

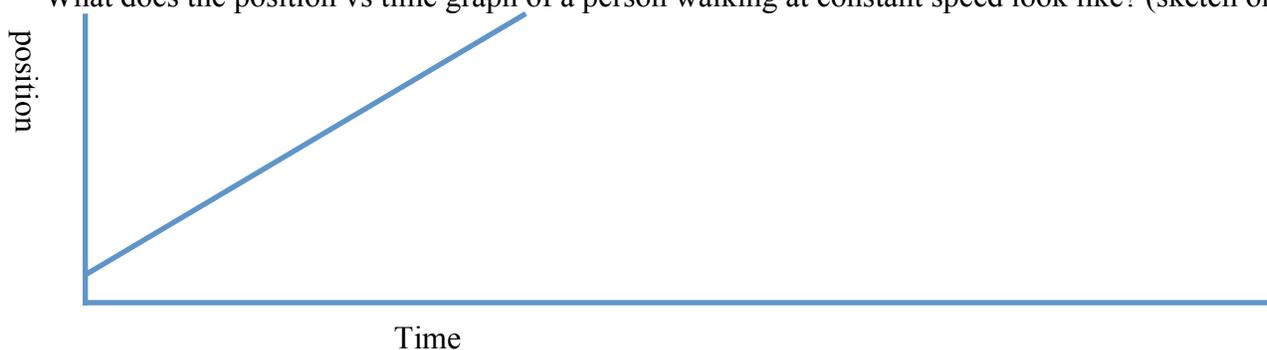
Speed and Velocity Problems

$$x_2 = x_1 + v_1t + \frac{1}{2}at^2 \quad v_2 = v_1 + at \quad v_2^2 = v_1^2 + 2a(x_2 - x_1) \quad g=9.8 \text{ m/s}^2$$

Solve the following problems. **The answers must have the correct units for credit. Show all work including the correct formula and variable list!**

For 1-6, a=0

1. A bicycle rider travels 22 km in 3.5 hours. What is the average speed of the bicycle rider?
6.3 km/hr
2. A high-speed train takes 2 hours to travel a distance of 454 km. What is the average speed of the train?
227 km/hr
3. Express the answer to #2 in meters per second. **63 m/s**
4. A bullet is shot from a rifle with a speed of 720 m/s. The target is 3240 m away. What time is required for the bullet to strike the target? **4.5 s**
5. Light from the sun reaches the earth in 8.3 minutes. The speed of light is 300,000,000 m/s. In meters, how far is the earth from the sun? **$1.49 \times 10^{11} \text{ m}$**
6. On a baseball diamond, the distance from home plate to the pitchers mound is 18.5 m. If a pitcher is capable of throwing a ball at 38.5 m/s, how much time does it take a thrown ball to reach home plate?
0.48 s
7. You run 100.0 m starting from rest and accelerating uniformly until you cross the finish line in 14.0 seconds. a) what is your acceleration? b) how fast are you going as you cross the finish line? **a) 1.02 m/s^2 b) 14.3 m/s**
8. You throw a ball straight up at starting at 12 m/s. How long does it take for the ball to get to the highest point? **1.22 s**
9. If the ball in #8 starts 2.20 m above the ground, how high will it be at the highest point?
9.55 m
10. A fighter jet landing on an aircraft carrier goes from 150 m/s to a stop in a distance of 420 m. What is the acceleration on the fighter jet? **-26.8 m/s^2**
11. A race car goes from a standing start to 35 m/s in 8.20 seconds. a) what is the acceleration of the car? b) how far will the car go in this time? **a) 4.27 m/s^2 b) 143.5 m**
12. What does the position vs time graph of a person walking at constant speed look like? (sketch one)



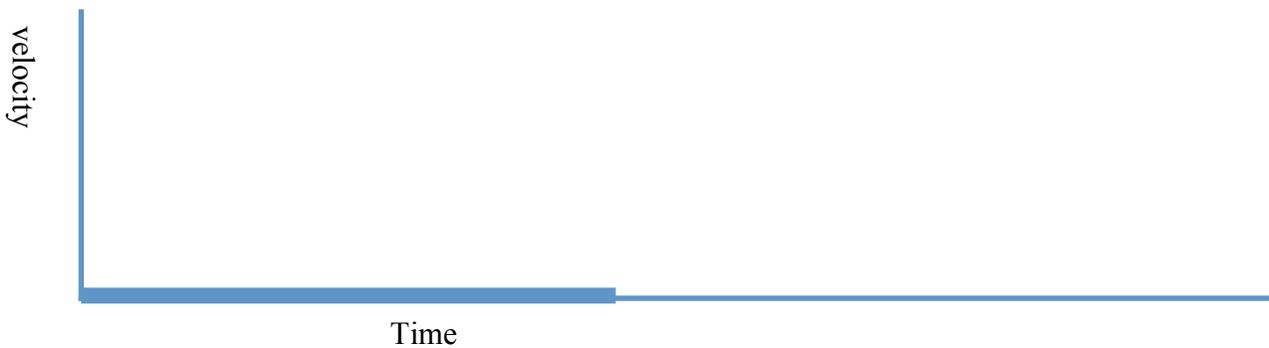
13. What does the position vs time graph of a person standing still look like? (sketch one).



