SUVAT Projectiles

Learning Objectives:

1. Recall the SUVAT equations
2. Use SUVATs to solve projectile questions

What are the SUVAT equations?

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

$$v = u + at$$

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

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

$$s = \frac{1}{2}(u + v)t$$

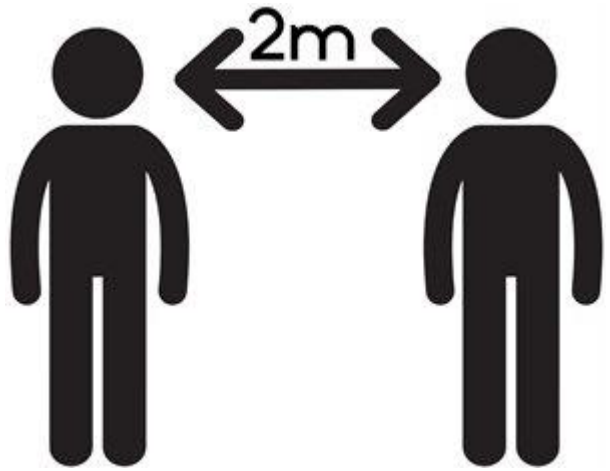
They are the equations of constant acceleration

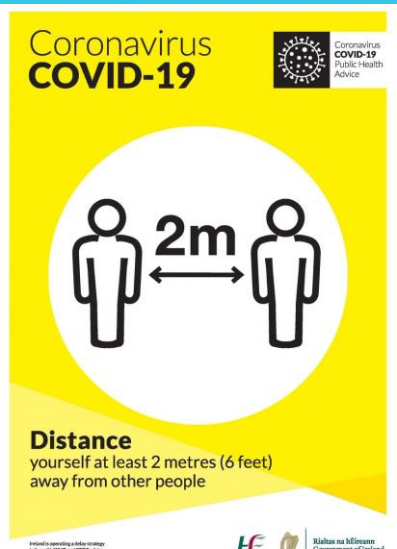
Is 2m enough?


