

# 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.

Question	Mark
1	
2	
3	
4	
5	
6	
7	
<b>Total</b>	

### 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.

# Paper 2B

- 1 James has been asked to write a short report about the average time per day students in his class spend on social websites.

James asked the students in his class to record how many minutes they spent on social websites on one day. His list of the results is given below.

37 0 25 69 35 16 28 39 58 18 43 35 52 47 36  
24 38 72 60 48 51 59 63 75 56 30 41 45 32 35

James draws a stem-and-leaf diagram and works out the median time.

Times in minutes	
7	2 5
6	0 3 9
5	1 2 6 8 9
4	1 3 5 7 8
3	0 2 5 6 7 8 9
2	4 5 8
1	6 8

Median time = 43 minutes

- a) Identify any errors that James has made and suggest improvements he could make.

[3 marks]

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- b) Find the correct median time.

[2 marks]

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3 Use **Defining poverty** on the Preliminary Material.

a) Assume £1 ≈ \$1.5

i Find the annual income in pounds that is equivalent to 1.25 dollars per day.

[2 marks]

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ii State whether the first newspaper report is based on absolute poverty or relative poverty. Use your answer to part i to justify your answer.

[2 marks]

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b) Assume that the percentiles for disposable, equivalised household incomes are as given in the table below.

Percentile	10th	20th	30th	40th	50th	60th	70th	80th	90th
Household income (£/week)	142	189	231	278	319	369	432	520	664

Source: ONS

Comment on the validity of the statement made by the official spokeswoman in the second newspaper report.

Show working to justify your comments.

[6 marks]

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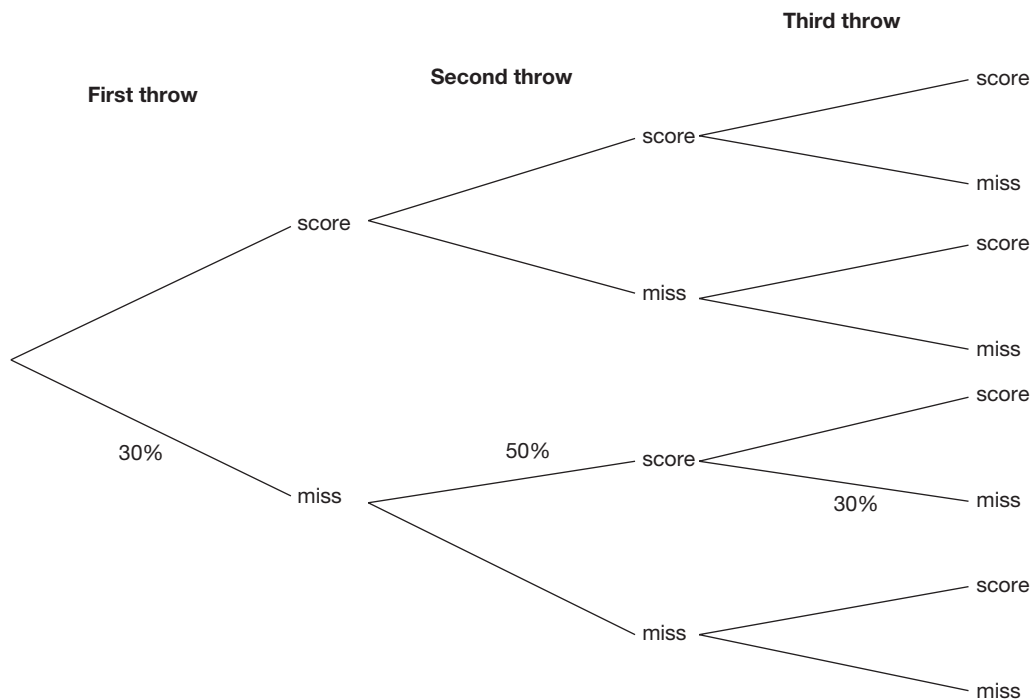
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- 5 In basketball, free throws are awarded for certain types of foul. Each successful throw is worth 1 point. Suppose that a player has been awarded 3 free throws and that their chance of being successful is 70% on the first throw. On subsequent throws their chance of success is 70% if they have been successful on the previous throw but is 50% if they were unsuccessful on their previous throw.

The tree diagram illustrates this. The probabilities have been filled in for the sequence of miss, score, miss.



- a) Complete the tree diagram.

[3 marks]

- b) What is the probability that the player scores 3 points?

[1 mark]

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- c) Find the player's expected score.

[6 marks]

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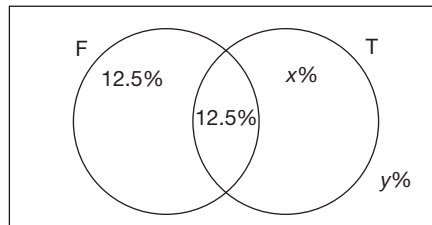


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- 6 Sickle cell trait is a genetic variation which gives protection against malaria. In West Africa, roughly 25% of the population have this variation and will not know about it unless they are tested. If someone with normal genes has a child with a person who has sickle cell trait then the child has probability 0.5 of having sickle cell trait.

The Venn diagram is for West African children born to women with normal genes.

F represents those children whose father has sickle cell trait and T represents those children who have sickle cell trait themselves.



- a) Explain each of the numbers 12.5%. Find  $x$  and  $y$ .

[5 marks]

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- b) In West Africa, a mother and her baby are tested and found to have normal genes. What is the probability that the father has sickle cell trait?

[3 marks]

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- 7 The headteacher has given permission for a school pop concert to be held and some staff have volunteered to assist. The work involved has been divided into a number of tasks, as shown in the table. The minimum time required to complete each task is also shown.

Activity	Immediate predecessor	Duration (hours)
A: Appoint committee to organise event	–	3
B: Decide on date	A	3
C: Book bands	A	6
D: Produce posters	B, C	8
E: Produce tickets	B, C	4
F: Arrange order of bands	C	2
G: Decide on time allocation for each band	C	2
H: Appoint compere	A	1
I: Arrange for sound engineer & lighting	B	4
J: Arrange practice sessions	F	6
K: Sell tickets	E	12
L: Concert	D, G, H, I, J, K	2

- a) Construct an activity network for the project and find the earliest start time and latest finish time for each activity.

[10 marks]



b) Construct a Gantt chart (cascade diagram) for the project.

**[4 marks]**  
(AQA, 2012)

A large grid for drawing a Gantt chart. The grid consists of 20 columns and 30 rows of small squares, providing a structured space for the student to draw their project schedule.