

ورقة عمل شرح وتدريبات درس تمثيل الحركة



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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 وتمارين رسوم الموضع والزمن

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ورقة عمل شرح وتدريبات درس السرعة والتمثيل البياني للحركة

2

شرح وتدريبات درس تصوير الحركة

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5

تحميل تطبيق المناهج للهواتف الذكية

تطبيق المناهج على Play Google (أندرويد)

تطبيق المناهج على Store App (آبل)

ACADEMIC SUPPORT · PHYSICS

Position & Time

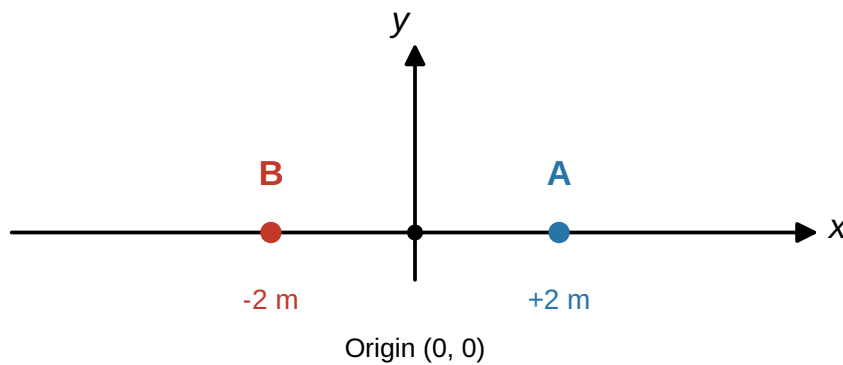
Unit 2 — Representing Motion | Section 2

Grade Level	9 Advanced
Semester	First Semester
Topics Covered	Coordinate systems · Scalar & vector quantities · Distance & displacement · Time interval · Resultant of vectors
Document Type	Explanatory & Assessment Worksheet
Prepared by	Dr. Hamza Shehadeh

1 Coordinate Systems & Frame of Reference

Physics uses a **coordinate system** to describe the position of an object precisely. The point at which all coordinates equal zero is called the **origin**.

Origin point: the point where the axes intersect, defined by $x = 0$ and $y = 0$.



A one-dimensional coordinate system. Object A is located 2 m to the right of the origin (+2 m); object B is located 2 m to the left of the origin (-2 m).

Description	Position
Position of body A (to the right of the origin)	+2 m
Position of body B (to the left of the origin)	-2 m

Scalar and Vector Quantities

Vector quantities

Have both a **magnitude** and a **direction**.

- Position
- Displacement
- Velocity
- Acceleration
- Force
- Weight

Scalar quantities

Have **magnitude only** — no direction.

- Time
- Mass
- Volume
- Distance
- Temperature

Classify each of the following quantities as scalar or vector:

Physical Quantity	Scalar	Vector
Force		✓
Velocity		✓
Time	✓	
Displacement		✓
Mass	✓	
Temperature	✓	
Weight		✓
Illuminance	✓	

Key rule: the magnitude of a vector quantity is represented by the **length** of the arrow that describes it, and its direction is shown by the direction in which the arrow points.

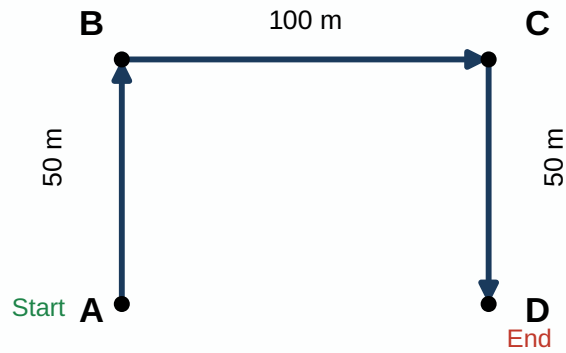
2 Distance and Displacement

Property	Displacement	Distance
Definition	The shortest straight-line distance from the starting point to the end point (the change in position of the object)	The total length of the actual path travelled by the object
SI unit	metre (m)	metre (m)
Type of quantity	Vector	Scalar
Sign	Positive or negative, depending on direction (e.g. right/east = +, left/west = -)	Always positive

$$\text{Distance} \geq |\text{Displacement}|$$

Worked Example

Arwa started moving from point A, passed through point B, then point C, and arrived at point D, as shown in the figure below.



Arwa's path: $A \rightarrow B$ (50 m) $\rightarrow C$ (100 m) $\rightarrow D$ (50 m).

