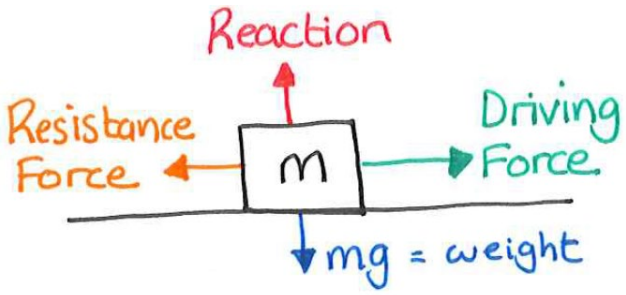
Forces (Horizontal)



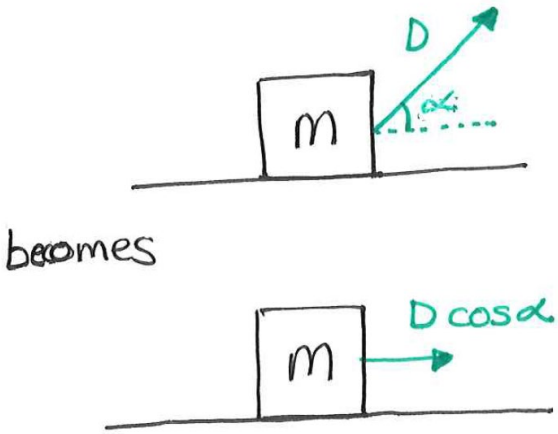
$F = ma$

F = Resultant Force

= Driving Forces − Resistant Forces

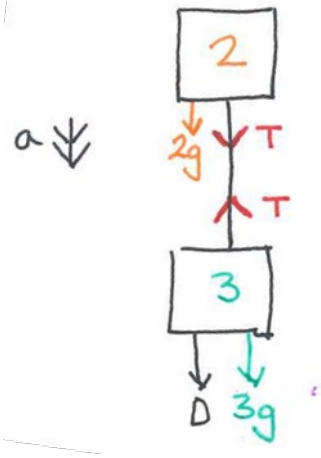
Forces at an Angle

Forces should be parallel to the ground.

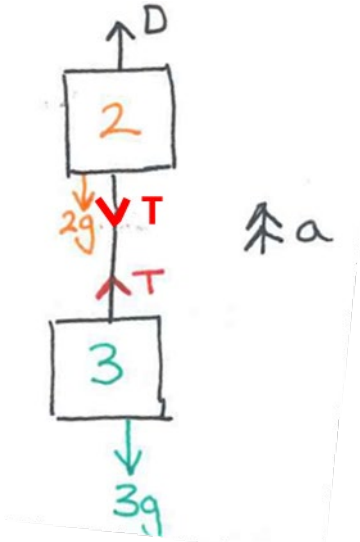


Tension

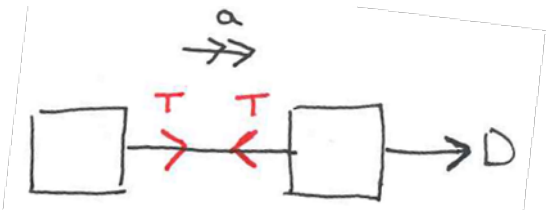
Descending



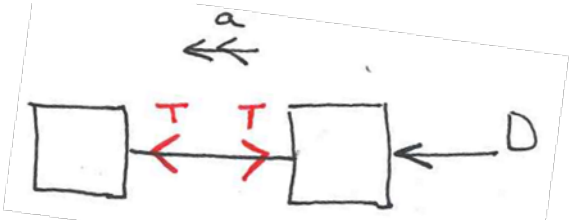
Ascending



Tension

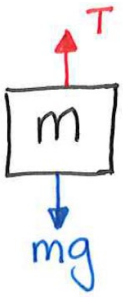


Thrust (Reversing)



Forces (Vertical)

Direction Matters!



