



FREE SAMPLE

The Greenway Delivery Challenge

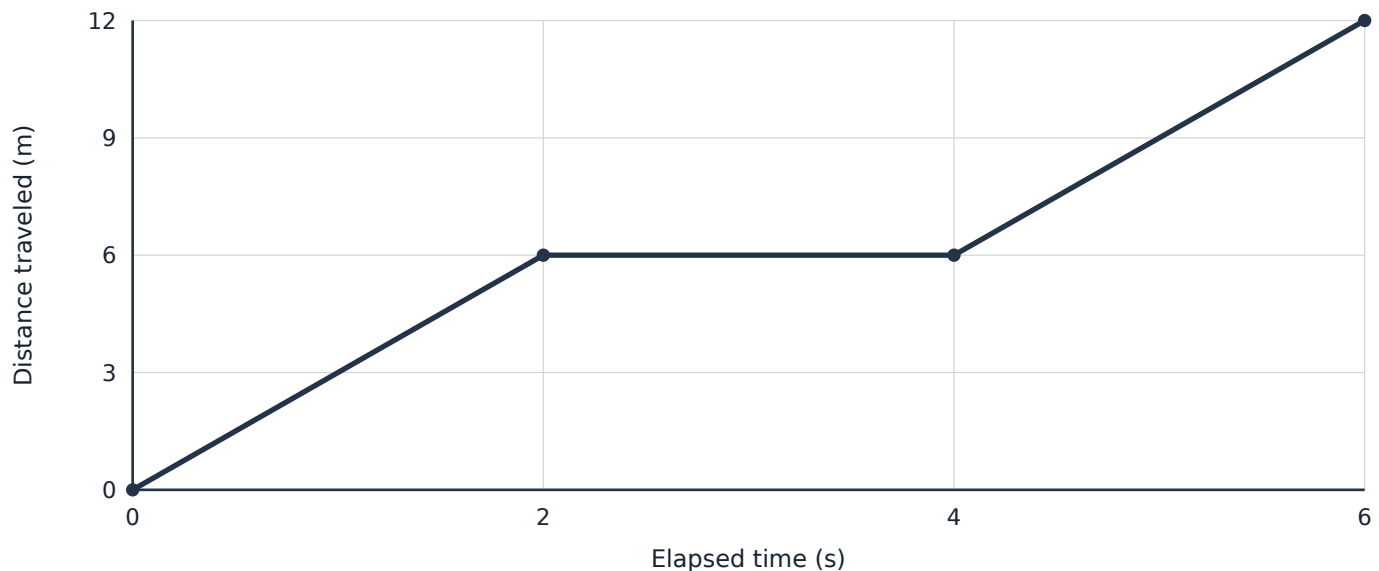
Distance-Time Graphs: Constant and Variable Motion

The mission

Two robot carts. One delivery deadline. A required pause.

Use distance-time graphs to decide which test plan meets both conditions.

A preview of the guided starter: motion and a pause



Practice data (s, m): (0, 0), (2, 6), (4, 6), (6, 12).

6-page free sample • Original packet page numbers retained.

Contains this guide plus packet pages 5, 6, 7, 18 and 24.

Try a 20-minute starter: warm-up (4 min), graph toolkit (5 min), worked example and guided practice (8 min), check and discuss (3 min). The paid packet adds the complete delivery investigation, stations, assessment and teacher materials.

All scenarios, datasets, questions and diagrams are original. Test data are fictional classroom models. 2023 NC science standards; verified October 15, 2026.



STUDENT INVESTIGATION

Your delivery-team briefing

Name: _____ Date: _____

A school garden club is testing two robot carts to deliver seed trays along a straight, closed test track. The cart must reach the **24-meter delivery marker within 12 seconds**. It must also make a **continuous pause of at least 2 seconds before reaching the marker** so a scanner can check its cargo.

You will compare fictional test records for Cart A and Cart B. The trials continue to 12 seconds, even if a cart passes the marker earlier. The carts move only forward during these trials. No real robot or outdoor test is required.

Your job

Plot the records, describe the motion, and recommend the cart that meets **both** conditions. Every decision needs numbers with units and an explanation of what the graph means.

W1. A distance-time graph contains the point (4 s, 8 m). What does that point tell you? Does it directly say the cart's speed is 8 m/s?

W2. Time keeps increasing while the recorded distance stays at 8 m. Is the cart moving in this model? Explain.

W3. A cart travels 8 m forward, then travels 4 m back. How much total distance has it traveled? Explain why turning back does not erase earlier travel.



STUDENT INVESTIGATION

A graph is a motion story

Name: _____ Date: _____

A distance-time graph connects **how much travel has accumulated** with **how much time has passed**. The horizontal axis shows elapsed time in seconds (s). The vertical axis shows total distance traveled in meters (m), counted from the beginning of the record. A point is read as (time, distance).

Read a segment, not just a height

Average speed during an interval = additional distance traveled ÷ elapsed time.

Use differences: (ending distance - starting distance) ÷ (ending time - starting time).

Graph feature	Motion described by this model
Straight line rising at one steady rate	Constant speed during that segment. Equal time intervals add equal distances.
Horizontal segment	A pause. Distance stays the same as time passes.
Different rates of rise in different intervals	Variable motion. The average speed changes between intervals.
Greater rate of rise on the same axes	Greater speed. Check the numbered scales before comparing separate graphs.

Distance is not a map position. Distance traveled adds up along the route, including return travel. It cannot decrease. The graph alone does not say north, south, left or right. Our main mission adds the separate information that the carts travel forward on a straight track.

Model limit: Measurements at a few times do not reveal every instant between them. When this packet connects points with straight segments, it assumes constant speed within each segment. Describe that model rather than claiming to know every detail of a real trip.

