2. A marine biologist records as a frequency distribution the lengths (L), measured to the nearest centimetre, of 100 mackerel. The results are given in the table below.

Length of mackerel (L, cm)	Number of mackerel
$27 < L \leq 29$	2
$29 < L \leq 31$	4
$31 < L \leq 33$	8
$33 < L \leq 35$	21
$35 < L \leq 37$	30
$37 < L \leq 39$	18
$39 < L \leq 41$	12
$41 < L \leq 43$	5
	100

(a) Construct a cumulative frequency table for the data in the table.

(2)

(b) Draw a cumulative frequency curve.

Hint: Plot your cumulative frequencies at the top of each interval.

(3)

(c) Use the cumulative frequency curve to find an estimate, to the nearest cm for

(i) the median length of mackerel:

(2)

(ii) the interquartile range of mackerel length.

(2)

(Total 9 marks)

4 A study measured the bone density (in g/cm^3) of a group of 25 year old adults, and a group of 60 year old adults. The results are shown below.

25 year old group:	1.35	1.15	1.3	1.3	1.15	1.25	1.3	1.15	1.3	1.45
	1.25	1.4	1.45	1.35	1.2	1.2	1.3	1.45	1.2	1.3
60 year old group:	0.85	0.9	0.85	1.0	0.95	1.05	0.9	0.9	0.95	0.95
	1.2	1.2	0.9	1.0	1.1	1.05	1.1	0.95	1.0	0.95

a Calculate the five-number summary for each of the data sets.

b Display the data in a parallel boxplot.

c Compare the measures of the centre of each distribution.

d Compare the measures of spread of each distribution.

e What conclusions can be drawn from the data?

49 A group of students compare their average test results for Physics (x) and Chemistry (y).

Physics Test (x%)	43	45	50	51	55	56	59	63	65	72	77	93
Chemistry Test (y%)	52	53	57	57	58	62	63	70	72	87	88	100

a Draw a scatter diagram for this data.

b Find the mean point $(\overline{x}, \overline{y})$.

c Draw a line of best fit by eye on the scatter diagram drawn in **a**.

d Using your graphics calculator, determine:

i the product-moment correlation coefficient r

ii the equation of the least squares regression line for y on x.

e Hence, predict to the nearest 1% the average test result in Chemistry for a student who achieved an average test result of 85% in Physics.

50 The table alongside shows the number of balloons in a giant party pack.

	Red	*Yellow*	*Blue*
Large	12	5	9
Medium	15	8	10
Small	24	11	6

a State the:

i total number of balloons in the pack.

ii number of medium balloons in the pack.

b One balloon is chosen at random from the pack. Find the probability that:

i the balloon is not yellow **ii** the balloon is either medium or small.

c Two balloons are selected at random from the pack. Find the probability that:

i both balloons are red **ii** neither of the balloons are large

iii exactly one of the balloons is blue **iv** at least one of the balloons is blue.

d Three balloons are selected at random from the pack. Find the probability that:

i all three balloons are small and yellow **ii** exactly two balloons are medium and red.

54 A club of beagle owners records the number of pups born per litter over a one year period. The results are shown in the frequency table.

Number of pups per litter (x)	*Frequency* (f)	$x \times f$
2	1	2
3	3	9
4	7	28
5	15	s
6	21	126
7	17	t
8	9	72
9	4	36
10	2	20

a Is this data discrete or continuous?

b Calculate the total number of litters for this one year period.

c Determine the value of: **i** s **ii** t

d How many beagle pups were born over this one year period?

e Calculate the average number of pups per litter.

f Using your graphics calculator, draw a boxplot to represent this data.

g Hence, determine the: **i** range **ii** interquartile range **iii** median.

10 Jose conducts a survey of 200 people to see which type of movie they prefer to watch. The results are shown in the table. Jose will conduct a χ^2 test at the 5% level of significance to determine whether the preferred movie type is independent of gender.

	Adventure	*Comedy*	*Action*	*Drama*
Men	25	25	40	15
Women	18	34	12	31

a State the null and alternative hypotheses.

b Calculate the expected frequency for the number of females who prefer comedies. Give your answer to the nearest whole number.

c Using your graphics calculator or otherwise, find the χ^2 statistic for Jose's data.

d Determine the number of degrees of freedom available for this calculation.

e Write down the critical value for the test.

f Give a conclusion for Jose's test, including reasons for your decision.

g Jose realised after he had completed the test that he entered some information incorrectly. The adventure and drama numbers for males had been reversed. Perform the test again with the correct data, and state whether the conclusion drawn in f is still valid.

11 Scientists are monitoring a population of wild ferrets. Their lengths are normally distributed with mean 50 cm and standard deviation 2.2 cm.

a A scientist captures one of the ferrets at random. Find the probability that the ferret is no more than 45 cm long.

b Find the proportion of ferrets measuring between 52 cm and 56 cm long.

c In a colony of 150 ferrets, how many would you expect to measure at least 48 cm in length?

d The longest 10% of ferrets are at least k cm long. Find k.

12 The lengths and weights of 10 melons are shown in the table below.

Length x (cm)	32	40	43	36	42	35	38	46	36	44
Weight y (kg)	1.9	2.8	2.8	2.4	2.5	2.3	2.6	2.8	2.0	2.5

a Plot this information on a scatter diagram. Use a scale of 1 cm to represent 5 cm on the x-axis, and 1 cm to represent 0.25 kg on the y-axis.

b Use your graphics calculator to calculate the linear correlation coefficient r. What does this value tell you about the relationship between the two variables?

c Use your graphics calculator to determine the equation of the least squares regression line. Draw this line on your graph.

d Use the line on your graph to estimate:

i the weight of a melon of length 35 cm ii the length of a melon of weight 2.5 kg.

14 A group of friends meet each week for a games night. The number of people attending ranges from 4 to 8, with the probabilities shown alongside.

Number of people	4	5	6	7	8
Probability	0.1	0.19	0.35	a	0.08

a Find a.

b Find the probability that on a randomly chosen week, less than 6 people attend.

c Over a period of 25 weeks, how many times would you expect at least 7 people to attend?

d Find the average number of people attending the games night each week.

15 a The 5th term of an arithmetic sequence is 50, and the sum of the first 15 terms is 1200.

i Determine two linear equations involving the first term u_1 and the common difference d.

ii Solve these equations simultaneously to find u_1 and d.

iii Write down the first 5 terms of the arithmetic sequence.

b A geometric sequence begins at 100, and each subsequent term is half of the previous one.

i Write down the first 5 terms of the geometric sequence.