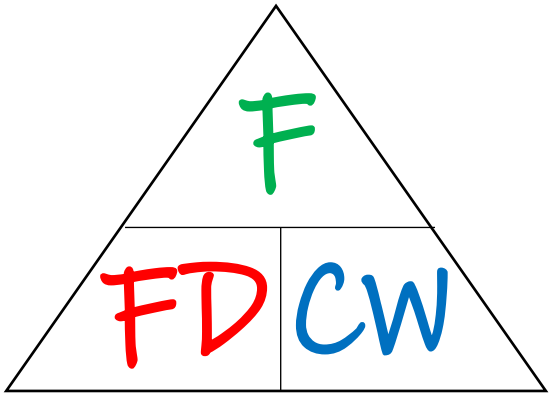
Histograms – Frequency Density

A histogram is an example of a continuous bar chart which is best used for data with unequal class intervals.

Unlike a bar chart, the ***area*** of the bar is what represents the frequency rather than the height.



Using the formula triangle:

$$\text{Frequency Density} = \frac{\text{Frequency}}{\text{Class Width}}$$

**Where the class width is the difference between the lower and upper bound of the class*

A histogram can be used for:

✓ Continuous Data

For each of the following frequency tables, calculate the (Class Widths and) Frequency Density required for a histogram

Time, t (secs)	Frequency	Class Width	Frequency Density
$0 \leq t < 5$	30	$5 - 0 = 5$	
$5 \leq t < 10$	20	$10 - 5 = 5$	
$10 \leq t < 12$	26	$12 - 10 = 2$	
$12 \leq t < 15$	27	$15 - 12 = 3$	
$15 \leq x < 25$	50	$25 - 15 = 10$	

Length, l (cm)	Frequency	Class Width	Frequency Density
$0 \leq l < 10$	8	10	
$10 \leq l < 15$	8	5	
$15 \leq l < 20$	6	5	
$20 \leq l < 30$	12	10	
$30 \leq l < 50$	16	20	

Width, w (mm)	Frequency	Class Width	Frequency Density
$0 \leq w < 4$	12		
$4 \leq w < 8$	8		
$8 \leq w < 10$	10		
$10 \leq w < 12$	9		
$12 \leq w < 15$	15		

Time, t (mins)	Frequency	Class Width	Frequency Density
$0 \leq t < 1$	7		
$1 \leq t < 2$	6		
$2 \leq t < 3$	8		
$3 \leq t < 5$	8		
$5 \leq t < 10$	10		

Depth, d (m)	Frequency	Class Width	Frequency Density
$0 \leq d < 10$	9		
$10 \leq d < 20$	4		
$20 \leq d < 40$	5		
$40 \leq d < 60$	8		
$60 \leq d < 80$	10		

SOLUTIONS

Time, t (secs)	Frequency	Class Width	Frequency Density
$0 \leq t < 5$	30	5 – 0 = 5	30 / 5 = 6
$5 \leq t < 10$	20	10 – 5 = 5	20 / 5 = 4
$10 \leq t < 12$	26	12 – 10 = 2	26 / 2 = 13
$12 \leq t < 15$	27	15 – 12 = 3	27 / 3 = 9
$15 \leq x < 25$	50	25 – 15 = 10	50 / 10 = 5

Length, l (cm)	Frequency	Class Width	Frequency Density
$0 \leq l < 10$	8	10	8 / 10 = 0.8
$10 \leq l < 15$	8	5	8 / 5 = 1.6
$15 \leq l < 20$	6	5	6 / 5 = 1.2
$20 \leq l < 30$	12	10	12 / 10 = 1.2
$30 \leq l < 50$	16	20	16 / 20 = 0.8

Width, w (mm)	Frequency	Class Width	Frequency Density
$0 \leq w < 4$	12	4	12 / 4 = 3
$4 \leq w < 8$	8	4	8 / 4 = 2
$8 \leq w < 10$	10	2	10 / 2 = 5
$10 \leq w < 12$	9	2	9 / 2 = 4.5
$12 \leq w < 15$	15	3	15 / 3 = 5

Time, t (mins)	Frequency	Class Width	Frequency Density
$0 \leq t < 1$	7	1	7 / 1 = 7
$1 \leq t < 2$	6	1	6 / 1 = 6
$2 \leq t < 3$	8	1	8 / 1 = 8
$3 \leq t < 5$	8	2	8 / 2 = 4
$5 \leq t < 10$	10	5	10 / 5 = 2

Depth, d (m)	Frequency	Class Width	Frequency Density
$0 \leq d < 10$	9	10	9 / 10 = 0.9
$10 \leq d < 20$	4	10	4 / 10 = 0.4
$20 \leq d < 40$	5	20	5 / 20 = 0.25
$40 \leq d < 60$	8	20	8 / 20 = 0.4
$60 \leq d < 80$	10	20	10 / 20 = 0.5