

Analyzing Experimental Data - Proportioning Techniques

time (s)	1	2	3	4	5	6	7
distance (m)	28	56	84	112	140	168	196

Diagram illustrating proportional relationships between time and distance data points:

- Red arrows: 1s to 2s (x2), 2s to 4s (x2), 1s to 3s (x3), 3s to 6s (x2).
- Blue arrows: 1s to 4s (x4), 2s to 8s (x4).
- Green arrows: 1s to 3s (x3), 3s to 9s (x3).

Since the multipliers for time are equal to the multipliers for distance, we can say that there is a direct relationship between distance and time

(Proportionality Statement) $d \propto t$

"d varies directly with t"

"d is directly proportional to t"

(general equation) $d = kt$

$$84\text{m} = k(3\text{s})$$

$$k = \frac{84\text{m}}{3\text{s}}$$

(Proportionality constant)

$$k = 28 \frac{\text{m}}{\text{s}}$$

(specific equation) $d = (28 \frac{\text{m}}{\text{s}})t$

f (Hz)	5	10	20	50	75	100
T (s)	0.2	0.1	0.05	0.02	0.013	0.01

$\times 2$ (5 to 10), $\times 5$ (10 to 50), $\times 10$ (50 to 100)
 $\times \frac{1}{2}$ (0.2 to 0.1), $\times \frac{1}{5}$ (0.1 to 0.02), $\times \frac{1}{10}$ (0.02 to 0.01)

$$T \propto \frac{1}{f}$$

Sample Problems (FOP p22)

1.

y	x
250	3
750	9
2500	30
5000	60

$y \propto x$
 $\times 3$ (250 to 750), $\times 10$ (2500 to 5000)
 $\times 3$ (3 to 9), $\times 10$ (30 to 60)

2.

A	B
20	14
80	28
80	42
2000	140

$A \propto B^2$
 square the multipliers
 $\times 4$ (20 to 80), $\times 9$ (80 to 2000), $\times 100$ (2000 to 20000)
 $\times 2$ (14 to 28), $\times 3$ (28 to 42), $\times 10$ (140 to 1400)

3.

F	r
900	1
225	2
36	5
14	18
1	30

$F \propto \frac{1}{r^2}$
 need to match the denominator of the multipliers of F
 $\times \frac{1}{4}$ (900 to 225), $\times \frac{1}{25}$ (225 to 36), $\times \frac{1}{900}$ (36 to 1)
 $\times 2$ (1 to 2), $\times 5$ (2 to 10), $\times 30$ (10 to 30)

TO DO: (in FOP booklet)

① Practice/p23

- find the prop
- write the general eq
- find k
- write specific eq.

② p38/26, 27 (same as above)