

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 school has 600 pupils.
- The head teacher wants to choose 8 pupils to appear on an advertising poster for the school.
- He decides to select 8 pupils using simple random sampling.
- He numbers the pupils from 001 to 600
- He uses this table of random digits.

068	944	408	875	163	977	584	946
916	745	538	936	053	538	436	988
011	444	733	097	300	643	040	752

- (a) He starts with 068 and reads **across** each row.
- Write down the number corresponding to each of the 8 pupils he selects.
- (b) Give **one** reason why this method may not be a suitable way to choose pupils for the poster.

[3 marks]

[1 mark]

- 2) The weight,  $X$  grams, of a bar of *PureAV* soap may be modelled by a normal distribution with mean 105 grams and standard deviation 4 grams.

Determine the probability that the weight of a randomly selected bar is:

- (i) less than 105 grams;
- (ii) **not** exactly 100 grams;
- (iii) more than 110 grams;
- (iv) between 102 grams and 108 grams.

[8 marks]

- 3) A mathematics class in a college took a test.
- The marks of the 10 female students in the class were as follows.

36 34 37 39 34 42 33 34 37 46

- (a) Calculate the mean mark of the 10 female students.
- (b) The mean mark of the 12 male students in the class was 36.5.

Calculate the mean mark of the 22 students in the class.

- 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.

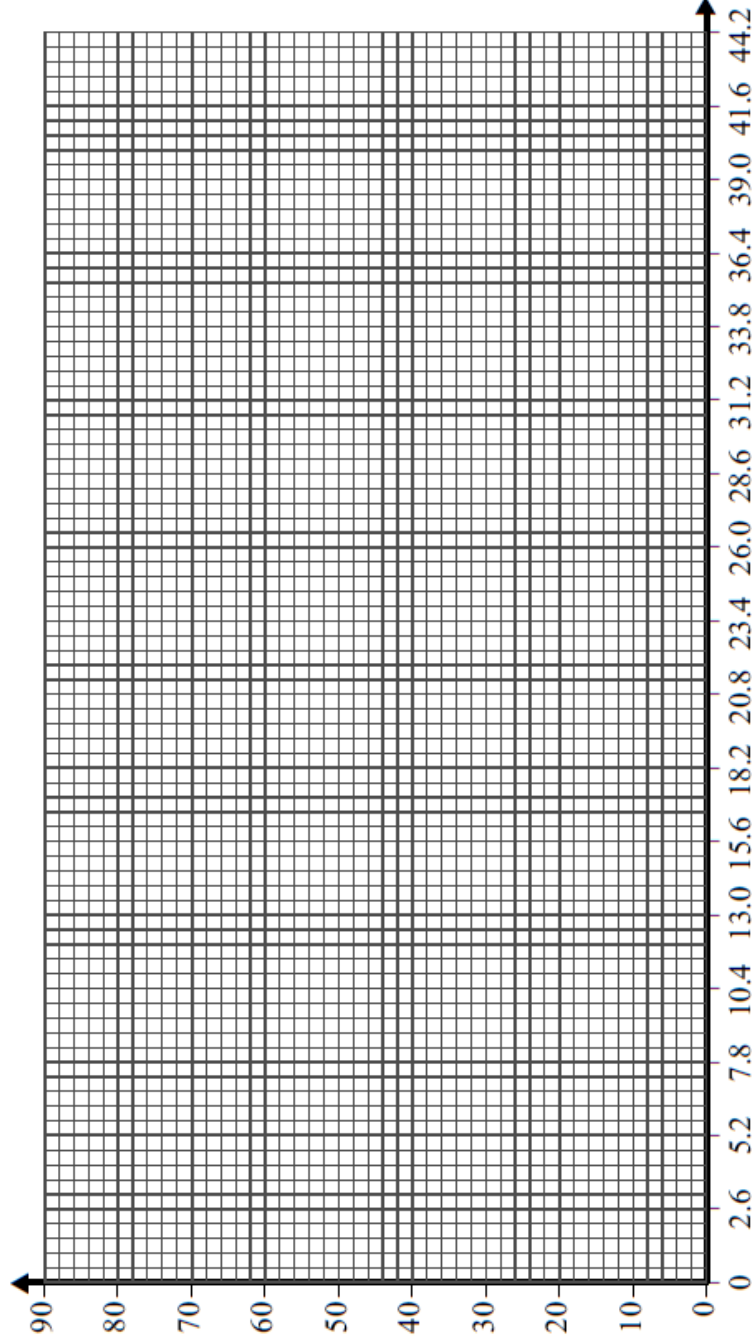
Write down **two** comparisons between the females' incomes in London and those in the North. (3 marks)

