1 A summary of 24 observations of \( x \) gave the following information:

\[ \Sigma (x - a) = -73.2 \quad \text{and} \quad \Sigma (x - a)^2 = 2115. \]

The mean of these values of \( x \) is 8.95.

(i) Find the value of the constant \( a \). [2]

(ii) Find the standard deviation of these values of \( x \). [2]

2 The random variable \( X \) takes the values \(-2, 0 \) and 4 only. It is given that \( P(X = -2) = 2p \), \( P(X = 0) = p \) and \( P(X = 4) = 3p \).

(i) Find \( p \). [2]

(ii) Find \( E(X) \) and \( \text{Var}(X) \). [4]

3 The six digits 4, 5, 6, 7, 7, 7 can be arranged to give many different 6-digit numbers.

(i) How many different 6-digit numbers can be made? [2]

(ii) How many of these 6-digit numbers start with an odd digit and end with an odd digit? [4]

4 The random variable \( X \) has a normal distribution with mean 4.5. It is given that \( P(X > 5.5) = 0.0465 \) (see diagram).

(i) Find the standard deviation of \( X \). [3]

(ii) Find the probability that a random observation of \( X \) lies between 3.8 and 4.8. [4]
The arrival times of 204 trains were noted and the number of minutes, \( t \), that each train was late was recorded. The results are summarised in the table.

<table>
<thead>
<tr>
<th>Number of minutes late ((t))</th>
<th>(-2 \leq t &lt; 0)</th>
<th>(0 \leq t &lt; 2)</th>
<th>(2 \leq t &lt; 4)</th>
<th>(4 \leq t &lt; 6)</th>
<th>(6 \leq t &lt; 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of trains</td>
<td>43</td>
<td>51</td>
<td>69</td>
<td>22</td>
<td>19</td>
</tr>
</tbody>
</table>

(i) Explain what \(-2 \leq t < 0\) means about the arrival times of trains. [1]

(ii) Draw a cumulative frequency graph, and from it estimate the median and the interquartile range of the number of minutes late of these trains. [7]

On any occasion when a particular gymnast performs a certain routine, the probability that she will perform it correctly is 0.65, independently of all other occasions.

(i) Find the probability that she will perform the routine correctly on exactly 5 occasions out of 7. [2]

(ii) On one day she performs the routine 50 times. Use a suitable approximation to estimate the probability that she will perform the routine correctly on fewer than 29 occasions. [5]

(iii) On another day she performs the routine \( n \) times. Find the smallest value of \( n \) for which the expected number of correct performances is at least 8. [2]

Box \( A \) contains 5 red paper clips and 1 white paper clip. Box \( B \) contains 7 red paper clips and 2 white paper clips. One paper clip is taken at random from box \( A \) and transferred to box \( B \). One paper clip is then taken at random from box \( B \).

(i) Find the probability of taking both a white paper clip from box \( A \) and a red paper clip from box \( B \). [2]

(ii) Find the probability that the paper clip taken from box \( B \) is red. [2]

(iii) Find the probability that the paper clip taken from box \( A \) was red, given that the paper clip taken from box \( B \) is red. [2]

(iv) The random variable \( X \) denotes the number of times that a red paper clip is taken. Draw up a table to show the probability distribution of \( X \). [4]