

01 / Coordinates & navigation

Name _____ Class _____ Date _____

Optional companion: every question is also in the game Flight Log. Pause before calculating; the whole simulation freezes. Choose Try manually when you want to learn through flight. Keep your first prediction, then note what actually happened.

Each bay has its own metre grid: origin at lower left, +x right, +y up. Velocity has a sign. Distance is total path length; displacement is final position minus initial position.

Formula strip: $v = v_0 + at$; $\Delta x = v_0 t + at^2/2$; $v^2 = v_0^2 + 2a\Delta x$; $\Delta x = (v_0 + v)t/2$. Use one axis and one constant-acceleration interval at a time. For a coast, $a = 0$.

Bay 1 uses flight assist: enter displacement in metres. It handles acceleration and braking. Begin at (2,2); request +6 m and activate the marker. Later bays use thrust commands.

L1-Q01 / B1 * Bonus answer

For +8 m, -3 m and -5 m, find total distance and net displacement.

Distance (m) _____ | Signed x displacement (m) _____

First prediction / working:

L1-Q02 / B1

From (2,2) go to (2,6), then (12,6): find displacement components and distance.

Signed x displacement (m) _____ | Signed y displacement (m) _____ | Distance (m) _____

First prediction / working:

Observed route / a correction I made:

02 / Burn, coast, brake

Bay 2: Jack starts at (4,8), at rest. Use $+0.5 \text{ m/s}^2$ for 6 s, coast for 5 s, then -1 m/s^2 for 3 s. Queue the sequence, close the console, and tap the central Resume control. Release thrust to coast; pausing does not stop velocity.

L1-Q03 / B2 * Bonus answer

From rest, accelerate at $+0.5 \text{ m/s}^2$ for 6 s. Find final velocity and displacement.

Horizontal velocity (m/s) _____ | Signed x displacement (m) _____

First prediction / working:

L1-Q04 / B2

Coast at $+3 \text{ m/s}$ for 5 s. Find displacement.

Signed x displacement (m) _____

First prediction / working:

L1-Q05 / B2 * Bonus answer

Brake from $+4 \text{ m/s}$ at -1 m/s^2 . Find stopping time and distance.

Time (s) _____ | Distance (m) _____

First prediction / working:

L1-Q06 / B2

Compare stopping distances from 2 and 4 m/s at braking magnitude 1 m/s^2 .

Stopping distance, 2 m/s (m) _____ | Stopping distance, 4 m/s (m) _____ | Distance ratio _____

First prediction / working:

Compare the measured velocity-time trace with your prediction. A review between legs freezes time but adds no braking.

03 / Relative motion & cables

Bay 3 uses station-frame velocities. MATCH changes velocity using finite thrust; it does not remove the gap between two objects.

L1-Q07 / B3 * Bonus answer

Jack +2 m/s; hook launched +6 m/s relative to Jack. Find station-frame hook velocity.

Horizontal velocity (m/s) _____

First prediction / working:

L1-Q08 / B3

Jack $x=6$, $v_x=2$; service socket $x=14$, $v_x=1$. Coast then brake at -1 m/s^2 to rendezvous at equal velocity.

Relative velocity (m/s) _____ | Coast time (s) _____ | Brake time (s) _____ | Total time (s) _____ | Meeting x coordinate (m) _____

First prediction / working:

Rendezvous scaffold: find the braking time first. Relative velocity falls from +1 to 0 during braking. Use its average to find how much of the 8 m gap closes while braking; coast through the rest.

Bay 4 practical: attach a fixed anchor, reel, arc sideways, release, transfer anchors, retrieve a missed head, catch and pulse the 40 kg drone, then compare the 160 kg body. These are observations, with no mass or force calculations.

What continued moving when I released the cable?

How did the heavier body respond differently?

04 / Cover, suit & patrols

Bay 5: unclamp and move cargo to hide the inspection tag. Releasing a clamp alone does not start motion. The coast question uses a separate, unobstructed trial.

L1-Q09 / B5 * Bonus answer

Released case $x=8$ m, $v_x=+1$ m/s. When will it reach $x=26$ m in an unobstructed coast?

Time (s) _____

First prediction / working:

L1-Q10 / B6

Given measured rebound $v_x=-1.4$ m/s, brake at $+1$ m/s². Find stopping time and signed displacement.

Time (s) _____ | Signed x displacement (m) _____

First prediction / working:

Bay 6: use the measured velocity after the impact, never a constant-acceleration equation across the collision. Brake and complete 3 active seconds of oxygen service. Bay 6 starts at 25%; Bay 8 starts full. Planning freezes oxygen and resealing.

L1-Q11 / B7

Cross 8 m at $+2$ m/s, then brake at -1 m/s². Find crossing time, braking distance and total time; compare with an 8 s clear window.