- 5) (a) The variable  $X$  represents the heights of American men.  
 5)  $X$  may be considered to have a normal distribution with mean  $\mu$  and variance  $\sigma^2$ .  
 A sample of size  $n$  is taken from the population of American men.
- Write down the distribution of the sample mean height  $\bar{X}$ . (2 marks)
- (b) American men have heights which are distributed normally with mean  $\mu$  cm and variance  $64 \text{ cm}^2$ .  
 A random sample of 22 American men is chosen to form a football team.  
 The mean height,  $\bar{x}$ , of these men is 176 cm.
- Calculate the 95% symmetric confidence interval for  $\mu$ .  
 Give your answers to one decimal place. (5 marks)
- 6) The table below gives the length and the weight of a sample of ten baby boys aged twelve months.
- (a) On the grid opposite, plot a scatter graph of the above data. Use Length (cm) on the  $x$ -axis and Weight (kg) on the  $y$ -axis. [2 marks]
- (b) Use your calculator to find:
- (i) the mean length,  $\bar{x}$ ; [1 mark]
- (ii) the mean weight,  $\bar{y}$ ; [1 mark]
- (iii) the product-moment correlation coefficient,  $r$ . [1 mark]
- (c) Interpret your value of  $r$  found in part (b)(iii) in the context of this question. [1 mark]
- (d) (i) Calculate the equation of the line of best fit of  $y$  on  $x$ . Give any numerical values correct to three significant figures. [3 marks]
- (ii) Plot the line of best fit on your scatter graph. [3 marks]
- (e) Use your equation or your line of best fit to estimate the weight of a twelve-month-old baby boy whose length is 76.3 cm. [2 marks]
- 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]

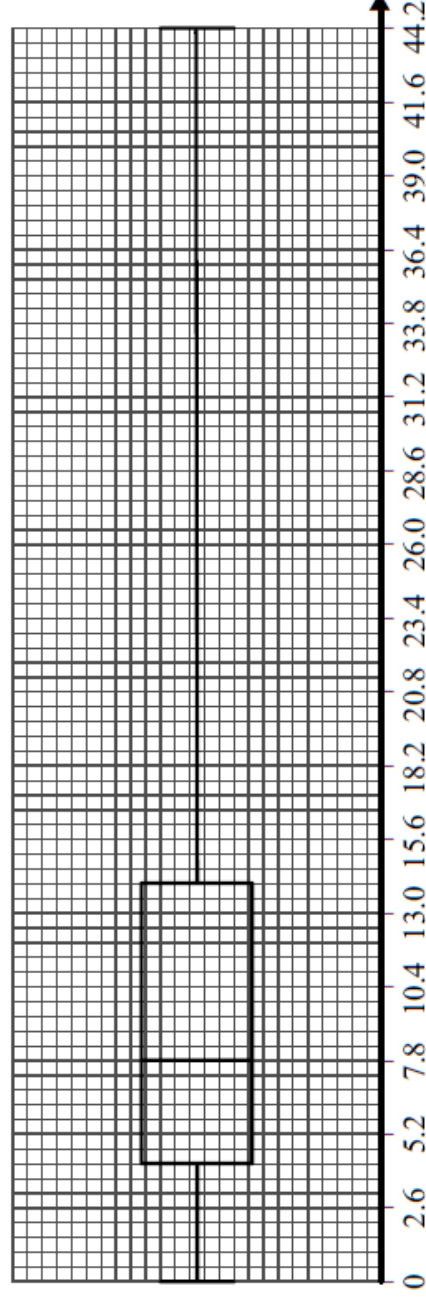
4)

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

Cumulative frequency **London**



**North**



Incomes,  $w$  (£000s)

6)

Baby boy	A	B	C	D	E	F	G	H	I	J
Length, $x$ (cm)	78.3	76.1	72.0	74.7	72.2	80.1	76.4	73.2	75.0	77.8
Weight, $y$ (kg)	11.1	9.7	8.2	9.0	8.5	12.0	10.5	8.7	9.4	10.5

