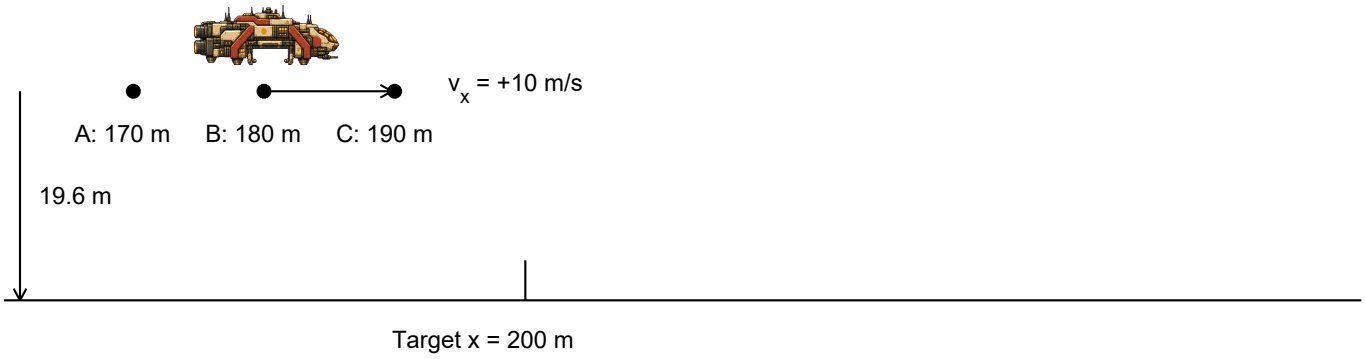
L1 / SHARED PLANNING STIMULUS / BEFORE THE 1v1 MATCH

Trajectory Planning Challenge

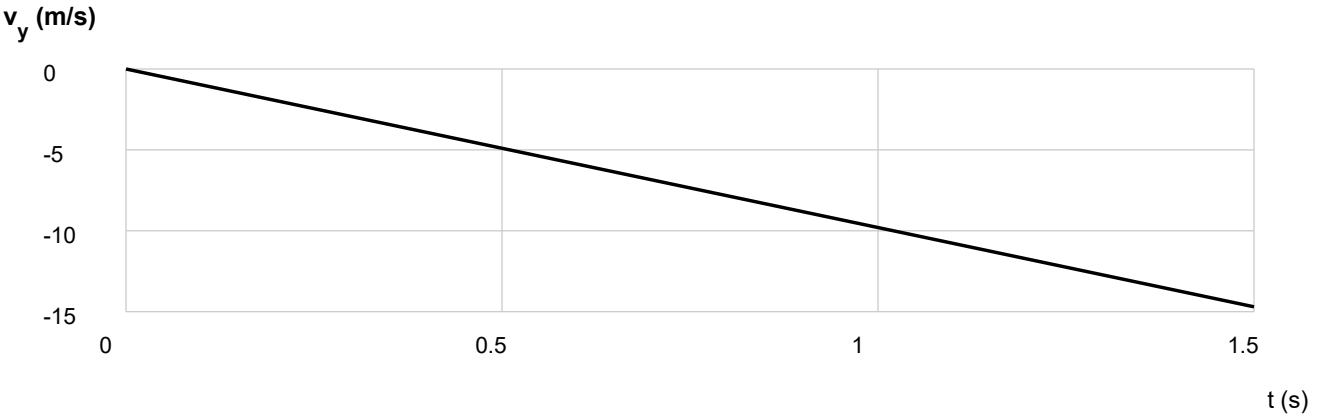
Name: _____ Crew: A / B Class: _____ Date: _____

A carrier travels right at +10 m/s and releases a package without an extra push from 19.6 m above level ground. Earth g = 9.8 m/s^2; no wind or drag. The target marker is at global x = 200 m. Proposed release positions: A = 170 m, B = 180 m, C = 190 m. Initial vertical velocity is zero.



Ground y = 0 m; +x right, +y up. Illustrative diagram; not to scale.

