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Candidate signature

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# Level 3 Certificate

## MATHEMATICAL STUDIES

Paper 2B Critical path and risk analysis

Wednesday 24 May 2017

Morning

Time allowed: 1 hour 30 minutes

### Materials

For this paper you must have:

- a clean copy of the Preliminary Material and 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 questions in the space 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 that 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.

For Examiner's Use

Pages	Mark
2 – 3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
<b>TOTAL</b>	

### 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.



J U N 1 7 1 3 5 0 2 B 0 1

IB/G/Jun17/E9

**1350/2B**

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

- 1** Oliver is researching costs for a new smartphone he is planning to buy. He collects information from **five** mobile network operators. The network operators offer the phone on a rental contract or on pay-as-you-go. Users must also make a one-off payment for the phone. He produces the table below.

Operator	One-off payment for the phone	Rental cost
A	£189.99p	£25
B	£129.99p	£36
C	£99.99p	£49
D	£9999p	£0 (pay-as-you-go)

- 1 (a)** Analyse Oliver's table, identifying **two** errors.

Then suggest **two** improvements he could make to his table.

**[4 marks]**

Error 1

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Error 2

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- 2** Use **Youth Unemployment** from the Preliminary Material.
- 2 (a)** Work out the decrease, between September–November 2014 and June–August 2015, in the number of people aged 16–24 who were unemployed.

Circle your answer.

[1 mark]

56 000

80 000

136 000

192 000

- 2 (b)** Two newsletters contained articles about the unemployment rate of the economically active population aged 16–24 in September–November 2015

Here are the two headlines.

**Unemployment rate for 16–24 year olds declines by one fifth in one year!**

**Always Young** newsletter

**For economically active 16–24 year olds, the ratio of men to women is about 11 : 10**

**Dynamic Youth** newsletter

Using the data given, comment on the validity of these headlines.

[8 marks]

**Always Young**

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**2 (c)** An independent body overseeing the quality of government reports suggested that the briefing paper could have been improved.

Suggest **three improvements** for future briefing papers.

**[3 marks]**

Improvement 1

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Improvement 2

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Improvement 3

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3



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ANSWER IN THE SPACES PROVIDED**

**Turn over for the next question**

**Turn over ►**



**3** A project manager is overseeing a software development project.

The table below lists the activities needed for this project, together with the duration of each activity and the immediate predecessors of each activity.

Task	Activity	Immediate predecessor(s)	Duration (days)
A	Gather client requirements	-	3
B	Graphic design	A	2
C	User-interface design	A	3
D	Back-end development	A	4
E	Front-end development	B, C	5
F	Back-end testing	D	1
G	Integration development	E, F	6
H	Legal certification	G	1
I	Documentation	G	2
J	Client acceptance testing	H, I	3

On the opposite page there is part of an activity network for this project.

**3 (a)** Complete the activity network on the opposite page.

Show the earliest start time and latest finish time for each activity.

**[7 marks]**

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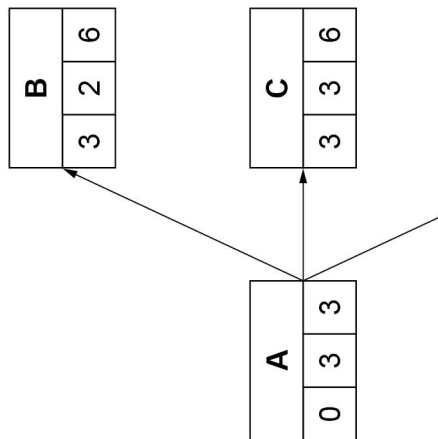
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7
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Turn over ►



3 (b) State the critical path.

[1 mark]

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Answer \_\_\_\_\_

3 (c) Calculate the float on task F.

[1 mark]

