STATISTICS (A) UNIT 1 **TEST PAPER 5**

1. 70% of the households in a town have a CD player and 45% have both a CD player and a personal computer (PC). 18% have neither a CD player nor a PC.
   (a) Illustrate this information using a Venn diagram. **(3 marks)**
   (b) Find the percentage of the households that do not have a PC. **(2 marks)**
   (c) Find the probability that a household chosen at random has a CD player or a PC but not both. **(2 marks)**

2. The random variable X has the normal distribution $N(2, 1{\cdot}7^2)$.
   (a) State the standard deviation of X. **(1 mark)**
   (b) Find $P(X < 0)$. **(2 marks)**
   (c) Find $P(0{\cdot}6 < X < 3{\cdot}4)$. **(4 marks)**

3. The discrete random variable X has probability function

$$P(X = x) = \begin{cases} cx^2 & x = -3, -2, -1, 1, 2, 3 \\ 0 & \text{otherwise.} \end{cases}$$

   (a) Show that $c = \frac{1}{28}$. **(3 marks)**
   (b) Calculate (i) $E(X)$, (ii) $E(X^2)$. **(3 marks)**
   (c) Calculate (i) $\text{Var}(X)$, (ii) $\text{Var}(10 - 2X)$. **(3 marks)**

4. The heights, h m, of eight children were measured, giving the following values of h:

   1·20, 1·12, 1·43, 0·98, 1·31, 1·26, 1·02, 1·41.

   (a) Find the mean height of the children. **(2 marks)**
   (b) Calculate the variance of the heights. **(3 marks)**

   The children were also weighed. It was found that their masses, w kg, were such that

$$\sum w = 324, \qquad \sum w^2 = 13\,532, \qquad \sum wh = 403.$$

   (c) Calculate the product-moment correlation coefficient between w and h. **(4 marks)**
   (d) Comment briefly on the value you have obtained. **(1 marks)**

5. The ages of the residents of a retirement community are assumed to be normally distributed. 15% of the residents are under 60 years old and 5% are over 90 years old.
   (a) Using this information, find the mean and the standard deviation of the ages. **(7 marks)**
   (b) If there are 200 residents, find how many are over 80 years old. **(3 marks)**

6. Of the cars that are taken to a certain garage for an M.O.T. test, 87% pass. However, 2% of these have faults for which they should have been failed. 5% of the cars which fail are in fact roadworthy and should have passed.

Using a tree diagram, or otherwise, calculate the probabilities that a car chosen at random

(a) should have passed the test, regardless of whether it actually did or not, **(4 marks)**

(b) failed the test, given that it should have passed. **(3 marks)**

The garage is told to improve its procedures. When it is inspected again a year later, it is found that the pass rate is still 87% overall and 2% of the cars passed have faults as before, but now 0·3% of the cars which should have passed are failed and x% of the cars which are failed should have passed.

(c) Find the value of x. **(8 marks)**

7. The back-to-back stem and leaf diagram shows the journey times, to the nearest minute, of the commuter services into a big city provided by the trains of two operating companies.

	Company *A*		Company *B*	
(3)	4 3 1	2	0 5 6 6 8 9	(6)
(4)	9 8 6 5	3	1 3 4 7 9	(5)
(4)	8 8 6 2	4	0 1 3 5 8	( )
(6)	9 7 5 3 2 1	5	2 6 8 9 9	( )
(3)	6 5 3	6	3 4 7 7	( )
(3)	3 2 2	7	0 1 5	( )

Key : 4 | 3 | 6 means 34 minutes for Company *A* and 36 minutes for Company *B*.

(a) Write down the numbers needed to complete the diagram. **(1 mark)**

(b) Find the median and the quartiles for each company. **(6 marks)**

(c) On graph paper, draw box plots for the two companies. Show your scale. **(6 marks)**

(d) Use your plots to compare the two sets of data briefly. **(2 marks)**

(e) Describe the skewness of each company's distribution of times. **(2 marks)**