SOCIAL
DISTANCING
AVOID CLOSE CONTACT WITH OTHERS
TO PREVENT THE SPREAD OF COVID-19

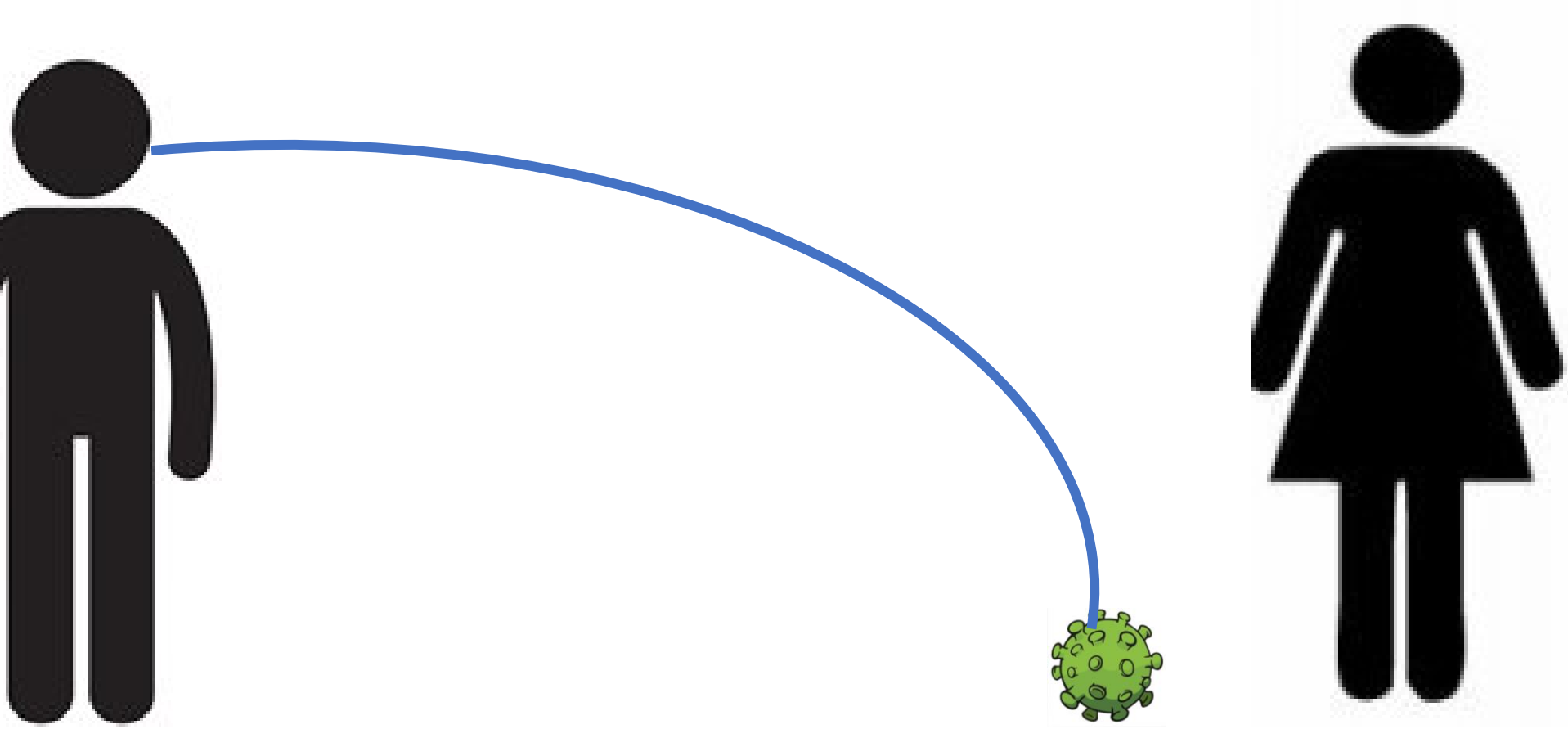

YOU NEED TO STAY 2 METRES
APART TO SAVE LIVES NOW
2 METRES


2metres
6'6"


2m


Coronavirus
COVID-19
Coronavirus COVID-19 Public Health Advice
2m
Distance
yourself at least 2 metres (6 feet)
away from other people

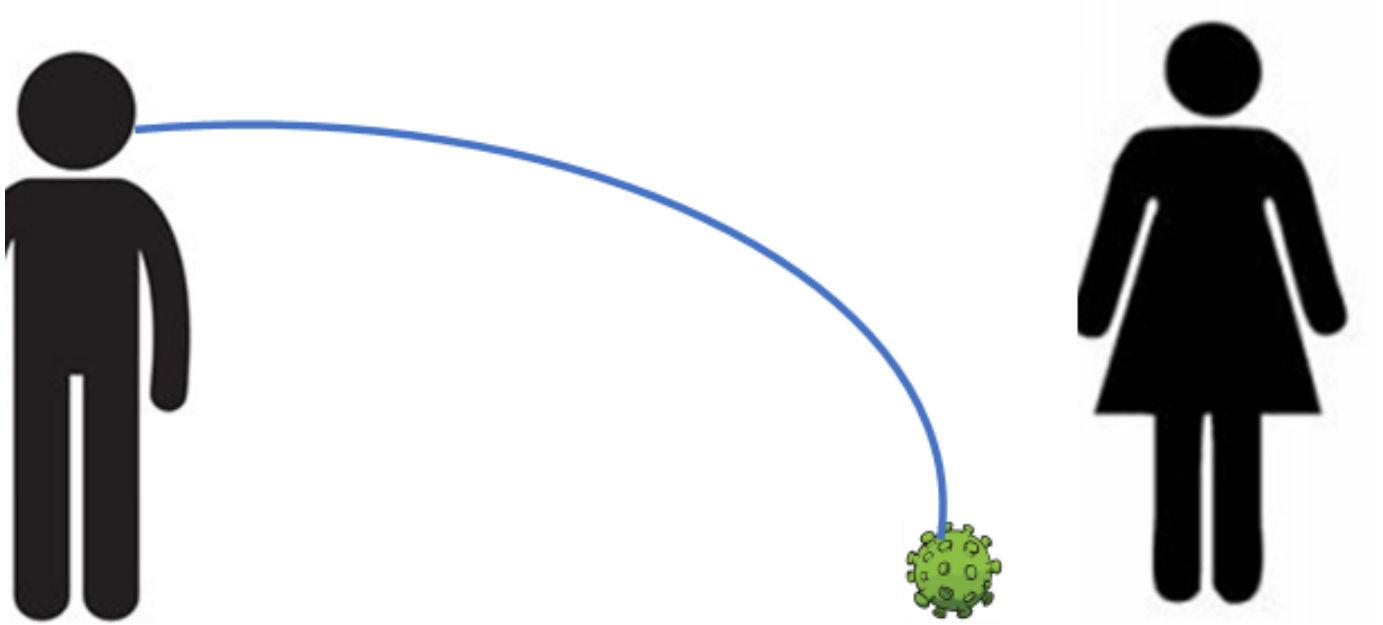
It is a projectiles question-
What do we need to know? What do we need to assume?

