

QUARTILES

Quartiles are values that divide the data in quarters.

The first quartile (Q1) is the value so that *25% of the data values are below it*; the third quartile (Q3) is the value so that *75% of the data values are below it*. You may have guessed that the second quartile is the same as the median, since the median is the value so that 50% of the data values are below it.

This divides the data into quarters; 25% of the data is between the minimum and Q1, 25% is between Q1 and the median, 25% is between the median and Q3, and 25% is between Q3 and the maximum value.

FIVE NUMBER SUMMARY

The five number summary takes this form:

Minimum, Q1, Median, Q3, Maximum

TO FIND THE FIRST QUARTILE, Q1

Begin by ordering the data from smallest to largest

Compute the locator: $L = 0.25n$

If L is a decimal value:

Round up to $L+$

Use the data value in the L +th position

If L is a whole number:

Find the mean of the data values in the L th and $L+1$ th positions.

TO FIND THE THIRD QUARTILE, Q_3

Use the same procedure as for Q_1 , but with locator: $L = 0.75n$

Example

Suppose a group of 10 athletes have their running speeds (in meters per second) recorded, and their speeds sorted from slowest to fastest are:

5.8, 6.2, 6.4, 6.6, 6.8, 7.0, 7.2, 7.4, 7.6, 7.8

What are the first and third quartiles of their running speeds?

Example

Suppose a group of 10 athletes have their running speeds (in meters per second) recorded, and their speeds sorted from slowest to fastest are:

5.8, 6.2, 6.4, 6.6, 6.8, 7.0, 7.2, 7.4, 7.6, 7.8

What are the first and third quartiles of their running speeds?

$$Q1: 0.25 \times 10 = 2.5$$

Rounding up, we get 3, the third position. So $Q1 = 6.4$ m/s

$$Q3: 0.75 \times 10 = 7.5$$

Rounding up, we get 8, the eighth position. So $Q3 = 7.4$ m/s

Example

Suppose a group of 10 athletes have their running speeds (in meters per second) recorded, and their speeds sorted from slowest to fastest are:

5.8, 6.2, 6.4, 6.6, 6.8, 7.0, 7.2, 7.4, 7.6, 7.8

What is the 5 number summary?

Example

Suppose a group of 10 athletes have their running speeds (in meters per second) recorded, and their speeds sorted from slowest to fastest are:

5.8, 6.2, 6.4, 6.6, 6.8, 7.0, 7.2, 7.4, 7.6, 7.8

What is the 5 number summary?

Median: mean of 5th and 6th position

$$\text{Median} = \frac{6.8 + 7.0}{2} = 6.9$$

Min = 5.8 , Max = 7.8

Five number summary: 5.8, 6.4, 6.9, 7.4, 7.8

Question

The monthly rent paid by 24 individuals was recorded, and the amounts sorted from lowest to highest are:

\$800, \$850, \$850, \$900, \$950, \$950, \$975, \$1000, \$1025, \$1050,
\$1075, \$1100, \$1125, \$1150, \$1200, \$1250, \$1300, \$1300, \$1350,
\$1400, \$1450, \$1500, \$1550, \$1600

Find the 5-number summary of this data.

Example

Using the data on weekly working hours from a group of employees, create the five-number summary.

Weekly Working Hours (hours)	Frequency
30	4
35	6
40	10
45	15
50	18
55	12
60	8
65	5

Example

Weekly Working Hours (hours)	Frequency
30	4
35	6
40	10
45	15
50	18
55	12
60	8
65	5

The total amount of employees is the total sum of the frequencies:

$$4 + 6 + 10 + 15 + 12 + 8 + 5 = 78$$

$$\text{Min} = 30, \text{Max} = 65$$

Q1: $78/4 = 19.5$, rounding up we get 20. 40 hours is in the 20th position and so $Q1 = 40$.

Median: $78/2 = 39$. The mean of the 39th and 40th position is 50.

