Kinematics Worksheet #2

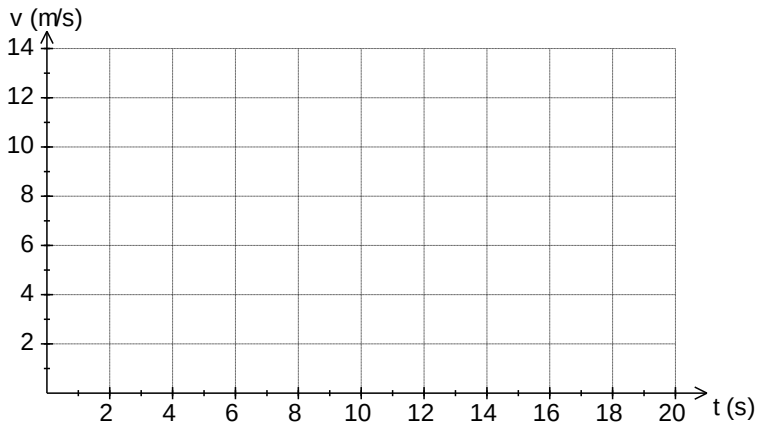
These problems cover the conditions from the first set of problems but also include situations where the direction, velocity &/or acceleration can change.

1. An object starts from rest and accelerates at 3.00 m/s^2 for 4.00s. Its velocity remains constant for 7.00 s and it finally comes to rest after another 5.00s.

a. find the distance covered in each of the three parts of the motion.

b. find the average velocity for the entire trip.

(try to solve this problem both algebraically and graphically).



2. A parachutist jumps from a height of 3.10x10^3 m and falls freely for 10.0s. He then opens his parachute and for the next 20.0 s slows down with an average acceleration of 4.50 m/s^2. After that he falls the rest of the distance to the ground at a uniform velocity.

a. What is his velocity just before the parachute opens?

b. At what altitude does the parachute open?

c. What is his velocity just before he hits the ground?

d. Calculate the time required for the whole descent.

e. From what height would he have to fall freely in order to strike the ground with the same velocity as he does when wearing a parachute?

3. A competitor on a tricycle wants to cover a race distance of 1500m in 4:00 minutes. He has gone at a constant velocity for 3.5 minutes but still has 240m left to go.

What acceleration is needed for him to complete the distance in 4:00?

4. A speed skater is skating along a straight frozen river at a constant velocity for 60.0s. When she gets to a certain mark, she begins to accelerate at 0.40 m/s^2 for 10.0s. During this acceleration, she travels 80.0m from the mark where she started accelerating.

a. How fast is she going at the end of her acceleration?

b. How fast was she going when she started to accelerate?

c. How far did she go in total over the 70.0s?

Kinematics Worksheet #3

These problems cover all of the conditions from the first two types of problems, and in addition may also involve more than one object. These problems are sometimes called race or chase problems.

1. Two trains, one travelling at 100.0 km/h west and the other at 128 km/h east are headed towards each other along a straight level track. When the trains are 1.2 km apart, each engineer simultaneously sees the other's train and applies the brakes. Both trains have equal constant (negative) accelerations of 0.90 m/s^2. Will there be a collision?

2. A turtle is moving with a constant acceleration along a straight path. He starts his stopwatch as he passes a fence post and notes that it takes him 10.0 s to reach a pine tree 10.0 m farther along the path. As he passes the pine tree, his velocity is 1.2 m/s. How far from the fence post was he when he started?

3. An efficient parcel service wants to speed up its deliveries by dropping parcels into trucks that are already moving. An employee is positioned on an overpass directly above a straight level road to drop parcels into trucks. One day, a delivery truck starts from rest and drives along a straight road with a constant acceleration of 4.9m/s^2. A package is released at the correct instant to land in the truck. If the overpass was 30.0m above the truck and the truck started from a position 100.0 m from the point of intersection, how long after the truck started did the employee wait before dropping the parcel?

4. A stone is dropped into the water from a bridge 44 m above the water. A second stone is thrown vertically downward 1.0 s after the first stone was dropped. Both stones strike the water at the same time. What was the initial velocity of the second stone?