Given	Value
Initial vertical velocity	0 m/s
Vertical acceleration	-9.8 m/s^2
Horizontal acceleration	0 m/s^2



Supplied partial graph through 1.5 s. Determine the ground-contact endpoint.

Work individually on L1.1-L1.5 before revealing the full flight. Teacher checks the original time and release plan before execution. Keep all first responses. Use the same crew alias in the browser; names stay on paper.

L1 / INDIVIDUAL CALCULATIONS AND EXPLANATIONS

Plan from common evidence

Use the shared diagram, conditions and partial graph on page 1. Keep original answers beside corrections. Earth g = 9.8 m/s^2.

L1.1 / State the initial vertical velocity and vertical acceleration, including signs and units.

L1.2 / Calculate the time from release to first ground contact. Start with the vertical equation.

Givens	**U**nknowns	**E**quation	**S**ubstitute	**S**olve

L1 / INDIVIDUAL CALCULATIONS AND EXPLANATIONS

Plan from common evidence

Use the shared diagram, conditions and partial graph on page 1. Keep original answers beside corrections. Earth g = 9.8 m/s^2.

L1.3 / Calculate the horizontal displacement, then use the diagram to choose release point A, B or C.

Givens	Unknowns	Equation	Substitute	Solve

L1.4 / Determine final vertical velocity. Explain what the signed area under the v_y-t graph through landing represents.

Givens	Unknowns	Equation	Substitute	Solve

Graph meaning / evidence: _____

L1 / INDIVIDUAL CALCULATIONS AND EXPLANATIONS

Choose the model deliberately

Use the shared diagram, conditions and partial graph on page 1. Keep original answers beside corrections. Earth g = 9.8 m/s^2.

L1.5 / Explain why substituting θ = 0° into the equal-height range shortcut is inappropriate for this drop. Use the diagram's elevations.

Before the 1v1 match

Open the Earth 1v1 lab match from L3 in the lab. Each crew selects a reference cannon or a carrier package, records predicted flight time and landing x plus target coordinates, and then locks orders. Paper acknowledgment is available; it does not invent a digital answer.

Alternate operator and checker. Both students calculate and explain their own work. The game remains paused during planning. You may skip assessed recording on unselected turns; skipping is not completion.

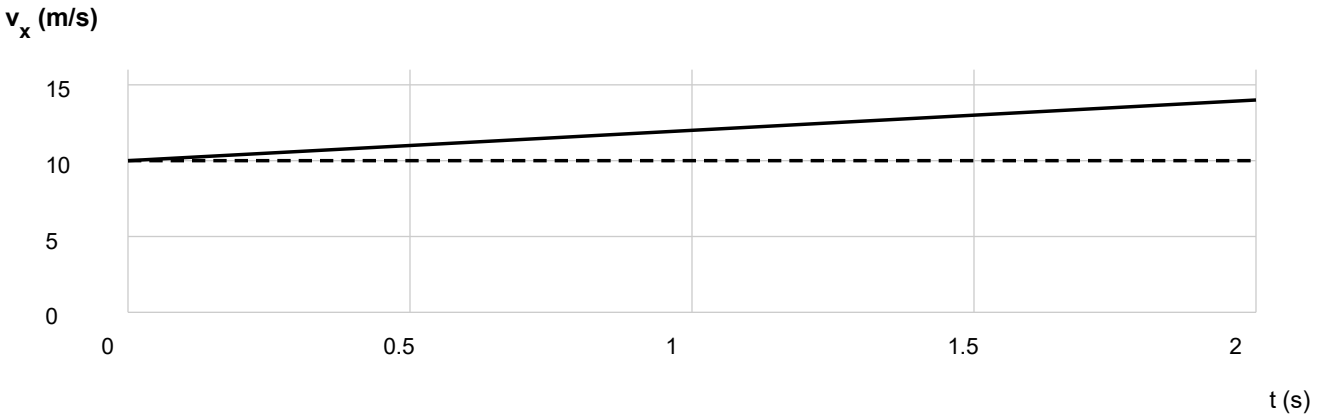
Keep the shell-centre muzzle or package-release point as your origin. Terrain, objects and the opponent can end a flight before the calculated unobstructed landing. For packages, record first contact separately from later bounce, braking and skid.