Q3: $3 \times 78/4 = 58.5$, rounding up we get 59. 55 hours is in the 59th position and so $Q3 = 59$.

5 number summary: 30, 40, 50, 59, 65

Question

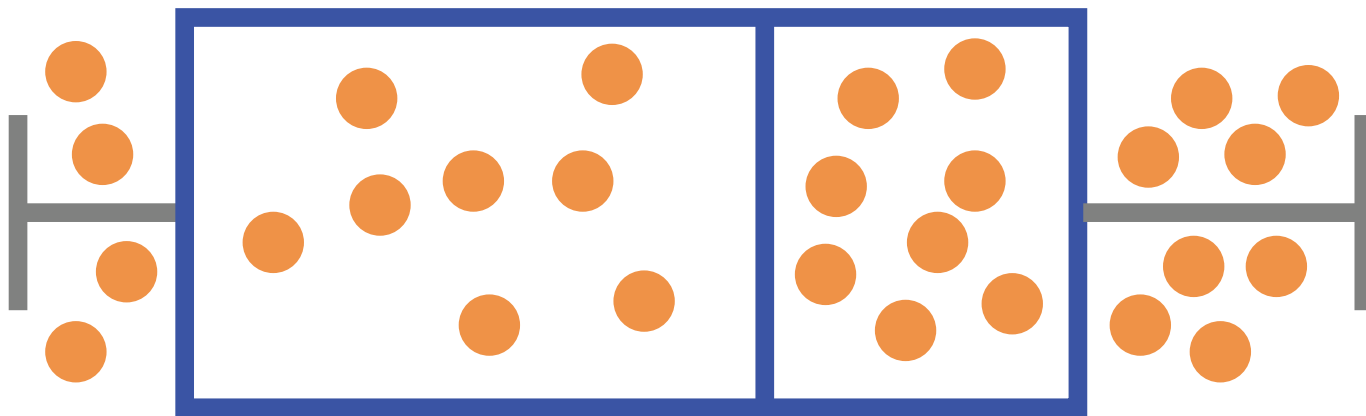
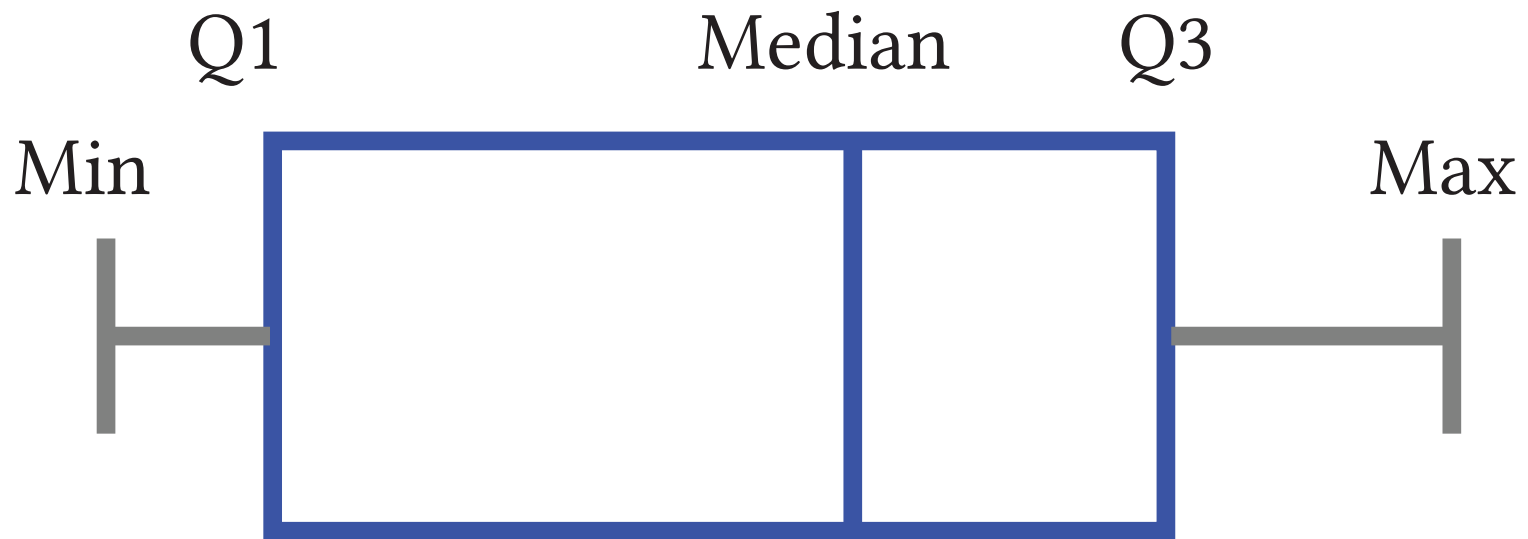
The daily caloric intake (in kilocalories) of 60 individuals was recorded, and their intake data is grouped as follows:

