Distance vs Displacement

Distance counts the whole path you walked; displacement only looks at the straight line from start to end, with its direction.

Name: Date: Score: ____ / 19

A. Fill in the blanks

1. Distance is the total ____ length travelled.

2. Displacement is the shortest straight line from start to ____, with direction.

3. Distance is a ____ quantity; displacement is a ____ quantity.

4. If you return to your starting point, your displacement is ____.

B. True or False

5. Displacement can be greater than distance. True / False

6. Distance and displacement are equal for straight-line motion in one direction. True / False

7. Displacement can be negative. True / False

8. Distance can be zero for a moving object. True / False

C. Assertion and reason

9. Assertion (A): Displacement can be zero even when distance is not.
Reason (R): Displacement depends only on the start and end points.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

10. Assertion (A): Distance is a vector.
Reason (R): Distance has only magnitude.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

D. Choose the correct option

11. A runner completes one full lap of a 400 m track. Displacement is:

(a) 400 m
(b) 200 m
(c) 0 m
(d) 800 m

Answer: _____

12. You walk 3 m east, then 4 m north. Displacement is:

(a) 7 m
(b) 5 m
(c) 1 m
(d) 12 m

Answer: _____

13. Which is a vector?

(a) distance (b) speed

(c) displacement (d) time

Answer: _____

14. You walk 6 m forward and 2 m back. Distance and displacement are:

(a) 8 m, 4 m (b) 4 m, 8 m

(c) 8 m, 8 m (d) 4 m, 4 m

Answer: _____

E. Numerical problems

15. A boy walks 40 m east and then 30 m north. Find his distance and displacement.

16. A particle goes once around a circle of radius 7 m. Find distance and displacement after one full round and after half a round.

F. Short answer questions

17. Give two differences between distance and displacement.

18. A car goes 10 km north then 10 km south. Find distance and displacement.

G. Match the columns

19. Match each item in Column A with the correct item in Column B.

Column A	Column B	Your answer
1. Total path length	(a) Scalar	1 → ____
2. Straight line start to end with direction	(b) Distance	2 → ____
3. Displacement after a round trip	(c) Displacement	3 → ____
4. Only magnitude, no direction	(d) Zero	4 → ____

Detailed solutions

1. path

2. end

3. scalar; vector

4. zero

5. False. |Displacement| ≤ distance, always.

6. True. The path is the straight line itself.

7. True. Its sign shows direction along the chosen axis.

8. False. A moving object always covers some path.

9. (a) A round trip ends where it began; R explains it.

10. (d) A is false (distance is a scalar); R is true.

11. (c) 0 m. Start and end are the same point.

12. (b) 5 m. $\sqrt{(3^2 + 4^2)} = 5$ m.

13. (c) displacement. It has magnitude and direction.

14. (a) 8 m, 4 m. Distance 6 + 2 = 8 m; displacement 6 − 2 = 4 m.

15. Distance = 40 + 30 = 70 m; Displacement = $\sqrt{(40^2 + 30^2)} = \sqrt{2500} = 50$ m; Direction: towards the north-east ($\tan\theta = 30/40$). **Answer: Distance 70 m; displacement 50 m towards the north-east**

16. Full round: distance = $2\pi r = 2 \times 22/7 \times 7 = 44$ m, displacement = 0; Half round: distance = $\pi r = 22$ m; Displacement = diameter = $2r = 14$ m. **Answer: Full: 44 m, 0; half: 22 m, 14 m**

17. Distance is total path length and a scalar; displacement is start-to-end straight line and a vector. Distance is never zero for a moving object; displacement can be zero for a round trip.

18. Distance = 20 km. Displacement = 0, because it ends where it started.

19. 1 → (b), 2 → (c), 3 → (d), 4 → (a). Distance counts every step; displacement only compares start and end.