**S1 Chapter 2 Linear Interpolation Questions**

**Example on board: Jan 2007 Q4**

Summarised below are the distances, to the nearest mile, travelled to work by a random sample of 120 commuters.

|  |  |
| --- | --- |
| Distance (to the nearest mile) | Number of commuters |
| 0 – 9 | 10 |
| 10 – 19 | 19 |
| 20 – 29 | 43 |
| 30 – 39 | 25 |
| 40 – 49 | 8 |
| 50 – 59 | 6 |
| 60 – 69 | 5 |
| 70 – 79 | 3 |
| 80 – 89 | 1 |

For this distribution,

 ~~(~~*~~a~~*~~) describe its shape,~~ **~~(1)~~**

 (*b*) use linear interpolation to estimate its median. **(2)**

**Test Your Understanding:** Use linear interpolation to estimate the median of the following:

1)

|  |  |
| --- | --- |
| **Age of relic (years)** | **Frequency** |
| 0-1000 | 24 |
| 1001-1500 | 29 |
| 1501-1700 | 12 |
| 1701-2000 | 35 |

2)

|  |  |
| --- | --- |
| **Shark length (cm)** | **Frequency** |
| $$40\leq x<100$$ | 17 |
| $$100\leq x<300$$ | 5 |
| $$300\leq x<600$$ | 8 |
| $$600\leq x<1000$$ | 10 |

**Exercises**

**Q1) Solomon Paper A Q5b**



**Q2) Solomon Paper E Q4a**

The ages of 300 houses in a village are recorded given the following table of results.

|  |  |
| --- | --- |
| Age $a$ (years) | Number of houses |
| $$0\leq a<20$$ | $$36$$ |
| $$20\leq a<40$$ | $$92$$ |
| $$40\leq a<60$$ | $$74$$ |
| $$60\leq a<100$$ | $$39$$ |
| $$100\leq a<200$$ | $$14$$ |
| $$200\leq a<300$$ | $$27$$ |
| $$300\leq a<500$$ | $$18$$ |

Use linear interpolation to estimate the median.

**Q3) Solomon Paper L Q7a**

A cyber-café recorded how long each user stayed during one day giving the following results.

|  |  |
| --- | --- |
| Length of stay (minutes) | Number of houses |
| $$0\leq l<30$$ | $$15$$ |
| $$30\leq l<60$$ | $$31$$ |
| $$60\leq l<90$$ | $$32$$ |
| $$90\leq l<120$$ | $$23$$ |
| $$120\leq l<240$$ | $$17$$ |
| $$240\leq l<360$$ | $$2$$ |

Use linear interpolation to estimate the median of these data.

**Q4) May 2013 Q4**

The following table summarises the times, *t* minutes to the nearest minute, recorded for a group of students to complete an exam.



[You may use ∑f*t*2 *=* 134281.25]

(*a*) Estimate the mean ~~and standard deviation~~ of these data. **(5)**

(*b*) Use linear interpolation to estimate the value of the median. **(2)**

**S1 Chapter 3 Linear Interpolation Questions**

**Test Your Understanding:**

1. For the relic data before, now find $Q\_{1}, Q\_{3}$ and the interquartile range.
2. For the shark length data before, now find $P\_{37}$ and $P\_{78}$.

**Exercises:**

**Q1) May 2013 Q4 (continued)**

The following table summarises the times, *t* minutes to the nearest minute, recorded for a group of students to complete an exam.



(*c*) Show that the estimated value of the lower quartile is 18.6 to 3 significant figures. **(1)**

(*d*) Estimate the interquartile range of this distribution. **(2)**

**Q2) June 2005 Q2**

The following table summarises the distances, to the nearest km, that 134 examiners travelled to attend a meeting in London.

|  |  |
| --- | --- |
| **Distance (km)** | **Number of examiners** |
| 41–45 | 4 |
| 46–50 | 19 |
| 51–60 | 53 |
| 61–70 | 37 |
| 71–90 | 15 |
| 91–150 | 6 |

(*c*) Use interpolation to estimate the median *Q*2, the lower quartile *Q*1, and the upper quartile *Q*3 of these data.

**Q3)**

The ages of 300 houses in a village are recorded given the following table of results.

|  |  |
| --- | --- |
| Age $a$ (years) | Number of houses |
| $$0\leq a<20$$ | $$36$$ |
| $$20\leq a<40$$ | $$92$$ |
| $$40\leq a<60$$ | $$74$$ |
| $$60\leq a<100$$ | $$39$$ |
| $$100\leq a<200$$ | $$14$$ |
| $$200\leq a<300$$ | $$27$$ |
| $$300\leq a<500$$ | $$18$$ |

Use linear interpolation to estimate the lower quartile, upper quartile and hence the interquartile range.

**Q4)**

A cyber-café recorded how long each user stayed during one day giving the following results.

|  |  |
| --- | --- |
| Length of stay (minutes) | Number of houses |
| $$0\leq l<30$$ | $$15$$ |
| $$30\leq l<60$$ | $$31$$ |
| $$60\leq l<90$$ | $$32$$ |
| $$90\leq l<120$$ | $$23$$ |
| $$120\leq l<240$$ | $$17$$ |
| $$240\leq l<360$$ | $$2$$ |

Use linear interpolation to estimate:

1. The lower quartile.
2. The upper quartile.
3. The 90th percentile.

**Q5)**

|  |  |
| --- | --- |
| Distance (to the nearest mile) | Number of commuters |
| 0 – 9 | 10 |
| 10 – 19 | 19 |
| 20 – 29 | 43 |
| 30 – 39 | 25 |
| 40 – 49 | 8 |
| 50 – 59 | 6 |
| 60 – 69 | 5 |
| 70 – 79 | 3 |
| 80 – 89 | 1 |

Find the interquartile range for the distance travelled by commuters.