**Derivation of Third Equation of Uniformly Accelerated Motion by Graphical Means**



The object has an initial velocity of, u, and undergoes constant acceleration, a, for a time, t, at which its final velocity is, v.

Area under graph = displacement, s

Area of trapezium, A = ½ (x + y) h, where x & y are the lengths of the parallel sides and h is the height.

Therefore, area, A = ½ (u + v) t – equ 1

We know that by definition, a = (v – u) / t

So, t = (v – u) / a

Substitute for t in equ 1

s = ½ (u + v) (v – u) / a

s = (v2 – u2) / 2a

v2 = u2 + 2 a s

QED

PS – this may look just as long as the algebraic derivation of this formula that we did in Module 1. Trust me – when you get used to this method, you only need to write down two or three lines.