

# MATHEMATICS

## Level One

### Levelling

#### Task One:

**Setting:** Levelling is the name given to the process of measuring the difference in elevation between two or more points. Levelling has many applications. It is used in laying foundations of buildings, in constructing roads, and for connecting tide gauges to solid ground. These tide gauges, which are used to monitor sea level changes, are usually found on wharves that may or may not subside with time.

Below is a list of the levelled heights of marks located around Dunedin over three years.

Mark	1998 (m)	1999 (m)	2000 (m)
Fundamental	3.251	3.251	3.251
Dunedin	1.728	1.729	1.729
Birch St	2.732	2.732	2.731
Fryatt St	1.704	1.706	1.705
Witness	3.465	3.466	3.465
Port Chalmers	1.717	1.716	1.717
Sleeper	3.683	3.683	3.683
BM1 Beach St	2.812	2.812	2.809
CGPS MRP	8.078	8.079	8.079

- 1) Calculate the average height of each mark over the three years given in the table.
- 2) What is the average change in height from the Fundamental to CGPS MRP
- 3) What is the average change in height from Dunedin to Port Chalmers?

#### Task Two:

Logan and Jill wanted to see how different their results would be if they measured the same distance using five different methods. They placed two marks on the pavement and measured between them using a variety of methods. The results are shown below.

Tape Measure: 25.75m, 25.76m 25.79m 25.72m  
One metre rule: 26.20m, 26.8m 26.6m  
Logan's pace: 26.50m  
Jill's pace: 28.3m,

The two girls were lucky enough to borrow an accurate EDM (Electronic Distance Measurement), which they used to measure between the two marks. They recorded five measurements: 25.721m 25.722m 25.722m 25.721m and 25.722m

- 1) Why do you think there are bigger differences between measurements, depending on which method is used?
- 2) How do you think the errors could have been made/introduced?

- 3) Which measurements do you think are the most and least correct? Why?
- 4) Calculate the mean, median and range for the measurements.
- 5) Plot this on a box and whisker graph. (You will also need the upper and lower quartiles for this). Are there any outliers (results that are very different from the rest)?