

Basics of Motion

1. How is distance different from displacement?
2. The following data represent the initial and final positions of a car, bicycle, pedestrian, and skateboarder.

	Initial Position (m)	Final Position (m)
Car	+2	+14
Bicycle	+7	+2
Pedestrian	-1	+2
Skateboarder	+4	-1

- (a) Draw a number line and mark the initial and final positions of each object.
 - (b) Calculate the distance each object traveled.
 - (c) Calculate the displacement of each object.
3. The dispatcher of a courier service receives a message from a truck that reports a position of +5 after a displacement of +2. What was the initial position of the truck? (Use both a number line and an equation to solve the problem.)
 4. Two taxis are traveling along a road in opposite directions. Taxi A changes its position from 6 km to 10 km during the same time that Taxi B moves from 6 km to 1 km.
 - (a) Draw a diagram to show the initial and final positions of each taxi.
 - (b) Calculate the displacement of each taxi.
 - (c) What can you conclude about the speed of the taxis?
 5. What is the difference between speed and velocity?
 6. What is the average speed of a car that traveled 300.0 miles in 5.5 hours?
 7. How much time would it take for the sound of thunder to travel 1,500 meters if sound travels at a speed of 330 m/s?
 8. An airplane travels 3260 km in 4 hours. What is the airplane's average speed?
 9. A person in a kayak paddles down river at an average speed of 10 km/h.
 - (a) How far has she traveled after 3.5 hours?
 - (b) The same person paddles upstream at an average speed of 4 km/h. How long would it take her to get back to her starting point?

10. Calculate the average velocity for each of the following objects.
 - (a) A bicycle travels north 36 km in 1.2 hours.
 - (b) A person runs 17 m east toward a bus stop in 2 seconds.
 - (c) A model car moves along a track from 26 cm to 2 cm in 0.5 seconds.
11. A skateboarder is coasting at a velocity of 2 m/s away from the corner. How far will he travel in 3.5 seconds?
12. A car rolls off a ramp with a constant velocity of 1.5 m/s onto a horizontal track. The end of the ramp is at position -12 m. The car reaches the end of the track in 0.5 seconds.
 - (a) Calculate the length of the track.
 - (b) Draw a number line showing the initial and final positions of the car.
13. What is acceleration?
14. A jet lands on a runway with an initial velocity of 72 m/s. 12 seconds later it comes to a stop. What was the jet's acceleration?
15. A car traveling with a velocity of 1.4 m/s accelerates to 5.6 m/s in 10s. Calculate the acceleration?
16. A poorly driven car travelling at 24m/s hits a tree and comes to rest in 0.2 seconds. What is the acceleration experienced by the passengers?
17. A sports car accelerates from rest to 30 m/s in 4 s. What is its acceleration?
18. A Formula 1 racing car slows on approaching a corner from 80m/s to 32m/s in 2 seconds. What is its acceleration?
19. Convert 100 km/h to m/s.
20. A truck traveling west at 50 km/h pulls out to pass another vehicle that is moving at a constant velocity. The truck increases its velocity to 60 km/h in 6 s. Calculate the acceleration of the truck.