# Week 3 Recitation Quiz

Part 1: Work on this question by yourself using this sheet of paper. You will have approximately 20 minutes to write your solution of this question. Please show all of your work. The solution process is MUCH more important than the final answer! Any numerical answer will usually be worth at most 10% of the total points.

2) Helicopters can be used to fight forest fires. One task they perform is to drop fire suppressant fluids on targeted hot spots. Consider a firefighting helicopter traveling horizontal with a constant speed $\mathbf{V_i}$. It flies at an altitude **h** above the ground. You've been tasked by the crew to calculate the horizontal distance **d** away from the fire, from which you must release the fluids to hit the fire. Assume air resistance is negligible.

(a) Draw a physical representation for this situation. Be sure to include representations of your coordinate system, the initial and final velocity, displacement, and acceleration of the dropped fluid.

(b) What is the horizontal acceleration of the water after it leaves the bucket?

$a_x$ =

(c) What is the vertical acceleration of the water after it leaves the bucket?

$a_y$ =

(d) What is the initial horizontal component of velocity for the water after it leaves the bucket?

$V_{ix}$ =

(e) What is the initial vertical component of velocity for the water after it leaves the bucket?

$V_{iy}$ =

(a) Find an equation for the time, t, it takes the water to hit the fire in terms $\mathbf{V_i}$, **h**, and **g**, the acceleration of gravity (not all of these need be present in the equation). This equation should have no numbers except for a 2 from one of the equations used to it.

(b) Find an equation for the horizontal distance **d** in terms $\mathbf{V_i}$, **h**, and **g**, the acceleration of gravity. This equation should have no numbers except for a 2 from one of the equations used to construct it.

# Week 3 Recitation Quiz

Part 2: Work on this question in groups using a whiteboard and markers. Your group will have approximately 20 minutes to write your solution of this question. Please show all of your work. The solution process is MUCH more important than the final answer! Any numerical answer will usually be worth at most 10% of the total points.

2) Ball A is launched from a table at an angle 30° up from the horizontal and the initial vertical component of its velocity is equal to 4 m/s. At the same time, ball B is fired from the same height, straight upward with an initial speed of 4 m/s. Which of the following statements about ball A and B during the time they are undergoing free-fall are true?

   □ (a) Both balls will take the same amount of time to hit the floor.

   □ (b) Ball A will hit the floor before ball B

   □ (c) Both balls will travel the same distance.

   □ (d) Both balls will undergo the same acceleration.

   □ (e) Both balls will have the same speed at some time during their motion.

   □ (f) Ball A will always be traveling faster than ball B.

3) Helicopters can be used to fight forest fires. One task they perform is to drop fire suppressant fluids on targeted hot spots. Consider a firefighting helicopter traveling horizontal with a constant speed Vi. It flies at an altitude h above the ground. You've been tasked by the crew to calculate the horizontal distance d away from the fire, from which you must release the fluids to hit the fire. Assume air resistance is negligible.

   (a) Draw a physical representation for this situation. Be sure to include representations of your coordinate system, the initial and final velocity, displacement, and acceleration of the dropped fluid.

   (b) Find an equation for the distance **d** in terms **Vi**, **h**, and **g**, the acceleration of gravity. This equation should have no numbers except for a 2 from one of the equations used to construct it.

   (c) Use Dimensional Analysis sensemaking to determine if your expression in part (b) is plausible.

   (d) If **Vi** = 44 m/s and **h** = 100 m, what must **d** be to hit the target?