

ورقة عمل شرح وتمارين رسوم الموضوع والزمن



تم تحميل هذا الملف من موقع المناهج الإماراتية

موقع المناهج ⇨ المناهج الإماراتية ⇨ الصف التاسع المتقدم ⇨ فيزياء ⇨ الفصل الأول ⇨ ملفات متنوعة ⇨ الملف

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المزيد من مادة
فيزياء:

إعداد: Shehadeh Hamza

التواصل الاجتماعي بحسب الصف التاسع المتقدم



صفحة المناهج
الإماراتية على
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

المزيد من الملفات بحسب الصف التاسع المتقدم والمادة فيزياء في الفصل الأول

ورقة عمل شرح وتدرجات درس السرعة والتمثيل البياني للحركة

1

شرح وتدرجات درس تصوير الحركة

2

اختبار الوحدة الثانية تمثيل الحركة

3

شرح منحنيات الموقع والزمن وتمثيل الحركة

4

ماكس بلانك في الفيزياء

5

تحميل تطبيق المناهج للهواتف الذكية

تطبيق المناهج على Play Google (أندرويد)

تطبيق المناهج على Store App (آبل)

Lesson Three: Position–Time Graphs

Physics – Unit 2: Representing Motion | Section 3: Graphical Representation of Motion

Grade Level	Grade 9 (Advanced) / Grade 10 (General)
Semester	First Semester
Topics Covered	Distance & Displacement • Time Interval
Document Type	Explanatory & Assessment Worksheet

● Part 1 | Position–Time Graphs: The Basics

Slope of a Position–Time Graph: The slope of a position–time curve equals the object's average velocity.

Time (s)	Position (m)
0.0	0.0
1.0	5.0
2.0	10.0
3.0	15.0
4.0	20.0
5.0	25.0

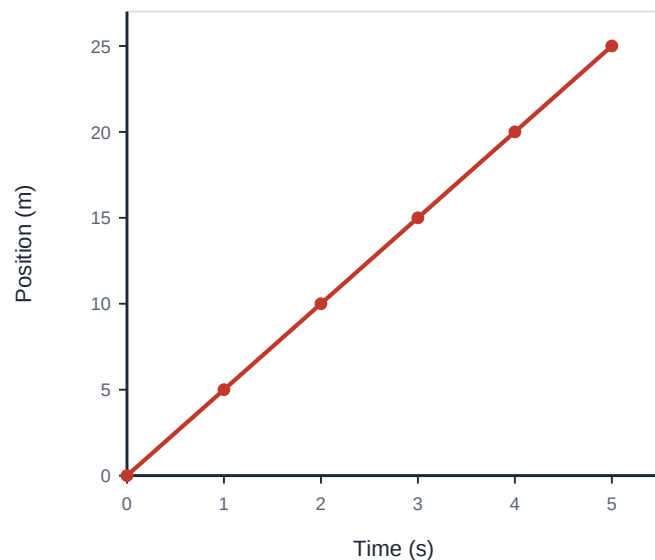
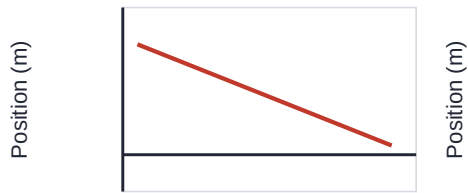


Table 1 & Figure 1. Position changes with time for an object moving at a constant speed in the positive direction. Slope = $(20-10)/(4-2) = 5 \text{ m/s}$.

Reading the Shape of a Position–Time Graph



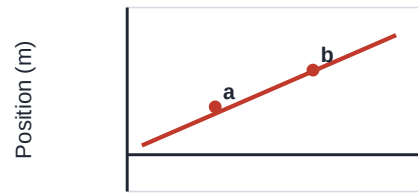
Time (s)

Object moves at a **constant speed** in the **negative** direction.
Slope is negative.



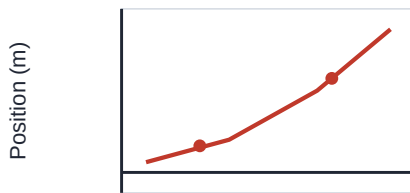
Time (s)

Position is **constant** — the object is **stationary**.
 $v = 0$, slope = 0.



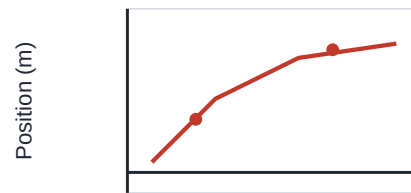
Time (s)

Object moves at a **constant speed** in the **positive** direction.
 $V_a = V_b$; slope is positive.



Time (s)

Slope **increases** → the object's speed is **increasing** (accelerating). $V_b > V_a$.



Time (s)

Slope **decreases** → the object's speed is **decreasing** (decelerating). $V_a > V_b$.

