AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

Level 3 Certificate
MATHEMATICAL STUDIES

Paper 2B Critical path and risk analysis

Wednesday 23 May 2018 Morning Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
- a clean copy of the Preliminary Material and the Formulae Sheet (enclosed)
- a scientific calculator or a graphics calculator
- a ruler.

Instructions
- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Show all necessary working; otherwise, marks for method may be lost.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- 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 marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You may ask for more answer or graph paper, which must be tagged securely to this answer booklet.
- The paper reference for this paper is 1350/2B.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

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Answer **all** questions in the spaces provided.

1 Use **Brexit** from the Preliminary Material.

1 (a) The UK population was 65 million in June 2016

What percentage of the population, correct to one decimal place, were eligible voters for the EU membership referendum?

Circle your answer.

[1 mark]

51.7 71.5 71.6 72.3

1 (b) One improvement that could be made to each graph in the Preliminary Material would be to label the axes.

Suggest **two** other improvements that could be made to each graph.

[4 marks]

Graph 1: EU immigration in the UK

Improvement 1

Improvement 2

Do not write outside the box

Graph 2: Brexit's impact on the pound

Improvement 1

Improvement 2

1 (c) For 2015, the UK paid the EU £14.6 billion.

During the campaign, Vote Leave claimed that the EU costs the UK over £350 million every week.

Is Vote Leave's claim justified?

You **must** show your working.

[2 marks]

Question 1 continues on the next page

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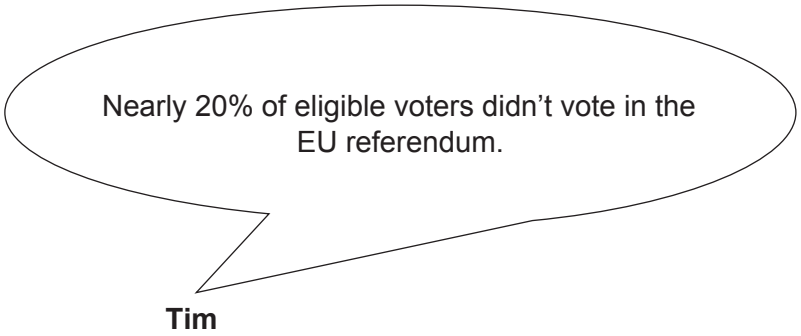
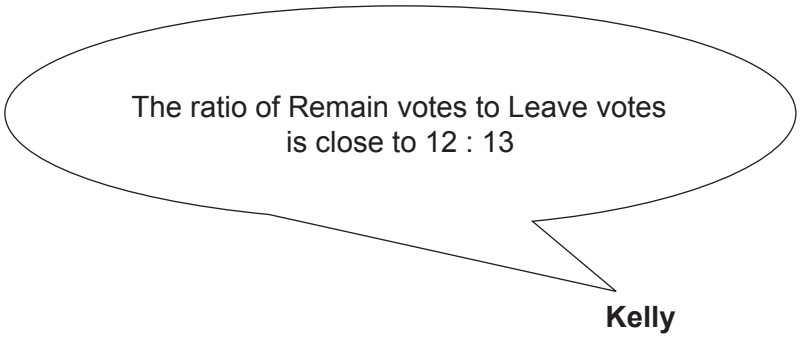
1 (d) Many people made comments on social media about the referendum.

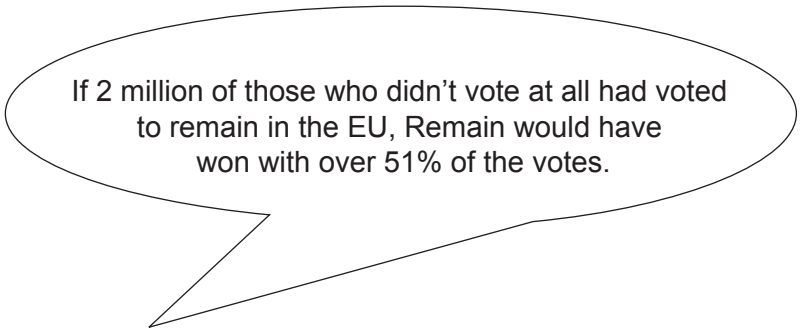
Here are three of the comments.



Tim



Kelly



Larissa

Using the table on page 2 of the Preliminary Material, check the validity of these comments.

You **must** show your calculations.

