1 A university graduate applied for 10 jobs after she gained her degree. The probability of her being offered any particular job is 0.2, independently of any other job. Let X be the number of jobs which she is offered.

(i) The distribution of X is $B(n, p)$. State the values of the parameters n and p. [1]

(ii) State the value of $E(X)$. [1]

(iii) Use the tables of cumulative binomial probabilities to find

(a) $P(X \leqslant 4)$, [1]

(b) $P(2 \leqslant X < 6)$. [2]

2 A football was rolled in a straight line along the floor of a sports hall. The distance travelled, x metres, was recorded at a time, t seconds, after the ball was released, for values of t from $t = 1.0$ to $t = 4.5$. The results are given in the table below.

t	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
x	8.0	13.2	15.8	18.4	21.0	22.2	24.0	25.1

$[n = 8,\ \Sigma t = 22.0,\ \Sigma x = 147.7,\ \Sigma t^2 = 71.00,\ \Sigma x^2 = 2966.29,\ \Sigma tx = 455.05.]$

(i) On graph paper plot a scatter diagram of the data. [2]

(ii) Calculate the product moment correlation coefficient for the data. [3]

(iii) State the value of Spearman's rank correlation coefficient for the data. [1]

(iv) State with a reason whether a linear model would be appropriate for these data, referring to either your calculations or the scatter diagram. [2]

3 Two tennis players X and Y play three sets of tennis against each other. The probability that X wins the first set is $\frac{2}{3}$. For each subsequent set the probability of a player winning the set is $\frac{3}{4}$ if that player won the previous set. There are no drawn sets, so every set results in either X or Y winning.

(i) Show this information on a tree diagram. [3]

(ii) Use the tree diagram to find the probability that

(a) X wins all three sets, [1]

(b) X wins two sets and Y wins one set. [3]

4 A mathematics student has been asked to calculate some properties of the volumes, $x\,\text{cm}^3$, of a sample of 8 solid objects. To make the calculations easier he decides to subtract $200\,\text{cm}^3$ from each volume. His results can be summarised as

$$\Sigma(x-200) = 17\,000, \qquad \Sigma(x-200)^2 = 86\,000\,000.$$

(i) Find the mean volume of the 8 solid objects. [2]

(ii) Find the standard deviation of the volumes of the 8 solid objects. [3]

(iii) Calculate the value of $\Sigma(x-300)$. [2]

5 A set of bivariate data (x, y) was collected for an experiment. You are given that

$$n = 10,\ \Sigma x = 78.9,\ \Sigma y = 64.0,\ \Sigma x^2 = 743.45,\ \Sigma y^2 = 476.52,\ \Sigma xy = 575.81.$$

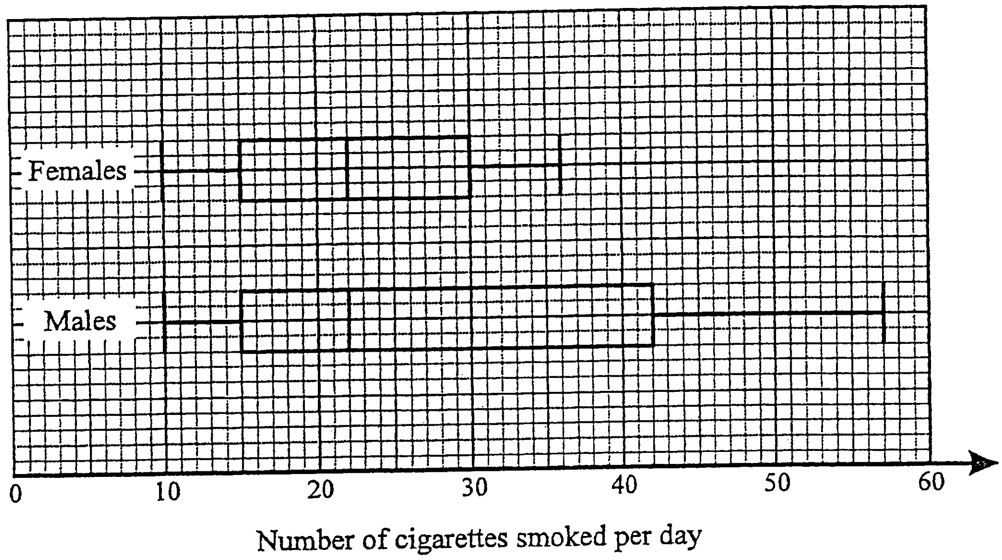
You are also given that the regression line of x on y has equation $x = 1.11 + 1.06y$, where the coefficients are given correct to 3 significant figures.

(i) Calculate the equation of the regression line of y on x, giving your answer in the form $y = a + bx$. [4]

(ii) State the coordinates of the point of intersection of the two lines. (You do not need to solve the simultaneous equations.) [2]

(iii) In the collection of the data neither variable was controlled. Use the appropriate line to estimate the value of x when $y = 3.4$. You may assume that $y = 3.4$ is within the range of the data collected. [2]

6 A survey was carried out into the number of cigarettes smoked in a particular day by a sample of 30 smokers. Fifteen of the smokers were female and fifteen were male. The results are shown in the box-and-whisker plot below.



(i) State the median number of cigarettes smoked by

(a) the females,

(b) the males. [2]

(ii) Calculate the interquartile range of

(a) the female data,

(b) the male data. [3]

(iii) Use the box-and-whisker plots to state one similarity and one difference when comparing the male data with the female data. [2]

(iv) The number of cigarettes smoked on that particular day is given for each of the male smokers in the list below.

23, 30, 37, 18, 15, 22, 44, 57, 15, 20, 22, 42, 14, 10, 47

(a) Construct a stem-and-leaf diagram for the male data given in the list above. [3]

(b) State one advantage of a stem-and-leaf diagram compared with a box-and-whisker plot. [1]

7 Two people, Ben and Chandra, were asked to rank 3 CDs, X, Y and Z, in order of preference. Ben stated that X was best, Y was second best and Z was the least good. Chandra chose her order of preference at random.

(i) How many different orders could Chandra choose? [1]

Let R be the value of Spearman's rank correlation coefficient between Chandra's order of preference and Ben's. The tables below show two of the possible orders Chandra could choose, and the resulting value of R.

Case 1

	X	Y	Z
Ben's ranking	1	2	3
Chandra's ranking	1	2	3

The resulting value of R is 1

Case 2

	X	Y	Z
Ben's ranking	1	2	3
Chandra's ranking	2	1	3

The resulting value of R is 0.5

(ii) Calculate the value of R for each of the other possible orders that Chandra could choose. [7]

(iii) Hence show that the distribution of R is given by the table below. [1]

r	-1	-0.5	0.5	1
$P(R = r)$	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{2}{6}$	$\frac{1}{6}$

(iv) Find $E(R)$ and $Var(R)$. [5]