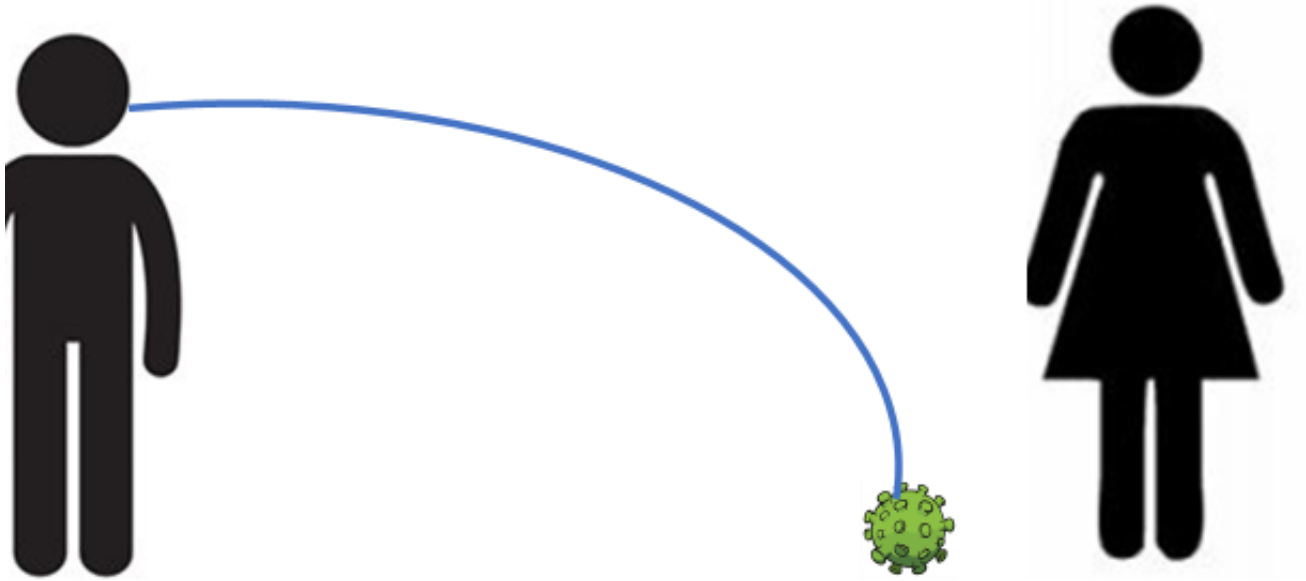


Average height (UK)= 168cm

Max speed of a water droplet from a cough= 22.4m/s

We'll assume there is no effect of air resistance and that a person can be infected from contact with the virus anywhere on their body.





Vertically

s=1.68m

u=0m/s

v=X

a=9.81m/s^2

t=?

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

t= 0.60s

Answer= 13.1m

Horizontally

s=?

