Topic 4: Newton's Laws and Connected Particles

1) Useful Formulae/Rules:

a) Formulae:

Notes:

- All the formulae below are in the Tables (pgs 50 – 57)

Newton's 2nd Law:

$$F = ma$$

Friction:

$$Friction = \mu R$$

μ = coefficient of friction

Work:

$$Work = Force \times Displacement \ (W = Fs)$$

Power:

$$Power = \frac{Work}{Time} = \frac{W}{t}$$

$$Power = Force \times Velocity = Fv$$

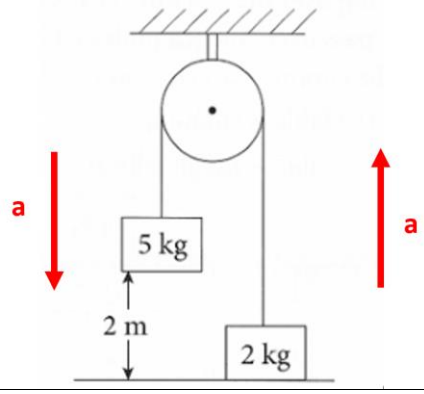
b) Other important rules:

Notes:

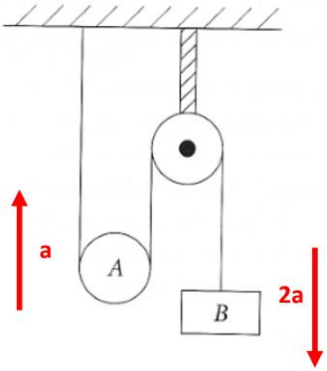
- Always draw diagrams showing all forces acting.
- If there is no acceleration in vertical direction => Forces Up = Forces Down
- If there is no acceleration in horizontal direction => Forces Left = Forces Right
- If there is acceleration in one direction => Net Force = Forces in direction of acceleration – Any opposing forces
- Generally, we always resolve forces that are at awkward angles to one another, so that we can compare them in the parallel and perpendicular direction.

2) Particles/Pulleys:

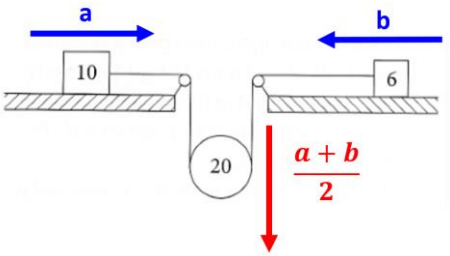
a) 1 Pulley and 2 Particles:



b) 1 Fixed Pulley and 1 Moveable Pulley:



c) 1 Moveable Pulley and 2 Particles:



3) General Tips for Exam Question:

- Do draw a force diagram for each particle separately.
- Do show the acceleration to one side of the diagram.
- Do write down the equation (F = ma) of motion for each particle.
- Don't assume all accelerations are 'a'.
- Don't fret if you get a negative acceleration: it just means the goes the other way……unless friction is at play.