[7 marks]

Tim's comment

Do not write outside the box

Kelly's comment

Larissa's comment

14

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2 Maria is planning to move to Spain. She wants to buy a house which, including all associated fees, will cost €327 500

In May 2014 she opened a Spanish bank account with a deposit of £17 000
The account pays no interest.

The current exchange rate is £1 = €1.08

This is a decrease of 10% from the May 2014 rate.

Maria owns a house in England which she bought for £253 000. She has no mortgage. The house is now worth 12.5% more than she paid for it.

Advise Maria on whether the money she gets from selling her house in England, together with the money in her Spanish bank account, will be enough to buy the house in Spain.

You **must** show your working.

[6 marks]

6

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

3 A company has two offices, Office **A** and Office **B**, at different locations.

The company carries out a survey into the main ways of travelling to work by employees at both offices.

The results are shown in the table below.

Main way of travelling to work	Number of employees	
	Office A	Office B
Bus	34	38
Train	57	50
Car	80	31
Bicycle	22	36
Walking	13	49
Other	25	11

3 (a) An employee is chosen at random from all employees who travel to work by bus or train.

Calculate the probability that the employee is from Office **A**.

[2 marks]

Answer _____

Do not write outside the box

3 (b) One of the offices is in the centre of a town. The other office is in a business park, 10 miles outside the town.

State which office, **A** or **B**, is more likely to be in the centre of the town.
Give a reason for your answer.

[2 marks]

4

Turn over for the next question

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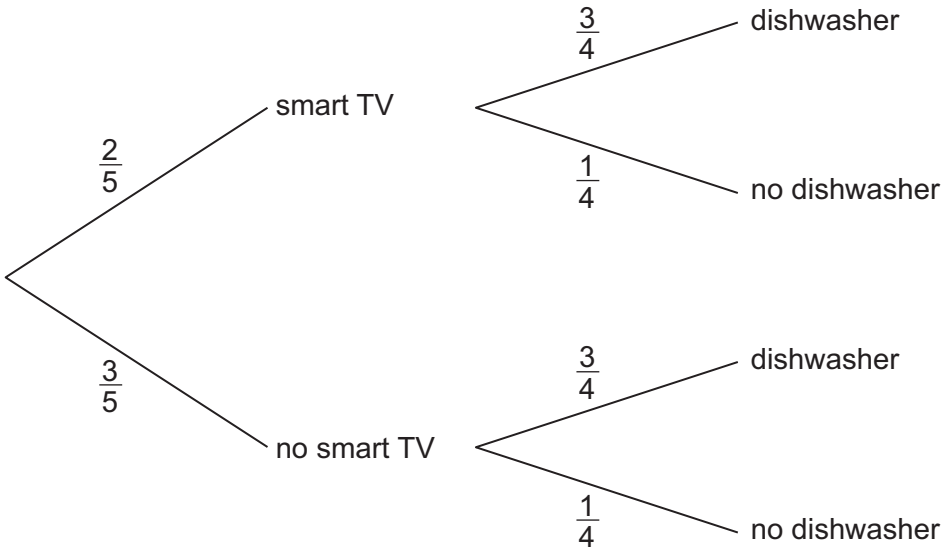
4 Hugo asks 40 students at his school if they have at home:

- a smart TV
- a dishwasher.

He uses their answers to construct the tree diagram below.



4 (a) Hugo claims that, for these students, "having a smart TV" and "having a dishwasher" are independent.

Explain why Hugo's claim is correct.

[1 mark]

Do not write outside the box

4 (b) In Hugo's school there are 1220 students.

4 (b) (i) Estimate the number of students in Hugo's school who have neither a smart TV nor a dishwasher at home.

[2 marks]

Answer _____

4 (b) (ii) State **one** assumption you made in question **4 (b) (i)**.

[1 mark]

4

Turn over for the next question

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5 Sandy is a builder. She is planning to renovate a conservatory for a customer. Some of the activities required for the project are listed below.