u=22.35m/s

v=X

a=0m/s^2

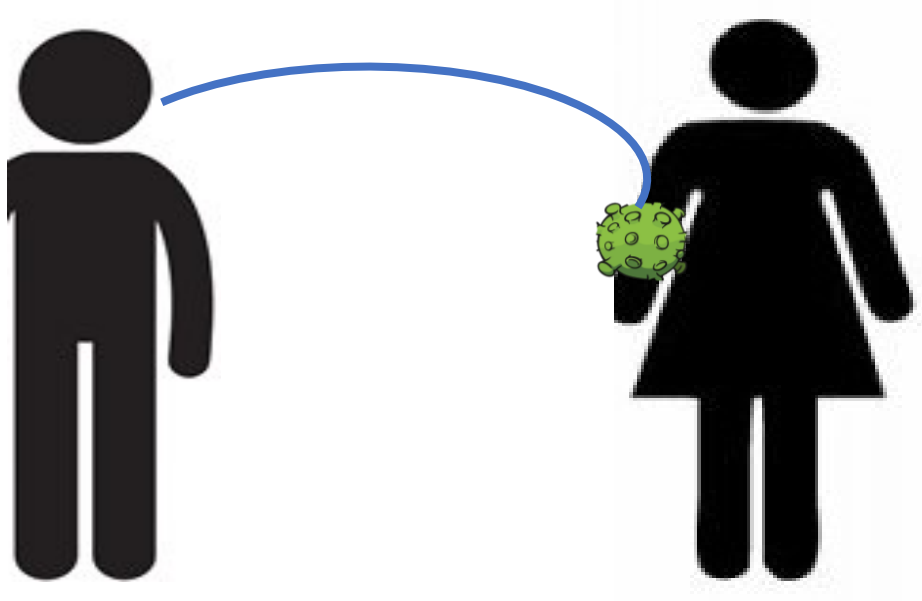
t=0.60s

Why is this answer so much larger than the advised distance?

[Projectile Motion & SUVAT - A-level & GCSE Physics – YouTube]

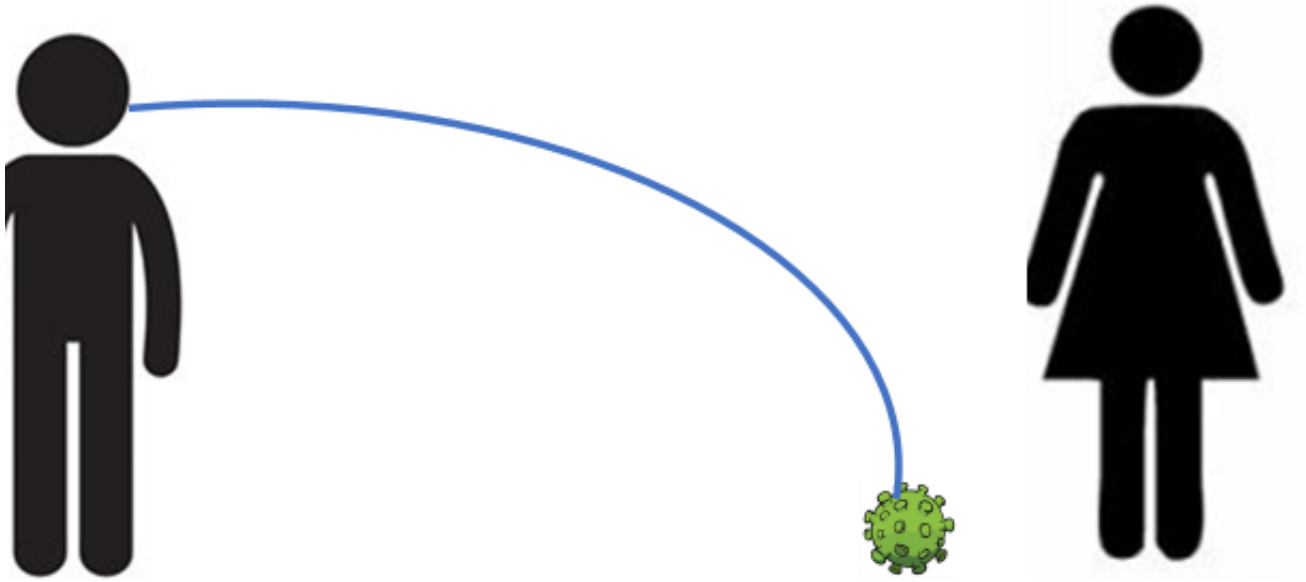
The first 7 minutes explain a similar example

Now let’s assume that to get infected the droplets have to hit a person in the top half of their body.



Average height of a person (UK)= 168cm

Average speed of a water droplet from a cough=10m/s



Vertically

s=0.84m

u=0m/s

v=X

a=9.81m/s^2

t=?