Word bank: interval = a span between two times; constant = unchanged; variable = changing; cumulative = adding up from the start.

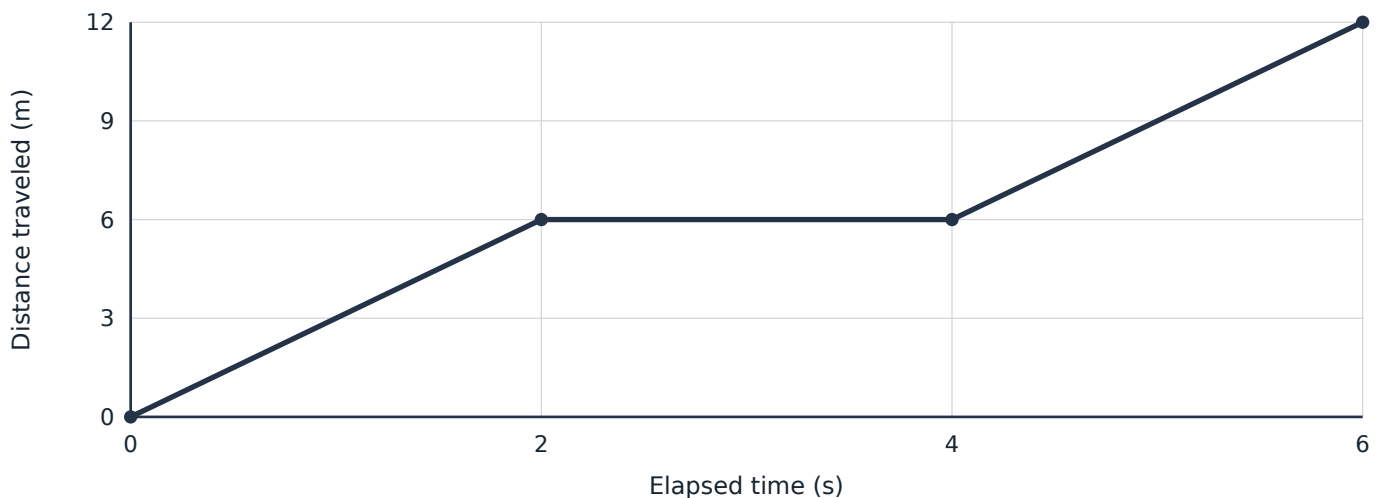


STUDENT INVESTIGATION

Watch one interval, then try

Name: _____ Date: _____

Practice cart: fictional motion model



Data: (0 s, 0 m), (2 s, 6 m), (4 s, 6 m), (6 s, 12 m).

Worked example • 0 to 2 seconds

The cart adds $6 - 0 = 6$ m in $2 - 0 = 2$ s.

Average speed = $6 \text{ m} \div 2 \text{ s} = \mathbf{3 \text{ m/s}}$. The rising straight segment models constant speed in this interval.

G1. During which interval is the cart stopped? Cite two coordinates.

G2. Find the average speed from 4 to 6 s. Show both differences and units.

G3. Find the average speed for the full 0-6 s trip. Why is it different from the speed in the moving segments?



TEACHER ANSWER GUIDANCE

Key • Warm-up and guided practice

Accept equivalent explanations, correct labeled diagrams or oral responses. Require units for numerical claims. Refer to the original student question labels when giving feedback.

Item	Expected response and reasoning
W1	After 4 seconds, the cart has traveled 8 meters in total. This is not a direct statement that its speed is 8 m/s. A speed requires a distance change divided by elapsed time.
W2	The cart is stopped in this model. Time increases while the cumulative distance remains 8 m, so additional distance is 0 m.
W3	12 m total: $8 + 4$. Returning does not erase travel already completed. The final position would be 4 m forward from the start, but that is a different quantity.
G1	Stopped from 2 to 4 s: the coordinates are (2 s, 6 m) and (4 s, 6 m).
G2	$(12 - 6) \text{ m} \div (6 - 4) \text{ s} = 6 \text{ m} \div 2 \text{ s} = 3 \text{ m/s}$.
G3	$12 \text{ m} \div 6 \text{ s} = 2 \text{ m/s}$. This includes the 2-second pause, so it is lower than the modeled moving speed of 3 m/s.

Useful feedback

If a student says “the graph is flat because the cart is slow,” ask how many additional meters appear between the two endpoints. If a student divides 12 by 4 for G2, ask which pair of times defines the interval.

Free-sample use: This page is included with the free starter sample. It answers all W and G questions in that sample. No answers for the full delivery investigation are included in the sample.



LICENSE AND SUPPORT

Use terms and classroom care

© 2026 Saint Pierre Learning Resources. All rights reserved.

Unless a listing says otherwise, each purchase includes a single-teacher license. The buyer may print and use the resource with their own students and may assign it through a password-protected classroom platform.

Allowed

- Classroom, tutoring, and personal instructional use.
- Reasonable copies for the purchasing teacher's students.
- Posting inside a secure learning-management system for those students.

Not allowed

- Reselling, sharing, or giving the files to other educators.
- Posting files on a public website, shared drive, or social-media page.
- Removing the copyright notice or presenting the work as your own.
- Using the content to create a competing product.

Schools and teams that need multiple users should contact support for additional licensing. Share the store's product or free-sample link rather than redistributing files.

Free-sample use

The free sample may be printed and used by one educator with their own students. The same no-redistribution and copyright restrictions apply. It is an excerpt and does not include the complete packet.

Current store policies: saintpierreresources.com/policies#license

Technical or accessibility support: saintpierreresources.com/support

Print on US Letter paper at actual size. Review student page ranges before sharing digitally. This PDF is for printing or annotation in a compatible reader; it is not a fillable form or editable PowerPoint.