Chapter 6 – Cube and Cube Roots (K Scale)

6.1 The Form of the K Scale

The K scale is labeled from 1 to 1,000. It consists of three parts, 1 to 10, 10 to 100 and 100 to 1,000, each a third size replica of the C and D scales. Hence the accuracy with which the K scale can be read is very much less than the C and D scales.

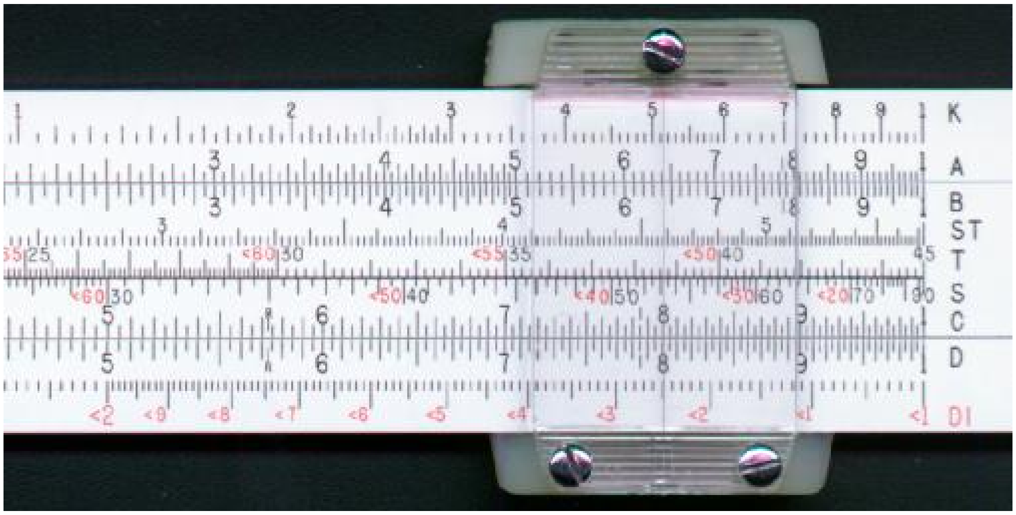

Fig 6-1

6.2 Cubes

Example 1: $8^3 = 512$ (Fig 6-1)

1. Set the hair line over 8 on the D scale.
2. Under the hair line read off 512 on the K scale as the answer.

Note: It is advisable to use the D scale in combination with the K scale, as using the C scale with the K scale will lead to errors if the slide is slightly displaced.

Example 2: $123^3 = 1{,}860{,}000$

1. Set the hair line over 123 on the D scale.
2. Under the hair line read off '186' on the K scale as the answer.
   $(12^3 = (1.23 \text{ x } 10^2)^3$
   $= 1.86 \text{ x } 10^6$
   $= 1{,}860{,}000$

Example 3: $0.378^3 = 0.0054$

1. Set the hair line over 378 on the D scale.
2. Under the hair line read off '54' on the K scale as the answer.
   $(0.378^3 = (3.78 \text{ x } 10^{-1})^3$
   $= 54 \text{ x } 10^{-3})$
   $= 0.0054$

Note:

(a) The cube of numbers between 1 and 10 is read directly off the K scale as numbers between 1 and 1,000.
(b) For numbers greater than 1,000, express the number in standard form (scientific notation) as in example 2 above. Notice that $1.23^3 = 1.86$, as read directly off the K scale.
(c) For numbers less than 1, express the number in standard form (scientific notation) as in example 3 above. Notice that $3.78^3 = 54$ as read directly off the K scale.

Exercise 6(a)

(i)	$6.5^3 =$	(v)	$165^3 =$
(ii)	$25^3 =$	(vi)	$0.063^3 =$
(iii)	$0.425^3 =$	(vii)	$0.705^3 =$
(iv)	$93.5^3 =$	(viii)	$206^3 =$

6.3 Cube Roots (Numbers between 1 and 1,000)

These are read directly by finding the number on the K scale, and with the aid of the hair line, its cube root is immediately below on the D scale.

