

AP PHYSICS
ONE-DIMENSIONAL MOTION REVIEW

Distance, Displacement, Speed, and Velocity

1. Bob walks 80 m and then he walks 125 m.
 - a. What is Bob's displacement if he walks east both times?
 - b. What is Bob's displacement if he walks east then west?
 - c. What distance does Bob walk in either case?
2. A high school athlete runs 1.00×10^2 m in 12.20 s.
 - a. What is the velocity in m/s? (8.20)
 - b. What is the velocity in km/h? (29.5)
3. A train leaves the station at the 0.0 m marker traveling with a constant velocity of 36.0 m/s.
 - a. How many seconds later will the train pass the 1620.0 m marker? (45.0)
 - b. What is the train's velocity in km/h? (130.)
4. At exactly 1:00 PM a car traveling north at a constant velocity of 94 km/h, is 17 km south of Houston on I-45. Where will it be at 3:30 PM? (218)

Acceleration

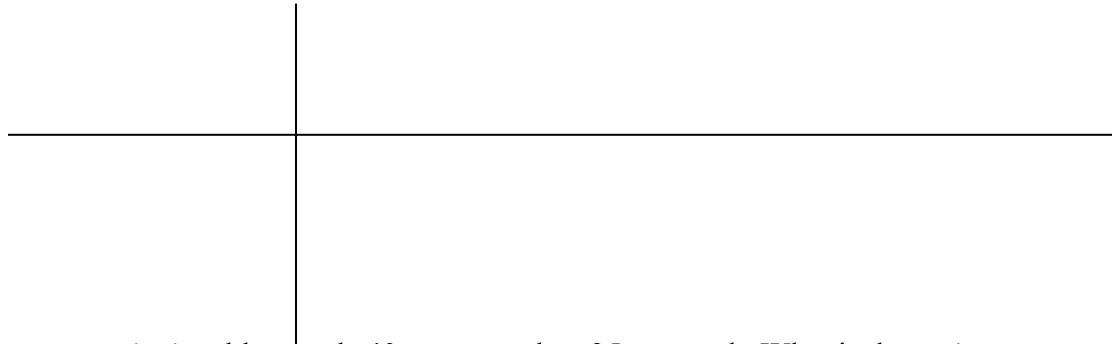
5. An Indy-500 racecar's velocity increases from +4.0 m/s to +36 m/s over a 4.0 s period. What is its acceleration? (8.0)
6. A bus is moving at 25 m/s. The driver steps on the brakes, and the bus stops in 3.0 s.
 - a. What is the acceleration of the bus? (-8.3)
 - b. Suppose the bus took twice as long to stop? How would the acceleration compare to the acceleration calculated above?
7. Sketch a velocity-time graph for an object whose velocity is constantly decreasing from 10 m/s at $t = 0.0$ s to -10 m/s at $t = 2.0$ s. What is its average acceleration?
8. A golf ball rolls up a hill on a Putt-Putt golf course hole.
 - a. If it starts with a velocity of +2.0 m/s and accelerates at a rate of -0.5 m/s^2 , what is its velocity after 2.0 s? (1.0)
 - b. If the acceleration occurs for 6.0 s, what is its final velocity? (-1.0)
9. If a car accelerates from rest at a constant 5.5 m/s^2 , how long will be required to reach 28 m/s? (5.1)
10. A rocket traveling at +88 m/s is accelerated uniformly to +132 m/s over a 1.5 s interval. What is the rocket's displacement over this interval? (1.7×10^2)
11. A car accelerates at a constant rate from 15 m/s to 25 m/s while it travels 125 m. How long does this motion take? (6.3)

12. A bike rider accelerates constantly to a velocity of 7.5 m/s during 4.5 s. The bike's distance is +19 m. What was the initial velocity of the bike? (0.9)
13. An airplane starts from rest and accelerates at a constant rate of $+3.00 \text{ m/s}^2$ for 30.0 s before leaving the ground. Can the airplane take off on a runway that is 1500 m long?
14. A driver brings a car traveling at +22 m/s to a complete stop in 2.0 s. Assume its acceleration is constant.
 - a. What is the car's acceleration? (-11)
 - b. How far does it travel before stopping? (22)
15. An airplane accelerates from a speed of 21 m/s at the constant rate of 3.0 m/s^2 over a distance of 535 m. What is its final velocity? (60.)
16. The pilot stops the same plane in 484 m using a constant acceleration of -8.0 m/s^2 . How fast was the plane traveling before the braking began? (88)

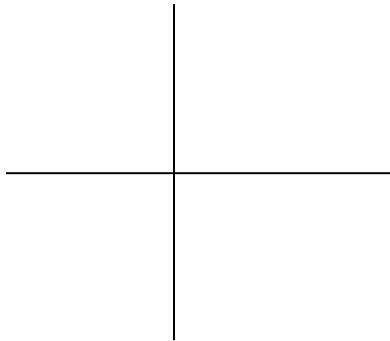
Freefall

17. A brick falls from a scaffold.
 - a. What is its velocity after 4.0 s?
 - b. How far does the brick fall during the first 4.0 s?
18. A baseball is thrown straight up with an initial speed of 27 m/s.
 - a. How long does it take the baseball to reach its maximum height? (2.8)
 - b. How high does the ball rise above its release point? (38)
19. A coin is tossed vertically upward.
 - a. What happens to its velocity while it is in the air?
 - b. What happens to its acceleration?
20. What is the final velocity of an object that starts from rest and falls freely for a distance of 64 m? (-35)
21. A pebble is dropped down a well and hits the water 1.5 s later. Determine the distance from the edge of the well to the water's surface.
22. A ball is thrown upward from the ground with an initial speed of 25 m/s. At the same instant, a ball is dropped from rest from a building 15 m high. After how long will the balls be at the same height? (0.60)

1. GRAPHICALLY SOLVE: A jogger runs 10.0 blocks due east, 25.0 blocks due south, and another 15.0 blocks due east. Assume all blocks are of equal size.



2. An ant on a picnic table travels 40. cm east, then 35 cm north. What is the ant's resultant displacement?



3. An athlete runs 120. m across a level field at an angle of 60.0° north of east. What are the horizontal and vertical components of this displacement?

