

# Stem and Leaf Diagrams

## Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • Foundation tier

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Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

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**1** (4 marks)

The stem and leaf diagram shows the ages, in years, of the members of a club.

|   |           |
|---|-----------|
| 1 | 5 7 8 8   |
| 2 | 0 2 3 5 9 |
| 3 | 1 1 1 4 6 |
| 4 | 0         |

Key: 2 | 3 represents 23 years

(a) How many people are in the club?

Each leaf is one person.

Count the leaves:  $4 + 5 + 5 + 1 = 15$

**Answer:** 15

(b) Write down the mode.

The mode is the value that appears most often.

The stem 3 has three leaves of 1.

So 31 appears three times.

**Answer:** 31

(c) Find the median age.

There are 15 values, so the median is the 8th value.

The diagram is already in order, so count along:

15, 17, 18, 18, 20, 22, 23, **25**

**Answer:** 25

**Tip:** Write the median as the full number, 25, using the key. Don't just write the leaf 5.

(d) Work out the range of the ages.

Largest value: 40

Smallest value: 15

Range =  $40 - 15 = 25$

**Answer:** 25

**Tip:** The range is one number. Work out  $40 - 15$ ; don't write "15 to 40".

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**2** (2 marks)

A café recorded the number of cups of tea it sold each day for 18 days.  
The stem and leaf diagram shows this information.

|   |             |
|---|-------------|
| 2 | 5 7 9       |
| 3 | 1 3 3 6 8 9 |
| 4 | 0 2 2 5 7 8 |
| 5 | 0 2 4       |

Key: 3 | 1 represents 31 cups

(a) Work out the range.

Largest number: 54 (stem 5, leaf 4)

Smallest number: 25 (stem 2, leaf 5)

Range =  $54 - 25 = 29$

**Answer:** 29

**Tip:** Read the largest and smallest values with their stems, using the key: 54 and 25.

(b) Leon says,

“The most cups of tea sold on one day was 9, because 9 is the biggest number in the diagram.”

Is Leon correct?

You must give a reason for your answer.

No.

The 9s are leaves. Each leaf must be read with its stem.

The leaf 9 in the 2 row is 29, and in the 3 row it is 39.

The largest value is in the last row: stem 5, leaf 4, which is 54 cups.

**Answer:** No, the most was 54 cups

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**3** (3 marks)

Here are the masses, in kg, of 15 dogs.

34 52 41 38 45 29 56 47 33 41 50 27 44 39 48

Show this information in an ordered stem and leaf diagram.

The stems are the tens: 2, 3, 4, 5.

The leaves are the units, written in order from smallest to largest.

Add a key.

|   |  |             |
|---|--|-------------|
| 2 |  | 7 9         |
| 3 |  | 3 4 8 9     |
| 4 |  | 1 1 4 5 7 8 |
| 5 |  | 0 2 6       |

Key: 2 | 7 represents 27 kg

Check:  $2 + 4 + 6 + 3 = 15$  leaves ✓

**Answer:** See diagram

**Tip:** Three things lose marks here: leaves not in order, a missing key, and missing out a value. Count your leaves at the end.

**Marks:** 3 marks for a fully correct ordered diagram with a key. 2 marks if it is correct but not ordered, or has no key. 1 mark for two correct rows.

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**4** (4 marks)

Maya measured the heights, in cm, of 17 tomato plants.  
The stem and leaf diagram shows her results.

|   |             |
|---|-------------|
| 2 | 6 8         |
| 3 | 0 4 4 7     |
| 4 | 1 3 5 5 5 9 |
| 5 | 2 3 6       |
| 6 | 0 8         |

Key: 4 | 1 represents 41 cm

(a) Find the median height.

There are 17 plants, so the median is the 9th value.

Count along the diagram:

26, 28, 30, 34, 34, 37, 41, 43, **45**

**Answer:** 45 cm

**Tip:** For  $n$  values the median is the  $\frac{n+1}{2}$ th value. Here  $\frac{17+1}{2} = 9$ .

(b) Work out the range.

Tallest: 68

Shortest: 26

$$\text{Range} = 68 - 26 = 42$$

**Answer:** 42 cm

- (c) One of the plants is chosen at random.  
Find the probability that this plant is less than 35 cm tall.

Plants less than 35 cm: 26, 28, 30, 34, 34

That is 5 plants out of 17.

$$\text{Probability} = \frac{5}{17}$$

**Answer:**  $\frac{5}{17}$

**Tip:** The denominator is the total number of plants, 17, not the number of rows.

*Marks:* 1 mark for finding the 5 plants (or  $\frac{5}{17}$ ). 1 mark for  $\frac{5}{17}$ .

