Substitution using SUVAT equations.

SUVAT Equations

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

$$s = vt - \frac{1}{2}at^2$$

$$s = \frac{1}{2}(u + v)t$$

s – displacement
u – initial velocity
v – final velocity
a – acceleration
t - time

1 Find the final velocity for an object that starts moving from rest and accelerates at a constant rate of $3ms^{-2}$ for twelve seconds.

2 A car is travelling at a velocity of $80ms^{-1}$. The driver applies the breaks and the car slows down at a rate of $12ms^{-2}$ over a distance of 240m. At what velocity is the car moving at the end of the section of road?

3 An object is dropped from a hot air balloon, starting from rest. It falls under gravity at $9.81ms^{-2}$ for 12 seconds when it hits the ground. What is the height of the hot air balloon?

4 A man runs at $11ms^{-1}$ at the start of a race. By the end of the race, he has slowed down to $7ms^{-1}$. He took 15 seconds to run the race. How far was the race?

5 A cheetah accelerated at a constant rate of $9ms^{-2}$ from rest. How far had the cheetah run by the time it got to $81ms^{-1}$?

6 A ball rolled down a road accelerating at a rate of $3ms^{-2}$. After 7 seconds, it was travelling at $35ms^{-1}$.

a. What was the initial velocity of the ball?
b. How long was the road?

7 A cat pounced on a pigeon from 4m away. The cat started its pounce from rest. It accelerated towards its prey at a rate of $2.5ms^{-2}$. One and a half seconds after the cat had pounced, the pigeon sensed it and tried to fly away. Did the cat catch the pigeon?

8 For each of the equations above, rearrange them to make either the initial velocity or the final velocity the subject.