Homework 18B

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) If I get my central heating serviced then the probability that it will fail in the next year is 0.04. If I do not get it serviced the probability that it will fail in the next year is 0.1.

The cost of a service is £50. The likely cost of a repair if it fails is £230.

What are the financial implications?

2) In a town the weather for a day is defined as being either dry or wet.

When a day is dry, the probability that the next day will be dry is 0.8
When a day is wet, the probability that the next day will be wet is 0.6

Monday is wet.

(a) Complete the following decision tree diagram.

(b) Work out the probability that both Tuesday and Wednesday will be wet.

(c) Work out the probability that Wednesday will be wet.

Fred is organising a charity tennis match to be played on Wednesday.
He has to decide on Monday whether the match will be played or cancelled.

If he decides on Monday to cancel Wednesday's match he will make a loss of £1000

If he decides on Monday **not** to cancel Wednesday's match and

    it is wet on Wednesday, he will make a loss of £3000
    it is dry on Wednesday, he will make a profit of £5000

Monday is wet.

*(d) Compare the risk to Fred of cancelling the match on Monday with the risk to Fred of **not** cancelling the match on Monday.
You must show your working.

3) A meal of chicken and chips is to be cooked. The work involved has been divided into a number of tasks, as shown in the table.

Activity	Immediate predecessor	Duration (minutes)
A: Peel potatoes	–	5
B: Heat oil	–	5
C: Prepare chicken	–	9
D: Make egg mix	–	4
E: Make breadcrumbs	–	3
F: Chop potatoes	A	4
G: Fry chips	B, F	13
H: Coat chicken with egg mix	C, D	3
I: Coat chicken with breadcrumbs	E, H	2
J: Fry chicken	B, I	10
K: Serve	G, J	3

(a) **In the space opposite**, construct an activity network for the project. *(3 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 time for activity F. *(1 mark)*

4) A survey of females' incomes, in various regions of the UK, was carried out. The table summarises the females' incomes for London and the North.

(a) Draw, on the grid given on the answer sheet, a cumulative frequency curve of the incomes of the females in London. *(3 marks)*

(b) Use your graph to estimate the median and the interquartile range of the incomes of the females in London. *(3 marks)*

(c) The box and whisker plot of the incomes of the females from the North is plotted on the answer sheet.

Write down **two** comparisons between the females' incomes in London and those in the North. *(3 marks)*

5) The table shows, for a random sample of 500 patients attending a dental surgery, the patients' ages, in years, and the NHS charge bands for the patients' courses of treatment. Band 0 denotes the least expensive charge band and band 3 denotes the most expensive charge band.

		Charge band for course of treatment				
		Band 0	Band 1	Band 2	Band 3	Total
Age of patient (years)	Under 19	32	43	5	0	80
	Between 19 and 40	17	62	22	3	104
	Between 41 and 65	28	82	35	31	176
	66 or over	13	53	68	6	140
	Total	90	240	130	40	500

(a) Calculate, **to three decimal places**, the probability that a patient, selected at random from these 500 patients, was:

(i) aged between 41 and 65;

(ii) aged 66 or over and charged at band 2;

(iii) aged between 19 and 40 and charged **at most** at band 1;

(iv) aged 41 or over, given that the patient was charged at band 2;

(v) charged **at least** at band 2, given that the patient was **not** aged 66 or over.

[9 marks]

6) A small software company has developed a new app.

The company has two options

- market and launch the app itself
- go into partnership with a larger software company who will market and launch the app.

If the company chooses to go into partnership it will pay a commission of 40% of the expected income from sales to the larger software company.

The income that can be expected depends on the level of sales and is shown below.

	Expected income (£)
High sales	500 000
Medium sales	200 000
Low sales	100 000

The table below shows the probabilities of each level of sales.

	Probability		
	High sales	Medium sales	Low sales
Market and launch the app itself	0.1	0.2	0.7
Go into partnership	0.5	0.3	0.2

Which option gives the higher expected income?
Justify your answer.

(6)

7) When buying a drum kit costing £342, Makeda considers two different lenders.

(a) The first lender requires Makeda to pay a single amount of £400 at the end of two years.

Calculate the APR charged by this lender.

Give the value of the APR as a percentage.

