2.3.5 Standards for measurements 3

Surface area of 3D shapes

Shape	Surface area	Terminology
Cube	$6L^2$	L = length of the edge
Rectangular prism	$2((w \times l) + (h \times l) + (h \times w))$	l = length w = width h = height
Cylinder	$2\pi r\ (r + h)$	r = radius of circular base h = height of cylinder
Cone	$\pi r\ (r + l)$	r = area of circular base l = slant height of cone
Sphere	$4\pi r2$	r = radius of sphere
Hemisphere	$3\pi r2$	r = radius of hemisphere

Area and volume of compound shapes

A compound or composite shape is made up of a combination of regular shapes.

This compound shape is made up of two rectangles. To calculate the area of the shape you should calculate each rectangle separately and then add them together to get the overall area.

Many compound shapes used in creating the built environment are far more complex than this, but the principle is the same – calculate the area and volume separately and then add the results.

Powers, indices and roots

An index or power is used to show that a quantity is repeatedly multiplied by itself.

Rules of Indices

First rule: $a^p \times a^q = a^{p+q}$

Second rule: $(a^p)^q = a^{pq}$

Third rule: $a^p \div a^q = a^{p-q}$

Fourth rule: $a^0 = 1$ and $a^1 = a$ and $1^x = 1$

Fifth rule: $a^{-1} = 1/a$

Sixth rule: $a^{½} = \sqrt{a}$

Calculating averages

An average is a number expressing the central or typical value in a set of data, in particular the mode, median or mean value.

The mean is the most used average. To calculate the mean value, you add up all the values and divide the total by the number of values in the set.

The median is the number in the middle of the list and the mode is the value that appears most often within the data. If no value is repeated there will be no mode.

Here is a list of data:

8, 17, 11, 14, 16, 25, 17, 23, 9

The mean is (8 + 17 + 11 + 14 + 16 + 25 + 17 + 23 + 9) ÷ 9 = 15.56

The median is (8, 9, 11, 14, **16**, 17, 17, 23, 25) = 16

The mode is the value that occurs most often which is 17.