Paul takes the company bus to work. According to the bus timetable he should arrive at  
work at 08 31. Paul believes the bus is not reliable and often arrives late. Paul decides  
to test the arrival time of the bus and carries out a survey. He records the values of the  
random variable

*X* = number of minutes after 0831 when the bus arrives.

His results are summarised below.

|  |  |  |
| --- | --- | --- |
| *n* = 15 | = 60 | = 1946 |

(*a*)Calculate unbiased estimates of the mean, *μ*, and the variance of *X*.

**(3)**

Using the mean of Paul’s sample and given *X* ~ N(*μ*, 102)

(*b*)(i) calculate a 95% confidence interval for the mean arrival time at work for this

company bus.

(ii) State an assumption you made about the values in the sample obtained by Paul.

**(5)**

(*c*)Comment on Paul’s belief. Justify your answer.

**(2)**

**Total 10 marks**

**S3 May 2017 qu.5**

**Mark scheme**

| Question Number | Scheme | Marks |
| --- | --- | --- |
| **5.** |  |  |
| **(a)** |  | B1 |
|  |  | M1,A1 |
|  |  | (3) |
| **(b)(i)** |  | M1,A1 |
|  |  | A1 |
|  |  | A1 |
| **(ii)** | Paul samples times of **buses randomly** or **independently** of each other | B1 |
|  |  | (5) |
| **(c)\*** | 0 / 0831 / 8.31(am) is ‘contained in’ the confidence interval | M1 |
|  | Paul’s belief is not supported / 0831 arrival time is reasonable | A1cao |
|  |  | (2) |
|  |  | **Total 10** |

Whole question assesses spec point 15 Hypothesis testing, significance testing, confidence intervals and power.

\*Part (c) is AO3