[4 marks]

(b) The second lender charges an APR of 14% and it requires two equal repayments, one at the end of the first year and the second repayment at the end of the second year.

Calculate the amount of each repayment.

[3 marks]

8) Nikita earned £4075 per month and had a tax-free allowance of £10 000.
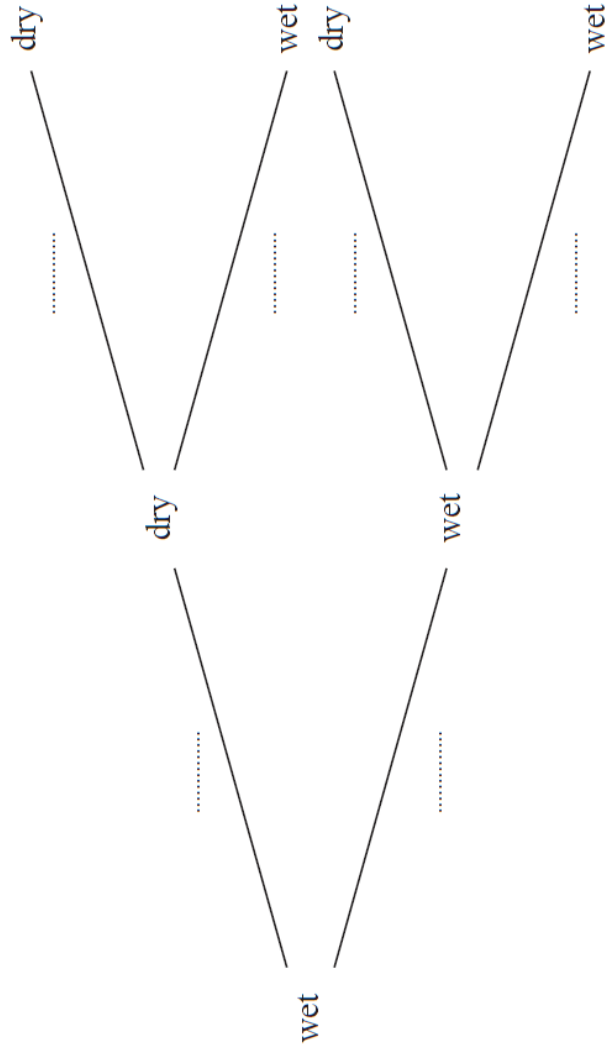
(a) Calculate Nikita's taxable income.

[3 marks]

