

Essential Pre-Uni Physics B1.9

A Level



A plumb bob has a weight of 1.0 N . It is swinging on the end of a piece of string, and at one particular instant, the string is inclined at 28° to the vertical. What is the component of the weight perpendicular to the line of the string? Give your answer to 2 significant figures.



Physics. *You work it out.*

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Essential GCSE Physics 16.8

A Level



A 0.50 N weight is stuck to the 20 cm mark of a uniform metre stick, which weighed 0.50 N before the weight was added. You can balance the metre stick horizontally on your finger, if you put your finger in the right place.

How far from the 0.0 cm end do you need to put your finger in order to get it to balance?

Gameboard:

[**STEM SMART Physics 50 - Revision - Mechanics**](#)

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Essential Pre-Uni Physics B2.3

A Level

Where bearings are given, they are in degrees East of North (so North is 000° , East is 090° , South is 180° and West 270°). For the purposes of this exercise, assume the Earth is flat.

Part A Swimming in a river

In which direction would I have to travel in order to travel North (relative to a stationary observer) if I am swimming in a river with a current running 0.40 m s^{-1} to the East, and I can swim at 1.5 m s^{-1} relative to the water? Give your answer as a bearing (degrees clockwise from North) to 3 significant figures.

Part B Flying in the wind

In which direction would I have to travel in order to travel North (relative to a stationary observer) if I am flying in a 15 km h^{-1} wind coming from the West and can fly at 90 km h^{-1} relative to the air? Give your answer as a bearing (degrees clockwise from North) to 3 significant figures.

Part C Speed Northwards

How fast do I move Northwards over the ground in part B?

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Essential Pre-Uni Physics B3.3

A Level

Assume that any dropped or thrown object accelerates downwards at 9.8 m s^{-2} . If a question says that an object is 'dropped' this means that its velocity is zero at the beginning of the motion.

Please give your answers to 2 significant figures. If asked for a velocity or displacement, your answer **MUST** contain a direction in order to be marked as correct. Take the positive direction to be upwards.

Part A Dropped weight

How much time does a dropped weight take to fall 120 m down a cliff?

Part B Thrown weight

How much time would the weight take to fall 120 m down the cliff if it was thrown downwards at 2.5 m s^{-1} ?

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Essential Pre-Uni Physics B3.7

A Level



Assume that any dropped or thrown object accelerates downwards at 9.8 m s^{-2} . If a question says that an object is 'dropped' this means that its velocity is zero at the beginning of the motion.

Please give your answers to 2 significant figures. If asked for a velocity or displacement, your answer **MUST** contain a direction in order to be marked as correct. Take the positive direction to be upwards.

The Dodonpa roller coaster accelerates from rest to 48 m s^{-1} (107 mph) with an acceleration of 26.5 m s^{-2} . How much time does it take?