● Part 2 | Worked Examples

Example 1: A Car on a Straight Highway

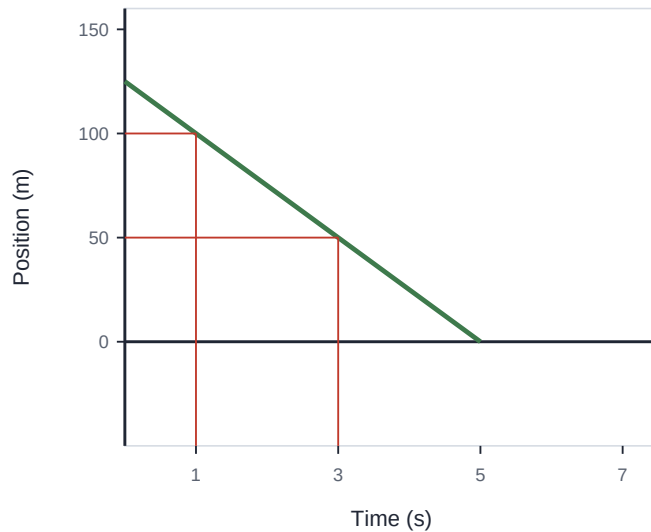


Figure 2. Position–time graph for the car's motion.

Describing the car's motion:

The car started at a position 125 m (positive relative to the origin).

It then moved at a constant speed in the negative direction, toward the origin.

It reached the origin at $t = 5$ s.

Example 2: Particle Model from the Graph

Draw a motion diagram using the particle model that matches the graph above.

Figure 3. Particle-model motion diagram derived from the position–time graph (reading from $t = 6$ s down to $t = 0$ s).**Example 3: Interpreting Position and Displacement**

Answer the following about the car's motion. Assume the positive x direction is East and the negative x direction is West of the origin point:

Solutions:

a. At what time was the car's position 25.0 m east of the origin? $\rightarrow t = 4.0$ s

b. Where was the car at $t = 1.0$ s? $\rightarrow x \approx 100$ m

c. What was the car's displacement between $t = 1.0$ s and $t = 3.0$ s?

$$\Delta x = x_f - x_i = 50 - 100 = -50 \text{ m (i.e., 50 m west)}$$

Example 4: Two Pedestrians

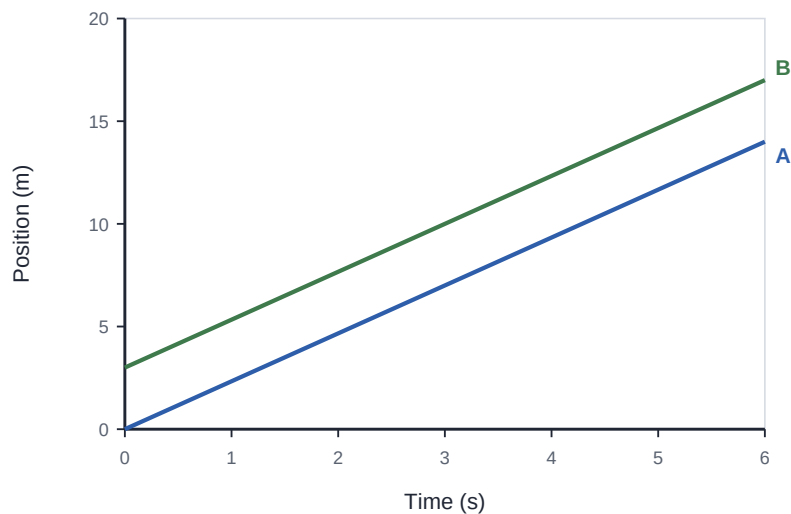


Figure 4. Position–time graph for two pedestrians walking along a straight sidewalk in the city.

Describe the motion of the two men in words. Assume the positive direction is East, starting from the origin point.

Description:

Person A: started from a point west of the origin, and moved at a constant speed in the positive direction until it passed through the origin, then continued its motion in the same direction.

Person B: started from a point east of the origin, and moved at a constant speed in the positive direction.

Example 5: Salem's Walk to the Music Room

Salem walked from the cafeteria to the music room, passing through the school's main hall, a distance of 100.0 m. A physics class recorded his position every 2.5 s and found he moved 2.6 m every 2.0 s. At what time was Salem at the following locations?