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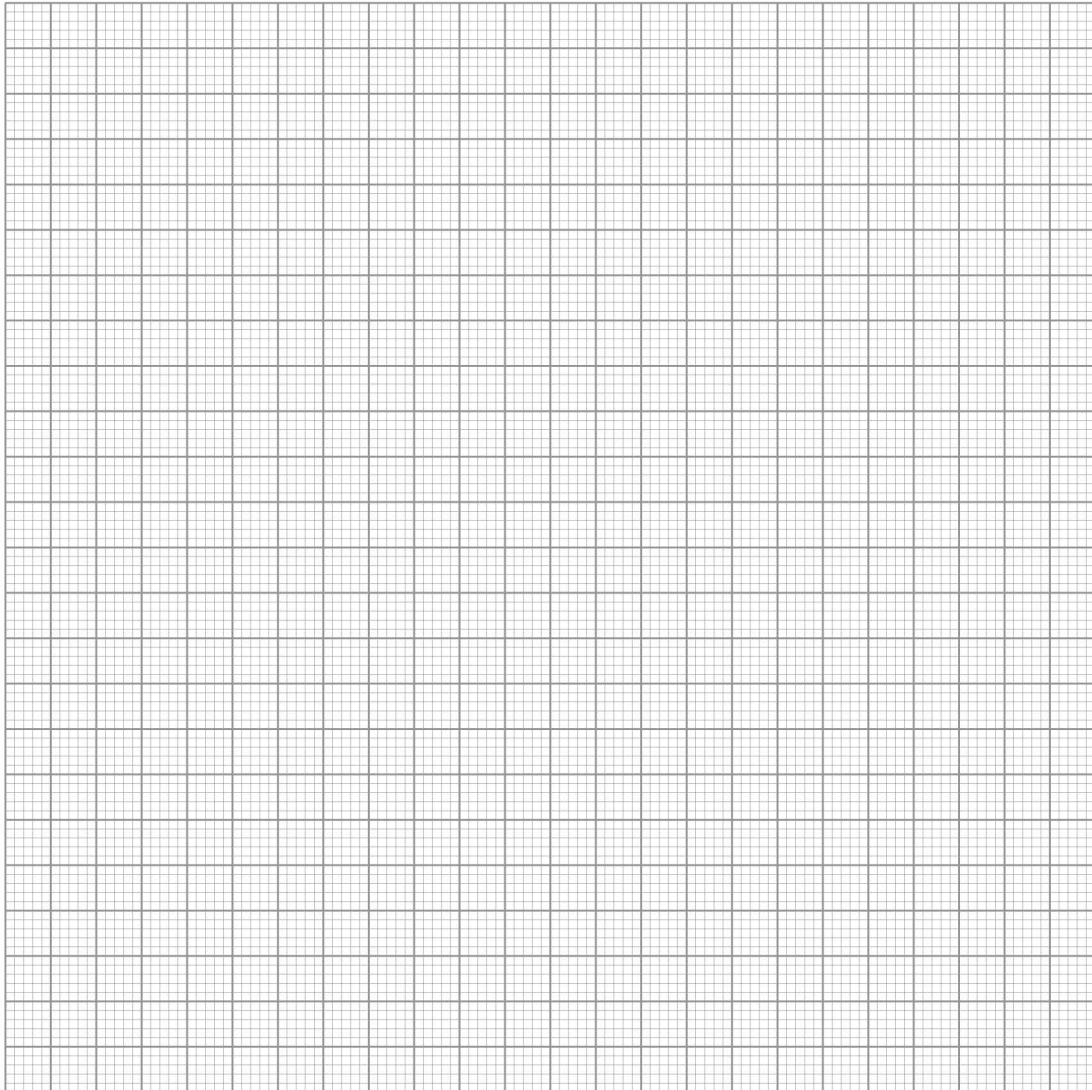
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Answer \_\_\_\_\_



