HIGHER

6.12 Box Plots: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 This question checks some key facts about box plots.

(a) Write down the name given to the difference between the upper quartile and the lower quartile of a data set. **(1)**

.....

(b) A box plot is drawn using five statistics, often called the five-number summary. Write down all five of these statistics. **(1)**

.....

(Total for Question 1 is 2 marks)

2 In a data set, the median is 18 and the maximum value is 30. Which of the following values could not be the upper quartile of the data set?

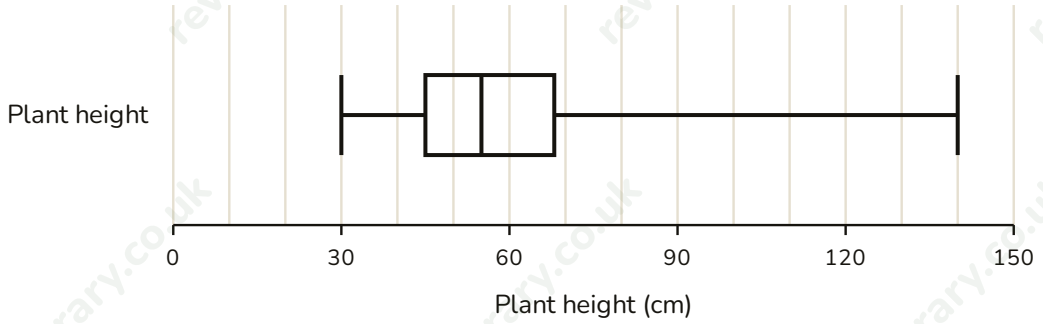
- ☐ A) 15
- ☐ B) 20
- ☐ C) 24
- ☐ D) 29

(Total for Question 2 is 1 mark)

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3 Priya, a gardener, recorded the height, in cm, of 15 tomato plants. The five-number summary is:

Minimum = 30, Lower quartile = 45, Median = 55, Upper quartile = 68, Maximum = 140



(a) Work out the interquartile range of the plant heights. **(1)**

.....

(b) The maximum height of 140 cm is much larger than the rest of the data. Suggest one reason why this value might not be typical of the tomato plants. **(1)**

.....

(Total for Question 3 is 2 marks)

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4 In a marathon, the finishing times of a large group of runners are shown on a box plot. The upper quartile finishing time is 4 hours 15 minutes, and 45 runners finished in a time longer than this.

(a) Work out the total number of runners in the group. **(2)**

.....

(b) Hence work out the number of runners who finished in less than the median time. **(1)**

.....

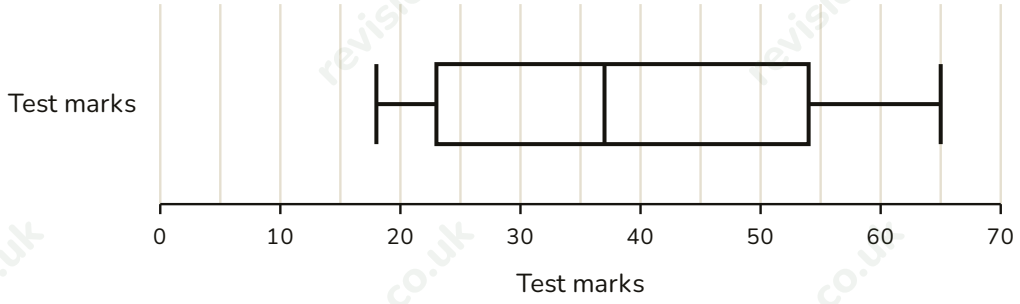
(Total for Question 4 is 3 marks)

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5 Two box plots show the heights (cm) for Boys and Girls. For Boys: median 36, interquartile range 22. For Girls: median 33, interquartile range 25. Compare the distributions.

(Total for Question 5 is 4 marks)

6 A box plot for test marks (marks) is drawn with minimum 18, lower quartile 23, median 37, upper quartile 54 and maximum 65. Work out the range and the interquartile range.



(Total for Question 6 is 3 marks)

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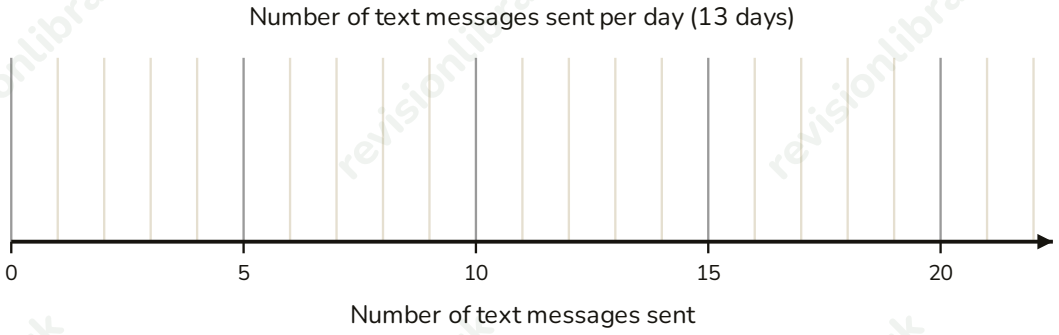
7 A box plot for the weekly savings (pounds) of 240 items has lower quartile 31, median 45 and upper quartile 47. Estimate how many items have a value less than 45.

