

Displaying data – Log scale



Teacher Notes/Answer Sheet

7 8 9 10 11 12



TI-Nspire



Investigation



Teacher



45 min

Introduction

Logarithmic scales are often used in charts and graphs. In some datasets a few points may be much larger than the rest; such data sets are said to be skewed towards the large values (positively skewed). Skewed graphs are more easily interpreted when converted to a more symmetrical distribution using a log scale.

A common base for logarithmic scales is the base 10 and is useful when the data range occurs over several orders of magnitude.

A dataset where this manipulation is required involves looking at weights of animals ranging from small insects, such as mosquitoes, through to large mammals such as whales.

Example

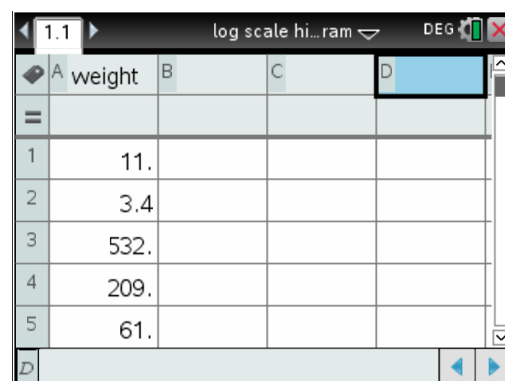
The adult weight of 27 animals (in kg) is as follows:

11	3.4	532	209	61	6650	9300	6.8	34
0.12	0.042	2.6	55	100	52	136000	0.13	187
1.6	500	35	27	1.0	25800	2580	190	521

Task 1.

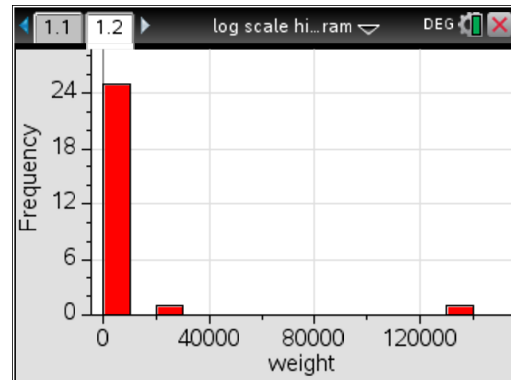
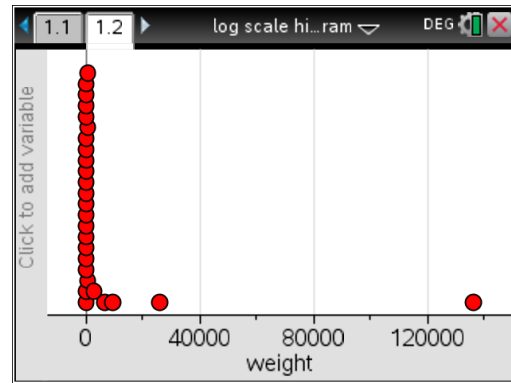
- Display the data as a histogram.

Enter the data in a **Lists & Spreadsheet** page and plot in a **Data & Statistics** page.



Change dot plot to a histogram

[menu]>Plot Type>Histogram



b. Describe the shape of the distribution.

Positively skewed with outlier/s.

Note: Be careful if discussing outliers here when describing the distribution as what may appear to be only one outlier may in fact be several due to the large variation in data values. In this example there are 5 outliers.

Task 2.

a. Use a column formula to convert the weight values to log values.

The log command can be accessed using **[ctrl]** **[10^x]**.

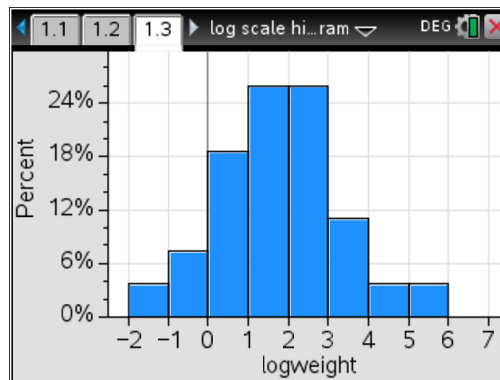
Hint: the log template is also in the 2D maths templates palette (**[math]**) or just type in log(...). It is not necessary to enter 10 as the base as it will automatically enter this in after pressing enter.

A	weight	B	logweight	C	D
1	11.		1.04139		
2	3.4		0.531479		
3	532.		2.72591		
4	209.		2.32015		

b. Display the transformed data as a histogram with Bin Setting Width of 1 and Alignment of -2
[menu]>Plot Properties>Histogram Properties>Bin Settings>Equal Bin Width).

Change the y-scale to Percent using **[menu]**>Plot

Properties>Histogram Properties>Histogram Scale>Percent



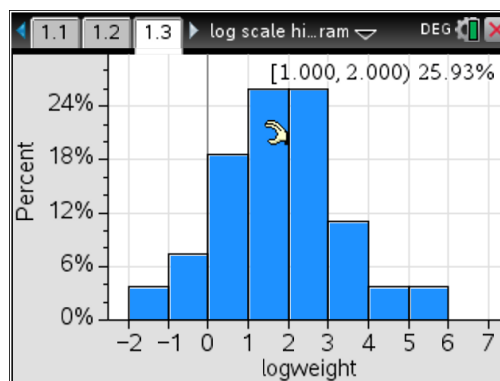
c. Describe the shape and distribution of the histogram.

Approximately symmetrical with no outliers.

d. What percentage of animals in the dataset had weights between 10 and 100 kg? Scroll across the histogram to show column details.

Hint: $\log 10 = 1, \log 100 = 2$

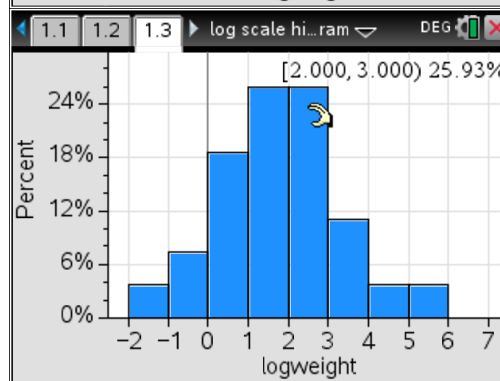
Approximately 26%



e. Compare the number of animals weighing between 100 kg and 1000 kg with the number weighing between 10 and 100 kg.

Hint: 100 – 1000 will be log values 2 – 3. i.e. $10^2 - 10^3$

Same number in each grouping.



Task 3.

Discuss why using the histogram with the log transformation was better than the original histogram in answering parts 2(d) and 2(e) above.

With the more appropriate scale values the bin width can be set at 1 which gives readings of [1,10), [10,100), etc. which allows easier interpretation of the data.