A Discuss plans with customer

B Remove old fittings

C Plaster walls

D Order and collect doors and windows

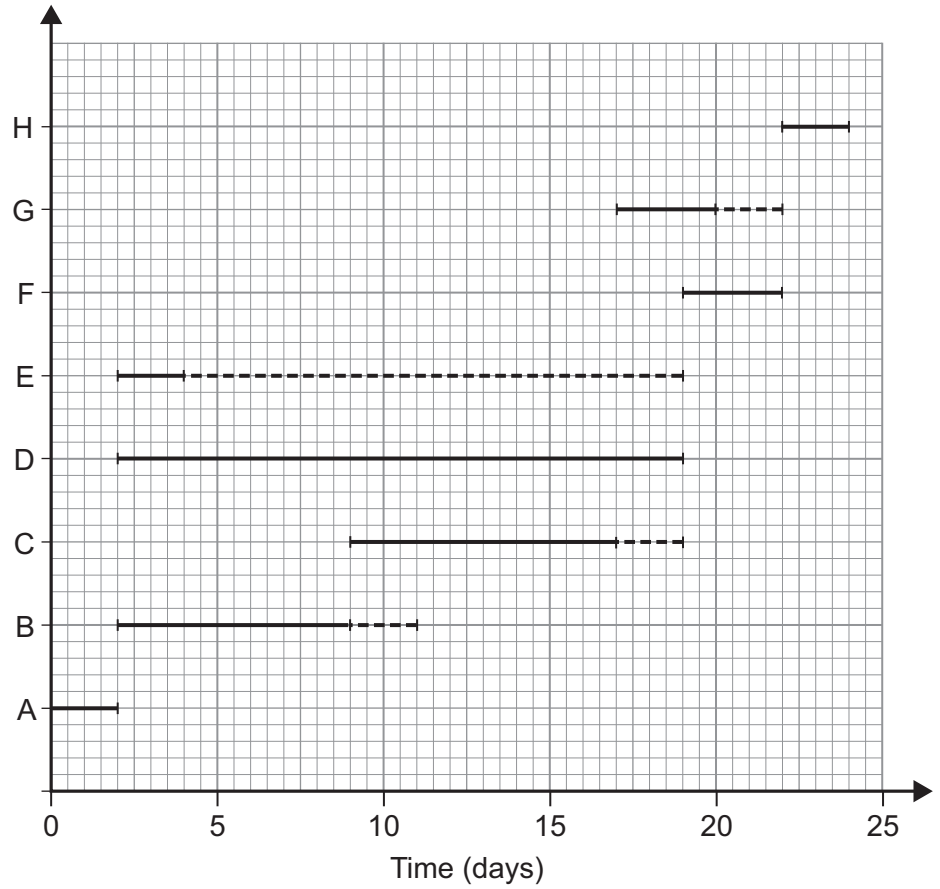
E Order and collect floorboards

F Fit doors and windows

G Lay floorboards

H Paint walls, doors and windows

Sandy draws the Gantt diagram below showing these activities.



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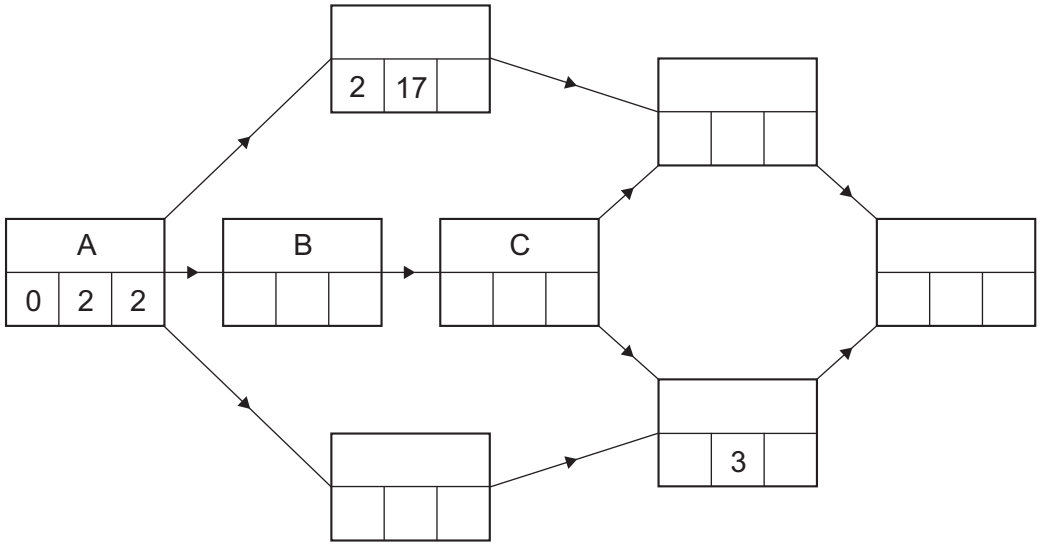
5 (a) (i) Complete the activity network to show the activities represented in the Gantt diagram.

[4 marks]



5 (a) (ii) State the critical path.

[1 mark]

Answer _____

5 (a) (iii) What is the **latest** possible start time for activity **E**?