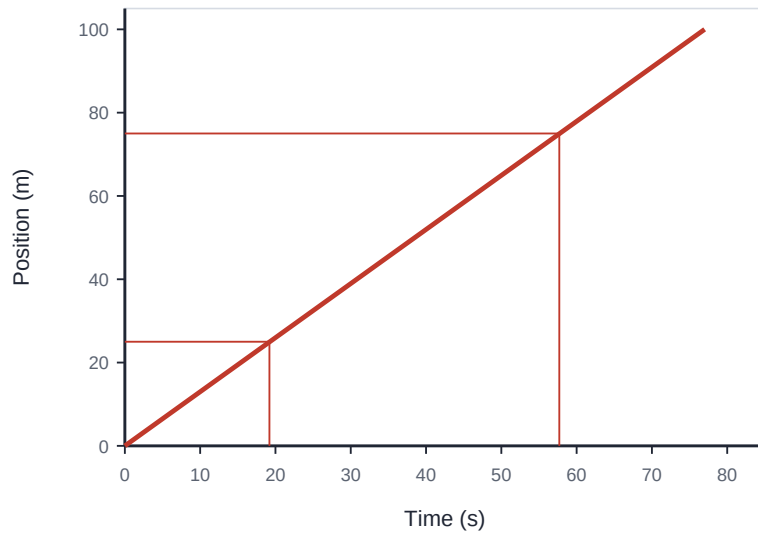


Figure 5. Position–time graph for Salem's walk.

Solutions:

Speed: $v = 2.6 \text{ m} / 2.0 \text{ s} = \mathbf{1.3 \text{ m/s}}$

a. 25.0 m from the cafeteria $\rightarrow t = 25/1.3 \approx \mathbf{19.2 \text{ s}}$

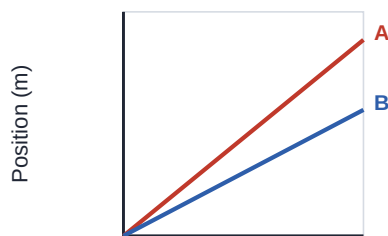
b. 25.0 m from the music room (i.e., 75.0 m from the cafeteria) $\rightarrow t = 75/1.3 \approx \mathbf{57.7 \text{ s}}$

c. Full distance (100.0 m) $\rightarrow t = 100/1.3 \approx 77 \text{ s}$

Instantaneous Position: The position of an object at a specific moment in time.

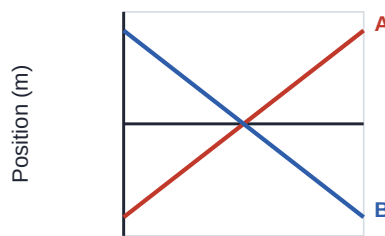
● Part 3 | Position–Time Graphs for Multiple Objects

A position–time graph can compare the motion of several objects at once.



Time (s)

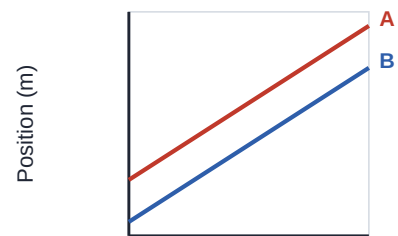
Same direction, $V_A > V_B$



Time (s)

Opposite directions, same speed magnitude:

$$V_A = -V_B$$



Time (s)

Same direction, same speed (parallel lines):

$$V_A = V_B$$

Example 6: Two Runners

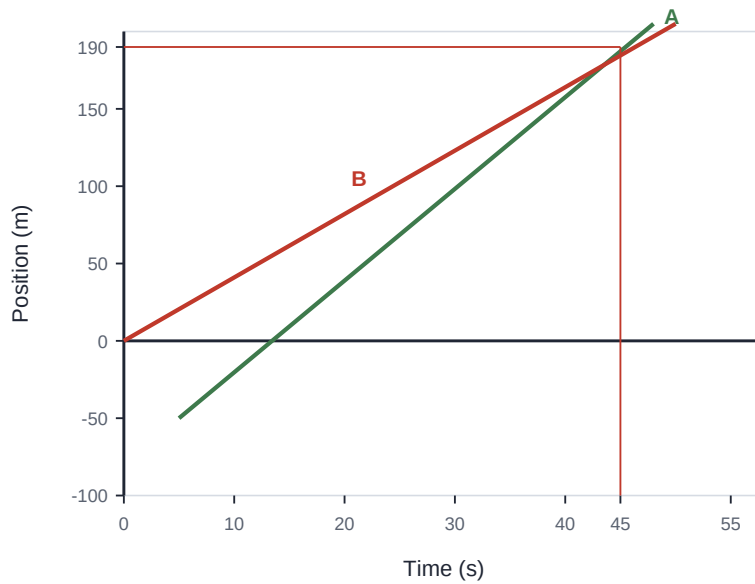


Figure 6. Position–time graph for two runners, A and B, moving along a straight path.

Solutions:

1. When and where does Runner A overtake Runner B? $\rightarrow x = 190 \text{ m}, t = 45 \text{ s}$
2. Where was Runner A's position at $t = 0 \text{ s}$? $\rightarrow x = 0$ (at the origin)
3. Which runner was ahead at $t = 48.0 \text{ s}$? $\rightarrow$ Runner B
4. Where was Runner B when Runner A was at position 0.0 m ? $\rightarrow -50 \text{ m}$
5. What was the distance between the runners at $t = 20.0 \text{ s}$? $\rightarrow 75 - 20 = 25 \text{ m}$

Example 7: Ahmad and Omar's Walk

Ahmad went out for a walk. After a while, his friend Omar went out for the same walk. The motion of each is represented on the position–time graph below.

