

| Qu 3  | Scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Marks                 | AO                   |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------|
| (a)   | $[68 - 7 = ]$ <b>61</b> (only)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | B1<br>(1)             | 1.1b                 |
| (b)   | $[25 - 14] =$ <b>11</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | B1<br>(1)             | 1.1b                 |
| (c)   | $\left[ \mu \text{ or } \bar{x} = \frac{607.5}{27} = \right] =$ <b>22.5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | B1<br>(1)             | 1.1b                 |
| (d)   | $\sigma = \sqrt{\frac{17\,623.25}{27} - "22.5"^2}$ <u>or</u> $\sqrt{146.4629...}$<br><br>= 12.10218... awrt <b>12.1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | M1<br><br>A1<br>(2)   | 1.1b<br><br>1.1b     |
| (e)   | $\mu + 3\sigma = "22.5" + 3 \times "12.1..." =$ awrt 59 so only <b>one</b> outlier                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | B1ft<br>(1)           | 1.1b                 |
| (f)   | Median increases implies that both values must be $> 20$<br>Mean is the same means that $a + b = 45$<br>So possible values are: e.g. $b = 21$ and $a = 24$ (o.e.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | M1<br>M1<br>A1<br>(3) | 3.1b<br>1.1b<br>2.2b |
| (g)   | Both values will be less than 1 standard deviation from the mean and so the standard deviation of all 29 values will be smaller                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | B1<br>(1)             | 2.4                  |
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ( 10 marks)           |                      |
| Notes |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       |                      |
| (a)   | B1 for correctly interpreting the box plot to find the range (more than 1 answer is B0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |                      |
| (b)   | B1 for correct understanding of IQR and answer of 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       |                      |
| (c)   | B1 for 22.5 only (or exact equivalent such as $\frac{45}{2}$ ). Allow 22 mins and 30 secs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                      |
| (d)   | M1 for a correct expression including square root. Allow $\sqrt{146}$ or better. Ft their mean<br>A1 for awrt 12.1<br>NB Allow use of $s = 12.3327...$ or awrt 12.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |                      |
| (e)   | B1ft for a correct calculation or value based on their $\mu$ and $\sigma$ and compatible conclusion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |                      |
| (f)   | 1 <sup>st</sup> M1 Correct start to the problem and a correct statement about the values based on median<br>Allow if their final two values are both $> 20$<br>2 <sup>nd</sup> M1 for a correct explanation leading to equation $a + b = 45$ (o.e. e.g. equidistant from mean)<br>Allow if their final two values sum to 45<br>A1 for a correct pair of values (both $> 20$ with a sum of 45) <b>and</b> at least some attempt to explain how their values satisfy at least one of the conditions (both $> 20$ <u>or</u> $a + b = 45$ ).<br>Ignore $a =$ or $b =$ labels<br>NB The values for $a$ and $b$ do not need to be integers. |                       |                      |
| (g)   | B1 for a correct explanation.<br>Must mention that both values are less than 1 sd (ft their answer to (d)) from the mean                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       |                      |