Circle your answer.

[1 mark]

2 days 4 days 17 days 19 days

5 (a) (iv) Sandy considers doing all the work herself.
She can do activities **D** and **E** at the same time as other activities.

How many days in total would it take her to complete the project?

[2 marks]

_____

_____

_____

Answer _____

Question 5 continues on the next page

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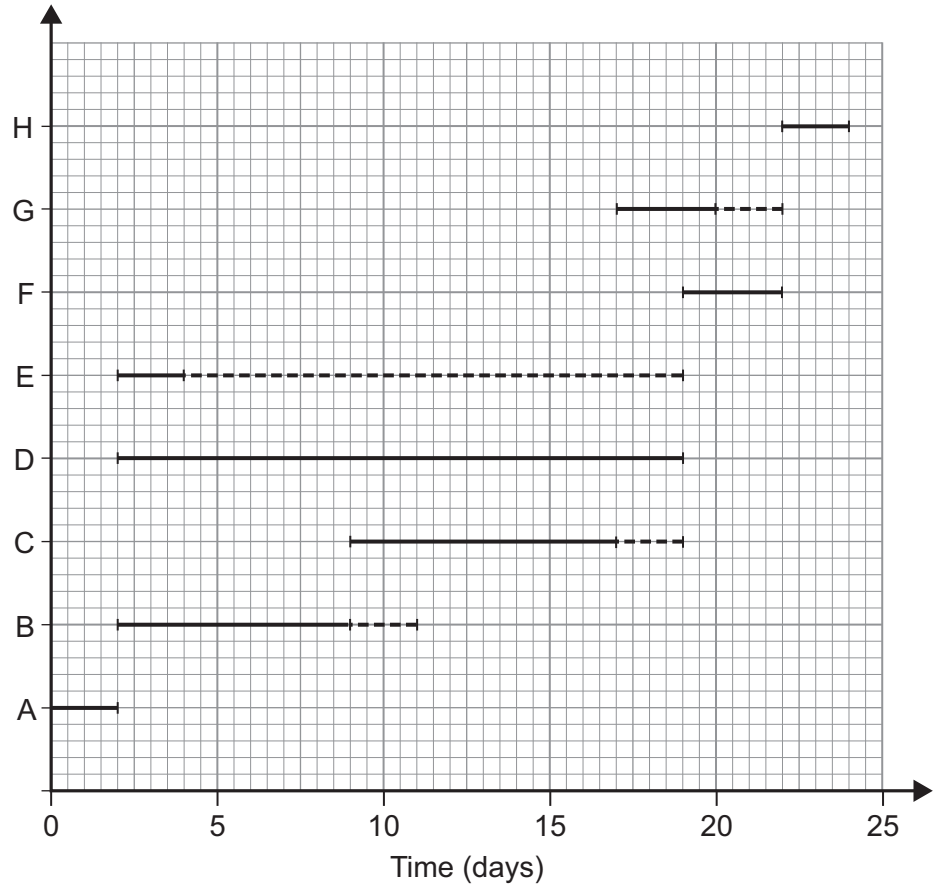
The Gantt diagram from page 12 is shown below to help you.