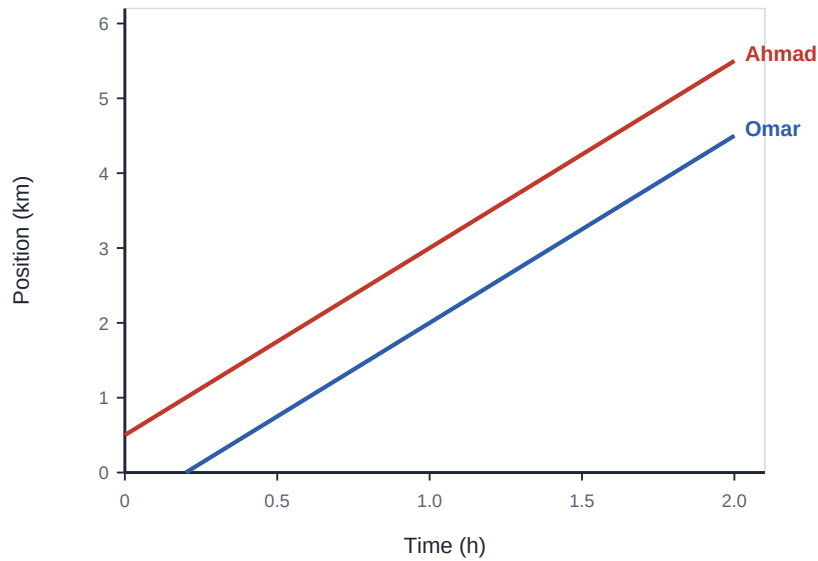


Figure 7. Position–time graph for Ahmad and Omar.

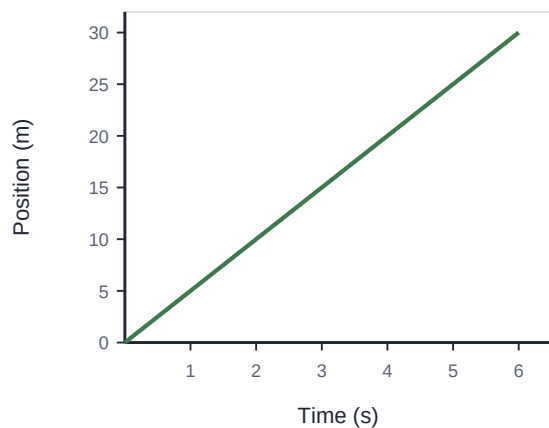
Solutions:

- a. Distance Ahmad had covered when Omar started walking → **0.5 km**
- b. Will Omar catch up to Ahmad? → **No** — because Ahmad's speed equals Omar's speed (the lines are parallel, so the gap between them stays constant).
- c. Ahmad's position after $t = 0.2$ h → **1.0 km**
- d. Time for Omar to reach 5.0 km from the starting point → **1.8 h**

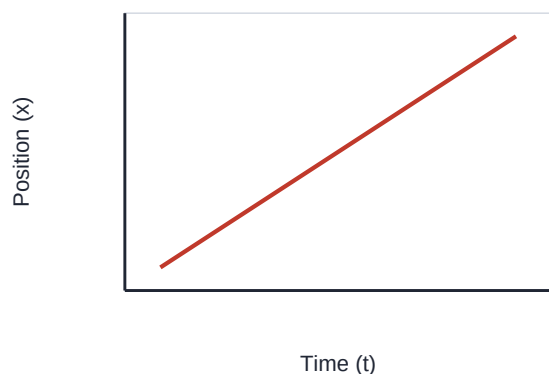
● Part 4 | Practice Questions

Q1. In the adjacent graph, when does the object reach the 23.0 m position?

A. 4.5 s	B. 3.5 s
C. 2.5 s	D. 1.5 s

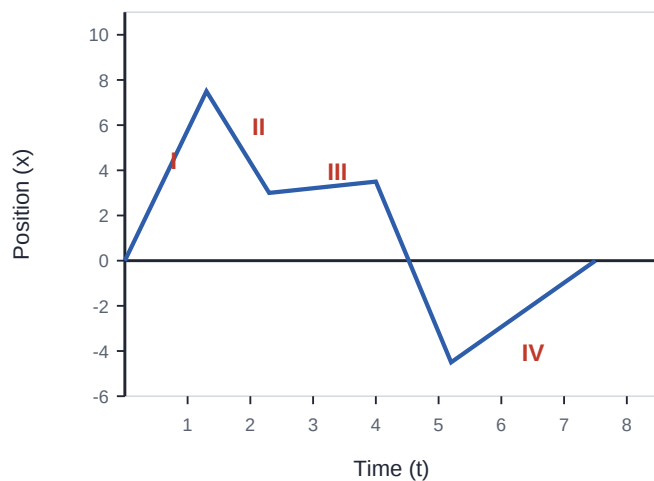


Q2. Which of the following describes the motion represented by the adjacent graph?



