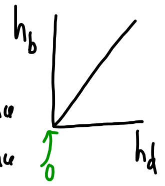
Working with Proportionalities in Physics

Recall Bounce that Ball:



drop $80\,cm \rightarrow 60\,cm$ bounce

$\times 2$ $40\,cm \rightarrow 30\,cm$ bounce $\times 2$

If you have a linear graph with a y-intercept of zero then this suggests a direct proportionality.

$y \propto x \Rightarrow$ "y is directly proportional to x"

"y varies directly with x"

Consider the Bounce that Ball Lab:

$h_b \propto h_d$ (proportionality statement)

$h_b = k\,h_d$ (general equation)

(k is called the proportionality constant)

$60\,cm = k(80\,cm)$

$k = \frac{60\,cm}{80\,cm}$

$k = 0.75$ ← proportionality constant

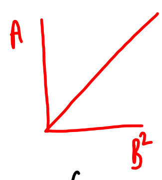
$h_b = 0.75\,h_d$ (specific equation)

$(y = mx + b)$

Examples:

A varies directly with the square of B $\Rightarrow A \propto B^2$

A graph of A vs B^2 would be linear with a y-intercept of zero.



F varies directly with the square of v and inversely with r.

$F \propto v^2$
$F \propto \frac{1}{r}$ } combine $F \propto \frac{v^2}{r}$

$F = \frac{kv^2}{r}$

Sheet:

1. a) $z \propto t^3$

   b) $p \propto w^2$

   c) $A \propto m$

   d) $V \propto r^3$

   e) $S \propto r$

2. $P \propto d^2$ (proportionality statement)

$P = kd^2$ (general equation)

$8.25 = k(10)^2$ take as 2sd

$k = \frac{8.25}{100}$

$k = 0.0825$ (solve for k)

$P = 0.0825d^2$ (specific equation)

$P = 0.0825(16)^2$

$P = \$21.12$

($21 with 2sd)