Crossing time (s) _____ | Braking distance (m) _____ | Total time (s) _____ | Clear-window margin (s) _____

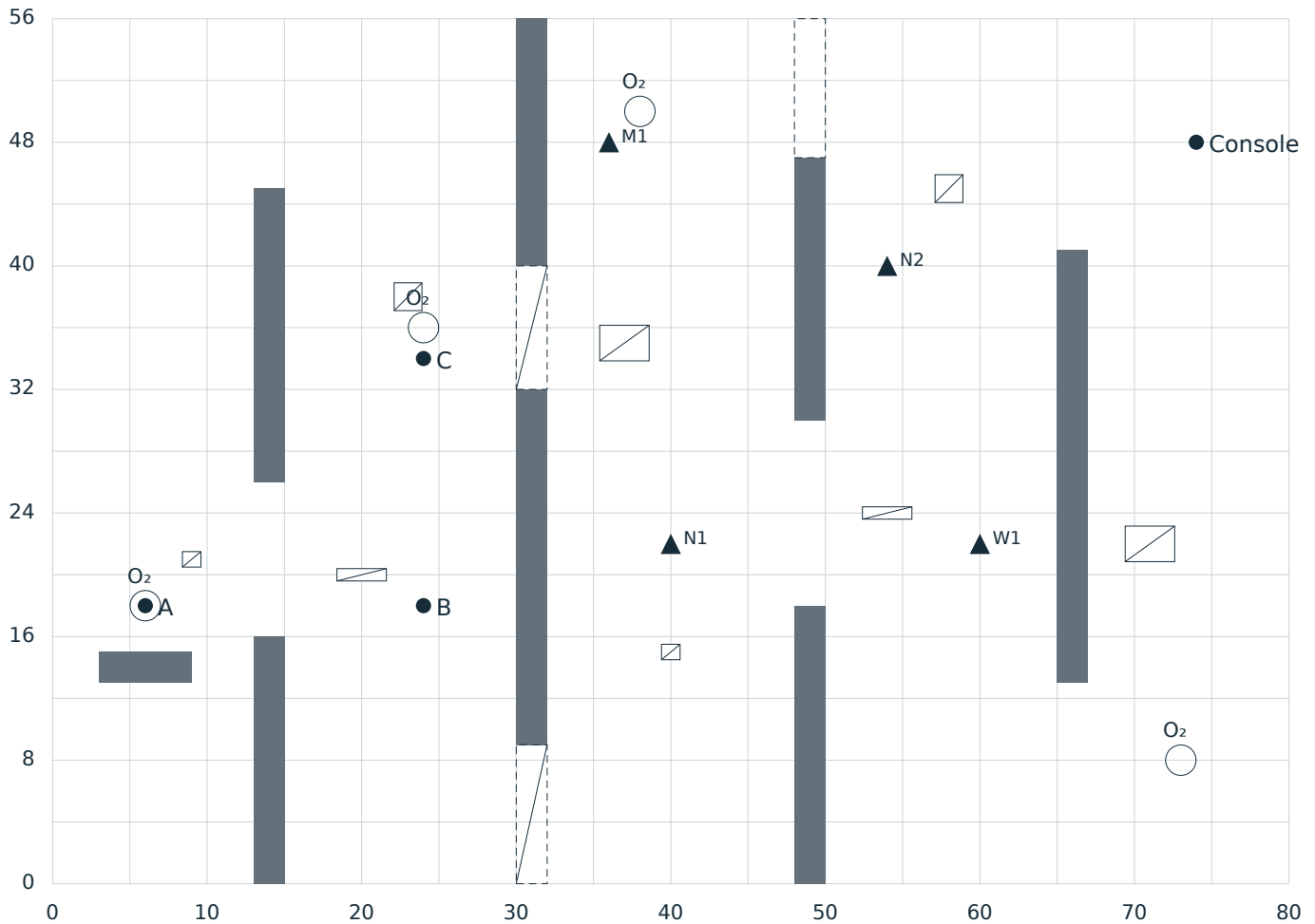
First prediction / working:

Bay 7 also has a Needle ram. Watch its windup and move across its committed approach. A poor command can cause exposure, collision or lost oxygen; skipping a calculation does not secretly strengthen enemies.

One useful change after observing a trial:

05 / Plot the relay rehearsal

B8 local grid, metres. Start A=(6,18), at rest. Stop at B=(24,18), then C=(24,34). Standard acceleration magnitude: 1 m/s². Use cruise speeds 3 m/s horizontally and 2 m/s vertically. Derive six rows on the next page.



Solid gray: wall. Crossed box: latched cargo. Dashed rectangle: shutter (crossed = initially closed). Circled point: O₂. Triangles: initial contacts N1/N2 Needle, M1 Mender, W1 Watcher. Enemies react; starts are not a promise of future positions.

Activate C to open both survey gates at x=30. Reach the console at (74,48) below 0.3 m/s and remain there 3 s without an active alarm. After a 3 s warning, the upper x=48 shutter closes when clear. Return to A using the lower crossing. Plot a route with room for your suit and cargo.

Outbound / return waypoints I chose:

06 / Commands & flight debrief

L1-Q12 / B8. One burn, coast and brake per axis. Mark a review after row 3 if desired. The requested time is command travel time; inspection, stopped-arrival verification, refills and later travel add active time.

Row	Burn / coast	a_x (m/s ²)	a_y (m/s ²)	Time (s)
1				
2				
3				
4				
5				
6				

Horizontal leg (s) ____ | Vertical leg (s) ____ | Total time (s) ____ | Distance (m) ____ | Signed x displacement (m) ____ | Signed y displacement (m) ____

First route versus actual route: what changed, or what worked?

Optional souvenir code: take the marked fields below, then use this custom decoder. Do not use alphabet positions or change signs.

16 → T 3 → H 4 → R 8 → U 18 → S 19 → T

Q01 distance | Q03 final velocity | Q05 stopping time | Q07 hook velocity | Q09 crossing time | Q12 total command time

Q01	Q03	Q05	Q07	Q09	Q12

Enter the six letters in menu Settings → Bonus codes for a Navigator patch, Sol-brass faceplate and music player. Rewards change appearance and listening only. Completing the practical course earns the separate mission password VECTOR.