OCR
Oxford Cambridge and RSA

Wednesday 8 June 2022 – Afternoon

Level 3 Certificate Core Maths A (MEI)

H868/02 Critical Maths

Time allowed: 2 hours

You must have:
- the Insert (inside this document)

You can use:
- a scientific or graphical calculator

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working.
- Give your final answers to a degree of accuracy that is appropriate to the context.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- This document has **20** pages.

ADVICE
- Read each question carefully before you start your answer.

Answer **all** the questions.

1 The two charts below show the percentage of people in different age groups who suffer from illnesses that limit their daily activities.
These are called 'disabling illnesses'.

Fig. 1.1 and **Fig. 1.2** show exactly the same data but using different types of chart.

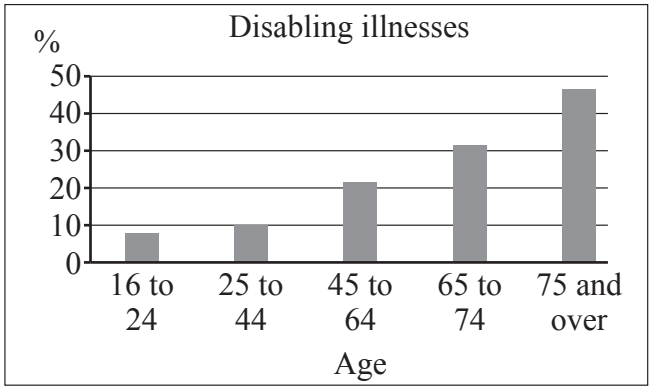


Fig. 1.1

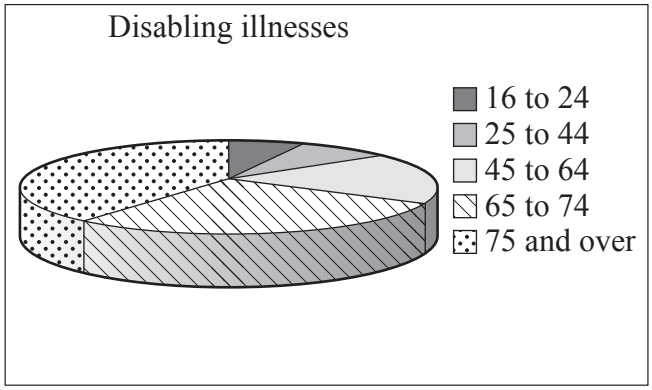


Fig. 1.2

(a) Give **two** reasons why **Fig. 1.1** presents the data more clearly than **Fig. 1.2**. **[2]**

1(a)	**First reason**
	Second reason

(b) Chronic illnesses are illnesses which go on for a long time.

Fig. 1.3 shows the percentages of 16- to 24-year-olds and 65- to 74-year-olds who reported suffering from chronic illnesses and disabling illnesses.

Age	Chronic illness (%)	Disabling illness (%)
16 to 24	15	8
65 to 74	57	32

Fig. 1.3

Older people have an increased risk of suffering from chronic illnesses.
The increase in the risk can be described in two ways.

For chronic illnesses, the proportion of 65- to 74-year-olds is

- 42 percentage points more than for 16- to 24-year-olds
- 280% more than for 16- to 24-year-olds

Calculate the change in the proportions suffering from disabling illnesses in the same two ways. **[3]**