A. Constant negative speed	B. Speed equal to zero
C. Increasing speed	D. Acceleration equal to zero

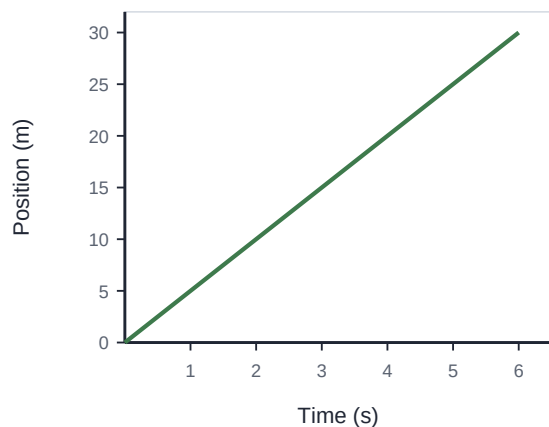
Q3. In which stage is the cyclist's speed the greatest?



A. I	B. II
C. III	D. IV

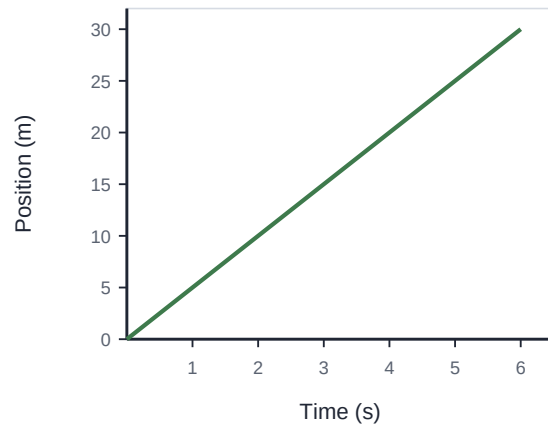
Q4. In the adjacent graph, where was the object located at $t = 1.5$ s?

A. 15 m	B. 10 m
C. 8 m	D. 5 m

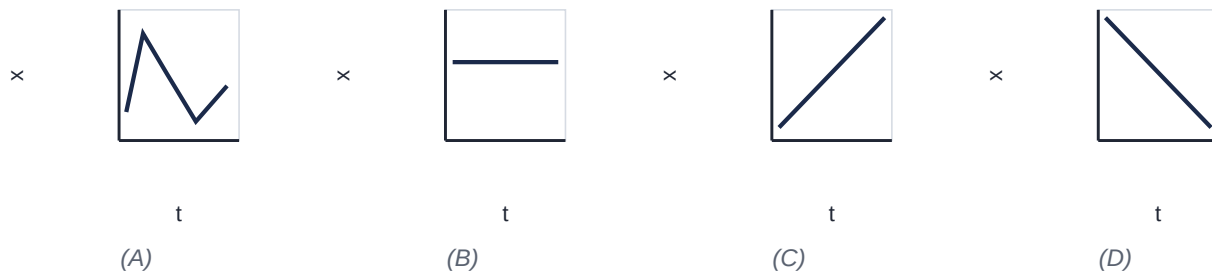


Q5. In the adjacent graph, what was the object's displacement during the period from $t = 1.0$ s to $t = 4.0$ s?

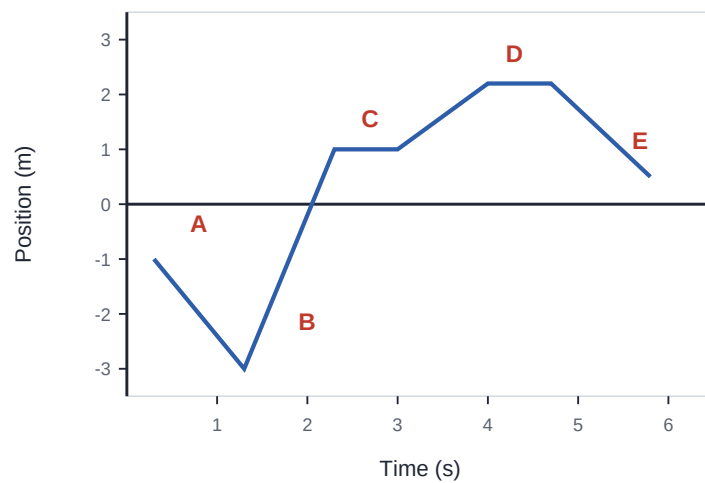
A. 30 m	B. 25 m
C. 20 m	D. 15 m



Q6. The following graphs show the relationship between position (X) and time (t) for four different objects. If the positive direction is forward, which of these objects is moving backward at a constant speed?

