

Physics

Linear & 2D Motion Homework

1. Which of the following units are SI, which are US Customary System, and which are both: hour, millimeter, pound, mile, liter, acre, cubic foot, square centimeter, gram, foot, pint, second.
2. Rewrite the following sentence so that it conveys **exactly the same information**, but contains no SI **prefixes** (i.e., use **only** SI base units) "A 10 kilogram rock was thrown so fast that it covered 1 centimeter in 10 microseconds."
3. Order the following items from shortest to longest: A 1000 millimeter ribbon, a 10 centimeter towel, a 100 meter road, a 1000 centimeter boat, a 10 millimeter animal, and a 10 kilometer cloud.
4. Give three examples of friction.
5. How does friction affect a moving object? How about a stationary object?
6. Does the **amount** of friction make any difference? For example, consider two identical objects, each initially moving at 10 meters/second, but one of them experiencing twice as much friction as the other. Compare their motions.
7. What would happen to a moving object if there were absolutely no friction?
8. Suppose you're on a plane from Sacramento to New York that's traveling at 350 miles/hour, and you get up and walk toward the back of the plane at 0.5 meters/second. What is your speed relative to Sacramento?
9. What is the difference between speed and velocity? How about distance vs. displacement?
10. If I told you the distance between my friend's house and the school, would you know where it is? What if I told you the displacement instead?
11. What is the average speed of a sprinter that completes the 100-meter dash in 10 seconds? Is the sprinter's speed constant over the entire distance?
12. It only takes Mr. Schneider's car 7.00 seconds to go from 0 to 62 mph. What is this change in velocity in SI units? Calculate the acceleration of Mr. Schneider's car.
13. Is it possible for a car going north to have an acceleration toward the south? Either give an example or explain why this is impossible.
14. Is it possible to drive around a curve at a constant velocity of 25 mph? Explain why or why not.
15. A rocket accelerates at 10 meters/second². If it launches at 2:00:00 PM, what is its velocity at 2:00:15 PM? What is the rocket's altitude at this time?
16. Mr. Schneider's car is going 35 meters/second when he notices a cop behind him. He applies the brakes, which cut his speed by 5.0 meters/second every second. What is his velocity 3.00 seconds after applying the brakes? How far did he travel during this time?
17. Complete the **Free Fall** practice sheet (the one with the speedometers).
18. Complete the **Displacement, Velocity, and Acceleration** practice sheet (the one with the buses).
19. Do vectors have magnitudes?
20. If something has only a magnitude, is it a vector or a scalar?
21. Which of the following are scalar quantities, which are vector quantities, and which are neither?
(a) velocity; (b) age; (c) color; (d) speed; (e) acceleration; (f) shape; (g) temperature.
22. What do you know for sure about two vectors whose sum is zero?
23. If I go north 8 km and west 6 km, what is my total displacement?
24. Complete the **Vectors** practice sheet (the one with the girl throwing the ball upward).

25. Suppose you're standing on a bus that moves at a **constant velocity**. If you drop a ball from your outstretched hand, you will see it fall in a vertical straight line (trust me or try it yourself). How would the path of the ball appear to someone standing on the side of the road?
26. Refer to the diagram in **problem #3** of the **Vectors** practice sheet. Suppose at **point A**, $v_x = 3.0$ meters/second and $v_y = 5.0$ meters/second. How long will the stone take to get to **point B**? How long will it take to get to **point C**? What is the horizontal displacement from **point A** to **point B**? How about from **point A** to **point C**?
27. A car drives at a constant speed of 40mph on a semi-circular bend in a mountain road for 5 seconds. During this time, in which direction is the car accelerating, or is there no acceleration at all? **Carefully** describe the car's motion after it suddenly hits a patch of frictionless ice during the turn.
28. In which direction are you accelerating at this moment? What would happen to you if you stopped accelerating in this direction?