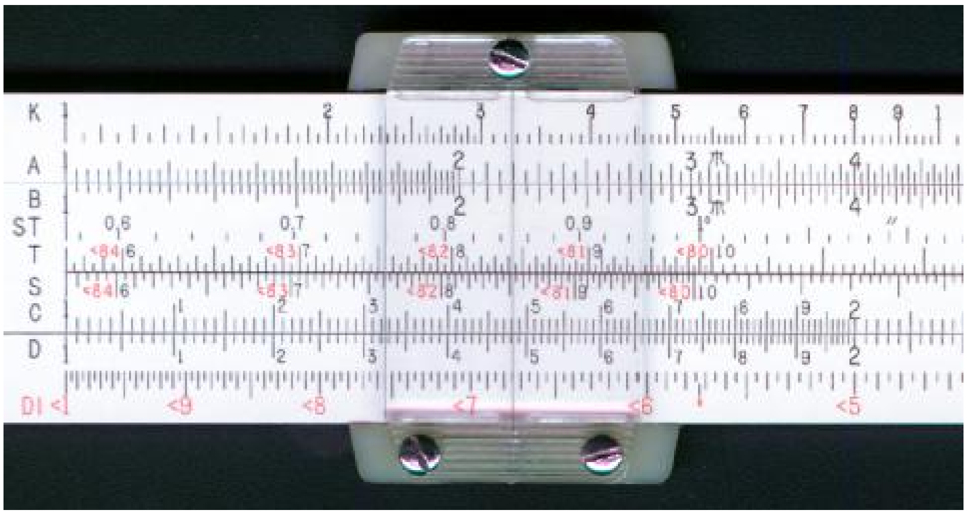

Fig 6-2

Example 1: $\sqrt[3]{3.25} = 1.48$ (Fig. 6-2)

1. Set the hair line over 3.25 on the K scale.
2. Under the hair line read off 1.48 on the D scale as the answer.

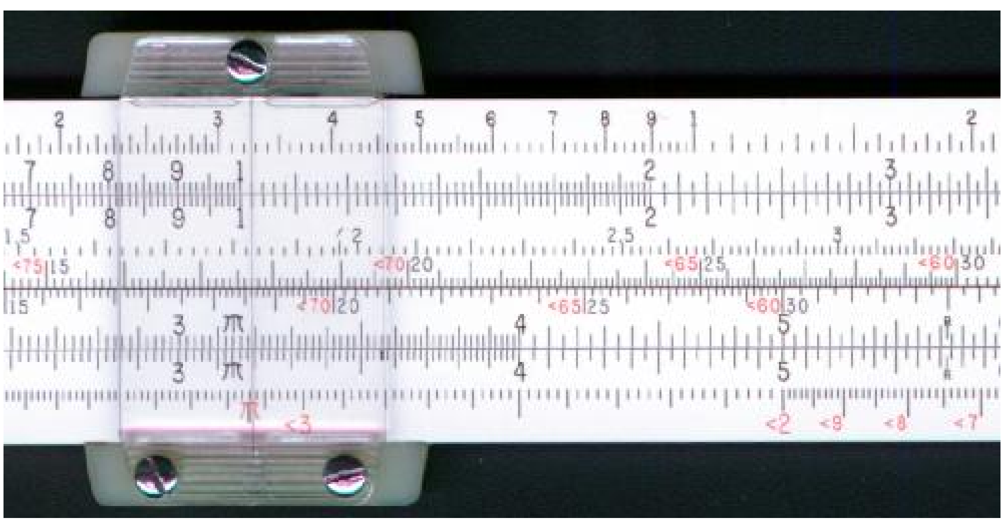

Fig 6-3

Example 2: $\sqrt[3]{32.5} = 3.19$ (Fig 6-3)

1. Set the hair line over 32.5 on the K scale.
2. Under the hair line read off 3.19 on the D scale as the Answer.

Example 3: $\sqrt[3]{325} = 6.875$ (Fig. 6-4)

1. Set the hair line over 325 on the K scale.
2. Under the hair line read off 6.875 on the D scale as the Answer.

Note:

(a) Note that 3.25, 32.5 and 325 are each at different points on the K scale.
(b) For numbers between 1 and 1,000, there is no difficulty in locating the decimal point, as their cube roots lie between 1 and 10, and are read directly off the D scale.