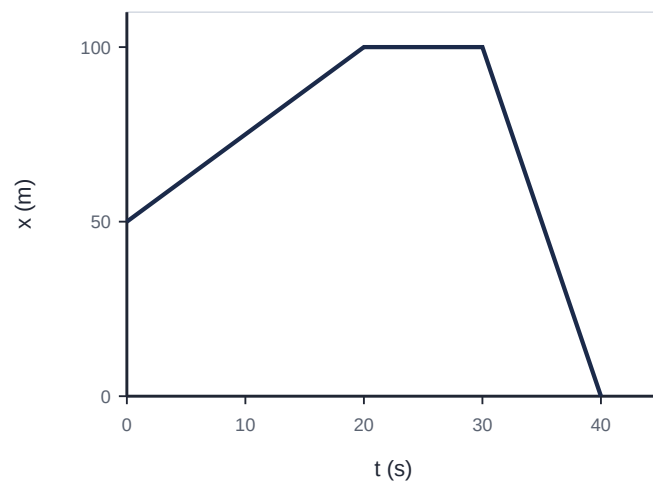


Q7. In the adjacent figure, during which time interval(s) was the object moving in the negative direction?



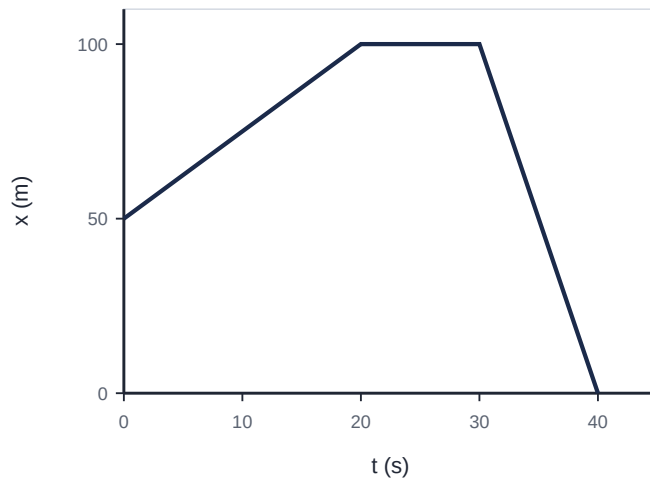
A. A, B	B. A, E
C. C, B	D. C, E

Q8. In the adjacent figure, when does the object reach the 50 m position?



A. 0 s, 40 s	B. 0 s, 35 s
C. 30 s, 40 s	D. 20 s, 30 s

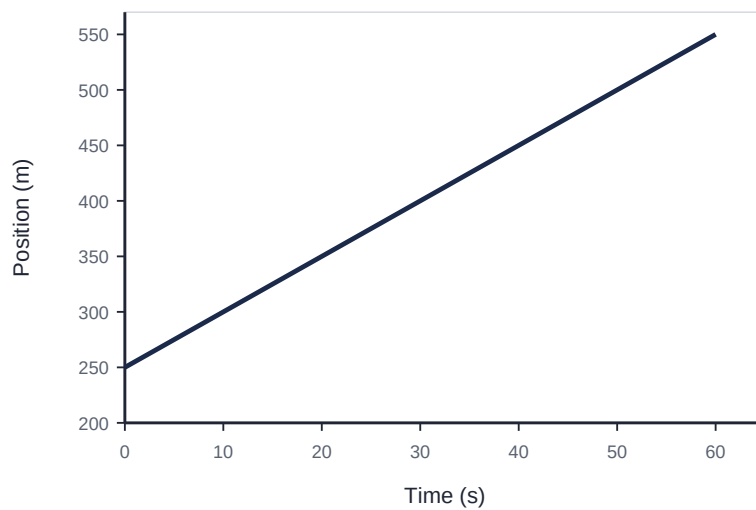
Q9. In the adjacent figure (same graph as Q8):



What is the total distance covered by the object?

What is the total displacement of the object?

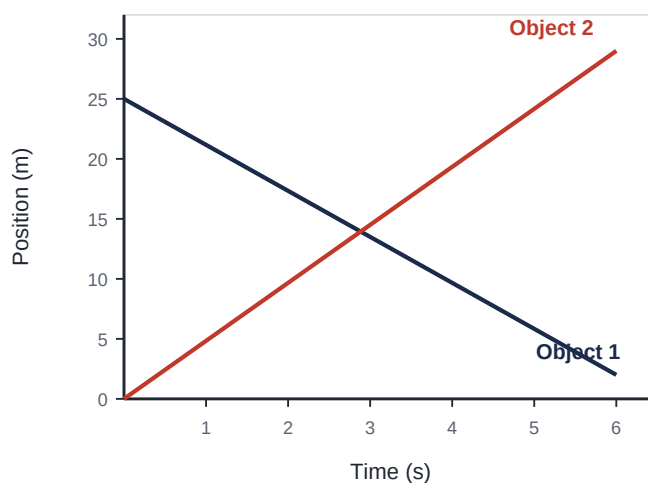
Q10. The adjacent (position – time) graph shows the position of a bike rider during a 60 s time interval.



