

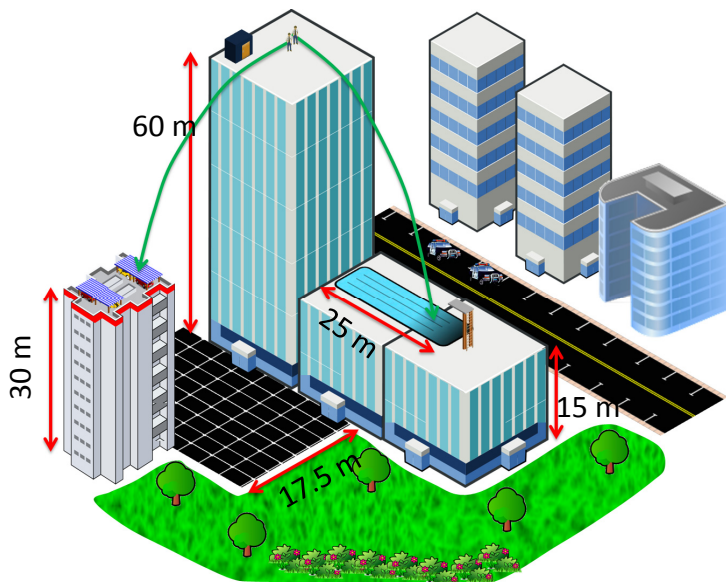


This worksheet is based on events in the mathematical thriller A Question of Will. Get it now at:

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## Escape from the Police Station (Falling, Dynamics, Velocities)

### SPOILER WARNING!!!



#### Question 1 (7 marks)

Will and Besra are trapped on the top of the police station, 60 metres above the ground. The gunmen are just about to storm the roof. The boys have two options to escape – jump to the nearby diving pool, or to the awnings on a multistorey car park. If they land short in either case, they die. By calculating the running speed required, choose the better of the two options.

#### Question 2 (4 marks)

Assume they can run fast enough to reach both the awning and the diving pool. Work out the vertical velocities at impact for the two jump options. If they can survive a 30% faster impact into the diving pool than the car park awning, which is the better choice?

#### Question 3 (4 marks)

A reasonable acceleration speed for a fit teenage boy is 2.5 m/s/s. Calculate the time and horizontal distance required for Will to hit the horizontal velocities you calculated for Question 1.

#### Hints and Additional Information

There's a formula for calculating how long it takes for an object to fall a certain distance:

$$t = \sqrt{\frac{2 \times h}{g}}$$

$g$  is gravity, and is 9.81 m/s/s

$h$  is the height the object falls, measured in metres

For Question 3, you may need the equation relating the distance travelled  $x$  to the time duration  $t$  and acceleration  $a$ :

$$x = \frac{1}{2}at^2$$