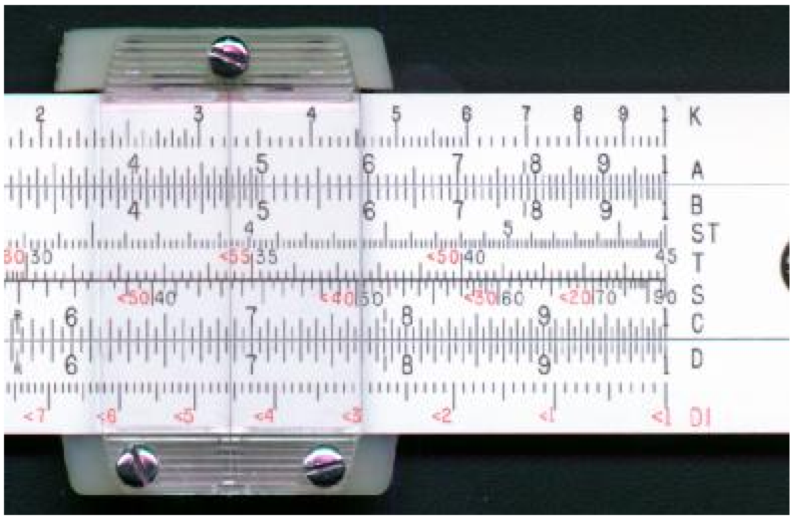

Fig 6-4

Exercise 6(b)

(i)	$\sqrt[3]{64} =$	(iv)	$\sqrt[3]{9.4} =$
(ii)	$\sqrt[3]{2.2} =$	(v)	$\sqrt[3]{94} =$
(iii)	$\sqrt[3]{132} =$	(vi)	$\sqrt[3]{940} =$

6.4 Cube Root (Numbers greater than 1,000)

For numbers such as 3,250, 32,500, etc. the difficulty is to decide where to locate them on the K scale to obtain its cube root. The following procedure will allow us to locate the number on the K scale and also automatically give us the position of the decimal point.

Example 1:

$$\sqrt[3]{3250} = 14.8$$

$$(\sqrt[3]{3250} = \sqrt[3]{3.25x1000} = \sqrt[3]{3.25}x10$$

The $\sqrt[3]{3.25}$ is found as shown in Example 1 in 6.3)

Therefore $\sqrt[3]{3250} = 1.48x10 = 14.8$

Example 2:

$$\sqrt[3]{32500} = 31.9$$

$$(\sqrt[3]{32500} = \sqrt[3]{32.5x1,000} = \sqrt[3]{32.5}x10$$

The $\sqrt[3]{32.5}$ is found as shown in Example 1 in 6.3)

Therefore $\sqrt[3]{32500} = 3.19x10 = 31.9$

Note: For cube roots of numbers greater than 1,000, we break the numbers up into factors, one of which is 1,000. We do not use 10 or 100, as these do not have simple cube roots, where as 1,000 has a cube root of 10.

Exercise (6c)

(i) $\sqrt[3]{1{,}200}$

(ii) $\sqrt[3]{94{,}000}$

(iii) $\sqrt[3]{10{,}000}$

(iv) $\sqrt[3]{132{,}000}$

6.5 Cube Roots (Numbers less than 1)

For numbers less than 1, we express them as a fraction over 1,000, or if the number is less than 0.001, as a fraction over 1,000,000.

Example 1:

$\sqrt[3]{0.325} = 0.6875$

$(\sqrt[3]{0.325} = \sqrt[3]{\frac{325}{1{,}000}}$

$= \frac{6.875}{10}$

Therefore the answer is 0.6875

Example 2:

$\sqrt[3]{0.0325} = 0.319$

$(\sqrt[3]{0.0325} = \sqrt[3]{\frac{32.5}{1{,}000}}$

$= \frac{3.19}{10}$

Therefore the answer is 0.319

Example 3:

$\sqrt[3]{0.00325} = 0.148$

$(\sqrt[3]{0.00325} = \sqrt[3]{\frac{3.25}{1{,}000}}$

$= \frac{1.48}{10}$

Therefore the answer is 0.148

(In each of the above examples $\sqrt[3]{325}$, $\sqrt[3]{32.5}$, $\sqrt[3]{3.25}$ is obtained in the usual way.)

Exercise 6(d)

(i) $\sqrt[3]{0.8}$

(ii) $\sqrt[3]{0.09}$

(iii) $\sqrt[3]{0.132}$

(iv) $\sqrt[3]{0.001}$

(v) $\sqrt[3]{0.0615}$

(vi) $\sqrt[3]{0.0094}$

6.6 Miscellaneous Problems

Exercise 6(e)

(i) $63^3 =$

(ii) $174^3 =$

(iii) $0.16^3 =$

(iv) $0.073^3 =$

(v) $\sqrt[3]{16.5} =$

(vi) $\sqrt[3]{980} =$

(vii) $\sqrt[3]{10{,}800} =$

(viii) $\sqrt[3]{0.0875} =$

(ix) $14.3^3 + 21.6^3 =$

(x) $\sqrt[3]{631 x 14.6^3} =$

(xi) $\sqrt[3]{73} - \sqrt[3]{20.25} =$

(xii) $\sqrt[3]{36 x 1.95^3} =$