Distance and Displacement Worksheet

Name: _____ **Date:** _____

Key Ideas

Distance is the total length of the path travelled by an object.

- Distance does not include direction.
- Distance is a **scalar quantity**.
- Distance is always positive or zero.
- Common units include metres (m) and kilometres (km).

Displacement is the change in position of an object from its starting point to its ending point.

- Displacement includes **direction**.
- Displacement is a **vector quantity**.
- Displacement depends only on the starting and ending positions, not on the path taken.
- An object that returns to its starting point has a displacement of **zero**.

Part A — Distance or Displacement?

Write **distance** or **displacement** beside each statement.

1. The total length of the path travelled. _____
2. The change in position from the starting point to the ending point. _____
3. A quantity that includes direction. _____
4. A quantity that does not require direction. _____
5. A student walks a total of 800 m during a trip to the store. _____
6. A student finishes 200 m east of where they started. _____
7. This quantity can be zero even though an object has moved. _____
8. This quantity increases as an object continues traveling along its path. _____

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Part B — Multiple Choice

1. Which statement best describes distance?

A. The straight-line change in position
B. The total path travelled
C. The direction an object moves
D. The difference between speed and velocity

2. Which statement best describes displacement?

A. The total path travelled
B. The amount of time an object moves
C. The change in position from start to finish, including direction
D. The speed of an object in a particular direction

3. A runner completes one full 400 m lap of a track and stops exactly where they started. What is the runner's displacement?

A. 0 m
B. 200 m
C. 400 m
D. 800 m

4. A student walks 10 m east and then another 5 m east. What distance did the student travel?

A. 5 m
B. 10 m
C. 15 m
D. 50 m

5. For the student in Question 4, what is the displacement?

A. 5 m east
B. 15 m east
C. 15 m west
D. 0 m

6. Which quantity must include a direction?

A. Time
B. Distance
C. Mass
D. Displacement

Part C — Calculate Distance and Displacement

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For each journey, determine both the **total distance travelled** and the **final displacement**.

Example

A person walks **8 m east** and then **3 m west**.
Distance = 8 m + 3 m = **11 m**
Displacement = 8 m east − 3 m west = **5 m east**

1. A student walks **12 m east** and then **5 m west**.

Distance = _____ Displacement = _____

2. A dog runs **20 m north** and then **8 m south**.

Distance = _____ Displacement = _____

3. A cyclist travels **50 m west** and then **20 m east**.

Distance = _____ Displacement = _____

4. A robot moves **15 m north** and then another **10 m north**.

Distance = _____ Displacement = _____

5. A student walks **25 m east**, then **10 m west**, and then another **5 m west**.

Distance = _____ Displacement = _____

6. A toy car moves **18 m east**, **7 m west**, and then **4 m east**.

Distance = _____ Displacement = _____

7. A runner travels **100 m north** and then **100 m south**.

Distance = _____ Displacement = _____

Explain why the distance and displacement are different:

Part D — Following a Journey

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A student leaves home and walks:

- 200 m east to a shop
- 100 m west to a friend's house
- 50 m west to a park

Answer the following questions.

1. What total distance did the student travel?

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2. How far east or west of home did the student finish?

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3. What was the student's displacement?

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4. Why is the displacement smaller than the distance?

Part E — Draw the Journey

For each situation, draw a simple diagram showing the starting point, movement, and finishing point. Use arrows to show direction.

Journey A

A person walks **10 m east**, then **4 m west**.

Diagram:

Distance = _____ Displacement = _____

Journey B

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A person walks **20 m north**, then **20 m south**.

Diagram:

Distance = _____ Displacement = _____

Part F — Challenge Problems

Challenge 1

A hiker walks:

- 40 m east
- 15 m west
- 25 m east
- 10 m west

Calculate the total distance travelled. Distance = _____

Calculate the hiker's final displacement. Displacement = _____

Challenge 2

A student walks **300 m east** from home to a store. The student then walks **120 m west** toward home.

a. What total distance has the student travelled?

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b. What is the student's displacement from home?

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c. How much farther must the student walk to return home?

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d. When the student finally arrives home, what will the total distance be?

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e. When the student arrives home, what will the displacement be?

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Challenge 3

Two students travel from the same starting point to the same finishing point.

Student A: walks directly from the start to the finish and travels 60 m.

Student B: takes a longer route and travels 95 m but finishes at exactly the same location as Student A.

a. Who travelled the greater distance?

b. Do the students have the same displacement?

c. Explain your answer.

Part G — Explain Your Thinking

Answer in complete sentences.

1. Can an object's distance be greater than its displacement? Explain and give an example.

2. Can an object's displacement be greater than its distance? Explain.

3. A runner says, "I ran 5 km, so my displacement must be 5 km." Explain why this statement is not necessarily correct.

4. Give an example of a journey where the distance is not zero but the displacement is zero.

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5. Why is direction important when describing displacement?

Exit Ticket

A student walks **30 m east**, then **12 m west**, and finally **7 m east**.

1. Total distance travelled: _____

2. Final displacement: _____

3. Which quantity tells you how much ground the student covered?

4. Which quantity tells you where the student finished compared with where they started?

5. In one sentence, explain the difference between distance and displacement.

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