1. Total distance travelled by Arwa:

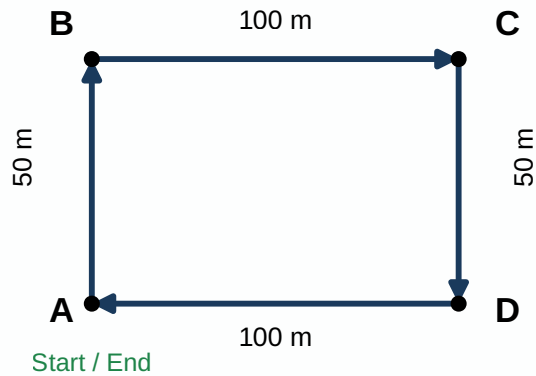
Distance = $50 + 100 + 50 = 200$ m

2. Arwa's displacement:

Displacement = **100 m to the right (East)** — the straight-line distance from A to D.

Worked Example

(b) If Arwa then returned to her starting point, find:



Arwa's complete path: $A \rightarrow B \rightarrow C \rightarrow D \rightarrow A$.

3. Total distance travelled by Arwa:

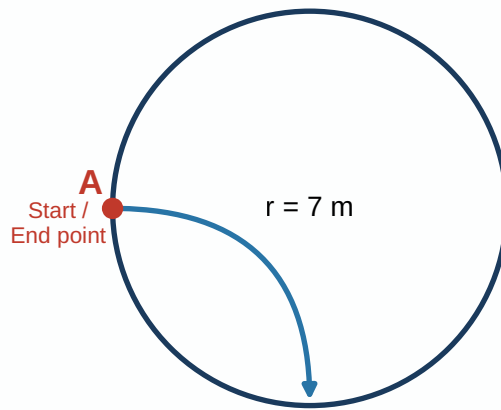
Distance = $50 + 100 + 50 + 100 = 300$ m

4. Arwa's displacement:

Since Arwa returns to her exact starting point, displacement = **0 m**

Worked Example

Arwa moves along a circular path of radius **7 m**, beginning her motion from point A, as shown.



Circular path of radius $r = 7\text{ m}$, starting and ending at point A.

	Distance	Displacement
After half a revolution	$\frac{1}{2}(2\pi r) = \pi \times 7 = \mathbf{22\text{ m}}$	14 m to the left (diameter)
After one full revolution	Circumference = $2\pi r = 2\pi \times 7 = \mathbf{44\text{ m}}$	Returns to the starting point $\rightarrow \mathbf{0\text{ m}}$

3 Displacement & Time-Interval Formulas

$$\Delta x = x_f - x_i$$

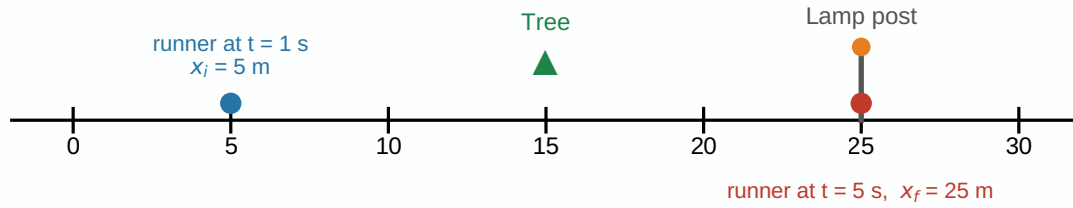
Displacement = Final position – Initial position

$$\Delta t = t_f - t_i$$

Time interval = Final time – Initial time

Worked Example

A runner passes a tree at **$t = 1\text{ s}$** (position $x_i = 5\text{ m}$) and passes a lamp post at **$t = 5\text{ s}$** (position $x_f = 25\text{ m}$), as shown below.



Position of the runner along a straight track, marked at two instants in time.

Displacement between the tree and the lamp post:

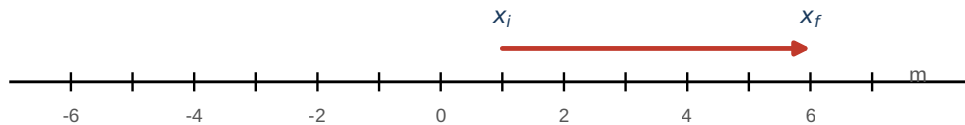
$$\Delta x = x_f - x_i = 25 - 5 = \mathbf{20\ m}$$

