

8

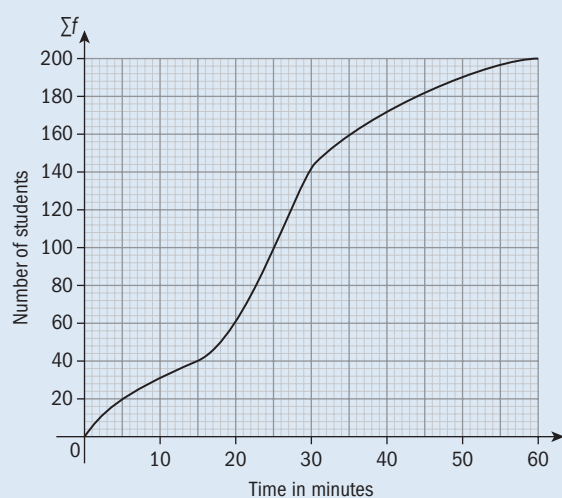
Measures of central tendency and spread

Try Investigation 1 after you have completed Exercise 8G.

Try Investigations 2 and 3 after you have completed Exercise 8H.

Investigation 1 – Measures of central tendency and spread from a cumulative frequency graph

The cumulative frequency graph has been drawn from a frequency table showing the time it takes a number of students to complete a computer game.



- a** From the graph find
- the median time
 - the interquartile range.

This means show the lines on the graph

$$\text{IQR} = Q_3 - Q_1$$

The graph has been drawn from the data given in the table below.

Time in minutes	Number of students
$0 < x \leq 5$	20
$5 < x \leq 15$	20
$15 < x \leq 20$	p
$20 < x \leq 25$	40
$25 < x \leq 35$	60
$35 < x \leq 50$	q
$50 < x \leq 60$	10

- b** Using the graph, find the values of p and q .
- c** Copy the table and add two more columns, one for the midpoint and one for frequency \times midpoint.
- d** Showing full working, find the mean.

Investigation 2 – comparing measures of central tendency

Try this after you have completed Exercise 8H.

A factory owner and the factory workers in Indobodia are involved in a dispute over wages. They both start with the basic data of monthly income (in US\$).

Wage (\$ per month)	2,000,000	1,000	600	200
Number of workers	1	10	14	25

- 1 Find
 - a the mean
 - b the mode
 - c the median monthly wage
- 2 To demonstrate that they deserved to earn more, which average would the workers choose and why?
- 3 Which average would the owner choose and why?
- 4 Which average do you think is the fairest and why?

The mean, mode and median are often called “averages”.

Investigation 3 – comparing measures of spread

Try this after you have completed Exercise 8H.

A basketball coach has these data on his players.

In the ten games so far:

Player A has scored 14, 16, 15, 12, 14, 15, 17, 14, 16 and 17 points.

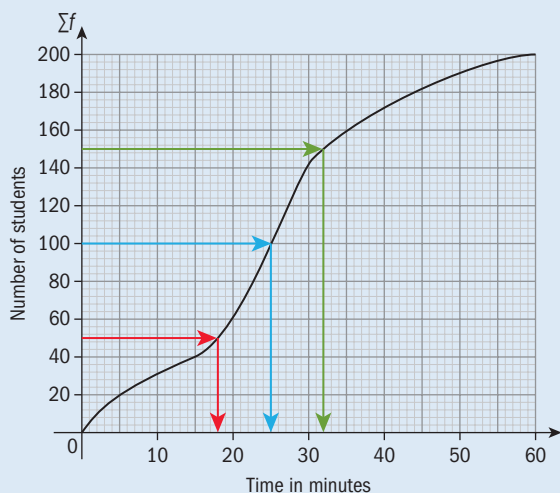
Player B has scored 0, 24, 22, 2, 8, 23, 2, 30, 0 and 39 points.

- 1 Copy and complete the table.

	Total points	Mean	Median	Range	Standard deviation
Player A					
Player B					

- 2 Situation 1. The coach is choosing a starting player and wants to have a reliable scorer. Who should he choose and why?
- 3 Situation 2. The team is losing by 10 points and there are 10 minutes to go. Player A and Player B are on the bench. Which player should he send on, and why?

Investigation 1 – Measures of central tendency and spread from a cumulative frequency graph



- a** i 25 minutes
 ii $32 - 17.5 = 14.5$ minutes
b $p = 20, q = 30$

c

Time in min	Number of students (f)	Midpoint	$f \times m$
$0 < x \leq 5$	20	2.5	50
$5 < x \leq 15$	20	10	200
$15 < x \leq 20$	20	17.5	350
$20 < x \leq 25$	40	22.5	900
$25 < x \leq 35$	60	30	1800
$35 < x \leq 50$	30	42.5	1275
$50 < x \leq 60$	10	55	550
	$\sum f = 200$		$\sum fm = 5125 (m)$

d $\text{Mean} = \frac{\sum fm}{\sum f} = \frac{5125}{200} = 25.6 \text{ min (1 dp)}$

Investigation 2 – comparing measures of central tendency

- Use your GDC to calculate mean, mode and median.
 - \$40,468
 - \$200
 - \$400
- The workers would choose the mode as it is the lowest average.
- The owner would choose the mean as it is the highest average.
- The median seems to be the fairest as the mode is the lowest wage in the data and only one person earns more than the mean.

If you need help with this, see chapter 17

Investigation 3 – comparing measures of spread

- 1** Use your GDC to calculate the mean, mode and median, range and standard deviation.

	Total points	Mean	Median	Range	Standard deviation
Player A	150	15	15	5	1.6
Player B	150	15	15	39	13.5

- 2** Situation 1. The coach should choose Player A. The players have the same mean and median, but Player A has lower standard deviation and range, indicating that he is more consistent.
- 3** Situation 2. The coach should choose Player B. The players have the same mean and median, but Player B's higher standard deviation and range indicate that he is more likely to be the one to score a large number of points.

If you need help with this, see chapter 17