

APP MATHS HW 2/9/19

1. Write down the 5 equations of motion.
2. A car accelerates from rest at a constant acceleration of  $4\text{m/s}^2$  for 35 seconds.
  - a. How fast is it then going?
  - b. How far has it travelled in that time?
3. A stone falls with a constant acceleration of  $9.8\text{m/s}^2$  from a height of 25m.
  - a. How long will it take to hit the ground if it starts from rest?
  - b. How fast will it be going when it hits the ground?
4. A rocket slows down to dock with the space station. It is originally travelling at  $50\text{m/s}$  when it is 300m away. What acceleration is needed to bring it to rest just at the space station?
5. A bullet hits a block of wood and travels through it. The wood is 10cm thick and the bullet enters it at  $300\text{m/s}$ . It comes out the other side at a speed of  $25\text{m/s}$ .
  - a. What was the acceleration of the bullet in the wood?
  - b. For how long was the bullet in the wood?

## SOLUTIONS

①  $v = u + at$   
 $v^2 = u^2 + 2as$   
 $s = \frac{1}{2}(u+v)t$   
 $s = ut + \frac{1}{2}at^2$   
 $s = vt - \frac{1}{2}at^2$

②  $u = 0$   
 $a = 4$   
 $t = 35$   
 $v = ?$

$v = u + at$   
 $= 0 + 4(35)$   
 $= \boxed{140 \text{ m/s}}$

$s = ?$

$s = ut + \frac{1}{2}at^2$   
 $= 0(35) + \frac{1}{2}(4)(35)^2$   
 $= \boxed{2450 \text{ m}}$

③  $a = 9.8$   
 $s = 25$   
 $u = 0$   
 $t = ?$

$s = ut + \frac{1}{2}at^2$   
 $25 = 0(t) + \frac{1}{2}(9.8)t^2$   
 $25 = 4.9t^2$   
 $5.1 = t^2$   
 $\boxed{t = 2.26 \text{ s}}$

$v = ?$

$v^2 = u^2 + 2as$   
 $v^2 = 0 + 2(9.8)(25)$   
 $v^2 = 490$   
 $\boxed{v = 22.1 \text{ m/s}}$

④

$$u = 50$$

$$s = 300$$

$$v = 0$$

$$a = ?$$

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

$$0 = 50^2 + 2(a)(300)$$

$$-2500 = 600a$$

$$\boxed{-4.17 \text{ m/s}^2 = a}$$

⑤

$$s = 0.1$$

$$u = 300$$

$$v = 25$$

$$a = ?$$

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

$$25^2 = 300^2 + 2a(0.1)$$

$$-89375 = 0.2a$$

$$\boxed{-446875 \text{ m/s}^2 = a}$$

$$t = ?$$

$$v = u + at$$

$$25 = 300 - 446875t$$

$$446875t = 275$$

$$\boxed{t = 0.00062 \text{ s}}$$