1(b)	**Percentage point increase**
	Percentage increase

2 The percentages by age of two different groups are shown in **Fig. 2**.

- The UK adult population
- The customers of a particular online shop

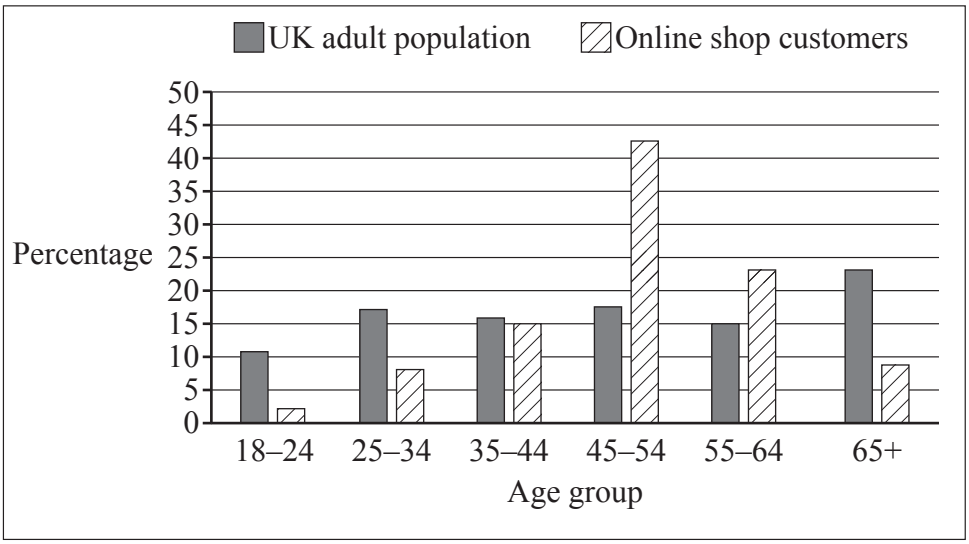


Fig. 2

(a) What percentage of the UK adult population is aged 55–64? **[1]**

(b) What percentage of the online shop's customers is aged 55–64? **[1]**

2(a)	
2(b)	

(c) **Fig. 2** shows there are more people aged 65+ than aged 55–64 in the **UK adult population**.

Explain why you would expect this to be the case. **[1]**

2(c)	

(d) The owners of the online shop are planning an advertising campaign.
They will target the campaign at **either** the 25–34 age group **or** the 55–64 age group.

Give a reason in favour of each of these options. **[2]**

2(d)	**Reason in favour of targeting 25–34**
	Reason in favour of targeting 55–64

(e) The advertising campaign is targeted at the 25–34 age group.

- The number of customers in this age group doubles.
- The number of customers in each of the other age groups stays the same.

What happens to the **percentages** of customers in the **other** age groups?
Tick the correct box and explain your reasoning. **[2]**

☐	They all go up
☐	They all go down
☐	They all stay the same
☐	There is no pattern to the changes

2(e)	**Explanation**

3 Nina is getting a new mobile phone.
She can insure it against theft and damage for £5 a month.

- If she does **not** have the insurance, it will cost her £300 if the phone is stolen and £60 if the phone is damaged.
- If she has the insurance, it will cover these costs.

2% of phones are stolen each year.
1.5% of phones are damaged each year.
Assume that the phone will **not** be stolen or damaged more than once in a year.

(a) Explain why theft is a higher risk for Nina than damage. **[1]**

(b) If the phone is **not** insured, what will be the average cost of theft and damage for one year? **[2]**

(c) Show that Nina is better off, on average, if she does **not** get the insurance. **[1]**

(d) Give a reason why Nina might choose to buy the insurance for the phone. **[1]**

(e) Give a reason why the insurance company needs to charge more than the expected payout for the insurance. **[1]**

3(a)	
3(b)	

3(c)	
3(d)	
3(e)	

4 A market researcher is interviewing people in a busy town in the UK on a Saturday morning to find out whether they approve of government policy.

The researcher wants to know how likely it is that the next person they meet is one of the following types of person.

A. An adult female
B. A female aged over 25 who has a university degree
C. A female aged over 25
D. An adult aged over 25

(a) Explain why A is more likely than C. **[1]**

(b) Assume the people in the town are typical of the UK.

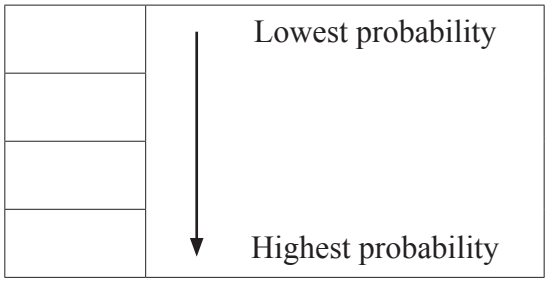
Put A, B, C and D in order of probability, with the least likely first. **[2]**

(c) The researcher's results are found **not** to be representative of the UK as a whole.

Suggest **one** possible reason for this. **[1]**

4(a)

4(b)



4(c)

5 Estimate the number of toilet rolls in a large lorry full of toilet rolls.
Show all your reasoning. **[7]**

5	

6 People in some jobs are tested for illegal drugs.
A test for a particular illegal drug is not completely accurate.
97% of those who **have** taken the drug will test positive.
99% of those who **have not** taken the drug will test negative.