(Total for Question 7 is 2 marks)

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8 Amelia recorded the number of text messages she sent on each of 13 days:

2, 5, 6, 6, 7, 8, 9, 9, 10, 12, 14, 15, 20



(a) Find the median number of texts sent. **(1)**

.....

(b) Find the lower quartile and the upper quartile of the number of texts sent. **(2)**

.....

(c) Hence find the interquartile range of the number of texts sent. **(1)**

.....

(d) Draw a box plot to represent Amelia's data on the grid provided. **(3)**

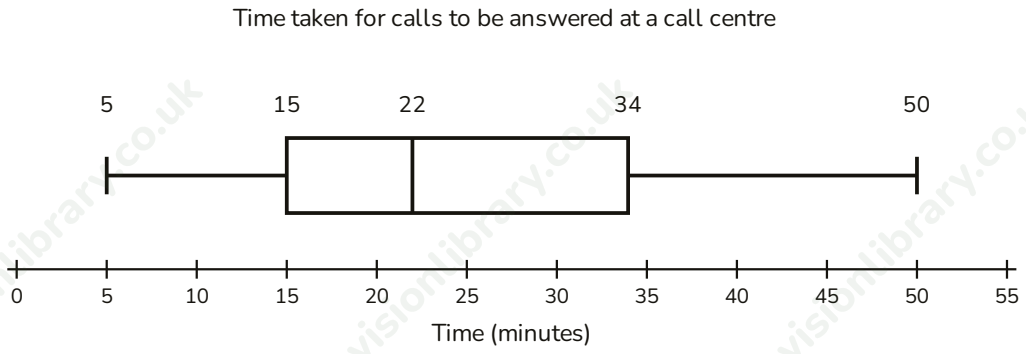
(Total for Question 8 is 7 marks)

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9 A call centre records the time, in minutes, taken for calls to be answered. The box plot for a large sample of calls has the following five-number summary.

Minimum = 5, Lower quartile = 15, Median = 22, Upper quartile = 34, Maximum = 50

For each statement below, write True, False or Cannot Tell, giving a brief reason.



(a) "More than half of the calls were answered in less than 20 minutes." **(1)**

(b) "The middle 50% of call answering times span 19 minutes." **(1)**

(c) "No call took longer than 50 minutes to be answered." **(1)**

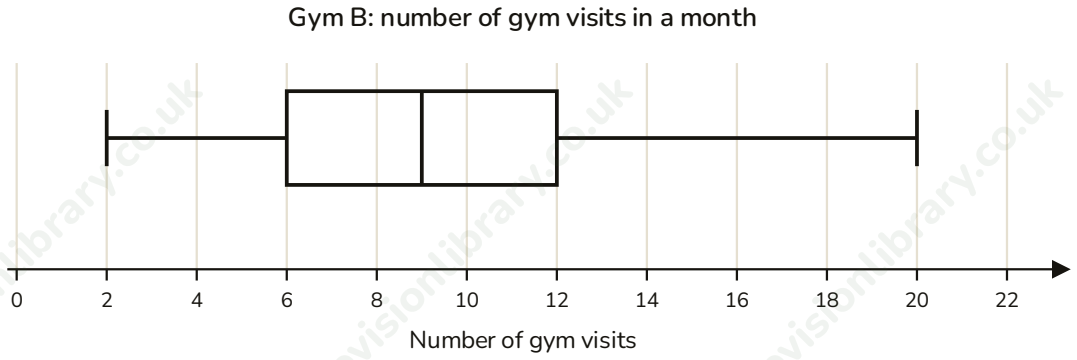
(Total for Question 9 is 3 marks)

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10 A gym recorded the number of visits made in a month by a sample of 11 members of Gym A:

3, 4, 4, 6, 7, 8, 8, 9, 11, 13, 18

The box plot for a sample of members of Gym B has the following five-number summary: minimum = 2, lower quartile = 6, median = 9, upper quartile = 12, maximum = 20.



(a) Find the median and the interquartile range for Gym A's 11 members. **(3)**

(b) Compare the number of gym visits made by members of Gym A and Gym B, making two comparisons in context. **(2)**

(Total for Question 10 is 5 marks)

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11 A list of 10 numbers, written in ascending order, is:

4, 7, 10, 13, x, 20, 23, 26, 29, y

The median of the 10 numbers is 17, and the range of the 10 numbers is 35.

(a) Find the value of x. **(2)**

.....

(b) Find the value of y. **(2)**

.....

(c) Hence find the interquartile range of the 10 numbers. **(2)**

.....

(Total for Question 11 is 6 marks)

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12 A statistician summarises a data set of 120 values. The lower quartile is 12. The median is x, and the upper quartile is (3x - 8). The interquartile range of the data set is 34. Separately, it is known that the minimum value in the data set is 5 and the maximum is 90.

