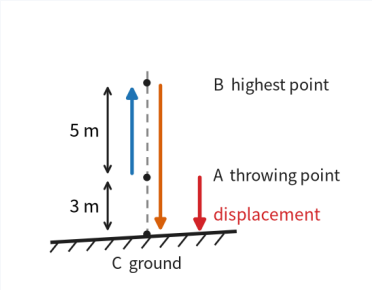
Answer key: Distance vs Displacement

Physics with Tiaotiao 跳跳 · Kinematics · High School Physics
Study sheet for the video "Distance vs Displacement": answer key

Answers and explanations

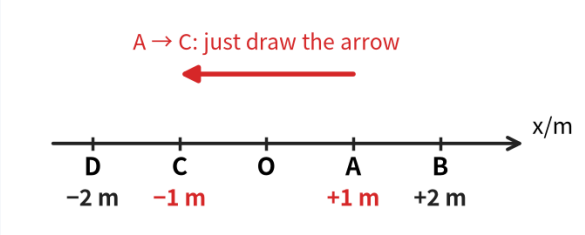
Tap a blue time to jump to the part of the video that explains the question.

1. A. Displacement only looks at the change in position from start to end, not at the motion in between. A and C are 3 m apart on a vertical line, so the magnitude is 3 m, pointing down from A to C.
For comparison, the distance is 5 + 5 + 3 = 13 m: the whole path added up.



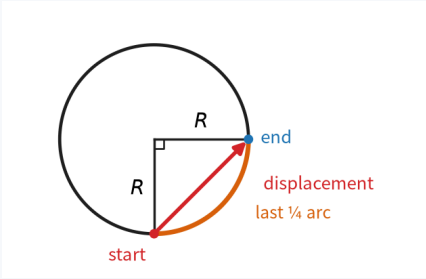
▶ **Watch 13:14, Example 1**

2. B, C, D are correct; **A** is wrong.
Coordinates: x_A = 1 m, x_B = 2 m, x_C = −1 m, x_D = −2 m. Use final − initial.



A From A to C the displacement is −1 − 1 = −2 m, not 2 m: the sign is missing. (The distance 1 + 3 = 4 m is right, but the statement is still wrong.)
B $x_D - x_B = -2 - 2 = -4$ m. B to D is all to the left, so the distance is 4 m.
C On a 1D axis one number gives a position. At D the coordinate is −2 m: the sign says which side of O, the number says how far from O.
D $x_D - x_A = -2 - 1 = -3$ m.
Tip: never drop the sign of a displacement. "Final minus initial" will not lose it.
▶ **Watch 14:05, Example 2**

3. B. Distance is the length of the path: 1¾ = 7/4 laps, each lap is 2πR, so s = 7/4 × 2πR = 3.5πR.



Displacement magnitude is the straight line from start to end. After 1 full lap and ¾ of a lap, exactly a quarter arc is left, so start, centre and end make a right angle. The two radii R are the short sides, and the displacement is the hypotenuse: $\sqrt{}(R^2 + R^2) = \sqrt{}2\ R$.

▶ Watch 16:18, Example 3

4. (1) F (2) F (3) T (4) F (5) F

(1) "One-way" is missing. With turn-backs, distance is greater than the magnitude of displacement.
(2) Distance is a number and displacement is an arrow, so they cannot be equal. It should say "distance equals the *magnitude* of the displacement". Exam tip: compare distance only with the magnitude.
(3) True. Run one lap and come back: displacement is 0, distance is not.
(4) Run one lap, or a bigger lap: distance grows, displacement is still 0.
(5) The 25 km is the length of the road you drive (it may have curves), not the straight line to the exit. It is a distance.

▶ Watch 17:39, Example 4