$g = 9.8\ ms^{-2}$

Direction of motion matters

$a\uparrow \quad F = ma$

$T - mg = ma$

$a\downarrow \quad F = ma$

$mg - T = ma$

Vectors and Forces

Adding vector forces

$F_1 = 2i + 3j$

$F_2 = 4i - j$

$F_1 + F_2 = 6i + 2j$

Magnitude

$a = 4i + 3j$

$|a| = \sqrt{4^2+3^2} = 5$

Bearings

Northline

Clockwise

Parallel

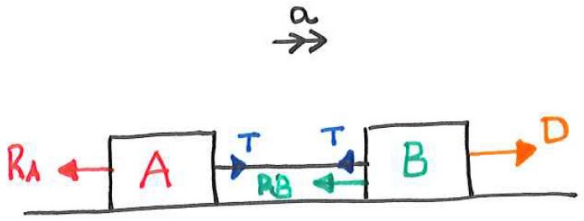
$ai + bj$

$xi + yj$

$\frac{b}{a} = \frac{y}{x}$

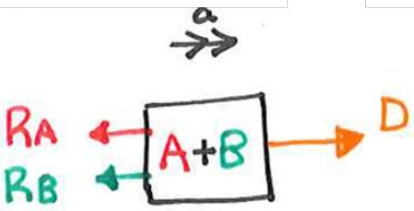
Connected Particles

(Horizontal Only)



Overall System

Good for calculating acceleration.

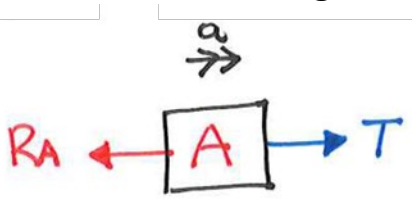


overall $F = ma$

$D - R_A - R_B = (A+B)a$

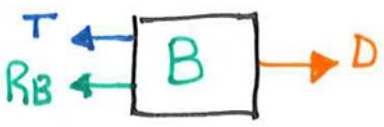
Individual Particles

Good for calculating tension.



partical A $F = ma$

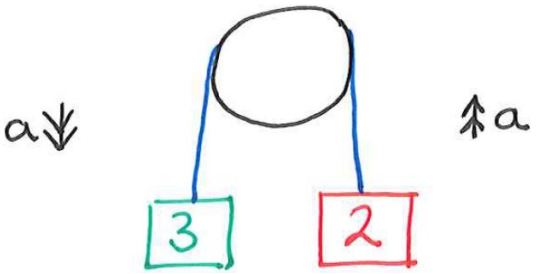
$T - R_A = Aa$



partical B $F = ma$

$D - T - R_B = Ba$

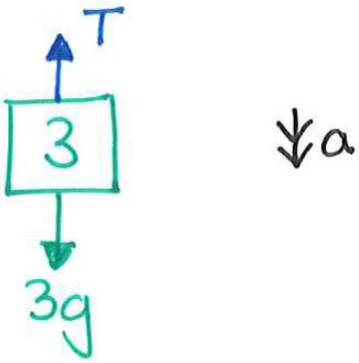
Pulleys



Overall System

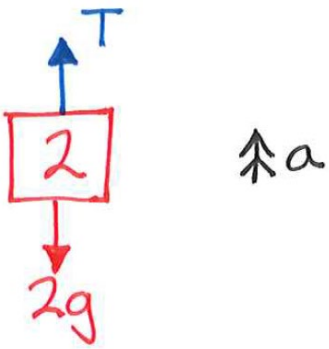
Cannot look at the an overall system as the particles are moving in direction directions.

Individually



$$F = ma$$

$$3g - T = 3a$$

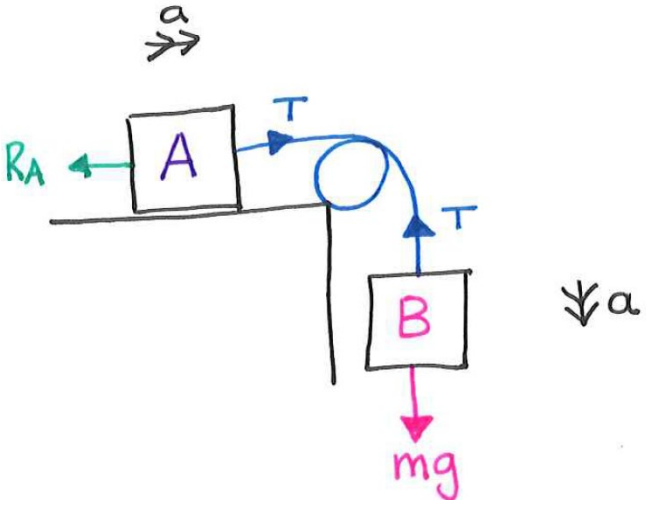


$$F = ma$$

$$T - 2g = 2a$$

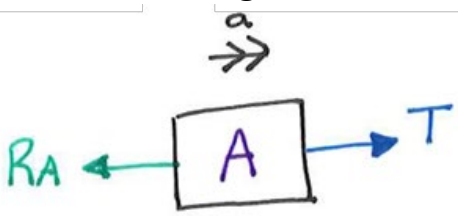
Connected Particles

(Horizontal and vertical)



