

2D VECTOR DISPLACEMENT SCAVENGER HUNT

Components, tip-to-tail addition, and resultant displacement

Name: _____	Period: _____	Date: _____
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INVESTIGATION QUESTION How do the components of ten connected displacement vectors determine the treasure location?		
TIME 30 minutes	SIMULATION BuildPhysics > 2D Vector Displacement Scavenger Hunt	UNIT 1 Kinematics

Learning targets

- Construct displacement vectors tip to tail from written magnitude-direction clues.
- Resolve each displacement into Δx and Δy components.
- Add components to determine the final position and resultant displacement.

Model before you measure

Angles are measured from the named reference direction. Use signs to show east/west and north/south components.	Component model $\Delta x = d \cos \theta$ $\Delta y = d \sin \theta$ $R = \sqrt{(\sum \Delta x)^2 + (\sum \Delta y)^2}$
Precision: The BuildPhysics tutorial checks the start point, magnitude, and direction before unlocking the next clue. Begin at (0, 0) and connect every vector tip to tail.	

Pre-lab prediction | 4 minutes

1. Explain why the final displacement is not necessarily equal to the total distance traveled.

2. What do positive and negative component signs represent in this coordinate system?

PART A Follow the clues and record components

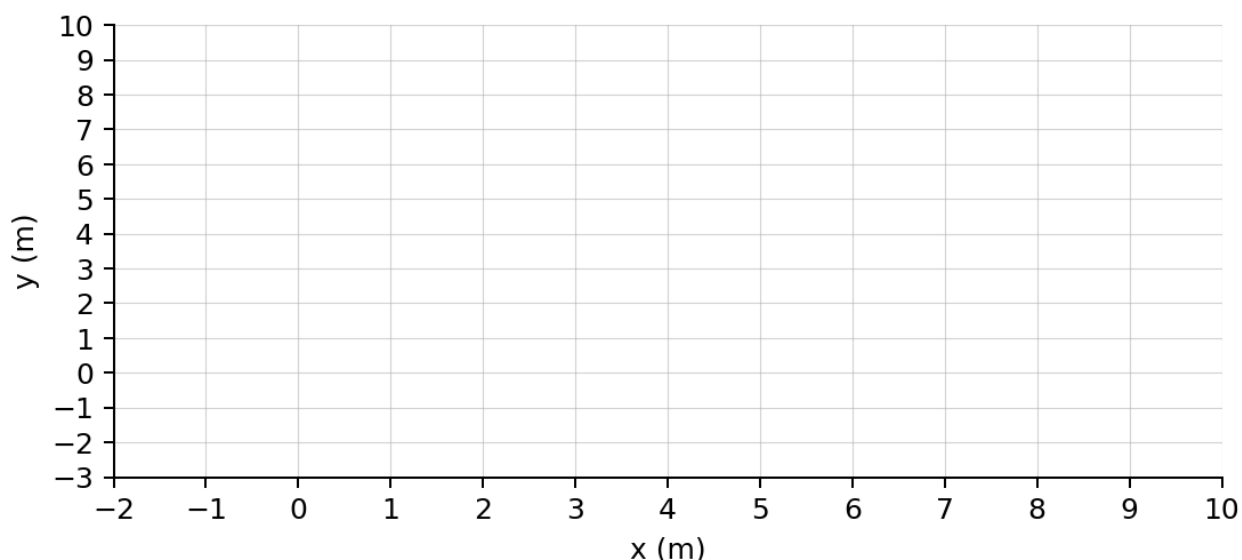
Setup | 2 minutes

- ☐ Load 2D Vector Displacement Scavenger Hunt. The guided sequence begins automatically.
- ☐ Use Measure Displacement for every clue. Record each vector after BuildPhysics verifies it.
- ☐ Show vector values, angles in degrees, and x/y components while collecting data.

Clue	d (m)	Direction	Δx (m)	Δy (m)	Cumulative x (m)	Cumulative y (m)
1	5.0	East				
2	4.0	30° N of E				
3	3.0	North				
4	4.0	45° N of W				
5	2.0	West				
Clue	d (m)	Direction	Δx (m)	Δy (m)	Cumulative x (m)	Cumulative y (m)
6	5.0	30° S of W				
7	3.0	South				
8	4.0	60° S of E				
9	2.0	East				
10	3.0	30° N of E				

3. After clue 10, record the treasure coordinates shown by BuildPhysics.

PART B Determine the resultant and analyze



Sketch the complete tip-to-tail path and draw one resultant from the origin to the treasure.

Resultant calculations | 7 minutes

$\Sigma \Delta x$ (m)	$\Sigma \Delta y$ (m)	Calculated R (m)	Calculated direction	Measured R (m)	Measured direction

4. Compare the sum of the ten magnitudes with the resultant magnitude. Why are they different?

5. Which clues caused the largest changes in cumulative x? Which caused the largest changes in cumulative y?

6. If clue 6 were changed from 5.0 m to 6.0 m in the same direction, predict the new final x and y coordinates.

7. Explain how the final position could be found without drawing the entire path to scale.

Claim-Evidence-Reasoning conclusion

Evaluate this statement: "When vectors are connected tip to tail, their magnitudes can be added directly to find the resultant magnitude."

CLAIM	Accept, reject, or revise the statement.
EVIDENCE	Cite at least two measurements or graph features.
REASONING	Connect your evidence to the kinematics model.

Exit ticket

A path ends at $(-4.0 \text{ m}, +3.0 \text{ m})$. Determine the resultant magnitude and describe its quadrant direction.