Essential Pre-Uni Physics B1.7

GCSE P P P A Level C C C

A ladder needs to be inclined at 10° to the vertical. It is $6.0\,\mathrm{m}$ long, and is propped against a wall. How far will the base of the ladder be from the base of the wall? Give your answer to 2 significant figures.

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Essential Pre-Uni Physics B1.9

GCSE C C C
A Level C C C

A plumb bob has a weight of $1.0\,\mathrm{N}$. 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.

Gameboard:

STEM SMART Physics 51 - Revision - Mechanics

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Essential GCSE Physics 16.8

GCSE C C C A Level P P P

A $0.50\,\mathrm{N}$ weight is stuck to the $20\,\mathrm{cm}$ mark of a uniform metre stick, which weighed $0.50\,\mathrm{N}$ 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 $0.0\,\mathrm{cm}$ end do you need to put your finger in order to get it to balance?

Gameboard:

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Essential Pre-Uni Physics B2.3

GCSE C C C A Level C C C

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

a) 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 $0.40\,\mathrm{m\,s^{-1}}$ to the East, and I can swim at $1.5\,\mathrm{m\,s^{-1}}$ relative to the water? Give your answer as a bearing (degrees clockwise from North) to 3 significant figures.

Part B Flying in the wind

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

Part C Speed Northwards

c) How fast do I move Northwards over the ground in part (b)?

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Essential Pre-Uni Physics B3.3

GCSE C C C A Level C C C

Assume that any dropped or thrown object accelerates downwards at $9.8\,\mathrm{m\,s^{-2}}$. 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 $120\,\mathrm{m}$ down a cliff?

Part B Thrown weight

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

Gameboard:

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Essential Pre-Uni Physics B3.7

GCSE P P P A Level P P P

Assume that any dropped or thrown object accelerates downwards at $9.8\,\mathrm{m\,s^{-2}}$. 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 $48\,\mathrm{m\,s^{-1}}\,(107\,\mathrm{mph})$ with an acceleration of $26.5\,\mathrm{m\,s^{-2}}$. How much time does it take?

Gameboard:

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Projectiles 6.1

A Level

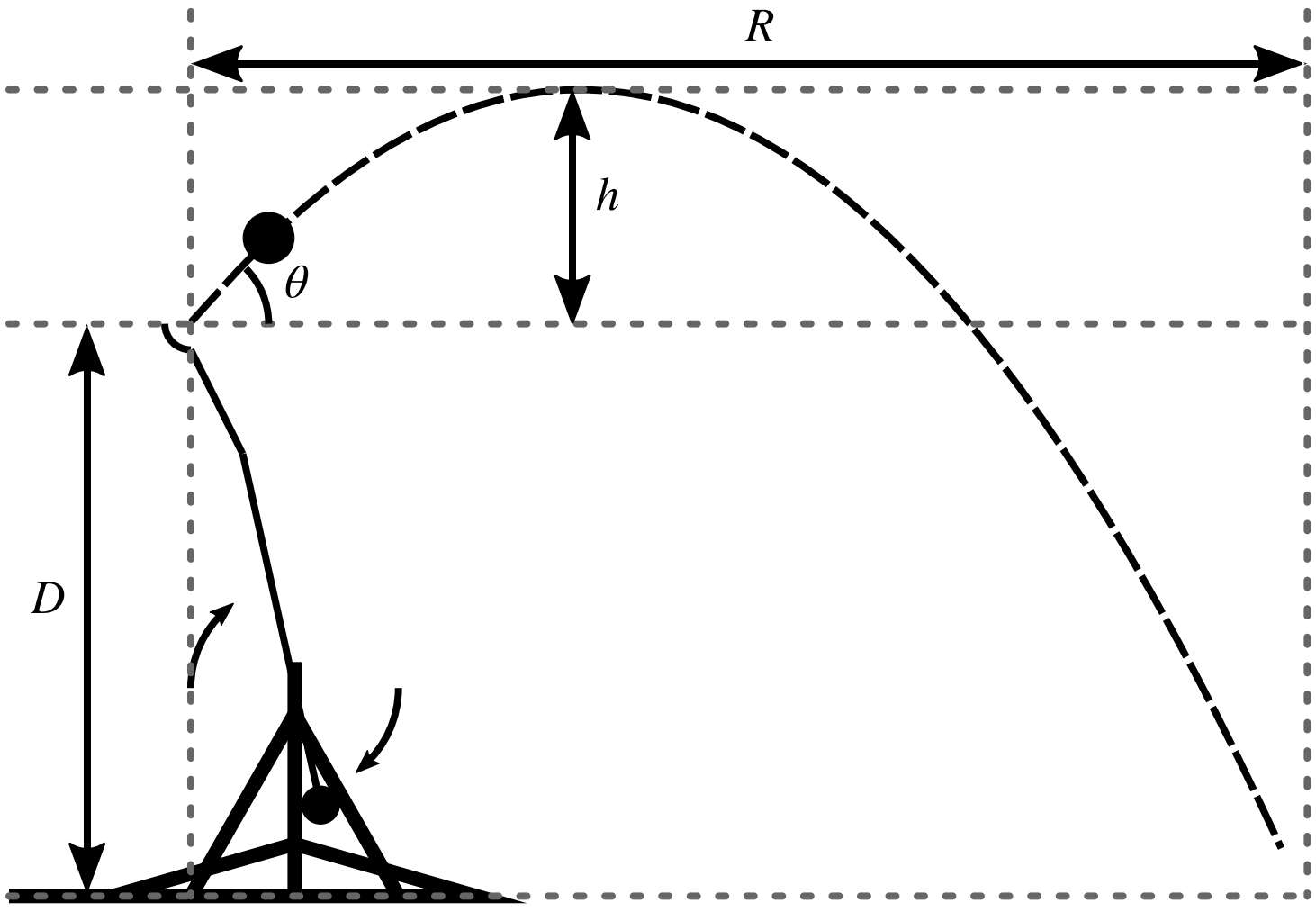

Figure 1: A trebuchet launches a missile towards the walls of a castle. The missile is massive enough that air resistance can be neglected.

Quantities:

u initial velocity $(\mathrm{m\,s^{-1}})$
a acceleration $(\mathrm{m\,s^{-2}})$
s displacement (m)
t time (s)
h height increase (m)

v final velocity $(\mathrm{m\,s^{-1}})$
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(), theta, u`

Part B The final vertical component of velocity

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

The following symbols may be useful: `D, T, g, h, h, sin(), theta, 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(), theta, 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(), theta, u`

Gameboard:

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Essential Pre-Uni Physics B4.9

A Level

C C C

A cricket batsman hits a ball at a speed of $27\,\mathrm{m\,s^{-1}}$ at an angle of $60\,^\circ$ 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 $9.8\,\mathrm{m\,s^{-2}}$.

Gameboard:

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Essential Pre-Uni Physics F1.10

GCSE P P P A Level P P P

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

Gameboard:

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Essential Pre-Uni Physics F2.3

GCSE C C C A Level P P P

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

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