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Projectiles 6.1

A Level

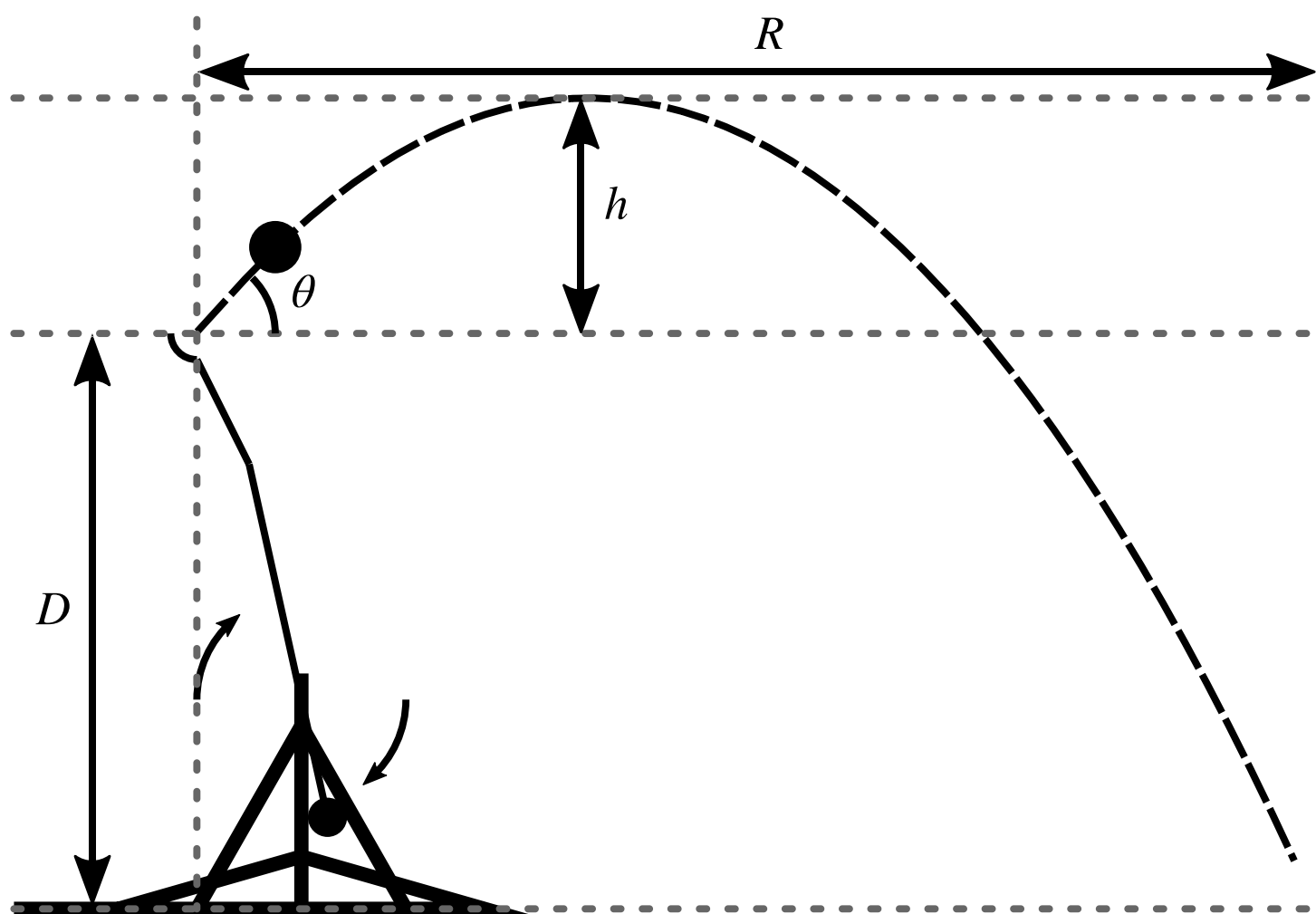


Figure 1: A trebuchet launches a missile towards the walls of a castle. The missile is massive enough that air resistance can be neglected.

Quantities:

u initial velocity (m s^{-1})

a acceleration (m s^{-2})

s displacement (m)

t time (s)

h height increase (m)

v final velocity (m s^{-1})

R range of projectile (m)

D initial vertical displacement (m)

T time of flight (s)

θ projection angle ($^\circ$)

Equations:

$$v = u + at \qquad s = \frac{v + u}{2}t \qquad s = ut + \frac{1}{2}at^2 \qquad v^2 = u^2 + 2as$$

Use the equations above to derive expressions for

Part A The height increase

the height increase h .

The following symbols may be useful: T , g , h , $\sin()$, θ , u

Part B The final vertical component of velocity

the final vertical component of velocity $v_{y,\text{final}}$ of the missile in terms of h .

The following symbols may be useful: D , T , g , h , $\sin()$, θ , u , v_y

Part C The time of flight of the projectile

the time of flight of the projectile T .

The following symbols may be useful: D , T , g , h , $\sin()$, θ , u

Part D The range of the projectile

the range of the projectile R .

The following symbols may be useful: D , R , $\cos()$, g , h , $\sin()$, θ , u

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Essential Pre-Uni Physics B4.9

A Level



A cricketer bats a ball at a speed of 27 m s^{-1} at an angle of 60° to the horizontal. How far away would you have to stand in order to catch it (assuming you want to catch it just before it hits the ground)?

Assume the downward acceleration is 9.8 m s^{-2} .

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Essential Pre-Uni Physics F1.10

A Level



Please give your answer to the lowest number of significant figures given in the question. You will not get the mark unless the correct unit is given. In this question, ignore the effects of friction & drag.

How long would it take a 637 N force to accelerate a 65 kg physics teacher from rest up to a speed of 100 m s^{-1} ? (NB this is over 200 mph) Give your answer to 2 significant figures.

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Essential Pre-Uni Physics F2.3

A Level



A neutron (mass = 1 u) is moving at 300 m s^{-1} when it smacks into a stationary ^{235}U nucleus (mass = 235 u), and sticks to it. What will the velocity of the combined particle be? Give your answer to 3 significant figures.

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