Calories (kcal)	Frequency
1800	5
2000	8
2200	12
2400	15
2600	10
2800	6
3000	4

Using this data, calculate the five-number summary.

BOX PLOT

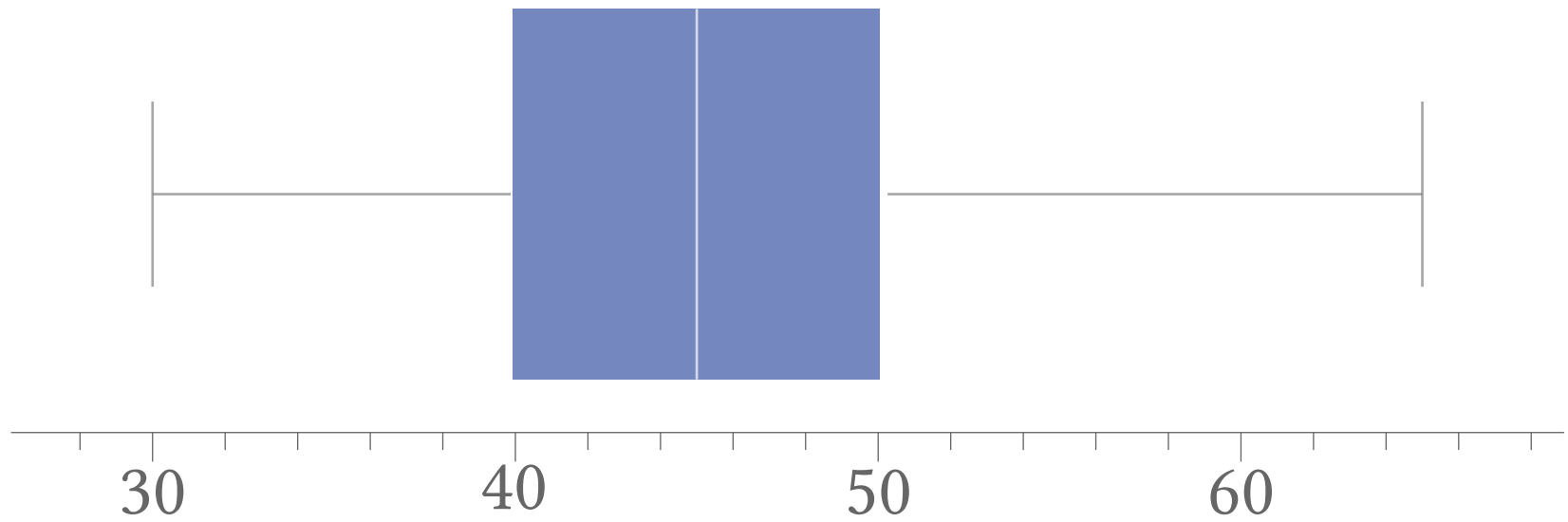
A **box plot** is a graphical representation of a five-number summary.