Time interval for this motion:

$$\Delta t = t_f - t_i = 5 - 1 = \mathbf{4\ s}$$

Reading Displacement & Distance from a Number Line

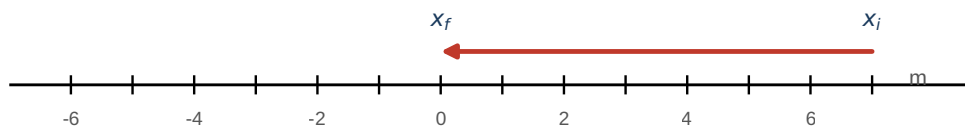
For straight-line motion between an initial position x_i and a final position x_f , the distance travelled equals $|\Delta x|$, and the displacement equals $x_f - x_i$ (with sign indicating direction).



$$x_i = 1\ \text{m} \quad x_f = 6\ \text{m}$$

$$\text{Distance} = |x_f - x_i| = \mathbf{5\ m}$$

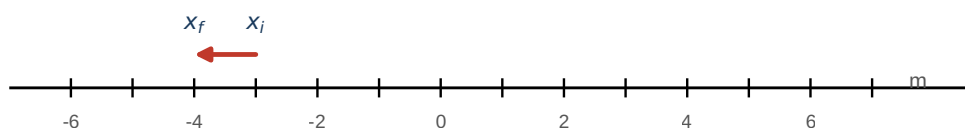
Displacement = $x_f - x_i = \mathbf{+5\ m}$ (to the right)



$$x_i = 7\ \text{m} \quad x_f = 0\ \text{m}$$

$$\text{Distance} = |x_f - x_i| = \mathbf{7\ m}$$

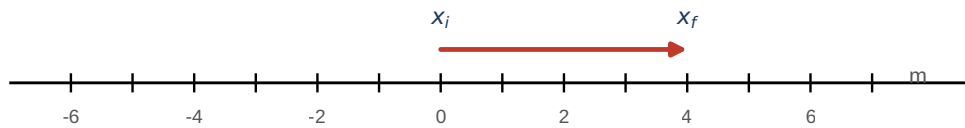
Displacement = $x_f - x_i = \mathbf{-7\ m}$ (to the left)



$$x_i = -3 \text{ m} \quad x_f = -4 \text{ m}$$

$$\text{Distance} = |x_f - x_i| = 1 \text{ m}$$

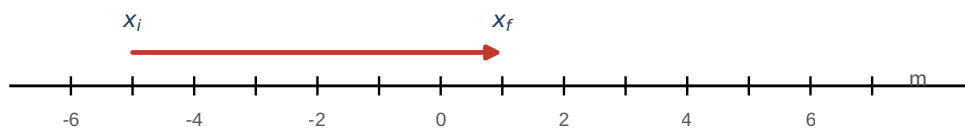
$$\text{Displacement} = x_f - x_i = -1 \text{ m (to the left)}$$



$$x_i = 0 \text{ m} \quad x_f = 4 \text{ m}$$

$$\text{Distance} = |x_f - x_i| = 4 \text{ m}$$

$$\text{Displacement} = x_f - x_i = +4 \text{ m (to the right)}$$



$$x_i = -5 \text{ m} \quad x_f = 1 \text{ m}$$

$$\text{Distance} = |x_f - x_i| = 6 \text{ m}$$

$$\text{Displacement} = x_f - x_i = +6 \text{ m (to the right)}$$

4 The Resultant of Vectors

$$R = A + B$$

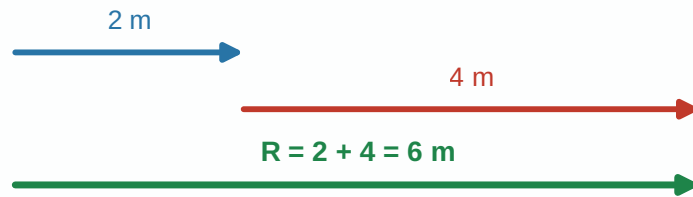
The resultant is the vector sum of the individual vectors

Rule for adding collinear vectors:

- If two vectors point in the **same direction**, their magnitudes are **added**; the resultant points in that same direction.
- If two vectors point in **opposite directions**, their magnitudes are **subtracted**; the resultant points in the direction of the **larger** vector.

Worked Example

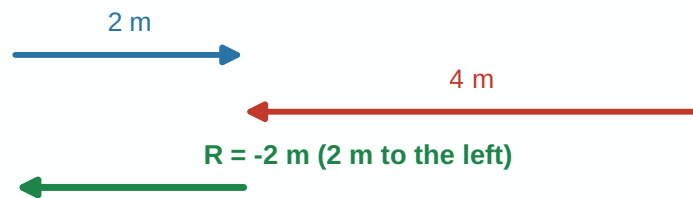
Adding vectors in the same direction:



$$R = A + B = 2 \text{ m} + 4 \text{ m} = \mathbf{6 \text{ m}}$$

Worked Example

Adding vectors in opposite directions:

