

Write your name here

Surname

Other Names

# AS/A Level Mathematics

## Box Plots and Outliers

**Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.**

### Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled..
- Answer the questions in the spaces provided  
– there may be more space than you need.
- You should show sufficient working to make your methods clear.  
Answers without working may not gain full credit.
- Answers should be given to three significant figures unless otherwise stated.

### Information

- The marks for **each** question are shown in brackets  
– use this as a guide as to how much time to spend on each question.

### Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

- 1 In a study of how students use their mobile telephones, the phone usage of a random sample of 11 students was examined for a particular week.

The total length of calls,  $y$  minutes, for the 11 students were

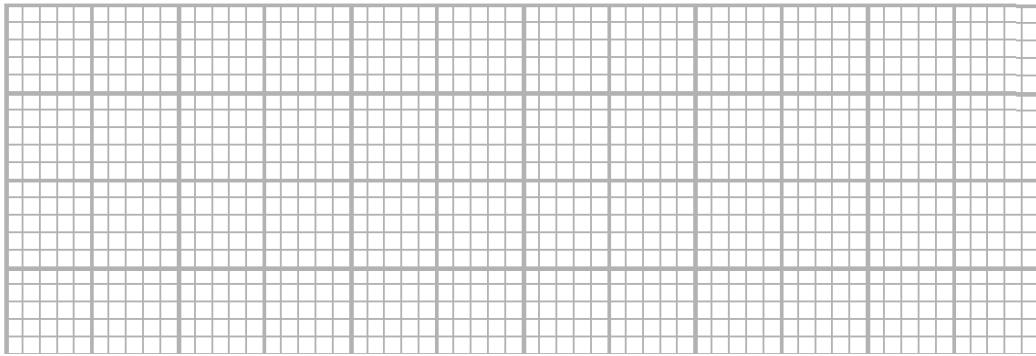
17, 23, 35, 36, 51, 53, 54, 55, 60, 77, 110

- (a) Find the median and quartiles for these data. (3)

A value that is greater than  $Q3 + 1.5 \times (Q3 - Q1)$  or smaller than  $Q1 - 1.5 \times (Q3 - Q1)$  is defined as an outlier.

- (b) Show that 110 is the only outlier. (2)

- (c) Draw a box plot for these data indicating clearly the position of the outlier. (3)



(Total for question 1 is 8 marks)

- 2 In a study of how much time students spend on social media, usage of a random sample of 15 students was examined for a particular day.

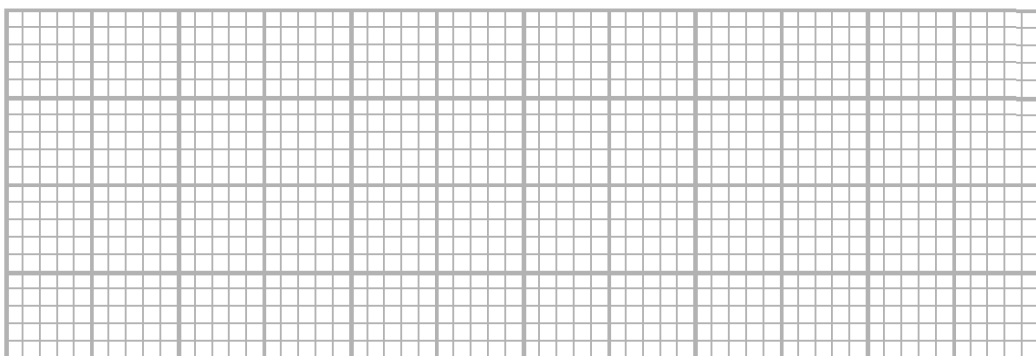
The total time of usage,  $x$  minutes, for the 15 students were

6, 25, 39, 62, 65, 74, 80, 94, 125, 127, 154, 159, 184, 210, 251

- (a) Find the median and quartiles for these data. (3)