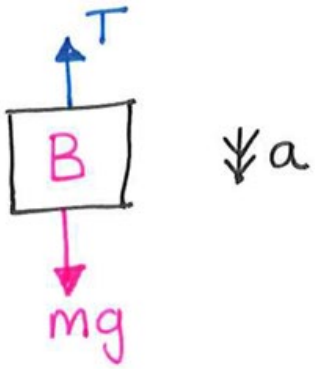
Individual Particles

Good for calculating tension.



$$F = ma$$

$$T - R_A = Aa$$



$$F = ma$$

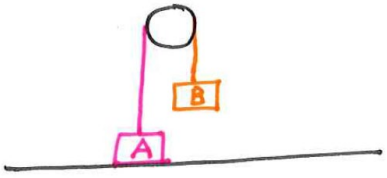
$$mg - T = Ba$$

Forces and SUVAT

Journey Part A

system is released ($u=0$)

Journey Part B



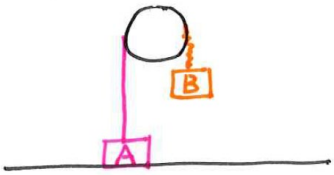
A hits ground

B keeps traveling up

For B driving force is now zero

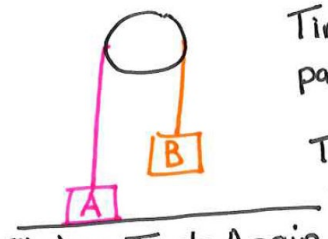
Recalculate acceleration ($F=ma$)