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

t= 0.41s

Answer= 4.1m

Horizontally

s=?

u=10m/s

v=X

a=0m/s^2

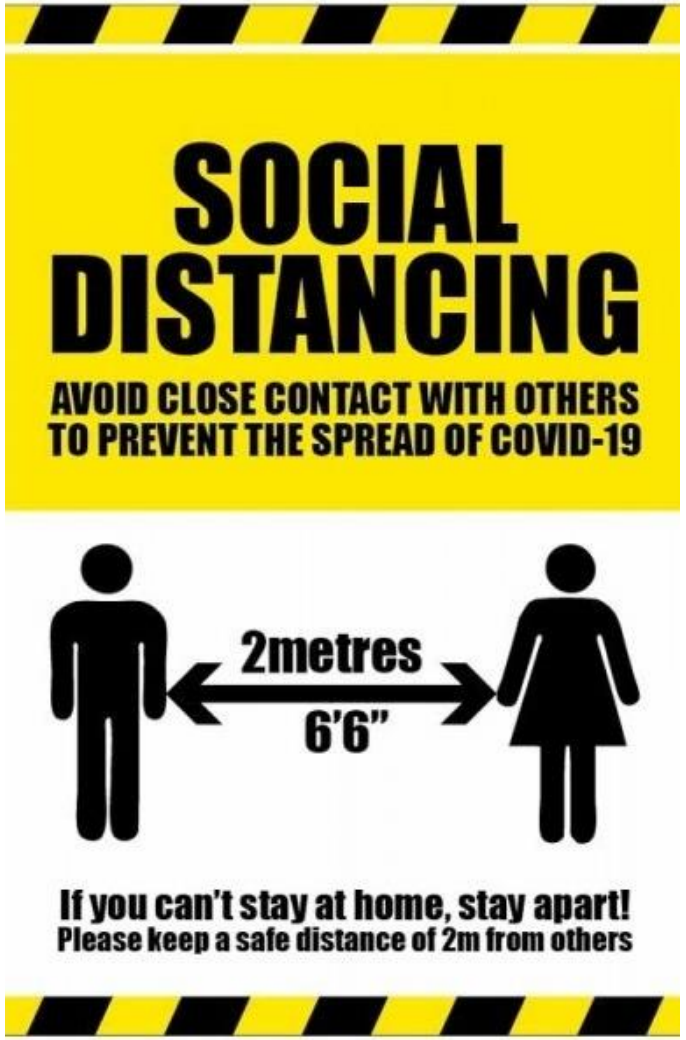
t=0.41s

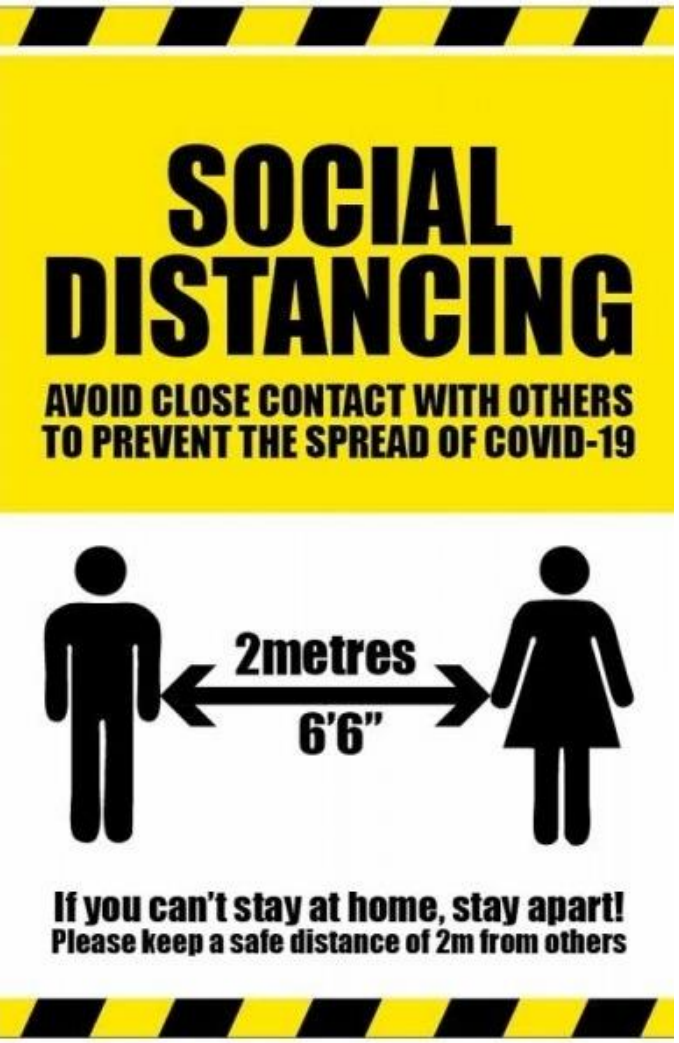
Extension: what is the government advice based on?