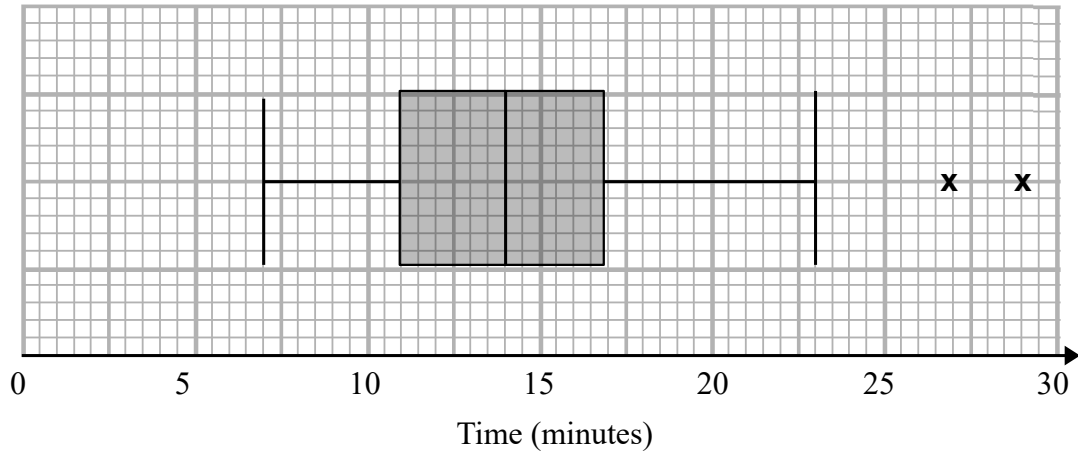
- (b) Show that there are no outliers. (2)

- (c) Draw a box plot for these data. (3)



(Total for question 2 is 8 marks)

- 3 Children from two schools A and B took part in a competition to complete a puzzle. The distribution of times taken, to the nearest minute, by children in school A are shown in the box plot below.



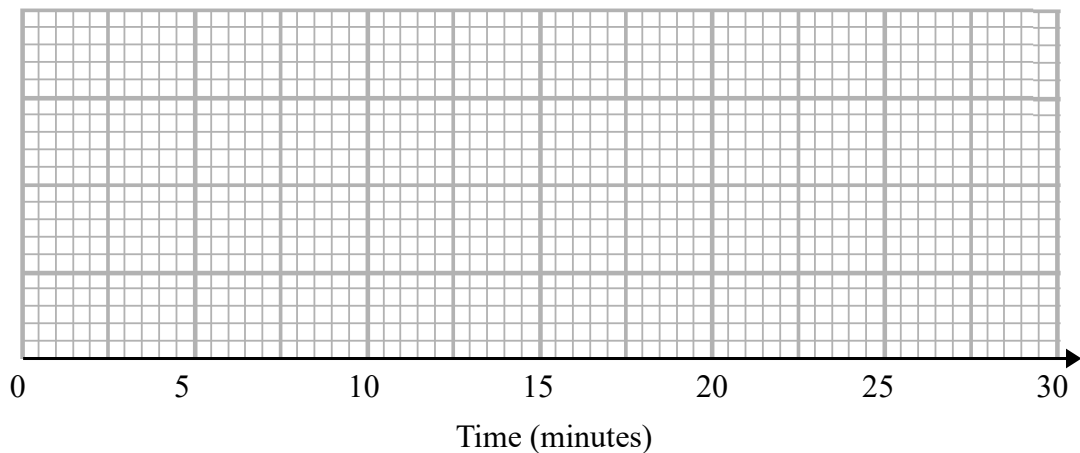
(a) Write down the time by which 75% of the children in school A had completed the puzzle. (1)

(b) State what the two crosses (x) represent on the box plot above. Interpret these in context. (2)

For school B the shortest time taken was 6 minutes, the longest time taken was 22 minutes and the quartiles were 12, 15 and 17 minutes respectively.

(c) Determine if there are any outliers. (3)

(d) Draw a box plot for this information. (3)



(e) Compare the two distributions. (3)

(Total for question 3 is 12 marks)