



The Budget and forecasting



This sequence is intended as a framework to be modified and adapted by teachers to suit the needs of a class group.

Resources needed

- Absolute, relative and percentage errors – Visualiser
- What is the government Budget? – Video
- Budget forecasting – Errors and exaggerations – Worksheet and Solutions
- Graphing and interpreting errors in Budget forecasting – Investigation and Solutions
- The Budget and forecasting – Data sheet
- Building charts and tables – How to sheet

Suggested activity sequence

Part A: Absolute, relative and percentage errors

Blue underling in italics

- 1 Explicitly teach students how to calculate absolute, relative and percentage errors. Refer to the visualiser.
- 2 You might like to give students a practice activity such as the one shown in the table below.

Scenario	Absolute error or difference with negatives if the scenario is a forecast	Relative error	Percentage error
The government estimated it would spend \$500 billion, but actually spent \$550 billion.	$500 - 550 = -50$	$\frac{-50}{550} = 0.09$	$\frac{-50}{550} \times 100 = -9\%$
They forecasted 20 mm of rain, but we really got 25mm.			
The report said the carpark held 280 cars, but we counted only 220 parking spaces.			
A measurement is 24.44 mm and the true or known value is 25.00 mm			



Part B: Budget forecasting – Errors and exaggerations

- 1 Play: What is the government Budget? as an introduction.
- 2 As a class, read the definitions on the data sheet, clarifying as you read if required.
- 3 Students complete the worksheet, either individually, in pairs or groups depending on students' level of readiness.
- 4 As a class discuss what students found. Ask students to share their conclusions about how statistics can be selected or exaggerated to support a point of view. Refer to *Budget forecasting and errors – Solutions*.

Part C: Graphing and interpreting Budget forecasting errors

- 1 As a class, read Part 1 of the investigation. If necessary, clarify the meaning of gross domestic product (GDP) and discuss why forecasting errors are better represented as a percentage of GDP rather than based on absolute dollar values. For example, dollar values fail to take account of:
 - The size of the economy
 - The size of the population (especially in relation to employment and income tax)
 - The rate of employment
 - Inflation
- 2 Students complete Part 1 of the investigation.

Part D: Graphing the distribution of forecasting errors

- 1 Revise the concepts of central tendency, mean and median and provide a definition (write them on the board).

Central tendency: The tendency for the values of a random variable to cluster round its mean, mode, or median.

Mean: The average, found by adding the numbers and dividing the sum by the number of numbers in the list.

Median: Is the middle value in a list ordered from smallest to largest.

- 2 Do a simple example as a whole class to model the task. If you're all working together on this, everyone will need access to a computer with spreadsheet software.

These are the Budget forecasting errors as a percentage of GDP of a hypothetical country between 2012 and 2016. All numbers are positive

0.4 0.5 0.5 0.8 0.3

- a. Set up a spreadsheet in Excel and arrange the error percentage values numerically from lowest to highest.

	A	B
1		Error percentage
2		0.3
3		0.4
4		0.5
5		0.5
6		0.8
7	Average (mean)	
8	Median	

- b. Use formulas to calculate average [=AVERAGE(B2:B6)] and median [=MEDIAN(B2:B6)]. With students, identify the mode.
- c. Discuss with students about the average and the median being the same and how a distribution graph of these figures might look (symmetrical).



- 3 The country suffered some setbacks in the following 5 years, including the COVID-19 event. The forecasting errors as a percentage of GDP between 2017 and 2022 were:
- 1.9 -1.1 -3.5 -2.2 -0.5 -0.7
- Add rows to your spreadsheet to include these values, correct the formulas and examine the new mean and median.
 - Discuss what's happened to these measures of central tendency.
 - Set up this table on your spreadsheet.

Weekly Pay (\$)	Number of years
-4 to -3.1	
-3 to -2.1	
-2 to -1.1	
-1 to 0	
0 to 1	
Total	=sum formula

- Add the formula to calculate total number of years – discuss with students what they expect the total to be and what should they do if it's not.
- Add a chart. Try both a line graph and a column graph, change the colours and add titles.

Part E: Investigating

- Walk the students through the instructions of Part 2 of the investigation, reminding them of the similarities to the problem you modelled.
- Students complete the investigation. Students may benefit from working individually and/or in small discussion groups.

Part F: Discussing results

When students have completed their investigations, discuss frequency and distribution and what students have learned, including reasons why the average percentage error is so much higher or lower than the median and how this is represented by the skew of their charts.

Refer to *Errors and exaggerations in Budget forecasting – Solution*.