

Using the Constant Acceleration Formulae

Starter

There is no need to copy the equations down again.

$$\begin{array}{ll} v = u + at & \text{No } s \\ s = ut + \frac{1}{2}at^2 & \text{No } v \\ v^2 = u^2 + 2as & \text{No } t \\ s = \frac{1}{2}(u + v)t & \text{No } a \\ s = vt - \frac{1}{2}at^2 & \text{No } u \end{array}$$

In the following situations, decide which equation you would use to solve the problem. You do not need to find the required value.

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|----------------------------|----------|-------------------------------|----------|
| (a) $a = 3, u = 2, v = 9$ | find t | (b) $s = 50, v = 11, a = 2$ | find u |
| (c) $v = 9, s = 35, t = 5$ | find a | (d) $u = 1, a = 2.5, t = 6$ | find s |
| (e) $t = 4, s = 86, v = 7$ | find u | (f) $u = 8, t = 6, s = 100$ | find a |
| (g) $u = 3, a = 2, s = 38$ | find v | (h) $v = 10, u = 6, a = 1.5,$ | find t |

Notes

Success Criteria – SUVAT questions

- Write down which letters you know.
- Write down which letter you are trying to find.
- Write down which letter you don't need.
- Choose the correct equation to use.

N.B. The **letter that you don't need** is often the quickest way to decide which formula to use.

E.g. 1 A bowls player projects the jack along the green with a speed of 4 m/s. It comes to rest 'short' at a distance of 25 m.

- What is the retardation caused by the surface of the green?
- With what speed should the jack be projected to reach a length of 30 m?

Working:

(a) The jack comes to rest so $v = 0$.
 $u = 4, s = 25, v = 0, a = ?$
 No $t \Rightarrow v^2 = u^2 + 2as$: $0^2 = 4^2 + 2 \times a \times 25$
 $-50a = 16$
 $a = -\frac{8}{25} = -0.32$

The retardation is 0.32 m/s²

(b) $v = 0, s = 30, a = -0.32, u = ?$
 No $t \Rightarrow v^2 = u^2 + 2as$: $0^2 = u^2 + 2 \times (-0.32) \times 30$
 $u^2 = 19.2$
 $u = \frac{4\sqrt{30}}{5} \approx 4.38$

The jack must be projected with a speed of 4.38 m/s (3 s.f.)

E.g. 2 The driver of a train begins the approach to a station by applying the brakes to produce a steady deceleration of 0.2 m/s^2 and brings the train to rest at the platform in 1 minute and 30 seconds. Find:

- (a) the speed of the train in m/s at the moment when the brakes were applied
- (b) the distance then travelled before stopping.

E.g. 3 At the same instant two children, who are standing 24 m apart begin to run directly towards each other. James starts from rest at a point *A*, running with a constant acceleration of 2 m/s^2 and William runs with a constant speed of 2 m/s. Find how long it is before they meet.

Video: [Constant acceleration \(horizontal\)](#)

Constant acceleration (horizontal) EQ

[Solutions to Starter and E.g.s](#)

Exercise

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Summary

SUVAT questions

1. Write down which letters you know.
2. Write down which letter you are trying to find.
3. Write down which letter you don't need.
4. Choose the correct equation to use.

$$v = u + at \quad \text{No } s$$

$$s = ut + \frac{1}{2}at^2 \quad \text{No } v$$

$$v^2 = u^2 + 2as \quad \text{No } t$$

$$s = \frac{1}{2}(u + v)t \quad \text{No } a$$

$$s = vt - \frac{1}{2}at^2 \quad \text{No } u$$