What was the bike rider's displacement from the starting point, 40 s after starting to move?

What was the bike rider's position from the starting point 100 s after starting to move, if he continued moving at the same velocity?

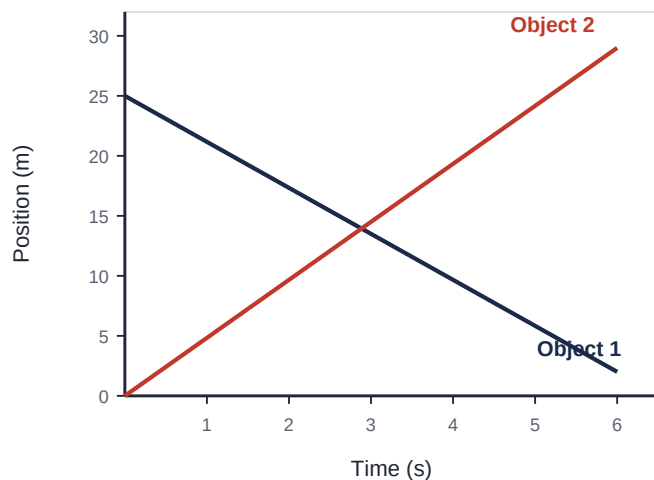
Q11. In the adjacent figure, when and where do the two objects meet?



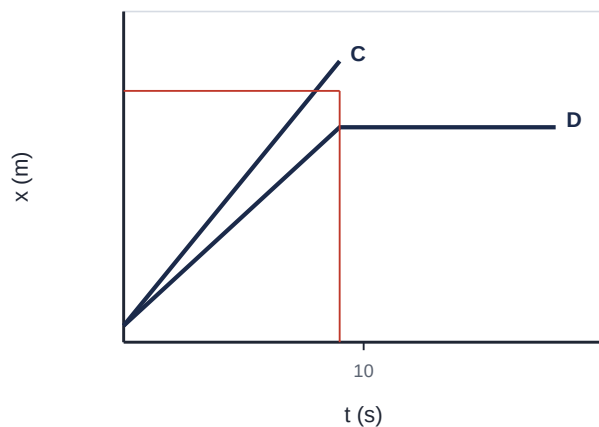
Time	Position
2.0 s	10.0 m
6.0 s	10.0 m
2.0 s	15.0 m
6.0 s	15.0 m

Q12. In the adjacent figure (same graph as Q11), what is the distance between the two objects at $t = 4.0 \text{ s}$?

A. 5.0 m	B. 10.0 m
C. 15.0 m	D. 20.0 m



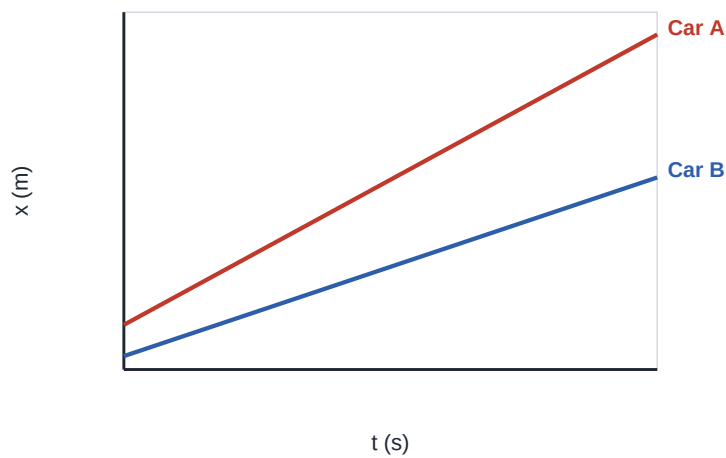
Q13. In the adjacent figure, at time $t = 10 \text{ s}$, which of the following is the same for both objects?



At $t = 10 \text{ s}$, the following is the same for both objects:

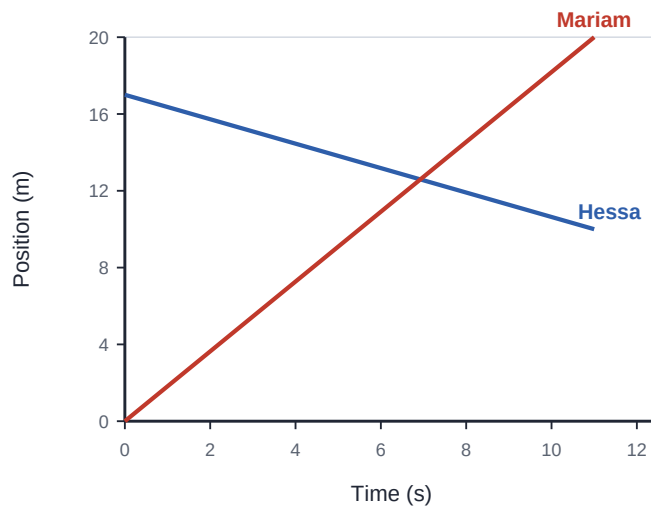
Average velocity
Instantaneous velocity
Position
Displacement

Q14. The adjacent graph shows changes in position over time for two cars, A and B. What can be concluded about the average velocity of cars A and B?



