

# Applications of the Kinematics Equations



## Mr. P's keys to solving kinematics questions:

1. Make a **variables list/draw** a diagram (when needed).
2. Choose an **equation** with the variables you need.
3. **Convert units** first if you need to.
4. **Rearrange** and plug and chug (cancel out units).
5. **Circle/box** your final answer, check sig. digs, **check** for reasonability.

## **The Slam Dunk:**

**In getting ready to slam dunk, Mr. P starts from rest and sprints to a speed of 6.00 m/s in 1.50 s. Assuming that the Mr. P accelerates uniformly, determine the distance he runs before the dunk.**



**Ans: 4.50 m**

## **The Dartgun:**

**The length of a primitive blowgun is 1.2 m. Upon leaving the barrel, a dart has a speed of 14 m/s. Assuming the dart is uniformly accelerated, how long does it take the dart to travel the length of the barrel?**



**Ans: 0.17 s**

## **The Accident:**

**A driver of a car going 90.0 km/h sees the lights of a barrier 40.0 m ahead. It takes the driver 0.75 s before she applies the brakes at an average breaking acceleration of  $-10.0 \text{ m/s}^2$ .**

**b) What is the maximum speed the car can be moving at and not hit the barrier? Assume all other data does not change.**

## **The Amazing Race**

**Mr.P runs a race with Roger and Chelsea. Mr.P runs with a constant acceleration. First, Mr.P passes Roger. 60.0 m and 6.0 s later, Mr.P passes Chelsea. His velocity as he passes Chelsea is 15.0 m/s.**

**a) What is Mr.P's speed as he passes Roger?**

**Ans: 5.0 m/s**

**b) What is Mr.P's acceleration?**

**Ans:  $1.7 \text{ m/s}^2$**



**c) How far back did Mr.P have to start to catch Roger?**

**Ans: 15 m**

## The Traffic Light

As a traffic light turns green, a waiting car starts with a constant acceleration of  $6.00 \text{ m/s}^2$ . At the instant the car begins to accelerate, a truck with constant velocity of  $21.0 \text{ m/s}$  passes by in the next lane.

a) How far will the car travel before it overtakes the truck?



### Secret Light Thing

The distances the two vehicles travel are equal.

The time it takes for them to meet are also equal.

Make two equations equal to distance equal to each other.

\*as  $v_f = v_i$  for the truck (only holds for this question!)

**Ans: 147 m**

**b) How fast will the car be traveling when it overtakes the truck?**

**Ans: 42 m/s**