Projectiles Homework Problems

SUVAT and Projectile Motion.

5 key point reminders:
- Everything has to be either horizontal or vertical, NOT diagonal
- Horizontal acceleration is zero, so not SUVAT, just s=vt
- Time is the same regardless of dimension
- ALWAYS use positive and negative to indicate direction.
- Make sure you have no changes in acceleration within your timeframe, and that every quantity in your SUVAT is talking about the same period of time.

A diver running 1.8m/s dives out horizontally from the edge of a vertical cliff and 3.0s later reaches the water below. How high was the cliff and how far from its base did the diver hit the water?

[3]

A football is kicked at ground level with a speed of 18.0m/s at an angle of 35.0° to the horizontal. How much later does it hit the ground?

[2]

A projectile is shot from the edge of a cliff 125m above ground level with an initial speed of 65.0m/s at an angle of 37.0° with the horizontal, as shown below. (a) Determine the time taken by the projectile to hit point P at ground level. (b) Determine the range X of the projectile as measured from the base of the cliff. At the instant just before the projectile hits point P, find (c) the horizontal and the vertical components of its velocity, (d) the magnitude of the velocity, and (e) the angle made by the velocity vector with the horizontal. (f) Find the maximum height above the cliff top reached by the projectile.

[13]

$v_0 = 65.0$ m/s

37.0°

$h = 125$ m

X

P

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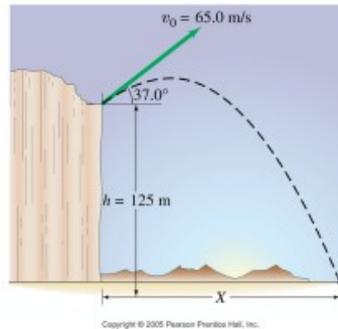
Q4. The diagram below shows two different rifles being fired horizontally from a height of 1.5 m above ground level.
Assume the air resistance experienced by the bullets is negligible.

(a)   When rifle **A** is fired, the bullet has a horizontal velocity of 430 m s^{-1} as it leaves the rifle. Assume the ground is level.

(i)   Calculate the time that the bullet is in the air before it hits the ground.   [2]
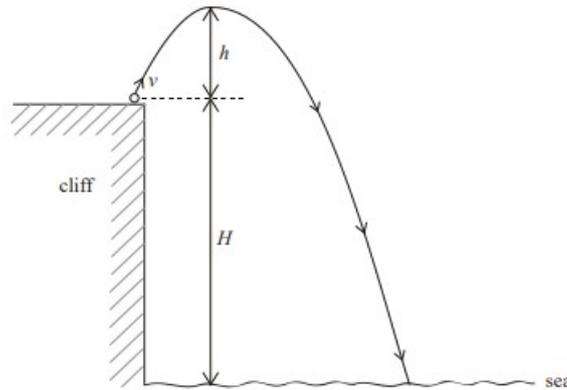
(ii)   Calculate the horizontal distance travelled by the bullet before it hits the ground.   [1]

(b)   Rifle **B** is fired and the bullet emerges with a smaller horizontal velocity than the bullet from rifle **A**.   [3]

Explain why the horizontal distance travelled by bullet **B** will be less than bullet **A**.

57. A stone is thrown with speed v from the top of a cliff of height H, as shown below.

The stone is thrown at an angle to the horizontal so that it rises to a height h above the top of the cliff before falling into the sea. The acceleration of free fall is g. Air resistance is negligible.

Which **one** of the following expressions gives correctly the speed of the stone as it hits the sea?

A. $v+\sqrt{(2gh)}$ B. $v+\sqrt{(2gH)}$

C. $\sqrt{(2g\{h+H\})}$ D. $\sqrt{(v^2+2gH)}$
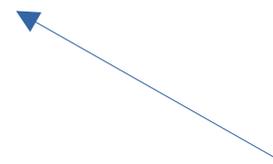
(1)

Hint: SUVAT is not the only physics you can use to solve this

••29 A projectile's launch speed is five times its speed at maximum height. Find launch angle θ_0.