

RAMP, TABLE, AND PROJECTILE MOTION

Release height, launch speed, flight time, and horizontal range

Name: _____	Period: _____	Date: _____
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INVESTIGATION QUESTION How does release height affect table-edge speed and landing range?		
TIME 30 minutes	SIMULATION BuildPhysics > Ramp, table, and projectile motion	UNIT 3 Work, Energy & Power

Learning targets

- Use energy conservation to predict horizontal launch speed.
- Connect table height with projectile flight time.
- Test how release height changes horizontal range.

Model before you measure

The block starts from rest on a frictionless ramp, crosses a horizontal table, and leaves the edge horizontally.	$mg\Delta h = \frac{1}{2}mv_x^2$ $t = \sqrt{(2H/g)}$ $R = v_x t$
Important: Use $g = 9.8 \text{ m/s}^2$. Keep table height H fixed in Part A, and measure release height relative to the table edge.	

Pre-lab prediction | 4 minutes

1. If release height increases, what happens to table-edge speed?

2. Should mass affect table-edge speed on a frictionless ramp?

3. Does changing release height change the time of fall from the table?

PART A Change release height

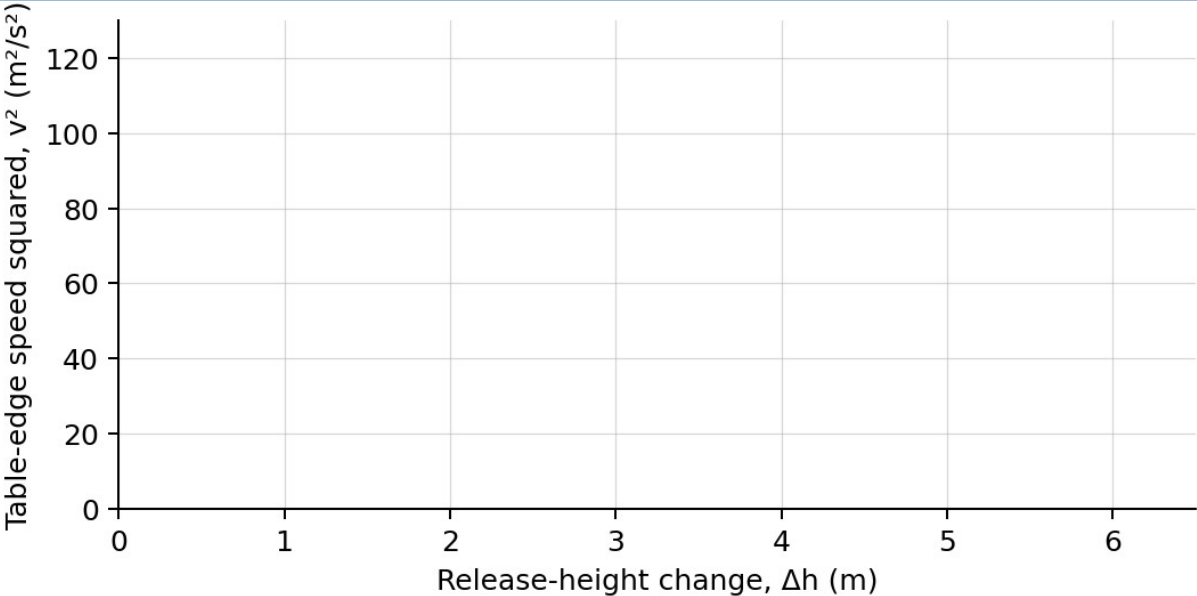
Setup | 3 minutes

- ☐ Load Ramp, table, and projectile motion. Confirm the block starts from rest and friction is off.
- ☐ Use the grid or displacement tool to place the block at four different release heights on the ramp.
- ☐ Record the vertical release-height difference Δh above the table edge.
- ☐ Reset, run through landing, and record edge speed, flight time, and horizontal range.

Same launch point: Every trial must leave the same table edge horizontally. Change only the block's release position.

Data table | 10 minutes

Trial	Release Δh (m)	Predicted edge speed (m/s)	Measured edge speed (m/s)	Flight time (s)	Range (m)
1					
2					
3					
4					



4. Plot measured edge speed squared versus release-height difference. Draw a best-fit line.

PART B Change mass at one release height

Mass test | 7 minutes

Controlled trial: Choose one release point from Part A and return the block to that same point after each mass change.

Mass (kg)	Edge speed (m/s)	Flight time (s)	Range (m)
1.0			
2.0			
4.0			

Analysis | 7 minutes

5. What did the slope of the v^2 -versus- Δh graph represent? Compare with $2g$.

6. Why did flight time remain nearly constant when release height changed?

7. How did changing mass affect edge speed, flight time, and range?

8. Explain why the mass cancels from the energy calculation.

Claim-Evidence-Reasoning conclusion

Evaluate this claim: A greater release height increases range because it increases both horizontal speed and flight time.

CLAIM	Accept, reject, or revise the statement.
EVIDENCE	Cite at least two measured trials or graph features.
REASONING	Connect your evidence to the energy model and controlled variables.

Exit ticket

If release-height difference is quadrupled while table height stays fixed, predict the factor by which edge speed and horizontal range change.