(a) A population has 20% of people taking the drug.
A random sample of 10 000 people from the population is tested for the drug.

Complete the two way table to show the expected frequencies. **[3]**

(b) What percentage of people test positive? **[2]**

(c) What percentage of those who test positive have actually taken the drug? **[2]**

6(a)

	Tests positive	**Tests negative**	**Total**
Has taken drug			
Has not taken drug			
Total			**10 000**

6(b)

6(c)

The same test for the drug is used on a different population.
Assume 2% of this population has taken the drug.

(d) Show that nearly 3% would test positive. **[4]**

(e) What percentage of those who have tested positive have actually taken the drug? **[1]**

6(d)	
6(e)	

7 This question refers to the article "**A: Attainment 8 and Progress 8**".
This was given out as pre-release material and is available as an Insert.

(a) Alex gets the GCSE results shown in **Fig. 7.1**.
Alex does **not** take any other qualifications.

Maths	7
English Language	5
English Literature	9
Biology	7
Chemistry	8
Physics	6
Art	4
French	7
Religious Studies	8
History	9

Fig. 7.1

(i) Calculate Alex's Attainment 8 score. Show your working clearly. **[5]**

(ii) A new system for calculating attainment is proposed.
It is similar to Attainment 8 but uses the **total** of English Language and English Literature for the English score.
The Maths and EBacc elements are the same as for Attainment 8.
The open element still contains the three highest point scores in any other subjects, but it cannot contain English Language or Literature as these have already been used.

Calculate Alex's score using the new system. **[2]**

7(a)(i)	

7(a)(ii)	

(iii) Tick the correct statement about the proposed new system for calculating attainment and justify your answer. **[2]**

7(a)(iii)	Compared to Attainment 8:
	☐ All students will get a lower score using the new system.
	☐ All students will either score lower or the same using the new system.
	☐ All students will get a higher score using the new system.
	☐ All students will either score higher or the same using the new system.
	Justification:

(b) **Fig. 7.2** and **Fig. 7.3** show the Progress 8 scores of a random sample of schools.
For both graphs, a negative improvement means that the score went down from 2018 to 2019.

(i) **Fig. 7.2** shows the overall Progress 8 score in 2018 and the improvement from 2018 to 2019 for each of the schools.

Circle a point in **Fig. 7.2** which represents a school which had below average Progress 8 in 2018 **and** did worse in 2019. **[1]**

7(b)(i)