L2 / SUPPLIED COMMON EVIDENCE / AFTER THE FIRST MATCH SEGMENT

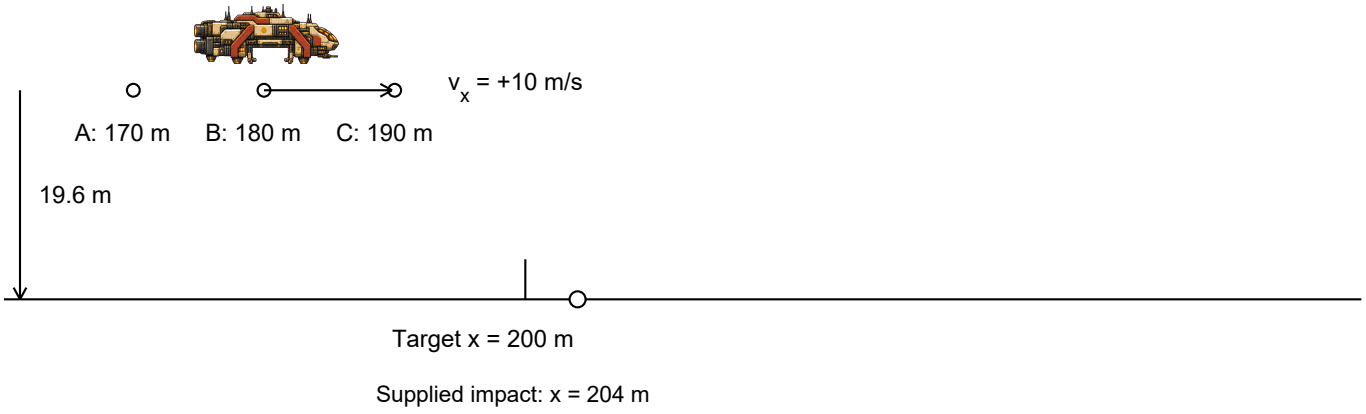
Diagnose the recorded miss

Supplied training record, not a student flight: the package uses the same height, initial velocities and gravity as L1 and releases at x = 180 m. A constant rightward wind effect changes its horizontal motion. No collision occurs before the ground. The target remains x = 200 m. Wind effect means horizontal acceleration (m/s^2), not wind speed.

t (s)	Global x (m)	Height y (m)	v_x (m/s)	v_y (m/s)
0	180	19.6	10	0
0.5	185.25	18.375	11	-4.9
1	191	14.7	12	-9.8
1.5	197.25	8.575	13	-14.7
2	204	0	14	-19.6



Solid: supplied wind-effect record; dashed: no-wind prediction.



Ground y = 0 m; +x right, +y up. Illustrative diagram; not to scale.

Use the same evidence for L2.1-L2.5. Record a revised release position before testing it. Explain the omitted model term; do not call this systematic miss random human error.

L2 / INDIVIDUAL CALCULATIONS AND EXPLANATIONS

Diagnose and revise

Use the supplied table, diagram and v_x-t graph on page 5. This is supplied model evidence, not a student flight.

L2.1 / Use two points from the supplied v_x-t graph to calculate horizontal acceleration. Show the slope and units.

Givens	**U**nknowns	**E**quation	**S**ubstitute	**S**olve

L2.2 / Use the table and target marker to determine whether the package lands short or beyond the target, and by how much. State the signed target miss.

L2 / INDIVIDUAL CALCULATIONS AND EXPLANATIONS

Diagnose and revise

Use the supplied table, diagram and v_x-t graph on page 5. This is supplied model evidence, not a student flight.

L2.3 / Calculate horizontal displacement using the area under the supplied velocity graph. Show a rectangle-plus-triangle or trapezoid calculation.

