You have one week to complete this. What you hand in should be your best work, and you must attempt every question.

If you are stuck then please either consult notes or textbooks, attend a workshop, or ask your teacher.

You may need to refer to the formula book, found here:

or financial information, found here:

1)

(a) Construct an activity network for the project. *(4 marks)*

(b) Find the earliest start time for each activity. *(2 marks)*

(c) Find the latest finish time for each activity. *(3 marks)*

(d) Find the critical activities. *(1 mark)*

(e) State the float times for activities D and L. *(2 marks)*

2) To motivate its staff, a company announces that it will send its best sales representatives on a holiday to Spain at the company's expense.

The company sends the best three sales representatives to Spain.

(a) One of the representatives goes to a waterpark and is charged €42. The exchange rate is €1.17 to £1.

Calculate this cost in pounds.

[3 marks]

(b) The three representatives go out to dinner and agree that the total cost of €66 will be divided between them in the ratio 3:4:5.

How much is paid by the person who pays the most?

[3 marks]

(c) The holiday costs the company £546 for **each** representative.

The total cost for three people is 84% of the total cost for four people.

How much extra would the company have paid if it had sent the best four sales representatives instead of three?

[5 marks]

3) Members of a library may borrow up to 6 books. Past experience has shown that the number of books borrowed, X, follows the distribution shown in the table.

| x	0	1	2	3	4	5	6
$P(X=x)$	0	0.19	0.26	0.20	0.13	0.07	0.15

(a) Find the probability that a member borrows more than 3 books.

[1 mark]

(b) Assume that the numbers of books borrowed by two particular members are independent.

Find the probability that one of these members borrows more than 3 books and the other borrows fewer than 3 books.

[3 marks]

(c) The library decides to introduce a fee of 10 pence for each book borrowed.

Assuming that the probabilities do not change, calculate:

the mean amount that will be paid by a member;

[3 marks]

4) Rodney runs a game at a school fundraising event. In the game, 10 unbiased coins are tossed and the number of heads obtained, X, is counted.

The table below shows part of the probability distribution for X, giving values correct to three decimal places.

(a) Show that $P(X = 10) = 0.001$, correct to three decimal places, and complete the table.

[2 marks]

(b) Rodney charges people 10p to play the game. He pays an £8 prize if 10 heads are obtained, a £2 prize if 9 heads are obtained, a 50p prize if 8 heads are obtained and no prize if 7 heads or fewer are obtained.

(i) Calculate the mean value of the prize paid per game

[2 marks]

(ii) Someone complains that the three prizes are too small and suggests that Rodney should double the size of each prize. Make **two** comments on this suggestion.

[2 marks]

5) A survey of the times taken by bus and by train of journeys from Oxford to London is taken.

Information about the times of 80 of these journeys is shown in the Venn diagram.

(a) Explain what the 8 represents.

[1 mark]

(b) How many of the bus and train journeys take 100 minutes or less?

[2 marks]

(c) A **bus** journey is chosen at random.

What is the probability it took longer than 100 minutes?
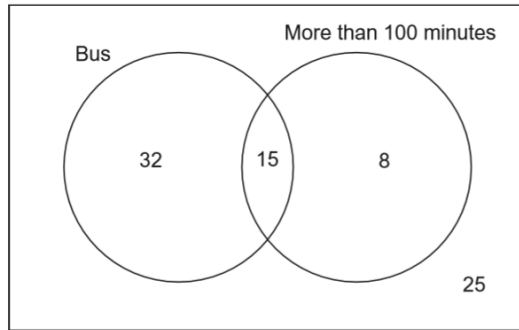
[2 marks]

6) **(a)** Complete the spreadsheet below.
Give the increases as percentages of the costs in 2010.
Give your percentages to one decimal place.

(b) State a formula which would give the content of cell E4.

7) **(a)** In 2014 the price of a tablet was lower than in 2013.

Taking 2013 as the base year, which of these statements is true about the index number for 2014?
Circle the correct answer.

[1 mark]

It is less than 100   It is exactly 100   It is more than 100

(b) In 2013 a laptop cost £500.
Using 2013 as base year, the index number for the cost of a laptop in 2014 was 110.

How much did it cost in 2014?

[2 marks]

8) The Santander e-saver account has an AER of 2.50%, with interest being compounded monthly.

(a) Tom placed £1000 in a Santander e-saver account. If he left it in the account for 12 months, making no deposits or withdrawals, how much would there be in the account at the end of this period?

(1 mark)

(b) Show that the nominal interest rate is 2.47%.

(4 marks)

(c) For the Nationwide account, the interest rate per month is 0.165% so that if Tom had placed his £1000 in this account, the amount of money, £A_n, in the account at the end of the nth month would be given by the recurrence relation

$$A_n = 1.00165\,A_{n-1}$$

Find the amount of money that Tom would have in his account at the end of 6 months.

(2 marks)

9) Rhian borrows £300 and pays back £175 after one year and a final £175 after a further year. The APR, i, expressed as a decimal is therefore given by

$$300 = \frac{175}{1+i} + \frac{175}{(1+i)^2}$$

(a) Show that the APR lies between 10.6% and 11%.

(3 marks)

(b) Use the interval bisection method, or otherwise, to find the interest rate as a percentage correct to one decimal place.

(3 marks)

Homework 14B – Answer sheet

1)

Activity	Immediate predecessor	Duration (weeks)
A: Choose musical to perform	–	1
B: Decide on performance dates	A	1
C: Obtain rights to perform musical	B	2
D: Arrange hire of hall	C	1
E: Audition for cast	C	1
F: Make the costumes	E	5
G: Rehearsals	E	10
H: Organise lighting	D	1
I: Print posters, programmes and tickets	D	2
J: Arrange staff for refreshments	D	1
K: Display posters	I	3
L: Sell tickets	I	2
M: Performance	F, G, H, J, K, L	1

4)

x	7 or fewer	8	9	10
$P(X=x)$	0.945	0.044		

6) **(a)** Complete the spreadsheet below.

Give the increases as percentages of the costs in 2010.

Give your percentages to one decimal place.

	A	B	C	D	E
	Item	Cost in 2010 (£)	Cost in 2011 (£)	Increase in cost (£)	Percentage increase in cost
1					
2	Fuel	1400	1721		
3	Insurance	623	815		
4	MOT	54	55		
5	Servicing	301	317		
6	Tax	173	182		
7	Total	2551	3090		

(5 marks)