Assuming average droplet speed is accurate, how far down your body does a droplet containing COVID-19 have to hit to be considered “safe” by the government?

Average height of a person (UK)= 168cm

Average speed of a water droplet from a cough=10m/s





Horizontally

s=2m

u=10m/s

v=X

$a=0m/s^2$

t=?

Vertically

s=?

u=0m/s

v=X

$a=9.81m/s^2$

t=0.2s

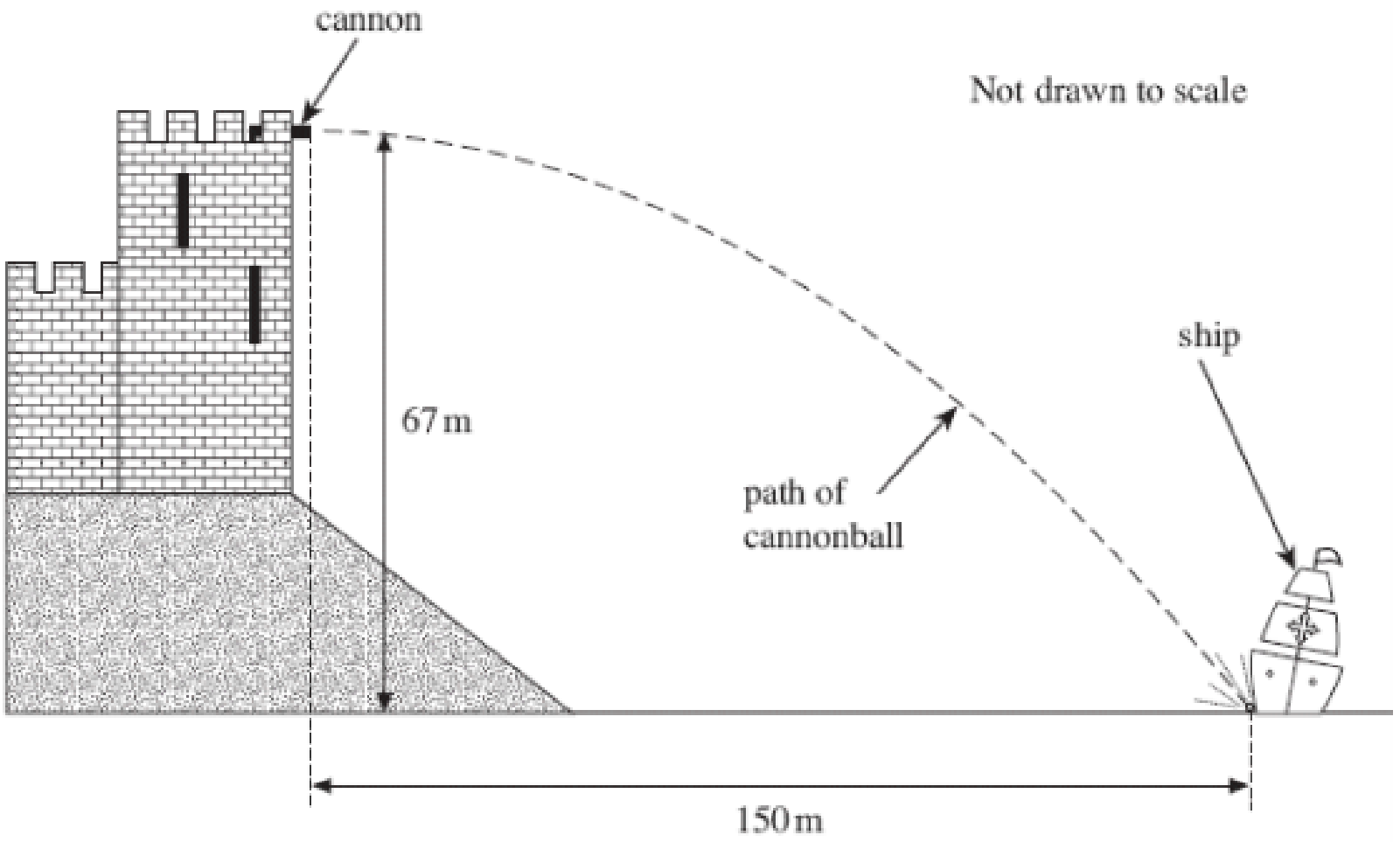
t= 0.2s

s= 0.19m

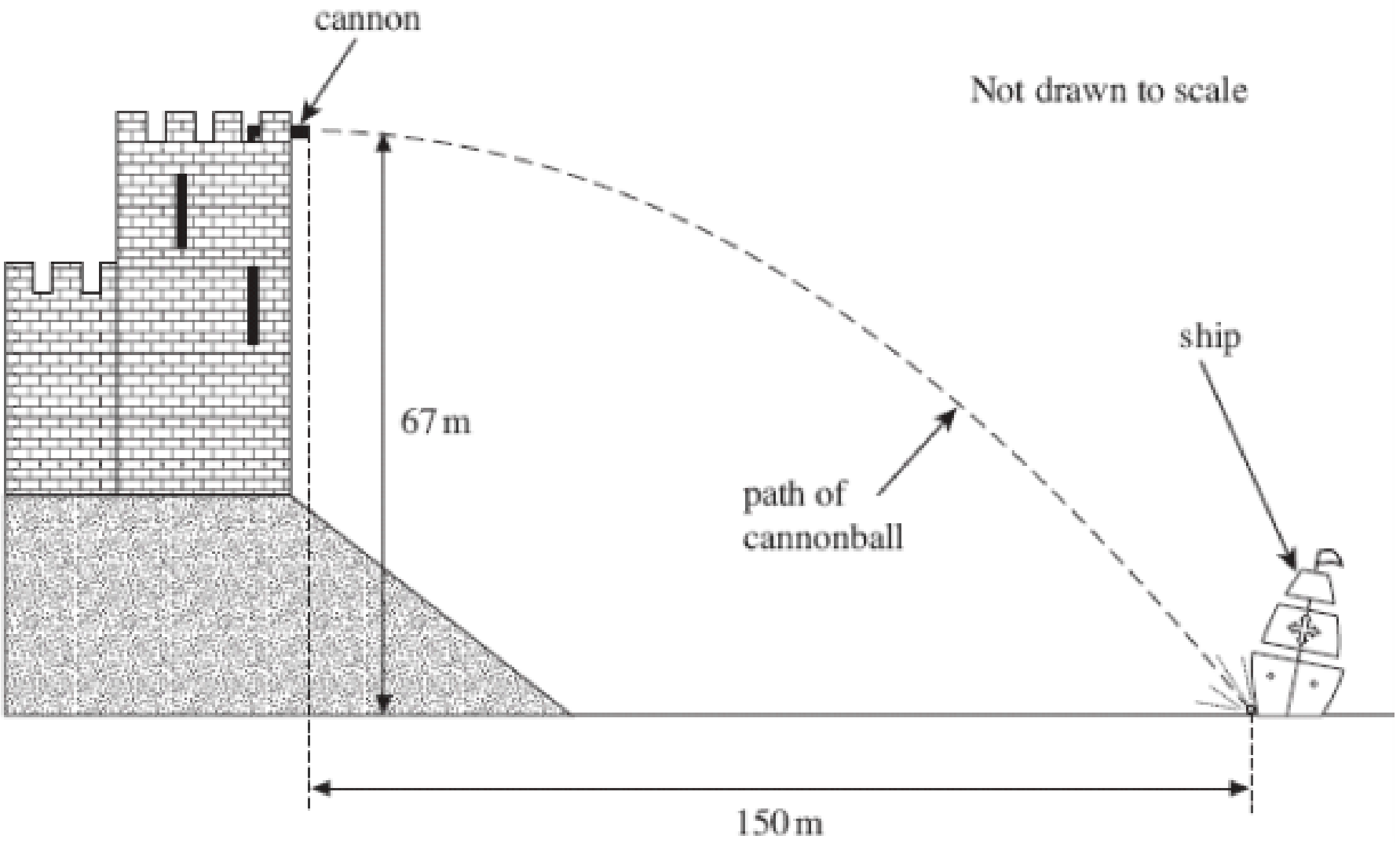
Try at home: Measure the distance from your forehead to your mouth

