

Chapter 4 – Combined Operation on the C and D Scale

4.1 Alternate Division and Multiplication

For a problem such as $\frac{414 \times 2.62}{545}$, if we multiply 414 by 2.62 and then divide by 545, the following steps would be required.

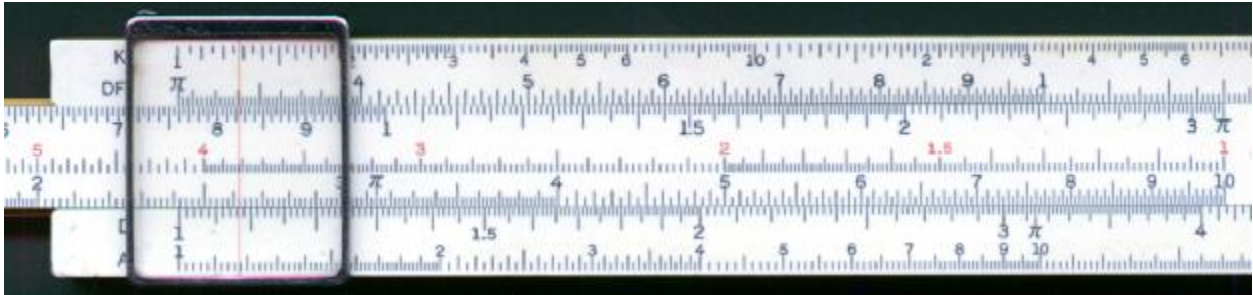


Fig 4-1

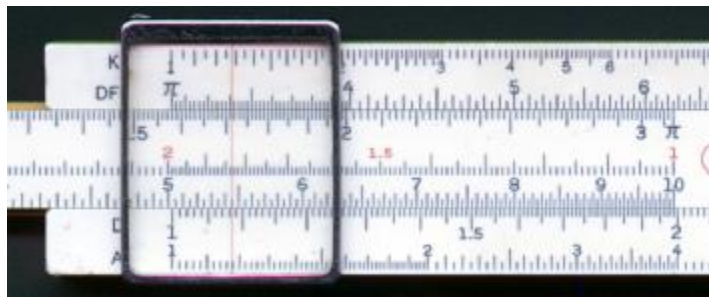


Fig 4-2

1. Place the right index on the C scale over 414 on the D scale. (Fig 4-1)
2. Set the hair line over 2.62 on the C scale. (Fig 4-1)
3. The hair line hold the answer on the D scale.
4. Move the slide so that 545 on the C scale is placed below the hair line (i.e. to divide the previous answer by 545). (Fig 4-2)
5. Below the right index of the C scale read off the answer as '199'.
6. (i.e. $\frac{414 \times 2.62}{545} \approx \frac{400 \times 3}{500} \approx 2$)
7. therefore the answer is 1.99

Note: By using the procedure above, we would have to hold the answer once with the hair line and move the slide twice. This could be reduced to only one move of the slide, with no need to hold the answer with the hair line, if we were first to divide 414 by 545, and then multiply by 2.62.

This saving is because the answer from a division is marked on the D scale by the left or right index of the C scale, thus allowing us to then multiply without moving the slide.



Fig 4-3

Example 1: $\frac{414 \times 2.62}{545} = 1.99$ (Fig 4-3)

1. Set the hair line over 414 on the D scale.
2. Place the 545 of the C scale under the hair line. (Right index on the C scale marks the answer of this division).
3. Reset the hair line over the 2.62 on the C scale.
4. Under the hair line read off 1.99 on the D scale as the answer.

The hair line is only used for convenience of reading values, and the slide is positioned once for the two calculations. These savings, apart from anything else, will increase accuracy and speed.

Example 2: $\frac{107.5 \times 30.6 \times 125}{18.5 \times 216} = 102.9$

1. Set the hair line over 107.5 on the D scale.
2. Place the 18.5 on the C scale under the hair line.
3. Reset the hair line over the 30.6 on the C scale.
4. Place the 216 of the C scale under the hair line.
5. Reset the hair line over the 125 on the C scale.
6. Under the hair line read off '1029' on the D scale as the answer.

(i.e. approx. $\frac{100 \times 30 \times 100}{20 \times 200} = \frac{300}{4} \approx 80$)

therefore the answer is 102.9

Note: The above method necessitated one move of the slide and one holding of the answer with the hair line. To multiply the three numbers in the numerator and then divide by the two numbers in the denominator would mean four moves of the slide, instead of one. Thus the three progressive answers would have to be held instead of only one, as in example 2. For the alternating division and multiplication, the only time extra moves may be required is when we run off the end of the scale for multiplication.

4.2 Locating the Decimal Point

The procedure outlined in 2.4 and 3.3 covers all that is required for combined operations.

Example:

$$\frac{560 \times 0.032 \times 95}{0.73 \times 410} = '569'$$

$$\text{(i.e. approx. } \frac{600 \times 0.03 \times 100}{1 \times 400} = \frac{6 \times 10^2 \times 3 \times 10^{-1} \times 10^2}{4 \times 10^2} = \frac{18}{4} \approx 4)$$

therefore the answer is 5.69

Exercise 4(a)

Locate the decimal points for the following:

(i) $\frac{370 \times 143}{18} = '294'$

(ii) $\frac{0.68 \times 16.3}{0.041 \times 23.2} = '1165'$

(iii) $\frac{564 \times 134 \times 413}{232 \times 1745} = '771'$

(iv) $\frac{1}{26.4 \times 3.44 \times 0.511} = '215'$

(v) $\frac{19.5 \times 135 \times 744}{220 \times 0.62 \times 5.1} = '281'$

4.3 Miscellaneous Problems

Exercise 4(b)

(i) $\frac{35 \times 23}{46}$

(ii) $\frac{12.78}{61}$

(iii) $\frac{0.21 \times 36}{0.125}$

(iv) $\frac{0.0835 \times 445}{96}$

(v) $\frac{1.4^2}{0.475}$

(vi) $\frac{64.5 \times 468}{0.374}$

(vii) $\frac{64 \times 2.5}{48 \times 0.15}$

(viii) $\frac{230 \times 560}{19 \times 840}$

(ix) $\frac{220 \times 0.36 \times 4.3}{0.15 \times 95}$

(x) $\frac{2.8 \times 76 \times 11}{0.37 \times 0.51}$

(xi) $\frac{2500 \times 0.052}{0.37 \times 46}$

(xii) $\frac{235}{11.5 \times 2.9 \times 3.22}$

(xiii) $\frac{5.72^2 \times 314}{7.66}$

(xiv) $\frac{23.4 \times 964 \times 183.5}{48.2 \times 38.2 \times 103.6}$

Exercise 4(c)

(i) Find V if $r=3.6\text{cm}$ and $h=7.1\text{cm}$, given that $V=\pi r^2 H$

(ii) Find F if $F = \frac{MV^2}{gr}$, given $M=145.0$, $V=42$, $g=9.8$ and $r=3.65$.

(iii) If $P = R \frac{(t-1)}{(t+1)}$ find P when $R=64.2$ and $t=1.54$.

- (iv) Simple Interest = $\frac{PRT}{100}$. Find the interest if P=\$245 at R=6.25% for T=5 Years.
- (v) Surface area, A, of a cylinder, is given by $A=2\pi r(h+r)$. Find A if r=7.3cm and h=12.2cm.