Givens	**U**nknowns	**E**quation	**S**ubstitute	**S**olve

L2.4 / Calculate a revised release x that reaches the marker with the same height, initial velocity, gravity and wind effect. Record it before testing.

Givens	**U**nknowns	**E**quation	**S**ubstitute	**S**olve

L2 / INDIVIDUAL CALCULATIONS AND EXPLANATIONS

Explain and test the correction

Use the supplied table, diagram and v_x-t graph on page 5. This is supplied model evidence, not a student flight.

L2.5 / Explain why changing only release position can correct this miss in the stated model. Support the explanation with numerical evidence.

Correction test record - complete before and after the reveal

Before testing	After testing
My release x (m): _____	Model contact x (m): _____
My predicted time (s): _____	Model flight time (s): _____
Target x (m): _____	Signed target miss (m): _____

Preserve your first release calculation. Explain agreement or a discrepancy:

L3 / INITIAL MATCH ATTEMPT AND PRACTICE REVISION

Your own trajectory evidence

Choose one completed assessed match attempt. Attach or print its spatial path, a relevant time graph and this evidence table. Use the lab's practice revision to replay the recorded field without changing the match. The initial and revised records must remain separate.

Required field	Initial attempt	Revised attempt
Attempt ID / date-time		
Source: match / practice / supplied		
Launcher or drop; speed / angle / direction		
Release time within round (s)		
Launch/release x, y (m)		
Target x, y (m)		
World-frame initial v_x, v_y (m/s)		
g and wind-effect a_x (m/s^2)		
Predicted flight time (s), landing x (m)		
Recorded first event type / time (s)		
Recorded event x, y (m)		
Signed prediction error (m)		
Signed target miss (m)		
Control intentionally changed		
Other conditions held / changed		

Prediction error = recorded x - predicted x. Target miss = recorded x - target x. An off-map exit is not an impact. Exact initial field, sealed orders and terrain changes are retained in the downloadable evidence.

Fallback if a usable match record is unavailable: analyze L2 and a corrected-release test. Label the source as supplied-model evidence. Do not describe it as your own match telemetry. Attach individual calculation work even when sharing a device.

L3 / INDIVIDUAL CALCULATIONS AND EXPLANATIONS

Explain your selected trajectory

Use your completed evidence table (page 9), selected trajectory and time graph. Label practice and supplied-data fallbacks honestly.

L3.1 / Identify the assumptions for your selected real match attempt. Decide whether the equal-height range shortcut applies, citing recorded conditions.

L3.2 / Show the original vertical/time and horizontal calculations. Use world-frame components, the actual release or muzzle point, and units.

Givens	**U**nknowns	**E**quation	**S**ubstitute	**S**olve

L3 / INDIVIDUAL CALCULATIONS AND EXPLANATIONS

Explain your selected trajectory

Use your completed evidence table (page 9), selected trajectory and time graph. Label practice and supplied-data fallbacks honestly.

L3.3 / Use a graph's slope, area or shape to check one specific model feature. Calculate signed horizontal prediction error and distinguish it from target miss.

Givens	**U**nknowns	**E**quation	**S**ubstitute	**S**olve

Graph meaning / evidence: _____

L3.4 / Propose and calculate a justified control change. State what stays constant, or disclose why the comparison is not controlled. Record the revised prediction before testing.

Givens	**U**nknowns	**E**quation	**S**ubstitute	**S**olve

L3 / INDIVIDUAL CALCULATIONS AND EXPLANATIONS

Evaluate the revision; transfer independently

Use your completed evidence table (page 9), selected trajectory and time graph. Label practice and supplied-data fallbacks honestly.

L3.5 / Compare original and revised results numerically. Explain whether the evidence supports your revision, including a limitation. Improvement or winning is not required for full reasoning credit.

X1 / Individual exit transfer: no wind; carrier v_x = +10 m/s; release height 44.1 m; Earth g = 9.8 m/s^2; target x = 200 m. Calculate the required release x and explain one changed quantity compared with L1.

Givens	**U**nknowns	**E**quation	**S**ubstitute	**S**olve