

Linear Motion Problems

1. What is the shortest possible time in which a bacterium could drift at a constant speed of 3.5 mm/s across a Petri dish with a diameter of 8.4 cm?
2. A child is pushing a shopping cart at a speed of 1.5 m/s. How long will it take this child to push the cart down an aisle with a length of 9.3 m?
3. An athlete swims from the north end to the south end of a 50.0 m pool in 20.0 seconds and makes the return trip to the starting position in 22.0 s.
 - a. What is the average velocity for the first half of the swim?
 - b. What is the average velocity of the second half of the swim?
 - c. What is the average velocity for the round trip?
4. A bus travels from El Paso, Texas to Chihuahua, Mexico in 5.2 hours with an average velocity of 73 km/h to the south. What is the bus's displacement? (Pre-AP and DI)
5. A school bus takes 0.53 hours to reach the school from your house. If the average velocity of the bus is 19.0 km/h to the east, what is the displacement? (Pre-AP and DI)
6. The Olympic record for a marathon is 2 hours 9 minutes, 21 seconds. If the average speed of the runner achieving this record is 2.436 m/s, what is the marathon distance?
7. Sally travels by car from one city to another. She drives for 30 min at 80 km/h, 12 min at 105 km/h, and 45 min at 40 km/h and she spends 15 min eating lunch and buying gas. (Pre-AP and DI)
 - a. Determine the average speed for the trip.
 - b. Determine the total distance traveled

8. Sketch a position time graph for each of the following situations.
 - a. An object at rest
 - b. An object with constant positive velocity
 - c. An object with constant negative velocity
9. What would be the acceleration of a turtle that is moving with a constant velocity of 0.25 m/s to the right?
10. Marissa's car accelerates uniformly at a rate of $+2.60 \text{ m/s}^2$. How long does it take for Marissa's car to accelerate from a speed of 88.5 km/h to a speed of 96.5 km/h? (Pre-AP and DI)
11. Nathan accelerates his skateboard uniformly along a straight path from rest to 12.5 m/s in 2.5 sec.
 - a. What is Nathan's acceleration?
 - b. What is Nathan's displacement during this time interval?
 - c. What is Nathan's average velocity during this time interval?
12. If a car is traveling eastward, can its acceleration be westward? Explain, and use examples.
13. A car traveling in a straight line has a velocity of $+5 \text{ m/s}$. After an acceleration of 0.75 m/s^2 , the car's velocity is $+8 \text{ m/s}$. In what time interval did this acceleration occur?

14. A car traveling at +7 m/s accelerates at the rate of $+0.8 \text{ m/s}^2$ for an interval of 2 seconds. Find v_f .
15. A snowmobile has an initial velocity of +3 m/s.
- If it accelerates at the rate of $+0.5 \text{ m/s}^2$ for 7 seconds, what is the final velocity
 - If it accelerates at the rate of -0.6 m/s^2 , how long will it take to reach a complete stop?
16. A car moving westward along a straight, level road increases its velocity uniformly from +16 m/s to +32 m/s in 10 seconds.
- What is the car's acceleration?
 - What is its average velocity?
 - How far did it move while accelerating?
17. A ball initially at rest rolls down a hill with an acceleration of 3.3 m/s^2 . If it accelerates for 7.5 seconds, how far will it move?
18. A bus slows down uniformly from 75 km/h to 0 km/h in 21 seconds. How far does it travel before stopping? (Pre-AP and DI)
19. A car accelerates from rest at -3 m/s^2 .
- What is the velocity at the end of 5 seconds?
 - What is the displacement after 5 seconds?
20. A car accelerates uniformly from rest to a speed of 65 km/h in 12 seconds. Find the distance the car travels during this time. (Pre-AP and DI)
21. A car starts from rest and travels for 5 seconds with a uniform acceleration of $+1.5 \text{ m/s}^2$. The driver then applies the brakes, causing a uniform acceleration of -2 m/s^2 . If the brakes are applied for 3 seconds, how fast is the car going at the end of the braking period, and how far has it gone from its start?
22. A boy sledding down a hill accelerates at 1.40 m/s^2 . If he started from rest, in what distance would he reach a speed of 7 m/s?
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23. A worker drops a wrench from the top of a tower 80 m tall. What is the velocity when the wrench strikes the ground?
24. A peregrine falcon dives at a pigeon. The falcon starts downward from rest with a free-fall acceleration. If the pigeon is 76 m below the initial position of the falcon, how long does the falcon take to reach the pigeon?
25. 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? (Pre-AP and DI)
26. A pebble is dropped down a well and hits the water 1.5 seconds later. Using the equations for motion with constant acceleration, determine the distance from the edge of the well to the water's surface.
27. A ball is thrown vertically upward from the ground with a speed of 25 m/s.
- How long does it take to reach its highest point?
 - When it reaches the highest point, how high off the ground is it?

1. 24 sec	2. 6.2 sec	3. 2.5 m/s -2.27m/s 0m/s	4. 379.6 km, south	5. 10.07 km	6. 18906 m	7. 53.5 km/hr 91 km	8. graphs	9. zero
10. 0.85 sec	11. 5 m/s^2 15.625 m 6.25m/s	12. yes	13. 4 sec	14. 8.6 m/s	15. 6.5 m/s, 5 sec	16. 1.6 m/s^2 , 24 m/s, 240 m	17. 92.8 m	18. 218.7 m
19. -15 m/s, - 37.5 m	20. 108.36 m	21. 32.25 m	22. 17.5 m	23. 39.6 m/s	24. 3.94 sec	25. 0.6 sec	26. 11.025 m	27. 2.55 sec, 31.9 m