(b) Calculate the amount of income tax which Nikita paid in the year.
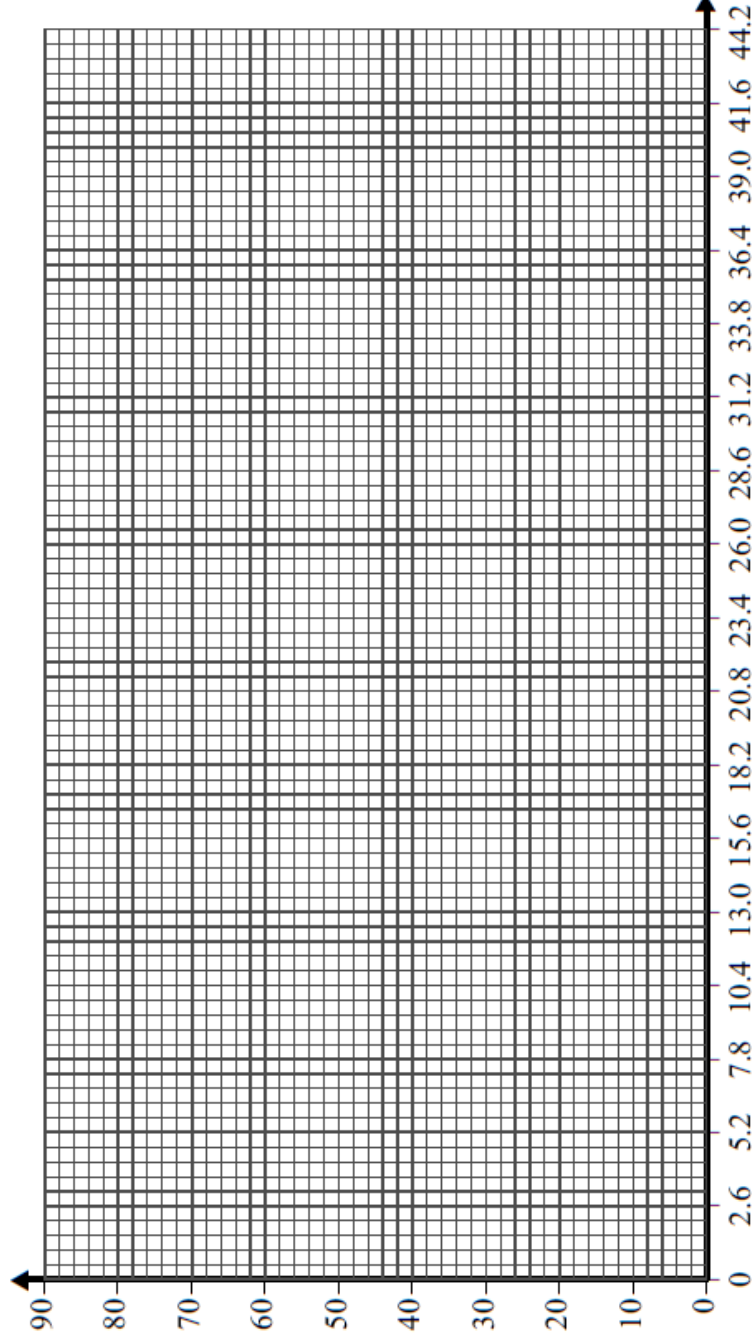
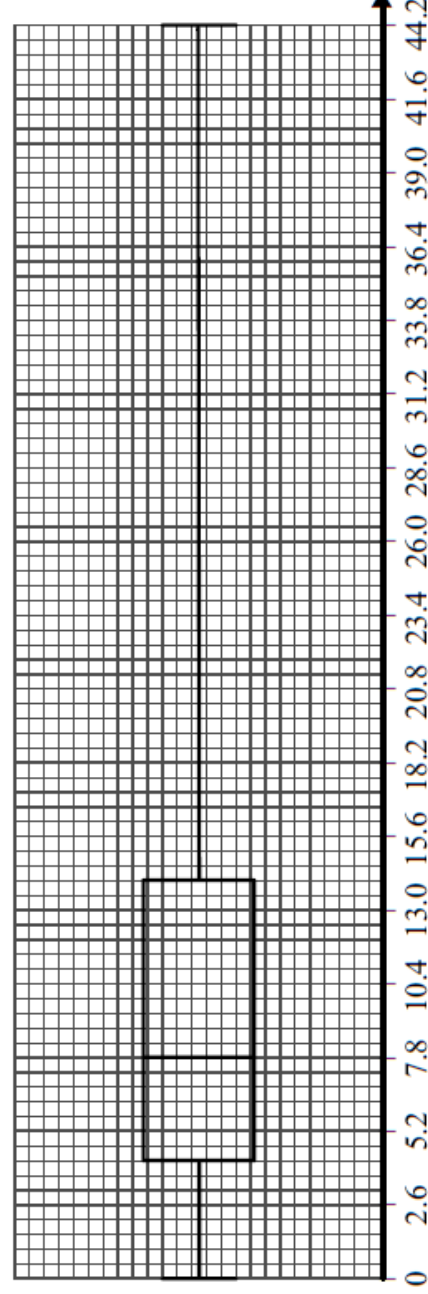**[5 marks]**

2)

Monday	Tuesday	Wednesday

wet

dry

wet

dry .... dry

wet .... wet

dry .... dry

wet .... wet

4)

Incomes, w (£)	Number of females in London	Number of females in the North
$0 < w \leqslant 2600$	7	29
$2600 < w \leqslant 5200$	14	56
$5200 < w \leqslant 10\,400$	25	64
$10\,400 < w \leqslant 15\,600$	16	35
$15\,600 < w \leqslant 20\,800$	8	25
$20\,800 < w \leqslant 28\,600$	10	15
$28\,600 < w \leqslant 36\,400$	4	5
$36\,400 < w \leqslant 44\,200$	4	5

London

Cumulative frequency

North

Incomes, w (£000s)