**3 (d)** Draw a Gantt chart (cascade diagram) for the project.

**[4 marks]**



6

Turn over ►



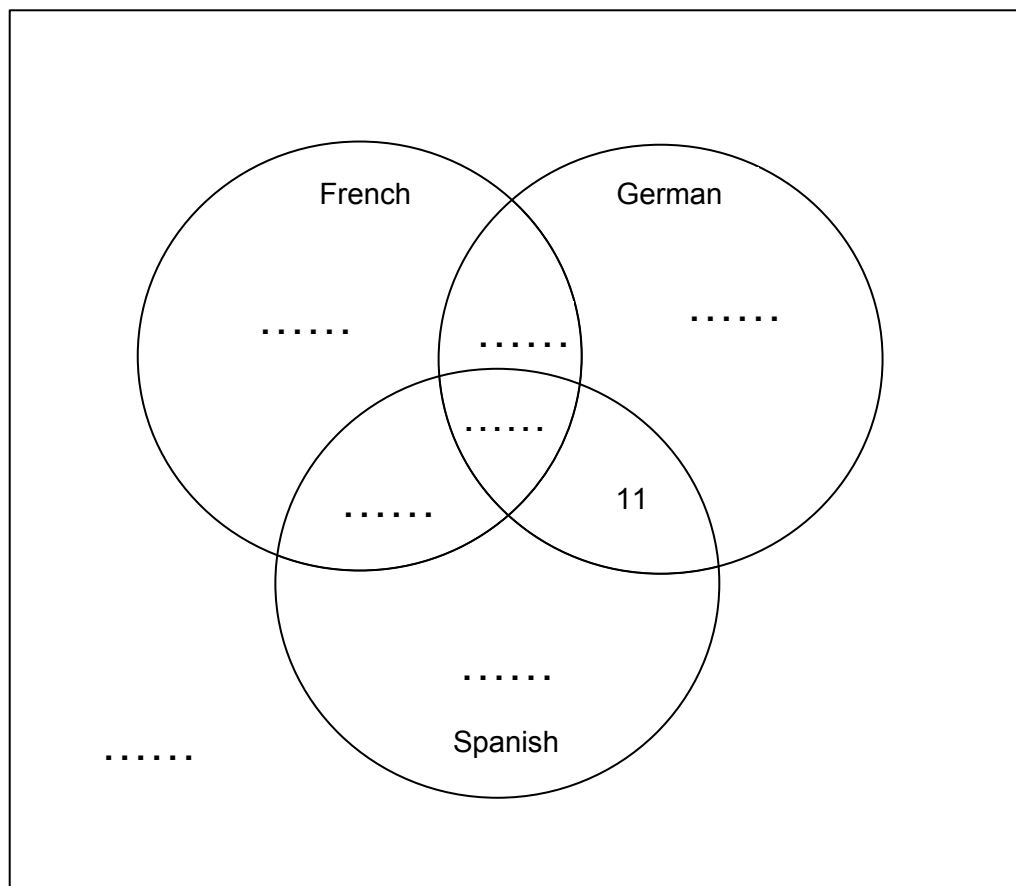
- 4 At a secondary school there are 250 pupils in Year 10  
Most pupils study at least one foreign language.  
The school offers courses in French, German and Spanish.

- 84 students study French
- 62 students study German
- 141 students study Spanish
- 19 students study both French and German
- 12 students study both German and Spanish
- 23 students study both Spanish and French
- 1 student studies French, German and Spanish

- 4 (a) Complete the Venn diagram with the **seven** missing numbers.

[4 marks]

£



**4 (b)** Calculate the percentage of Year 10 pupils at the school who do **not** study a language.

**[2 marks]**

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Answer \_\_\_\_\_ %

**4 (c)** Some of the Year 10 pupils at the school study only one language.  
One of these pupils is chosen at random.

Calculate the probability that this pupil studies French.

**[1 mark]**

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Answer \_\_\_\_\_

7

**Turn over for the next question**

**Turn over ►**



**5** Here is some information about smoking and a common disease.

- 20% of the population are smokers. The rest are non-smokers.
- 22% of smokers get the disease.
- 10% of non-smokers get the disease.

**5 (a)** What percentage of the population are smokers who get the disease?

**[2 marks]**

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Answer \_\_\_\_\_ %

**5 (b)** What percentage of those who get the disease are smokers?

**[5 marks]**

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Answer \_\_\_\_\_ %



**5 (c)** A media report on the disease makes the following statements:

**Statement 1**

Most of those who get the disease are smokers.

**Statement 2**

Smokers are more than twice as likely as non-smokers to get the disease.

Comment on each of these statements.

You should refer to the information given at the beginning of the question, and to your answer to **5(b)**.

**[4 marks]**

Statement 1

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Statement 2

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**5 (d)** If the percentage of smokers in the population decreased from 20%, what would happen to the percentage of those getting the disease who were smokers?

Circle your answer.

**[1 mark]**

It would  
decrease

It would stay  
the same

It would  
increase

Impossible  
to tell

Turn over ►

12



6 There are 20 football clubs in the English Premier League (EPL).

At the end of each season, in May, the clubs finishing in the lowest three positions are relegated (moved down to a lower league).

It is estimated that a club loses £65 million in TV money, sponsorship, etc if it is relegated.

In January a club is in 17th place in the EPL and its Chief Executive is worried that the club may be relegated in May.

The club's top goalscorer, Soares, often gets injured and misses games.

The Chief Executive has the option of signing a new player, Morris, as cover for Soares.

You are a member of the club's statistical team.

The Chief Executive asks you to analyse the costs involved in the different options.

You produce the following figures and estimated probabilities:

- The cost of signing Morris is £12 million
- The cost of relegation is £65 million
- The probability that Soares will get a serious injury is 0.4
- If Morris is signed, the probability that the club will be relegated is 0.3
- If Soares gets a serious injury and Morris is not signed, the probability that the club will be relegated is 0.85
- If Soares does not get a serious injury, the probability that the club will be relegated is 0.3

Advise the Chief Executive on whether the club should sign Morris, based on the expected costs to the club.

**[8 marks]**

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