1. Using the coding $y = \frac{x-90}{5}$, and showing each step in your working clearly, calculate the mean and the standard deviation of the 20 observations of a variable X given by the following table:

x	75	80	85	90	95	100	105	110
Frequency	1	2	3	6	4	2	1	1

(8 marks)

2. A darts player throws two darts, attempting to score a bull's-eye with each. The probability that he will achieve this with his first dart is 0·25. If he misses with his first dart, the probability that he will also miss with his second dart is 0·7. The probability that he will miss with at least one dart is 0·9.

   (a) Show that the probability that he succeeds with his first dart but misses with his second is 0·15. **(5 marks)**

   (b) Find the conditional probability that he misses with both darts, given that he misses with at least one. **(3 marks)**

3. The entrance to a car park is 1·9 m wide. It is found that this is too narrow for 2% of the vehicles which need to use the car park. The widths of these vehicles are modelled by a normal distribution with mean 1·6 m.

   (a) Find the standard deviation of the distribution. **(4 marks)**

   It is decided to widen the entrance so that 99·5% of vehicles will be able to use it.

   (b) Find the minimum width needed to achieve this. **(4 marks)**

4. A pack of 52 cards contains 4 cards bearing each of the integers from 1 to 13. A card is selected at random. The random variable X represents the number on the card.

   (a) Find $P(X \leq 5)$. **(1 mark)**

   (b) Name the distribution of X and find the expectation and variance of X. **(4 marks)**

   A hand of 12 cards consists of three 2s, four 3s, two 4s, two 5s and one 6. The random variable Y represents the number on a card chosen at random from this hand.

   (c) Draw up a table to show the probability distribution of Y. **(3 marks)**

   (d) Calculate $\text{Var}(3Y-2)$. **(6 marks)**

5. The following data were collected by counting the number of cars that passed the gates of a college in 60 successive 5 minute intervals.

12	20	19	31	32	35	37	29	26	27	20	17
15	9	8	11	13	17	17	21	25	27	28	25
30	32	37	40	45	45	44	47	42	41	36	38
35	34	30	30	27	26	29	24	23	21	21	18
16	16	19	22	26	28	23	17	15	10	12	13

(a) Make a stem and leaf diagram for this data, using the groups 5 - 9, 10 - 14, ..., 45 - 49. Show the total in each group and give a key to the diagram. **(7 marks)**

(b) Find the three quartiles for this data. **(4 marks)**

(c) On graph paper, draw a box plot for the data. **(4 marks)**

(d) Describe the skewness of the distribution. **(1 mark)**

6. A missile was fired vertically upwards and its height above ground level, h metres, was found at various times t seconds after it was released. The results are given in the following table:

t	1	2	3	4	5	6	7
h	68	126	174	216	240	252	266

It is thought that this data can be fitted to the formula $h = pt - qt^2$.

(a) Show that this equation can be written as $\frac{h}{t} = p - qt$. **(1 mark)**

(b) Plot a scatter diagram of $\frac{h}{t}$ against t. **(5 marks)**

Given that $\sum h = 1342$, $\sum \frac{h}{t} = 371$ and $\sum \frac{h^2}{t^2} = 20\,385$,

(c) find the equation of the regression line of $\frac{h}{t}$ on t and hence write down the values of p and q. **(8 marks)**

(d) Use your equation to find the value of h when $t = 10$. Comment on the implication of your answer. **(3 marks)**

(e) Find the product-moment correlation coefficient between $\frac{h}{t}$ and t and state the significance of its value. **(4 marks)**