Journey Part C



B reaches its greatest height where $v=0$

Journey Part D

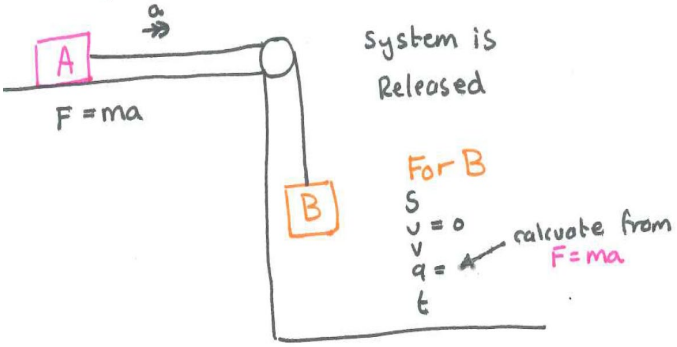


Time from part B to part C = Time from part C to part D

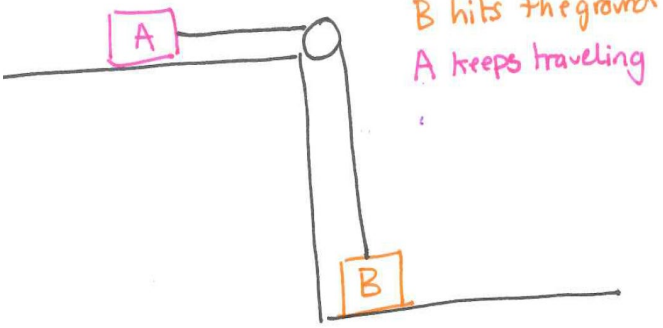
String Taut Again

Forces and SUVAT

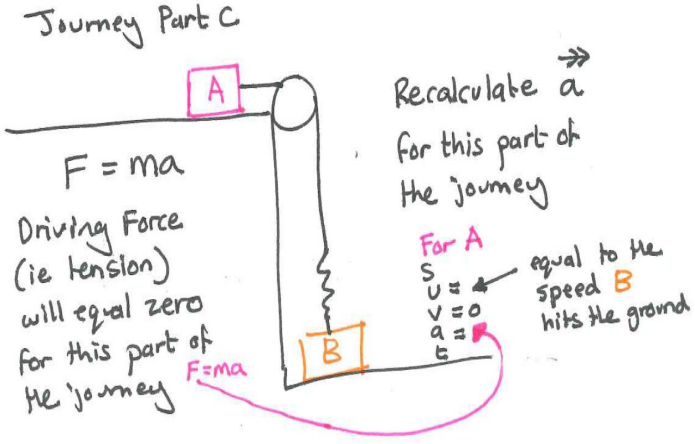
Journey Part A



Journey Part B

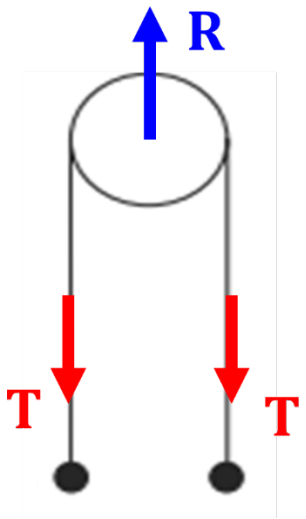


Journey Part C



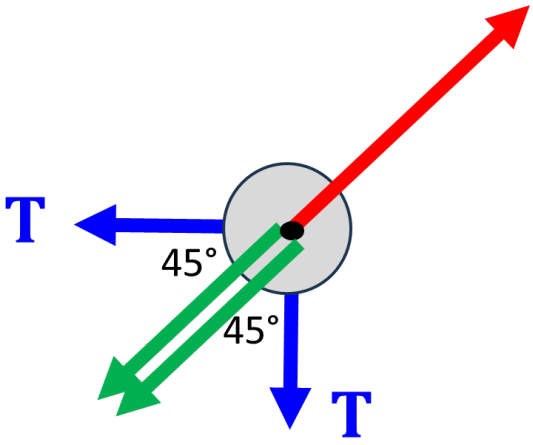
Forces Exerted on a Pulley

Both vertical



The force exerted on the pulley is $2T$ in the downwards direction.

Horizontal and Vertical

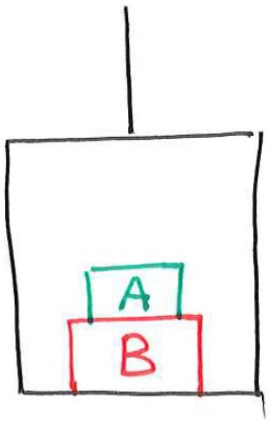


The force exerted on the pulley is $\mathbf{2T\cos 45}$ in the south-west direction.

Lifts and Scale Pans

Newtons 3rd Law
Everything has an equal and opposite reaction.

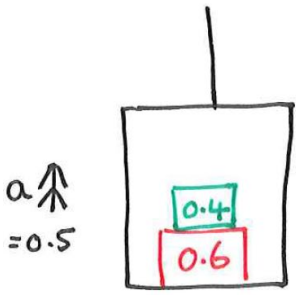
Stacked Particles
Always easier to work out the forces exerted using the particle on top.



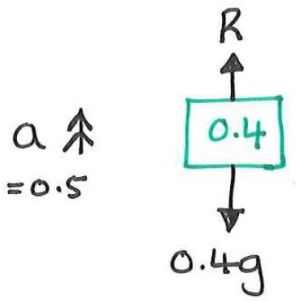
Force exerted on B by A = Force exerted on A by B

Ascending Example

Find the force exerted on A by B.
(In other words, find the driving force of A)



Partical on Top



$F = ma$

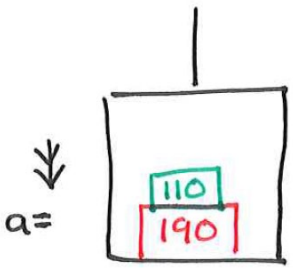
$R - 0.4g = 0.4(0.5)$

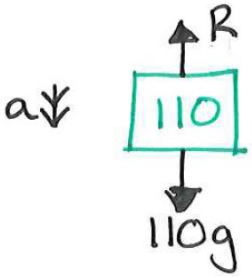
$R = 4.12$

Force excerted on A by B is 4.12

Descending Example

Find the force exerted on A by B.
(In other words, find the reactional force of A)





$F = ma$

$100g - R = 110(1.8)$

$R = 880$

Force excerted on A by B is 880
