Chapter 7 – Inverted (Reciprocal) Scale (CI)

7.1 The Form of the CI Scale

The CI scale is identical with the C scale except that the CI scale reads from right to left for this reason great care should be taken in reading the CI scale. Note, by the term 'reciprocal of a number 'N' we mean $\frac{1}{N}$.

7.2 Reciprocals (Numbers between 1 and 10)

For numbers between 1 and 10 on the C scale, its reciprocal is read directly off the CI scale as a number between 1 and 0.01. We can also find reciprocal by working from the CI scale to the C scale.

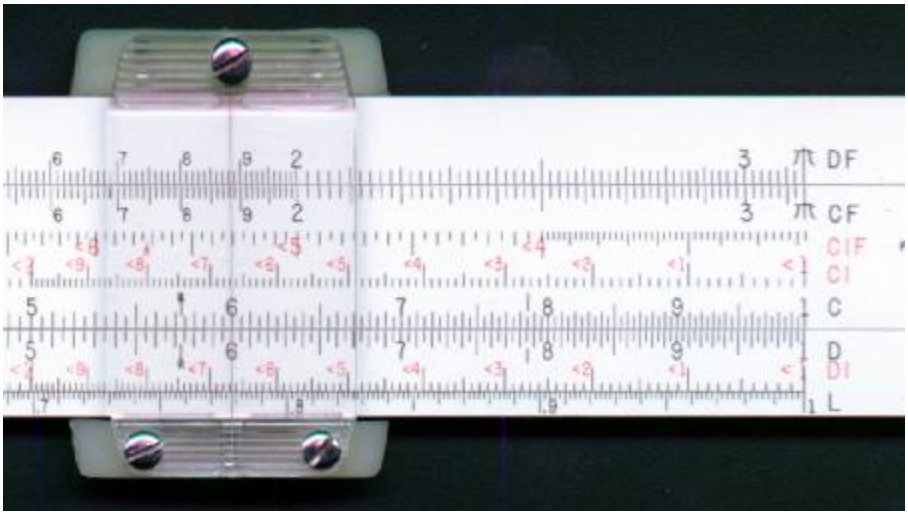

Fig 7-1

Example 1: $\frac{1}{6} = 0.167$ (Fig. 7-1)

1. Set the hair line over 6 on the C scale.
2. Under the hair line read off 0.167 on the CI scale.

or

1. Set the hair line over 6 on the CI scale.
2. Under the hair line read off 0.167 on the C scale.

Example 2: $\frac{1}{2.44} = 0.41$

1. Set the hair line over 2.44 on the C (or CI) scale.
2. Under the hair line read off 0.41 on the CI (or C) scale.

Exercise 7(a)

(i) $\frac{1}{8}$ (iii) $\frac{1}{3.76}$ (iv) $\frac{1}{7.4}$

(ii) $\frac{1}{1.5}$

7.3 Reciprocals (Numbers outside the range 1 to 10)

For numbers less than 1, their reciprocals will always be larger than 1.
e.g.

$$\frac{1}{0.2} = 5$$

$$\frac{1}{0.02} = 50$$

$$\frac{1}{0.002} = 500$$

For numbers greater than 10, their reciprocals will always be smaller than 0.1.
e.g.

$$\frac{1}{20} = 0.05$$

$$\frac{1}{200} = 0.005$$

Example 1:

$$\frac{1}{0.042} = 23.8$$

1. Set the hair line over 42 on the C (or CI) scale.
2. Under the hair line read off '238' on the CI (or C) scale as the answer.

To locate the decimal point, the following procedure is possibly the easiest

Note: $\frac{1}{0.042} = \frac{100}{4.2} = 100x0.238$

(As the reciprocal of a number between 1 and 10 is always between 1 and 0.1.) The answer is therefore 23.8.

Example 2: $\frac{1}{420} = 0.00238$

1. Set the hair line over 420 on the C (or CI) scale.
2. Under the hair line read off '238' on the CI (or C) scale as the answer.

Note: $\frac{1}{420} = \frac{1}{4.2x100} = 0.238x\frac{1}{100}$

Therefore the answer is 0.00238.

Note: Some modern Slide Rules have a DI scale located on the body. This scale can be used in conjunction with the D scale to obtain recprocals.

Exercise 7(b)

(i) $\frac{1}{2.6} =$

(ii) $\frac{1}{26} =$

(iii) $\frac{1}{.26} =$

(iv) $\frac{1}{1.11} =$

(v) $\frac{1}{0.625} =$

(vi) $\frac{1}{262} =$

(vii) $\frac{1}{0.0575} =$

(viii) $\frac{1}{0.0018} =$

(ix) $\frac{1}{0.000645} =$

(x) $\frac{1}{1740} =$

7.4 Multiplication (CI and D Scales)
Note that instead of multiplying 2 by 7, we could divide by the reciprocal of 7.

i.e. $2x7 = 2 \div \frac{1}{7}$

Example 1: $2x7 = 14$ (Fig. 7-2)

1. Set the hair line over 2 on the D scale.
2. Place the 7 of CI scale under the hair line.
3. Below the left index of the C scale read off 14 on the D scale as the answer.

Note: When we place the 7 of the CI scale under the hair line (step 2 above), this brings 0.1428 on the C scale immediately above the 2 on the D scale. Thus we are dividing 2 by 0.1428.

(i.e. $2 \div 0.1428 = 2 \div \frac{1}{7} = 2 \times 7$)

Example 2: 4.15 x 1.35 = 5.6

1. Set the hair line over 4.15 on the D scale.
2. Place the 1.35 of the CI scale under the hair line.
3. Below the right index of the C scale read off 5.6 on the D scale as the answer.

Note: Using the D and CI scale to multiply, we never run off the end of the scale for the answer as we did when using the C and D scales. The answer is always found on the D scale under the left or right index of the C scale.

Exercise 7(c)

(i) 1.5 x 4.7 =
(ii) 2.2 x 2.4 =
(iii) 2.258 x 3.1 =
(iv) 1.95 x 5.05 =
(v) 7.6 x 1.25 =
(vi) 6.88 x 1.09 =

7.5 Division (CI and D scale)
Instead of dividing, say, 108 by 7.5, we could simply multiply by the reciprocal of 7.5.

i.e. $108 \div 7.5 = 108 \times \frac{1}{7.5}$

Example 1: 108 ÷ 7.5 = 14.4

1. Place the left index of the C scale over 108 on the D scale.
2. Set the hair line over 7.5 on the CI scale.
3. Under the hair line read off 14.4 on the D scale as the answer.

Note: In the above procedure we have effectively multiplies 108 by 0.1335, or $\frac{1}{7}$, (i.e. the value on the C scale under the hair line.)

$(108 \times 0.1335 = 108 \times \frac{1}{7.5} = 108 \div 7.5)$

Example 2: 96 ÷ 149 = 0.644

1. Place the right index of the C scale over 96 on the D scale.
2. Set the hair line over 149 on the CI scale.
3. Under the hair line read off 0.644 on the D scale as the answer.

Note: When we divide with the CI and D scales, sometimes we use the left index (example 1 above), while on other occasions we use the right index (example 2 above). This is dictated by the numbers involved, and if one index does not bring the numbers we are dividing by onto the scale, the other index will.

Exercise 7(d)

(i) $43 \div 5.5 =$

(ii) $5.7 \div 1.9 =$

(iii) $77 \div 35 =$

(iv) $675 \div 326 =$

(v) $196 \div 14 =$

(vi) $6.6 \div 14.2 =$