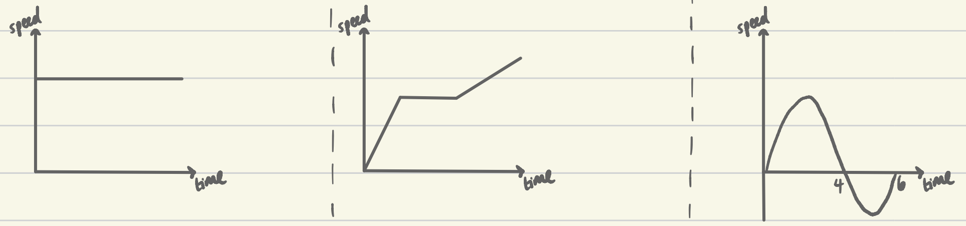
# Kinematics - motion

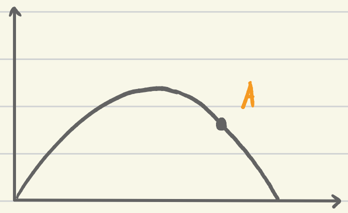
| | Constant Speed, $a=0$ | Constant Acceleration | Variable Acceleration |
|---|---|---|---|
| Kinematic Equations | dist = <br> kmph $\longrightarrow$ $ms^{-1}$ <br> $ms^{-1}$ $\longrightarrow$ kmph | F $v=$ <br> F $s=$ <br> F $s=$ <br> F $v^2=$ <br> F $s=$ | s/x <br> v <br> a |
| Speed-Time Graphs | speed / time | speed / time | speed / 4 / 6 / time |
| [redacted] | $\underline{r}=$ | $\underline{v}=$ <br> $\underline{r}=$ <br> $\underline{r}=$ | $\underline{r}$ <br> $\underline{v}$ <br> $\underline{a}$ |



distance travelled =

acceleration =

## [redacted]




Horizontal Motion
$a=$

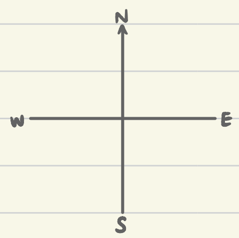
Vertical Motion
$a=$

Find the speed and direction of motion at A

## [redacted]

"moving in the direction $\begin{pmatrix}2\\3\end{pmatrix}$"

"is north-east of the origin"




## Modelling Assumptions

smooth pulley:

light string:

inextensible string:

particle:

rod:

+ obvious ones like smooth, rough, etc.

# Forces

## Equilibrium

static/at rest
on the point of slipping/limiting equilibrium
constant speed

Vector forces

## Dynamics, $F=ma$

If none of the above, it is accelerating/decelerating

Resolve using $F=ma$, in the direction of

Vectors, use $\underline{F}=m\underline{a}$ where $\underline{F}$ is the resultant, $\underline{R}$

$\underline{R}=$

## [redacted]

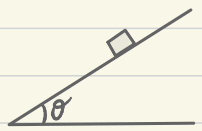
Always opposes

If static, $F_r$

If limiting equilibrium/dynamic $F_r$

$0 \leq \mu$

On slopes

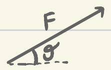



$> F_{max}$

$\leq F_{max}$

## Forces Diagrams - Basic

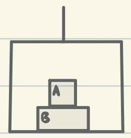
[redacted]




Tension

Thrust

Boxes on boxes/Lifts



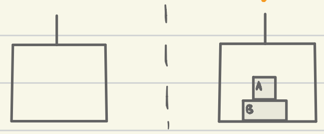

A: m kg
B: M kg    Lift: L kg

A:

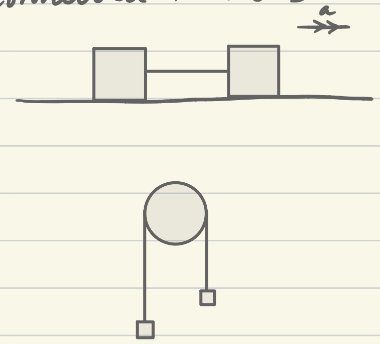
B:

Lift:

Whole system:



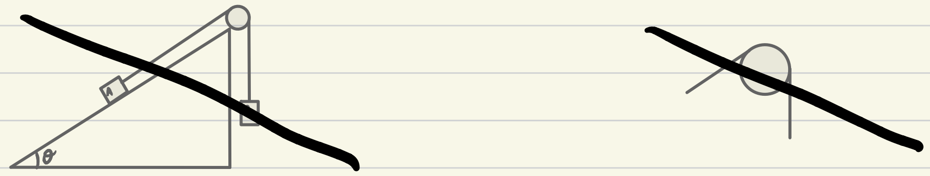

## Connected Particles




Method

1)
2)
3)
4)
5)
6)

**NONE OF THE BELOW ↓**

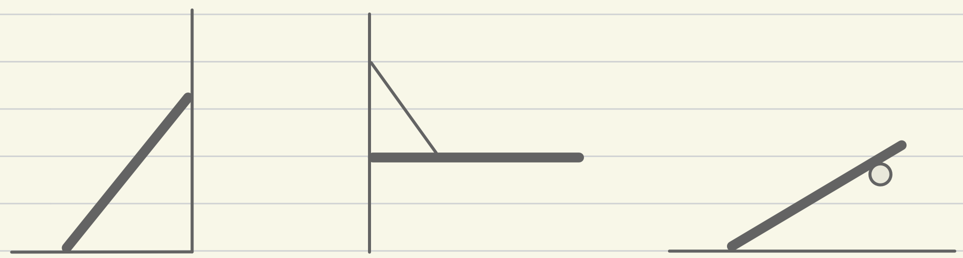



## [redacted]


uniform:

non-uniform:

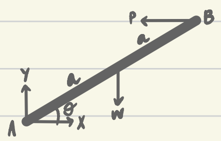
on the point of tilting about A:



## [redacted]

moment =

anticlockwise =




[redacted]

1)

2)

3)

BICEN MATHS