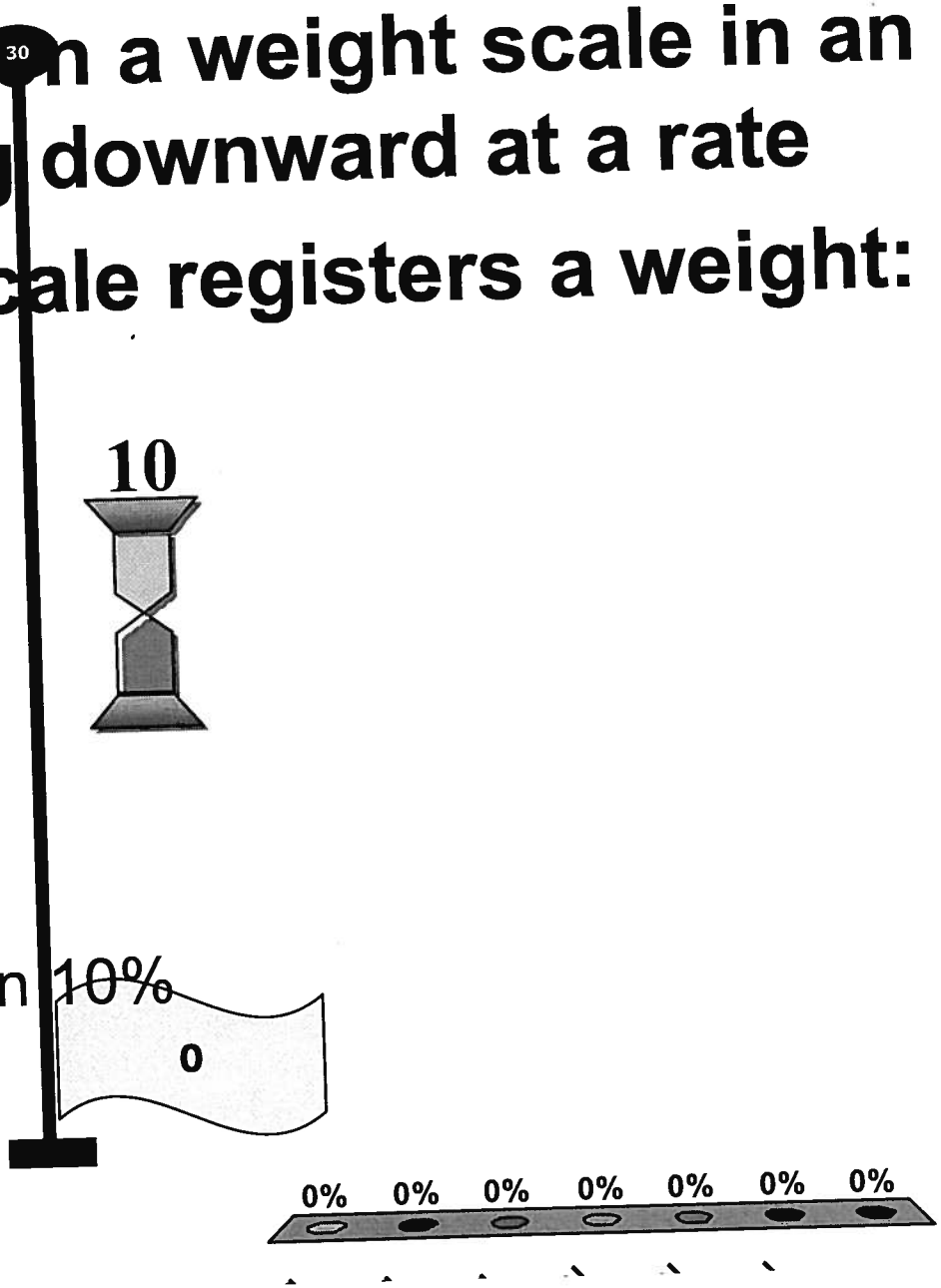
A 60 kg man stands on a weight scale in an elevator accelerating downward at a rate A=g/2=5 m/s^2. The scale registers a weight:

a) 30 kg
b) 60 kg
c) 120 kg
d) 300 N
e) 600 N
f) 1200 N
g) None of above is within 10%



The correct answer is: d) 300 N; as follows.

- 1) Weight is a force, not a mass. Therefore answers **a), b) and c)** have inappropriate mass units and **cannot be correct**.
- 2) Viewed from an **inertial frame**, the man is accelerating (take downward as - direction) at a rate, **A** = **g**/2 = -5 m/s^2. Thus, **NII requires**:
  $\mathbf{F}^{NET} = \mathbf{F}_{GRAV} + \mathbf{F}_{Scale} = M\mathbf{A} = -60*5$. Therefore,
  $\mathbf{F}_{Scale}$ = Weight = M**A** – $\mathbf{F}_{GRAV}$,
  and $-\mathbf{F}_{GRAV} = +\ 60*10$ upward, so that
  Weight = $\mathbf{F}_{Scale}$ = -(60*5)+(60*10) = + 300 N. (d)
- 3) Viewed from the **accelerating A-frame**, the man is at rest. Therefore the net force acting upon him must be zero, but **because the frame of reference is accelerating**, **the pseudo-force, -MA, must be added** to the physical forces to get correct results. Thus,
- $0 = \mathbf{F}_{GRAV} + \mathbf{F}_{Scale} + \mathbf{F}_{Pseudo} = \mathbf{F}_{GRAV} + \mathbf{F}_{Scale} - M\mathbf{A} = 0$, and
  $\mathbf{F}_{Scale} = -\mathbf{F}_{GRAV} + M\mathbf{A} = +\ 60*10\ - 60*5 = +300$N. (d)
  Of course, one gets the same result either way:There is only one motion!