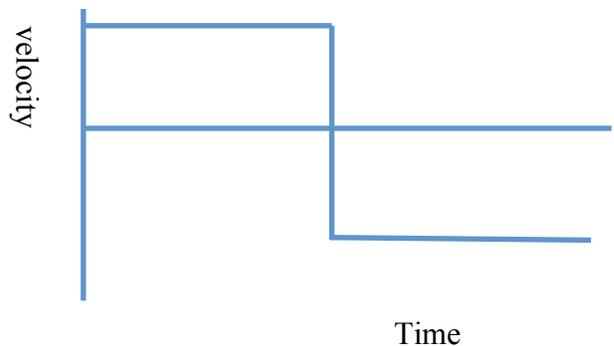
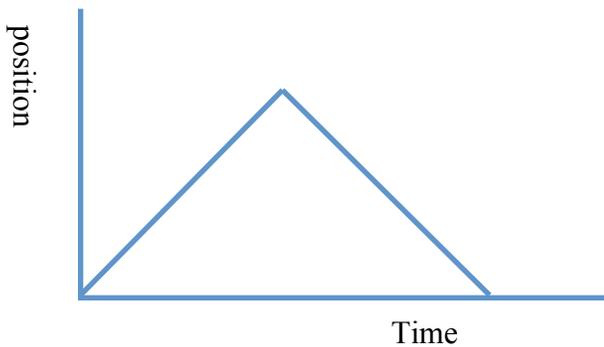
14. What does a velocity vs time graph of a person walking at constant speed look like? (sketch one).



15. What does the velocity vs time graph of a person standing still look like? (sketch one).

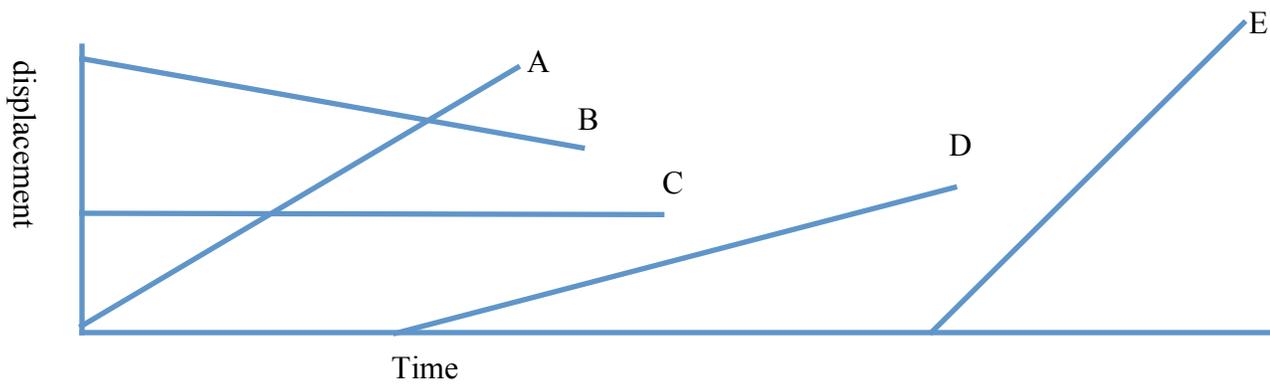


16. A hockey player crosses her own blue line and skates to the other blue line at a constant velocity and then instantly (she is VERY good) skates backward at a constant velocity to her own blue line again. Sketch a graph of position vs time and another of velocity vs time.



17. If you accelerate at 1.63 m/s^2 on your bike... a) how long will it take you to go from a standing start to 15 m/s ? b) how far will you go in this time? a) 9.20 s b) 69 m
18. If you drop a ball from the top of a 58 m building, a) how long will it take to hit the ground? b) how fast will it be going when it hits the ground? 3.44 s
19. When a bullet is shot from a rifle, it starts at zero and reaches a speed of 720 m/s in a distance of 43 cm . a) what is the acceleration of the bullet? b) How long does this take? a) $603,000 \text{ m/s}^2$ b) 0.00119 s

20. On the following graph, which object (A, B, C, D or E) has the greatest velocity? Why?
E – it has the greatest slope, velocity is the slope of displacement (position) vs time



21. On the above graph, which object (A, B, C, D or E) is standing still? Why?
C – The position isn't changing. The slope is zero
22. On the above graph, which object (A, B, C, D, or E) has a negative velocity? Why?
B – The slope is negative. The position (displacement) is decreasing with time.