(a) Form an equation in x for the interquartile range, and solve it to find the median. **(3)**

(b) Write down the upper quartile of the data set. **(1)**

.....

(c) Work out the number of values in the data set that lie between the median and the maximum. **(1)**

.....

(d) Write down the range of the data set. **(1)**

.....

(Total for Question 12 is 6 marks)

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Mark scheme · 6.12 Box Plots: Test Pack

Question 1

(a) oe: interquartile range (IQR) **B1**

(a) Answer: Interquartile range (IQR)

(b) oe: all five needed - minimum, lower quartile, median, upper quartile, maximum **B1**

(b) Answer: Minimum, lower quartile, median, upper quartile, maximum.

Question 2

A cao, with the reason that the upper quartile must be greater than or equal to the median (18) **B1**

Answer: A

Question 3

(a) 23 cm cao **B1**

(a) Answer: 23 cm

(b) oe: it could be an unusual/faster-growing variety, a measurement error, or an outlier that does not represent the typical plant in the group **B1**

(b) Answer: It may be an unusually tall or fast-growing plant, a different variety, or a measurement error - a possible outlier.

Question 4

(a) 0.25 x n = 45 oe, recognising that 25% of runners finish after the upper quartile **M1**

(a) n = 180 cao **A1**

(a) Answer: 180 runners

(b) ft: 90 cao **B1**

(b) Answer: 90 runners

Question 5

compares medians: Boys higher by 3 **B1**

comment in context on typical value **B1**

compares IQRs: Boys smaller by 3 **B1**

comment in context on consistency **B1**

Answer: Boys: higher median (36 compared with 33); Boys: smaller IQR (22 compared with 25), so more consistent

Question 6

65 - 18 or 54 - 23 **M1**

range = 47 **A1**

IQR = 31 **A1**

Answer: range = 47, IQR = 31

Question 7

uses the correct fraction of the data, e.g. 1/4 or 1/2 or 25% or 50% **M1**

120 cao **A1**

Answer: 120

Question 8

(a) 9 cao **B1**

(a) Answer: 9 texts

(b) splitting the data into a lower half (2,5,6,6,7,8) and an upper half (9,10,12,14,15,20) and finding the median of each half **M1**

(b) LQ = 6 and UQ = 13, both cao **A1**

(b) Answer: LQ = 6 texts, UQ = 13 texts

(c) ft: 7 cao **B1**

(c) Answer: 7 texts

(d) ft: whiskers drawn correctly from the minimum (2) to the box, and from the box to the maximum (20) **B1**

(d) ft: box drawn correctly from the lower quartile (6) to the upper quartile (13) **B1**

(d) ft: median (9) correctly marked inside the box **B1**

(d) Answer: Box plot with min 2, LQ 6, median 9, UQ 13, max 20

Question 9

(a) False, since the median is 22 minutes, at least half of the calls took 22 minutes or longer, so no more than half were answered in less than 20 minutes oe **B1**

(a) Answer: False

(b) True, since IQR = 34 - 15 = 19 **B1**

(b) Answer: True

(c) True, since the maximum value recorded was 50 minutes **B1**

(c) Answer: True

Question 10

(a) median = 8 cao **B1**

(a) identifying LQ from the lower half (3,4,4,6,7) and UQ from the upper half (8,9,11,13,18) **M1**

(a) IQR = 7 cao **A1**

(a) Answer: Median = 8 visits, IQR = 7 visits

(b) ft: median comparison in context, e.g. Gym B's median (9) is slightly higher than Gym A's median (8), so Gym B members typically visit slightly more often oe **B1**

(b) ft: IQR comparison in context, e.g. Gym A's IQR (7) is greater than Gym B's IQR (6), so the number of visits made by Gym A members is slightly more variable/less consistent than Gym B's oe **B1**

(b) Answer: Gym B members typically visit slightly more often (higher median); Gym A's visit numbers are slightly more variable (larger IQR).

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Question 11

(a) $(x + 20)/2 = 17$ oe **M1**

(a) $x = 14$ cao **A1**

(a) Answer: x = 14

(b) $y - 4 = 35$ oe **M1**

(b) $y = 39$ cao **A1**

(b) Answer: y = 39

(c) ft: identifying LQ from the lower half (4,7,10,13,14) and UQ from the upper half (20,23,26,29,39) **M1**

(c) ft: IQR = 16 cao **A1**

(c) Answer: IQR = 16

Question 12

(a) forming the equation $(3x - 8) - 12 = 34$ oe **M1**

(a) correctly rearranging to $3x = 54$ (or an equivalent correct algebraic step) **M1**

(a) $x = 18$ cao **A1**

(a) Answer: x = 18, so the median is 18

(b) ft: 46 cao, from $3(18) - 8$ **B1**

(b) Answer: 46

(c) Cannot be determined exactly: repeated median values mean the summary does not fix the count between the median and maximum. **B1**

(c) Answer: Cannot be determined exactly from the summary.

(d) 85 cao **B1**

(d) Answer: 85

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