

- 2009
1. (a) A particle is projected vertically upwards from the point  $p$ . At the same instant a second particle is let fall vertically from  $q$ . The particles meet at  $r$  after 2 seconds. The particles have equal speeds when they meet at  $r$ .

Prove that  $|pr| = 3|rq|$ .

qr

$$v = u + ft$$

$$v = 0 + 2g$$

pr

$$v = u - 2g$$

$$\Rightarrow 2v = u$$

$$v^2 = u^2 + 2fs$$

qr

$$v^2 = 0 + 2g|qr|$$

pr

$$v^2 = u^2 - 2g|pr|$$

$$v^2 = 4v^2 - 2g|pr|$$

$$3v^2 = 2g|pr|$$

$$3(2g|qr|) = 2g|pr|$$

$$3|qr| = |pr|$$

or

qr

$$v = u + ft$$

$$v = 0 + 2g$$

pr

$$v = u - 2g$$

$$\Rightarrow u = 4g$$

$$v^2 = u^2 + 2fs$$

qr

$$4g^2 = 0 + 2g|qr|$$

$$\Rightarrow |qr| = 2g$$

pr

$$4g^2 = 16g^2 - 2g|pr|$$

$$\Rightarrow |pr| = 6g$$

$$3|qr| = |pr|$$