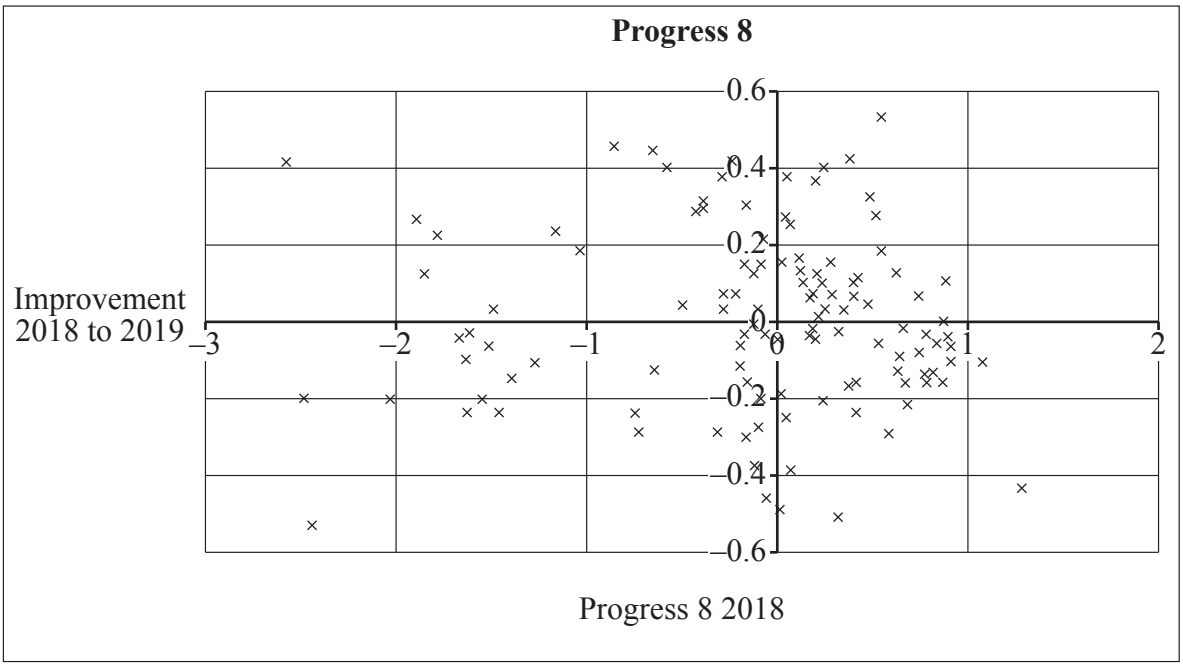


Fig. 7.2

(ii) **Fig. 7.3** shows the equivalent data for just the Maths element from Progress 8.

Circle the point in **Fig. 7.3** which represents the school with the greatest improvement in the Maths element of Progress 8 from 2018 to 2019. **[1]**

7(b)(ii)

7(c)(i)

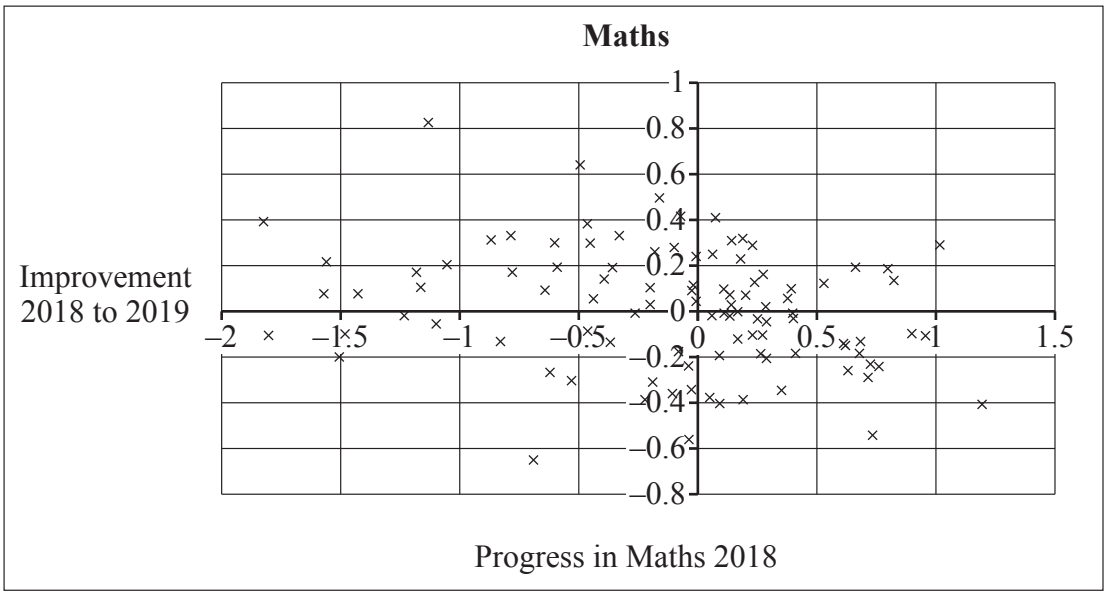


Fig. 7.3

(c) **(i)** Draw a line of best fit on **Fig. 7.3**. **[1]**

(ii) What feature of **Fig. 7.3** shows that there is regression to the mean? **[1]**

7(c)(ii)

8 A large number of people are taking part in a programme to improve their memories.

Li says:

"There is just as much chance of a randomly chosen person improving as there is of them doing worse."

To test Li's theory, a random sample of 256 people taking part in the programme is taken. People who did neither better nor worse are **not** included in the sample.

(a) Assume that Li is correct.
Imagine lots of random samples of 256 people are taken and the number of people with improved memories is counted in each sample.

(i) What would be the mean number of people with improved memories in the samples? **[1]**

(ii) What would be the standard deviation of people with improved memories in the samples? **[2]**

(b) A random sample of 256 people is taken and 120 of them have improved memories.

Explain whether this provides evidence that Li was wrong about people having just as much chance of improving as doing worse. **[3]**

8(a)(i)	
8(a)(ii)	
8(b)	

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).