A. Car B's speed is greater than Car A's speed, in the same direction	B. Car A's speed is greater than Car B's speed, in the same direction
C. Equal in magnitude, opposite in direction	D. Equal in magnitude, same direction

Q15. Based on the adjacent graph for the motion of Mariam and Hessa in the school yard, Hessa's motion began heading north.



1. What is the position at which Mariam and Hessa meet?

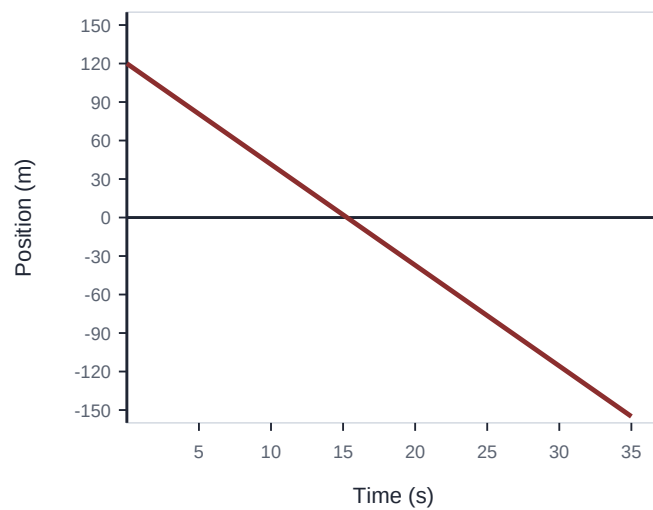
2. Compare the average velocity of Mariam and Hessa in terms of:

• Magnitude

• Direction

3. What is the distance between Mariam and Hessa after 4.0 s have passed?

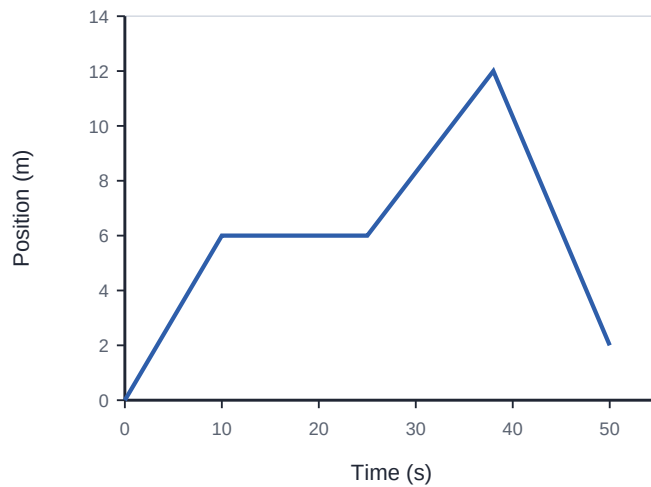
Q16. The adjacent (position – time) graph is for the motion of a car that started moving from the west.



Calculate the average velocity of the car's motion, 25 s after it started moving.

Find the car's position 35 s after it started moving, if it continued its motion at the same velocity.

Q17. The adjacent graph shows Mariam's motion, which began heading East.



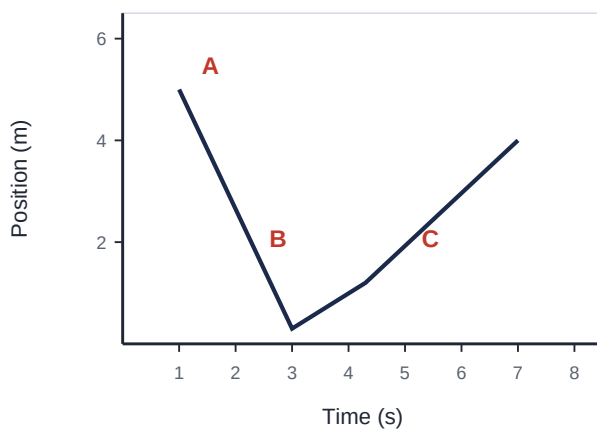
1. At which positions did Mariam stop moving?

2. Describe Mariam's motion during the first ten seconds.

3. During which time intervals did she move west?

4. Calculate Mariam's average velocity.

Q18. The adjacent graph shows the linear motion of a toy car, which begins moving north. Using the graph, answer the following:



1. Complete the following table:

Stage	Speed Description (constant – changing – zero)	Direction of Motion (north – south)
A		
B		
C		

2. Calculate the total distance covered by the object.

3. Calculate the total displacement of the object.
