A-Level Mathematics: Kinematics

Priority Learning

Revision Sheet

Name: _____ **Date**: _____

<u>Aims of this worksheet:</u>

- Learning the suvat equations.
- Learning how to translate a question into a suvat.
- Practice common exam style questions.

The Equations

This section covers the suvat equations and what the variables mean.

The Variables

- s = Displacement
- u = Initial velocity
- v = Final velocity
- a = Acceleration
- t = Time

Remember: for a falling object the acceleration is 9.8ms^{-1}.

Velocity

Velocity is displacement per unit time.

Acceleration

Acceleration is the change in velocity per unit time. Change in velocity is $v - u$.

Which leads us to the following equations.

The Equations

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$a = \frac{v - u}{t}$$

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

$$s = vt - \frac{1}{2}at^2$$

Example

A ball is thrown up in the air with velocity 10ms^{-1}. How long does it take for it to hit the ground?

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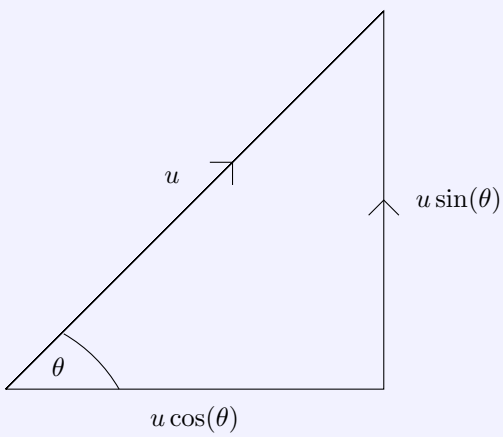
Motion For A Particle Travelling At An Angle

When a particle is travelling at an angle is has velocity in both the vertical and horizontal directions.

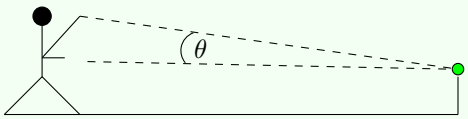


Example

A ball is thrown at an angle 30 degrees to the horizontal with initial velocity 8ms^{-1}. How far away does it land?

Example

A tennis ball is served from a height of 2m above the ground. The player hits the ball at an angle θ as shown in the diagram. The magnitude of the velocity of the serve is 10ms^{-1} and the net is 12m away and 0.8m tall. What is the minimum angle the tennis player needs to serve at in order for the ball to clear the net?



Example (cont..)

Example

Two cars are in a race, a blue car and a red car. The red car is 200m ahead of the blue car. The red car is travelling at a constant velocity of 12ms^{-1}. The blue car is travelling at 5ms^{-1} and then begins to accelerate at 1.5ms^{-2}. It is a straight track and the finish line is 250m away from the red car. Who will win the race?