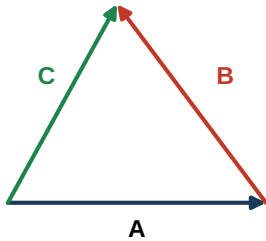


$R = -2 \text{ m} + 4 \text{ m}$... taking the leftward vector (4 m) as positive and the rightward vector (2 m) as negative:

$R = \mathbf{-2 \text{ m, i.e. 2 m to the left}}$ (in the direction of the larger vector)

Case	Vector A	Vector B	Resultant $R = A + B$
Same direction	+5 km	+2 km	7 km (same direction as A and B)
Opposite directions	-4 km	+6 km	+2 km (direction of B)
Opposite directions	-7 km	+4 km	-3 km (direction of A)

The Triangle Rule for Vector Addition



$C = A + B$, added tip-to-tail.

When two vectors **A** and **B** are added tip-to-tail, the resultant **C** is the vector drawn from the tail of the first vector to the tip of the second:

$$C = A + B$$

The resultant of several vectors points in the general direction of the sum; when subtracting, the resultant points in the direction of the larger (opposing) vector.



Practice Questions

Section 2: Position and Time — Unit 2: Representing Motion

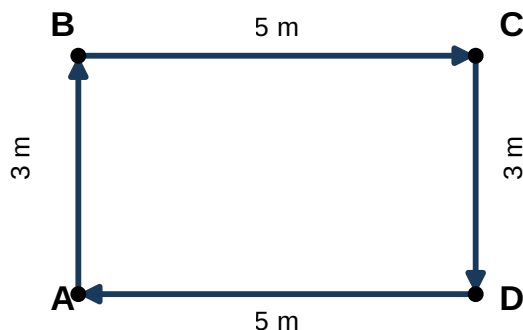
Question 1

The figure represents two vectors: the first has a magnitude of 8 m pointing East, and the second has a magnitude of 5 m pointing West. What is the sum of these two vectors?



Question 2

Adam began his motion at point A, passing through points B, C, and D as shown in the figure, before returning to point A. What are the displacement and the distance travelled by Adam?



Displacement	Distance
16 m	16 m
0 m	16 m
34 m	34 m
0 m	34 m

Question 3

Which of the following quantities is a scalar quantity?

Question 4

What expresses the magnitude of a vector?

Question 5

The result of subtracting the initial position from the final position is called the ...

Question 6

Arwa went from her house to school, then returned home. If the distance between Arwa's house and the school is 300 m, which statement is correct?

Question 7

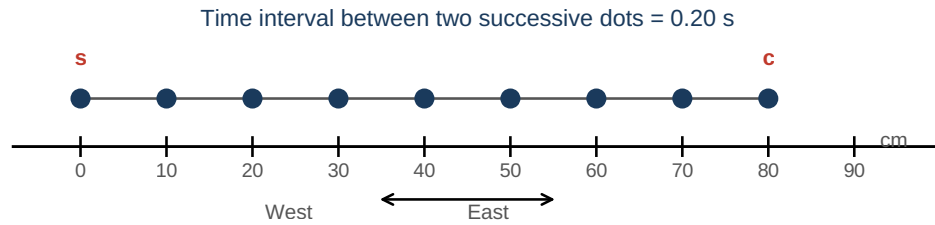
Which of the following always has a value of zero for every coordinate in a Cartesian coordinate system?

Question 8

Arwa moved a distance of 150 m to the East, then moved a distance of 50 m to the West. Find Arwa's displacement.

Question 9

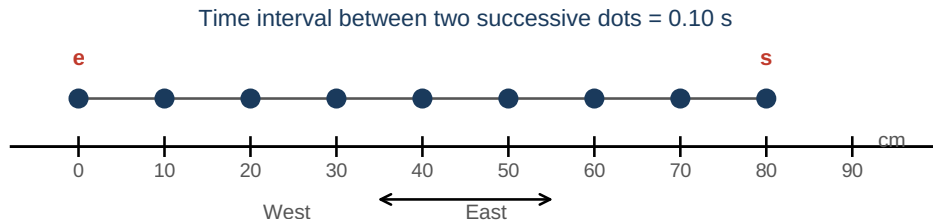
Based on the adjacent figure showing the motion of a toy car, with a time interval of **0.20 s** between each two successive images, what are the displacement of the car and the time elapsed between positions (s) and (c)?



