Level 3 Certificate
MATHEMATICAL STUDIES

Paper 2B

Name: _____

Class: _____

Date: _____

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a clean copy of the Preliminary material
- a scientific calculator or a graphics calculator
- a copy of the formulae sheet
- a ruler.

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in your name, class and the date at the top of this page.
- Answer all the questions.
- Do all rough work on this paper. Cross through any work that you do not want to be marked.
- In all calculations, show clearly how you work out your answer.
- The final answer to questions should be given to an appropriate degree of accuracy.
- You may not refer to the copy of the Preliminary material that was available prior to this examination. A clean copy is enclosed for your use.
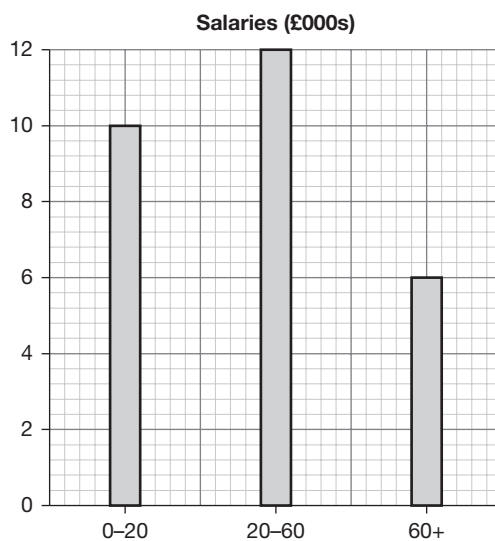
Information

- The maximum mark for this paper is 60.
- The marks for each question are shown in brackets [ ].
- Use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Question	Mark
1	
2	
3	
4	
5	
6	
7	
Total	

OXFORD

Paper 2B

1 The results of a survey of salaries is illustrated by the graph shown below.

Salaries (£000s)

a) Criticise this graph.

[2 marks]

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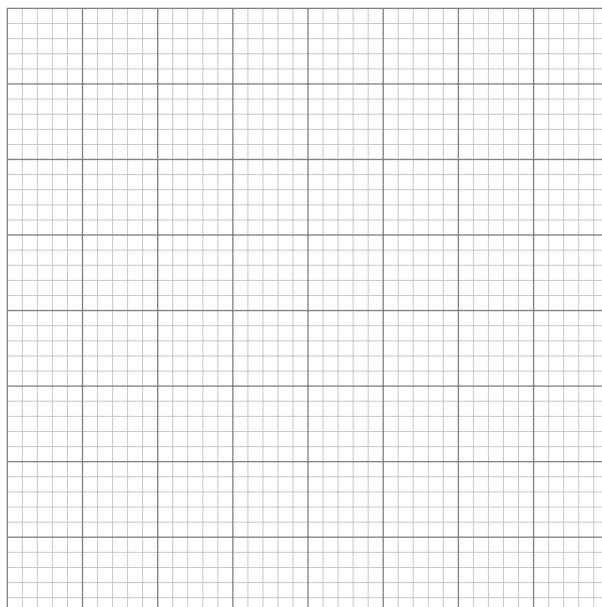**b)** Making any necessary assumptions, which should be stated, draw a more suitable diagram to represent these data.

[4 marks]

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2 Andy has borrowed £1000 which he must repay in two equal instalments, £600 at the end of the first year and a final payment of another £600 at the end of the second year. Andy makes the statement:

I will have to pay £200 interest over the two years of the loan. This is £100 per year and means that I am paying 10% interest per year.

a) Which part of Andy's statement is correct?

[1 mark]

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b) Andy is not a mathematician. Using simple calculations, explain to him why the interest rate that he is paying is more than 10%.

[3 marks]

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3 Use **Make schools pay!** in the Preliminary Material.

a) The report *Crossing the Line* was discussed on a radio programme on 25th August 2015. Referring to the data used in the report, it was stated that

Further Education colleges take five times more English students and six times more maths students who don't make the grade than schools.

Comment fully on the numbers used in this statement.

[4 marks]

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b) Explain briefly why '*fining schools **could** be self-defeating*'.

[2 marks]

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c) Explain the observation that

The work that is done in secondary schools in the five years leading up to GCSEs may greatly affect the result of an individual student or the result of all the students in that school but does not affect the overall GCSE results of the nation's students.

[4 marks]

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4 Some of the data from a health survey of 1000 US citizens in 2013 are summarised in the Venn diagram.

Key
F – Female
U – Under 15
A – Asthmatic

a) Use these data to provide evidence for or against each of the following statements.

   i This was a stratified survey.

[2 marks]

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   ii Asthma affects approximately 1 in 12 people.

[2 marks]

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b) Assuming that this sample is representative of the population as a whole, write a brief summary of how gender and age affect the proportions of people with asthma.

[6 marks]

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5 Marcus is preparing a vegetable curry for his flatmates. The table lists the separate activities, their durations and precedences.

Activity	Duration (minutes)	Immediate predecessor(s)
A: Lay the table	5	–
B: Chop vegetables	8	–
C: Mix spices	4	–
D: Fry spices and vegetables	3	B, C
E: Cook rice	15	–
F: Add water and cook curry	12	D
G: Serve chutneys	2	A
H: Microwave poppadoms	3	–
I: Serve meal	3	E, F, G, H

a) Suppose that the meal has to be prepared in the shortest possible time.

Construct an activity network and find the earliest start time and latest finish time for each activity.

[7 marks]

b) On the other hand, suppose that Marcus receives no help and that only activities E and F can be carried out at the same time as other activities.

What is the latest that Marcus must start preparing the meal if he wishes it to be served by 7pm? Explain fully, in context, how this can be achieved.

[4 marks]

6 Each ticket in a lottery costs £1. The chances of a ticket winning a prize are given in the table.

Lottery – £1 per ticket		
	Odds of Winning	**Prize**
Match 6	1 in 2 000 000	£100 000
Match 5	1 in 400 000	£10 000
Match 4	1 in 10 000	£250
Match 3	1 in 5000	£50
Match 2	1 in 250	£20
Match 1	1 in 250	£10

a) What is a person's expected loss for each ticket they buy?

[4 marks]

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b) This lottery is advertised with the statement.

> For only £1 you have a chance of 1 in 120 of winning a prize of up to
>
> £100 000!!!

Explain why this statement is factually correct but, nevertheless, misleading.
You must show your working.

[4 marks]

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7 **a)** Briefly describe the 'cost–benefit principle'.

[2 marks]

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b) A company has an annual revenue of £500 000.

The company outsources approximately 50 hours of work each month at a cost of £60 per hour.

The owners of the company are considering an expansion which would enable all the work to be done in-house.

The costs involved in this expansion are:

- salary and associated costs of £5000 per month
- leasing an extra $20\,m^2$ of office space at an annual cost of £100 per m^2.

The only other foreseeable benefit of the expansion is that it would enable the company to bid for one special contract which would increase the company's revenue by approximately 10% per annum.

What would the odds of winning the special contract need to be to justify the expansion?
Fully justify your answer with numerical calculations.

[9 marks]

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