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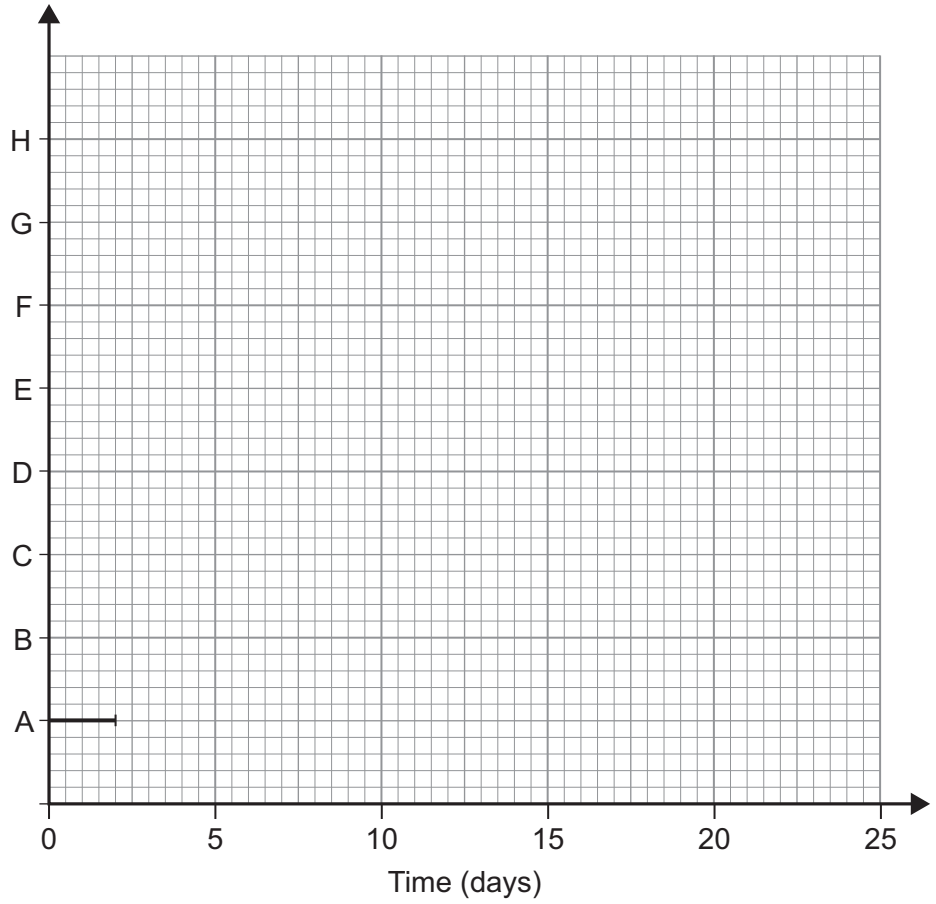
5 (b) Sandy decides not to do all the work herself. Before the start of the project, Sandy finds out that activity **D** will take only 14 days.

5 (b) (i) Complete the Gantt diagram below so that it includes this new information and any other changes which occur as a result.

[5 marks]



5 (b) (ii) State the new float time for activity **E**.

[1 mark]

_____

_____

Answer _____ days

14

Turn over ▶

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6 Statisticians collect data on the number of points won by tennis players when they are serving.

If the player gets their first serve in, they have a chance to win the point on their first serve.
If the player does not get their first serve in, they get a second serve and have a chance to win the point on that serve.

A statistician uses data about the tennis player Venus Williams to work out the probabilities in the table.

Event	**Probability**
Venus gets her first serve in	0.68
Venus wins the point if she gets her first serve in	0.80
Venus wins the point if she does not get her first serve in	0.49

6 (a) Work out the probability of Venus Williams winning the point when she is serving.

[3 marks]

Answer _____

6 (b) For a particular tournament, a tennis racket manufacturer offers Venus Williams a bonus payment of $50y$ dollars, where y% is the percentage of points that she wins when she is serving.

Estimate the expected bonus payment that Venus Williams receives.

[1 mark]

Answer _____ dollars

Do not write outside the box

6 (c) The statistician works out the following probabilities for another tennis player, Johanna Konta, when she is serving.

Event	Probability
Johanna gets her first serve in	0.66
Johanna wins the point if she gets her first serve in	0.75
Johanna wins the point if she does not get her first serve in	x

The probability of Johanna Konta winning the point when she is serving is 0.69
Calculate the value of x, giving your answer to two significant figures.

[4 marks]

Answer _____

8

Turn over for the next question

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7 A building company hires a crane to complete a large construction project.

The hire charge is £3000 per week when booked in advance.
If the crane is needed for longer than booked, the hire charge for each extra week is £9000

You are working for the company as the project manager.

You expect that the construction project will need a crane for 10 weeks.
You estimate that there is a 40% chance that the project will be delayed and the crane will be needed for longer than 10 weeks.
You estimate that, if the project is delayed, there is a 90% chance that the crane will be needed for 1 extra week and a 10% chance that the crane will be needed for 2 extra weeks.

You offer the building company three options:

- **Option A**
  Hire the crane for 10 weeks.
  If the project is delayed, pay the increased hire charge.
- **Option B**
  Hire the crane for 11 weeks.
  If the project is further delayed, pay the increased hire charge.
- **Option C**
  Hire the crane for 12 weeks.

7 (a) Advise the building company on which of the three options they should choose.
Base your advice on the expected cost of each option.

[8 marks]

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Question 7 continues on the next page

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7 (b) The project will **not** be delayed if an extra full-time worker is employed for 5 weeks. It would cost £640 per week to employ the additional worker.

Explain whether you would recommend that the building company should employ the additional worker.
You must justify your recommendation.

[2 marks]

10

END OF QUESTIONS