## 5 (5 marks)

Here are the times, in minutes, that 20 people spent in a gym.

41 56 28 34 62 45 30 59 47 36  
25 53 41 67 39 50 43 32 64 48

- (a) Show this information in an ordered stem and leaf diagram.

Stems 2, 3, 4, 5, 6 (the tens).

Put the leaves (the units) in order in each row.

|   |  |             |
|---|--|-------------|
| 2 |  | 5 8         |
| 3 |  | 0 2 4 6 9   |
| 4 |  | 1 1 3 5 7 8 |
| 5 |  | 0 3 6 9     |
| 6 |  | 2 4 7       |

Key: 3 | 6 represents 36 minutes

Check:  $2 + 5 + 6 + 4 + 3 = 20$  leaves ✓

**Answer:** See diagram

**Tip:** Tick off each value in the list as you put it in the diagram, then count the leaves: there should be 20.

*Marks:* 3 marks for a fully correct ordered diagram with a key. 2 marks if it is not ordered or has no key. 1 mark for at least three correct rows.

- (b) Work out the percentage of these people who spent more than 50 minutes in the gym.

More than 50 minutes: 53, 56, 59, 62, 64, 67

That is 6 people out of 20.

$$\frac{6}{20} = \frac{30}{100} = 30\%$$

**Answer:** 30%

**Tip:** “More than 50” does not include 50 itself.

*Marks:* 1 mark for  $\frac{6}{20}$  (or 6 people). 1 mark for 30.

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**6** (4 marks)

Some students did a reaction test.

The back-to-back stem and leaf diagram shows their times, in seconds.

| Girls   |   | Boys    |
|---------|---|---------|
| 8 5 2   | 1 | 4 9     |
| 7 3 3 1 | 2 | 2 5 8 9 |
| 4 0     | 3 | 1 3 6 8 |
|         | 4 | 0       |

Key: 5 | 1 | 4 means 15 seconds for a girl and 14 seconds for a boy

- (a) Work out the median time for the girls and the median time for the boys.

In a back-to-back diagram, the girls' leaves are read from right to left, away from the stem.

Girls in order: 12, 15, 18, 21, **23**, 23, 27, 30, 34

There are 9 girls, so the median is the 5th value: 23

Boys in order: 14, 19, 22, 25, 28, **29**, 31, 33, 36, 38, 40

There are 11 boys, so the median is the 6th value: 29

**Answer:** Girls 23, boys 29

Marks: 1 mark for each correct median.

- (b) Compare the reaction times of the girls and the boys.

**Average:** the girls' median (23) is lower than the boys' median (29).

So on average the girls reacted faster.

**Spread:** girls' range =  $34 - 12 = 22$

Boys' range =  $40 - 14 = 26$

The girls' range is smaller, so their times were more consistent.

**Answer:** Girls faster on average (lower median); girls more consistent (smaller range)

**Tip:** Make one comparison of an average (median) and one of spread (range). Use words like “lower” or “more consistent”, and say what they mean for reaction times.

*Marks:* 1 mark for comparing the medians in context. 1 mark for comparing the ranges.

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**7** (3 marks)

Leah weighed 19 apples from an orchard.

The stem and leaf diagram shows their masses, in grams.

|    |           |
|----|-----------|
| 11 | 6 9       |
| 12 | 2 5 7     |
| 13 | 0 3 4 8 8 |
| 14 | 1 5 6 9   |
| 15 | 2 7       |
| 16 | 0 3 5     |

Key: 12 | 5 represents 125 g

Leah also weighed 19 apples from a supermarket.

The lightest of these apples weighed 132 g.

The heaviest of these apples weighed 158 g.

The median mass of these apples was 141 g.

Compare the masses of the apples from the orchard with the masses of the apples from the supermarket.

Orchard: there are 19 apples, so the median is the 10th value.

Count along: 116, 119, 122, 125, 127, 130, 133, 134, 138, **138**

Median for the orchard = 138 g

Range for the orchard =  $165 - 116 = 49$  g

Range for the supermarket =  $158 - 132 = 26$  g

The supermarket apples have a higher median (141 g compared with 138 g).

So on average, the supermarket apples were heavier.

The orchard apples have a bigger range (49 g compared with 26 g).

So the masses of the orchard apples were more varied (less consistent).

**Answer:** Supermarket heavier on average (141 v 138); orchard more varied (range 49 v 26)

**Tip:** Read the key: 12|5 is 125 g. The stem here is the first two digits. For the supermarket you must work out the range yourself:  $158 - 132$ .

*Marks:* 1 mark for the orchard median 138 or range 49 (or the supermarket range 26). 1 mark for comparing the medians in context. 1 mark for comparing the ranges.

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