Example

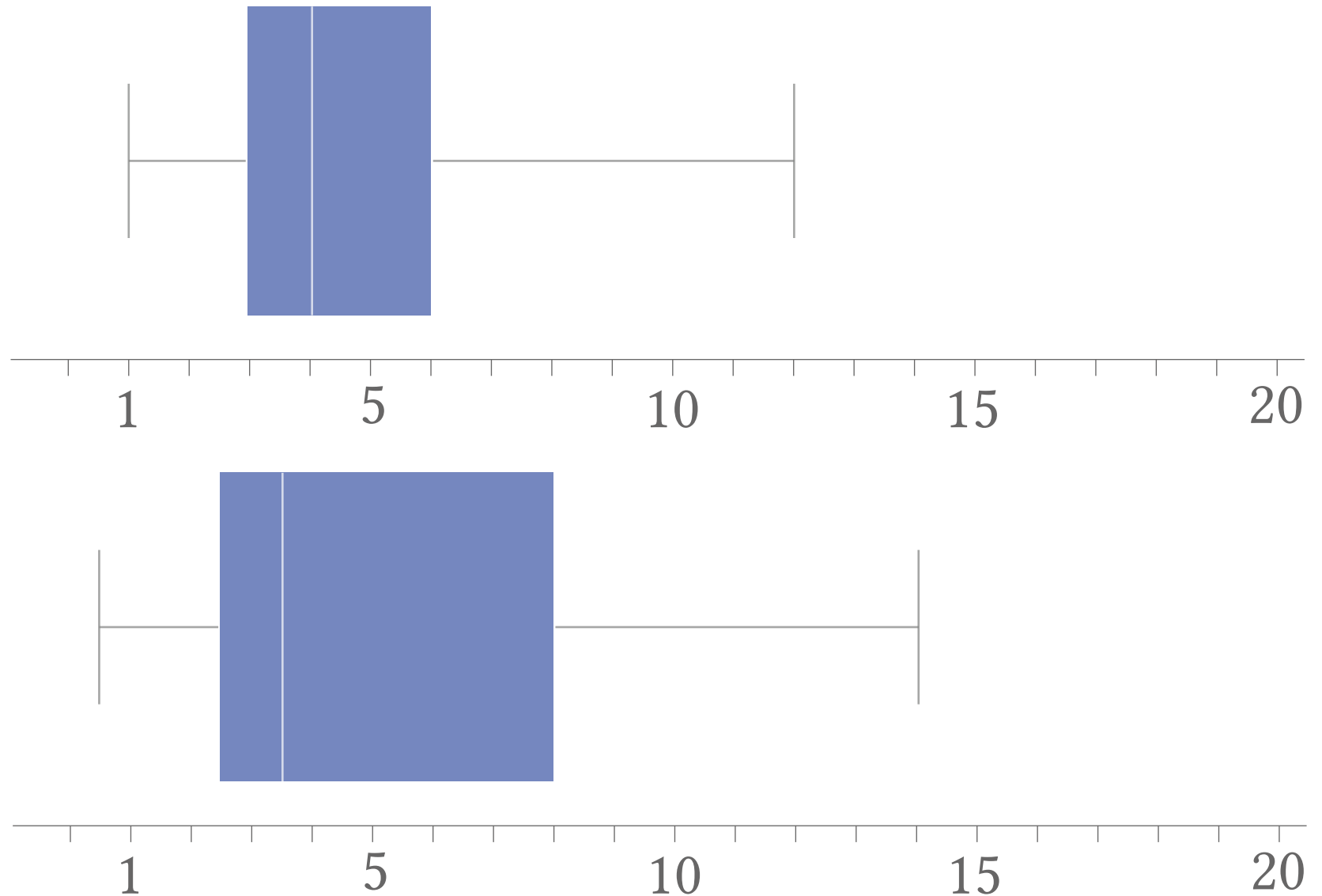
five-number summary:

30, 40, 45, 50, 65



Example

The box plot of delivery times in days for two retailers is shown below:



Which retailer would you choose for a faster delivery?