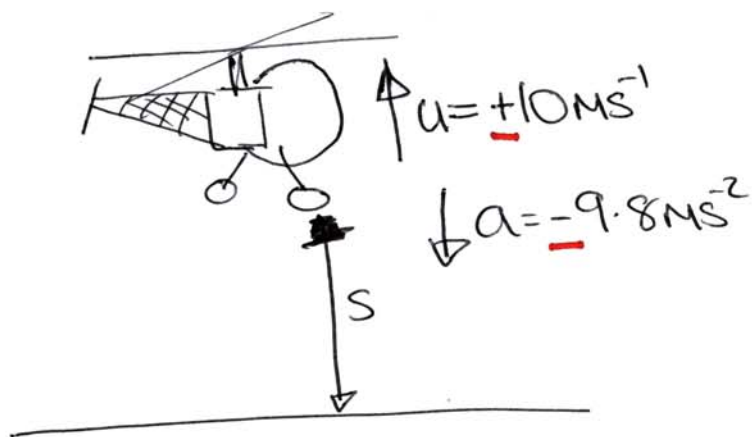


A helicopter is rising vertically at  $10 \text{ m/s}$  when a wheel falls off. The wheel hits the ground  $8 \text{ s}$  later. Calculate at what height the helicopter was flying when the wheel came off.



We have vertical motion in both directions here so sign convention is important.

Choose up as positive  
down as negative

$$u = +10 \text{ m/s}^{-1}$$

$$a = -9.8 \text{ m/s}^{-2}$$

$$s = ?$$

$$v = ?$$

$$t = 8 \text{ s}$$

written down  
what you  
know +  
don't know

$$v = u + at \quad \text{no } s$$

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

$$v^2 = u^2 + 2as \quad \text{no } t$$

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

$$s = (+10 \times 8) + \left(\frac{1}{2} \times (-9.8) \times 8^2\right)$$

$$s = 80 - 313.6$$

$$s = -233.6 \text{ m}$$

sig figs

Height of helicopter was 234 m when the wheel fell off.

the "-" tells us this is downwards i.e. this is the distance the wheel fell.