Time	Displacement	
0.40 s	43 cm East	☐
0.40 s	43 cm West	☐
0.80 s	73 cm East	☐
0.80 s	73 cm West	☐

Question 10

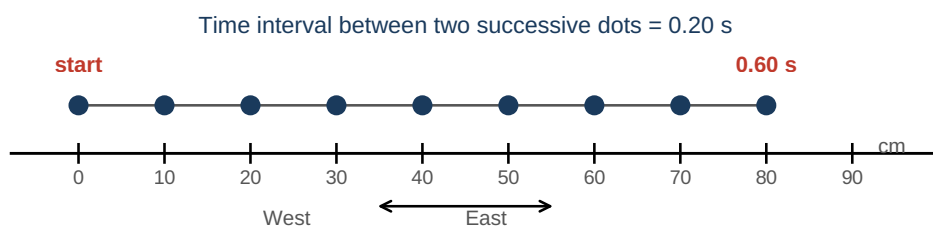
Based on the adjacent figure showing the motion of a toy car, with a time interval of **0.10 s** between each two successive images, what are the time elapsed and the displacement of the car between the two marked positions?



Time	Displacement	
0.20 s	80 m to the right	☐
0.10 s	70 m to the right	☐
0.20 s	80 m to the right	☐
0.30 s	70 m to the right	☐

Question 11

Based on the adjacent figure showing the motion of a toy car (time interval 0.20 s between successive images), what is the displacement of the car after **0.60 s**?



+70 cm

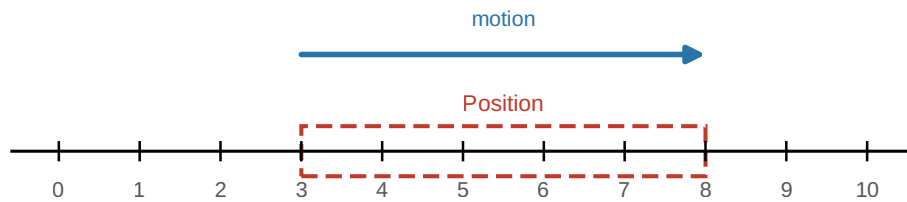
+80 cm

-70 cm

-80 cm

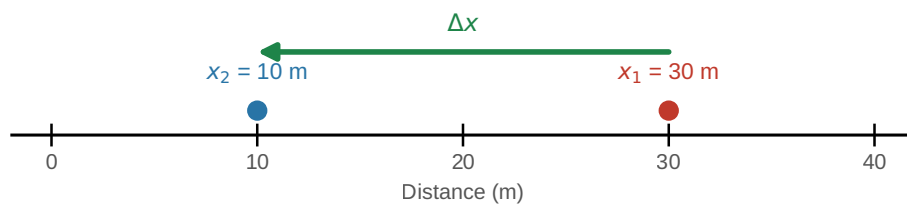
Question 12

In the graph shown, a toy car moves from position (3 m) to position (8 m). Which of the following statements is correct?



Question 13

Arwa begins her motion at position (30 m) and moves to the left until she reaches position (10 m). What is Arwa's displacement?



Question 14

Which of the following statements about drawing vectors is correct?

A vector must be drawn to correctly solve every physics problem

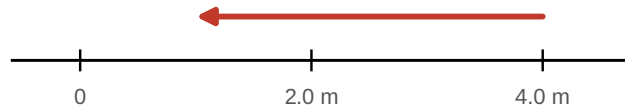
The length of a vector should be directly proportional to its magnitude

Every physical quantity in physics is a vector

A vector is a quantity that has magnitude but no direction

Question 15

In the figure below, what is the magnitude of the object's displacement?



5 m

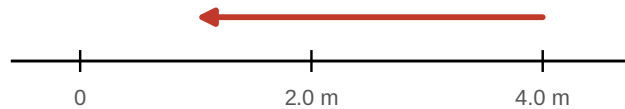
4 m

3 m

0 m

Question 16

In the same figure, what is the magnitude of the distance travelled by the object?



5 m

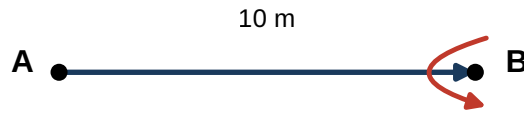
4 m

3 m

0 m

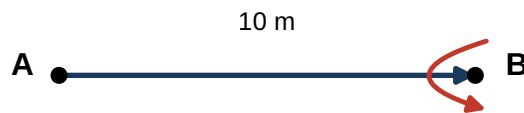
Question 17

In the figure below, what is the magnitude of the object's displacement?



Question 18

In the same figure, what is the magnitude of the distance travelled by the object?



Question 19

A car moved 20 km to the East, then 30 km to the West. Find:

- (a) the displacement of the car,
- (b) the total distance travelled by the car.
