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) The weights of tins of tomatoes produced by Smiley plc are Normally distributed with mean, 157 g and standard deviation, 3.5 g.

(a) Within what weight limits would you expect almost all of the tins produced to fall?

(b) The label on each tin states that the weight of tomatoes is 150g.
Using the symmetry of the Normal distribution, estimate the percentage of these tins that are below 150g.

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) Bob, a church warden, decides to investigate the lifetime of a particular manufacturer's brand of beeswax candle. Each candle is 30 cm in length.

From a box containing a large number of such candles, he selects one candle at random. He lights the candle and, after it has burned continuously for x hours, he records its length, y cm, to the nearest centimetre. His results are shown in the table.

x	5	10	15	20	25	30	35	40	45
y	27	25	21	19	16	11	9	5	2

(a) State the value that you would **expect** for a in the equation of the least squares regression line, $y = a + bx$. *(1 mark)*

(b) (i) Calculate the equation of the least squares regression line, $y = a + bx$. *(4 marks)*

(ii) Interpret the value that you obtain for b. *(2 marks)*

(iii) It is claimed by the candle manufacturer that the total length of time that such candles are likely to burn for is more than 50 hours.

Comment on this claim, giving a numerical justification for your answer. *(2 marks)*

4) (a) The waist–hip ratio (WHR) for women is distributed normally with a mean of 0.78 and standard deviation of 0.065.

Calculate the percentage of women with a waist–hip ratio greater than 0.85. *(4 marks)*

(b) The waist–hip ratio (WHR) for men is distributed normally with mean 0.89 and a standard deviation of 0.071.

The top 20% of men are regarded as having a high waist–hip ratio.

Calculate the smallest waist–hip ratio for these men. *(4 marks)*

5) Robert wants to make a Japanese Garden. He needs to buy a special type of gravel to make the wave patterns.

(a) The diameter of the pebbles making up the gravel follows a normal distribution with a mean of 5 mm and a standard deviation of 1.3 mm.

The gravel is difficult to rake into patterns if the diameter of the pebbles is greater than 6 mm.

What is the probability that a pebble will have a diameter greater than 6 mm?
[4 marks]

(b) Gravel is sold in 'bulk' bags.
Each bag will cover an area of 18 m² to a depth of 25 mm.
One bag costs £159.00

Robert's Japanese Garden measures 4.8 m by 9.9 m.
He needs a depth of 50 mm of gravel to make the wave patterns.

Calculate the total cost of the gravel.
[4 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)

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
1	**Item**	**Cost in 2010 (£)**	**Cost in 2011 (£)**	**Increase in cost (£)**	**Percentage increase in cost**
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)