calculate the price of low-fat bars which would be expected to give sales of 20%. **[3]**

While most candidates gained full marks, a few who attempted the question did not get any marks.

Question 7 (b) (ii)

(ii) Calculate what the equation predicts for sales of low-fat bars priced at £3.10. **[2]**

Only a few candidates did not get any marks, while many got full marks. In common with Question 7 (b) (i), logically presented algebraic working was not always evident. However, candidates did not seem concerned about stating zero sales as the correct answer.

Question 7 (c)

(c) Reducing the price of low-fat bars by 50% reduces the average monthly profits of a vending machine from £498 to £480.

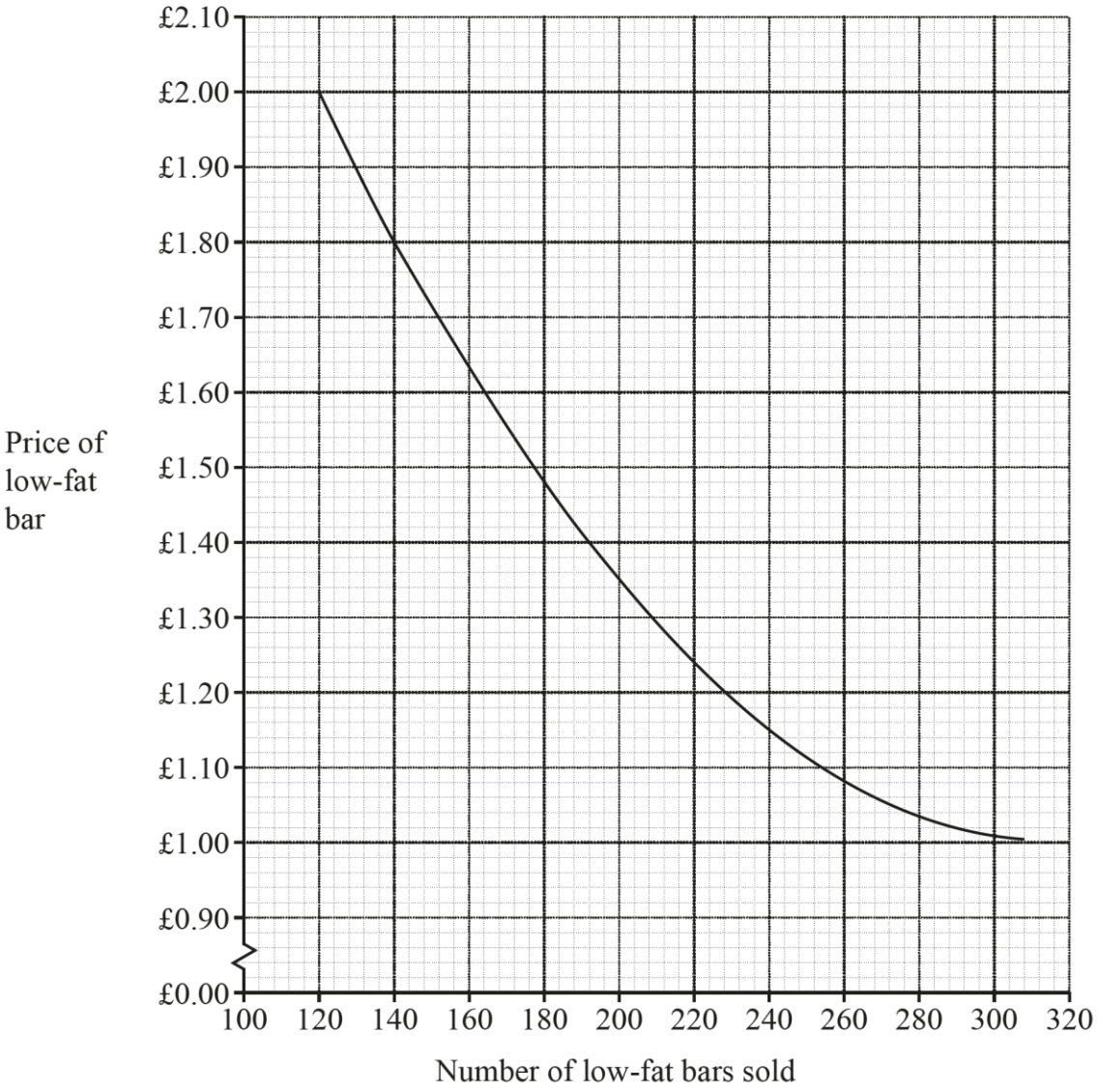
The percentage drop in profit is $\frac{498-480}{498} \times 100$.

Without using a calculator, calculate an estimate for the answer to the calculation.
Show all the steps in your estimation. **[2]**

Most candidates achieved full marks. Those that got only 1 mark tended not to recall that the calculation gave a percentage value of 4 not 0.04. There were rare instances of obvious calculator use; these gained no marks.

Question 7 (d) (i)

(d) Given the possible drop in profit, the company carry out a more thorough investigation of the sales of low-fat bars for different prices.
They produce the demand curve shown below.



(i) How many low-fat bars does the demand curve predict will be sold at £1.60? **[1]**

Most candidates, including the least successful, were able to interpret the demand curve.

Question 7 (d) (ii)

(ii) The original price of the low-fat bars is £2.
What price would double the number of sales made at the original price? **[2]**

Most candidates gained at least 1 mark or better. The item was accessible to most of the least successful candidates. Errors tended to involve inaccurately reading the demand curve. In such cases, '2 x 120 = 240' seen or implied would have resulted in 1 of the 2 available marks being given.

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