Past Paper Practice Questions

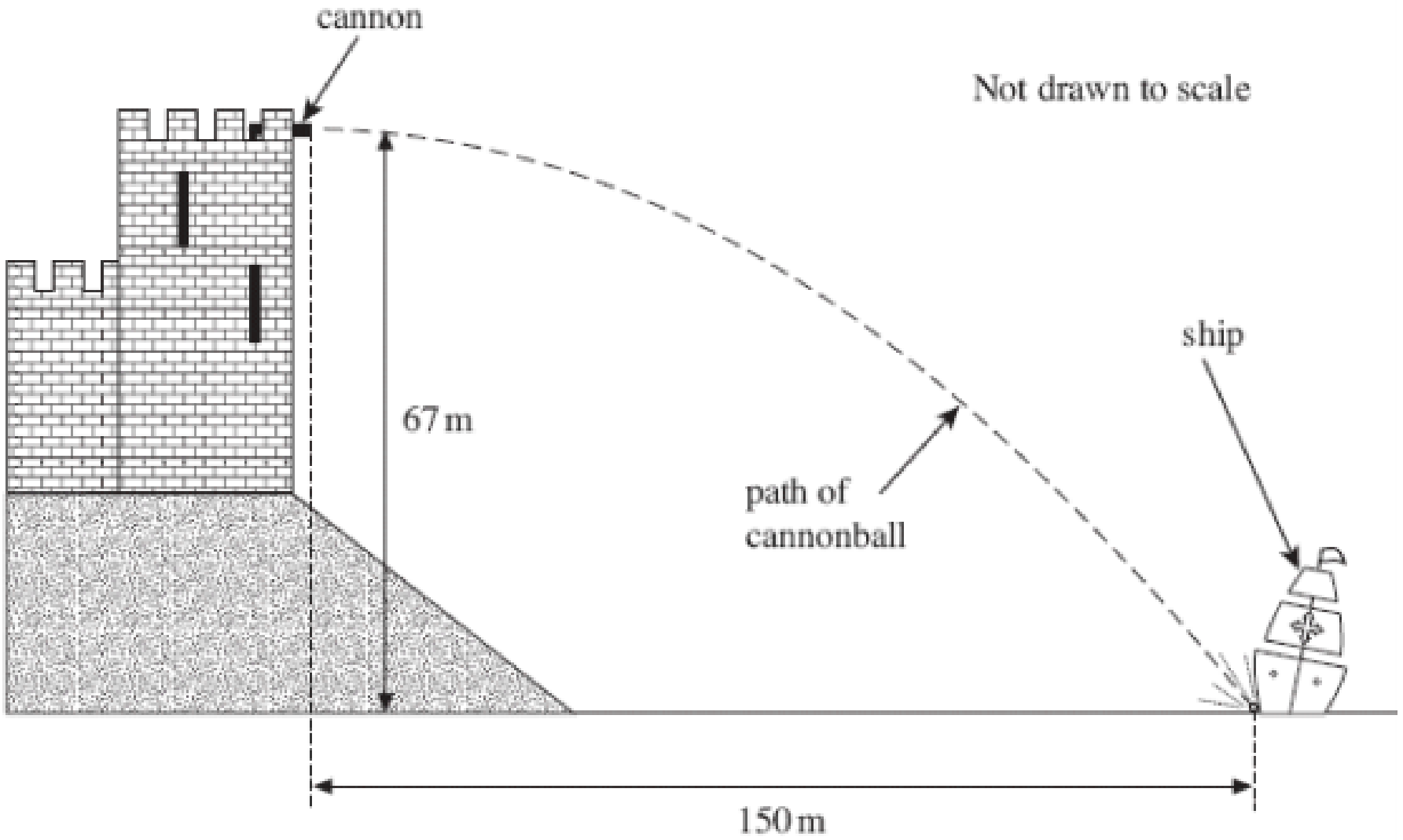
Q6. In a castle, overlooking a river, a cannon was once employed to fire at enemy ships. One ship was hit by a cannonball at a horizontal distance of 150 m from the cannon as shown in the figure below. The height of the cannon above the river was 67 m and the cannonball was fired horizontally.



(a) (i) Show that the time taken for the cannonball to reach the water surface after being fired from the cannon was 3.7 s. Assume the air resistance was negligible.



(ii) Calculate the velocity at which the cannonball was fired. Give your answer to an appropriate number of significant figures.



(iii) Calculate the vertical component of velocity just before the cannonball hit the ship.

Answers

ii. U=40.5m/s

iii. V=36.3m/s

Any Questions?

Consolidation

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