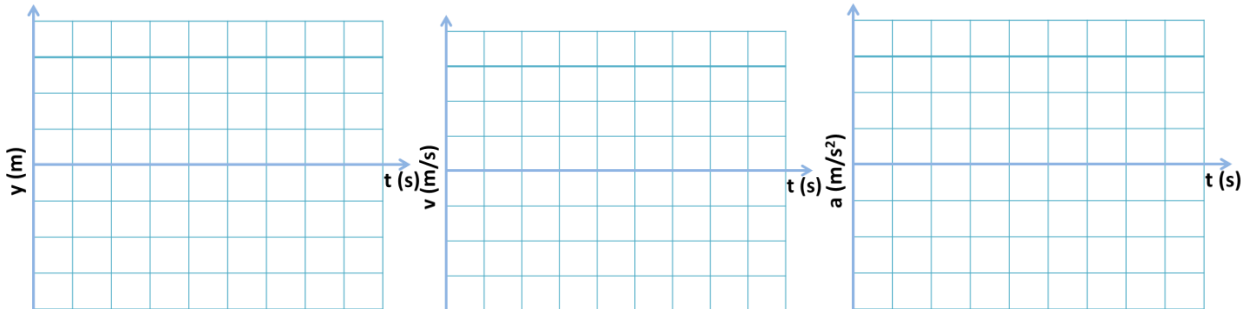


# Worksheet 1.7

## Motion in the Y-Direction

1. Write down the equations that describe motion in the y-direction.
  
2. A group celebrating rebels in Libya fire their guns into the air. One man stands on his roof 5 m above the ground, leans over the edge and fires his gun vertically. The bullet leaves his gun with a velocity of 900 m/s. Draw the y vs t, v vs t, and a vs t graphs for the bullet's travel until it reaches the ground.



Rewrite the equations from (1) using the information provided in the question.

How long does it take for the bullet to reach its maximum height?

What is the maximum height of the bullet?

What is the velocity of the bullet as it hits the ground? Approach this problem from the time when the initial velocity in the y-direction is zero (at its maximum height) and treat it as an object falling from its maximum height.

For the following questions, draw the motion diagram associated with each question along with the  $x$  vs  $t$ ,  $v$  vs  $t$ , and  $a$  vs  $t$  graphs that describe the motion.

3. Steph Curry drops a basketball from the top of the Transamerica Building in SF ( $h=260$  m). Knowing that gravity accelerates the basketball at a rate of  $-9.8 \text{ m/s}^2$  with what velocity does the basketball hit the ground? How long does it take to hit the ground?
4. A hot air balloon is floating at a constant height 30 m above the ground when someone onboard releases an apple core. What is the velocity when the apple core hits the ground? How long does it take to reach the ground?
5. A person standing at the edge of a 100 m cliff drops one ball straight down and throws another ball straight down with an initial velocity of 10 m/s. Neglecting air resistance, with what velocities do the two balls hit the ground below the cliff? How much time passes between the two balls hitting the ground?

6. A ball is thrown vertically from the ground from a tower 120 m in height. The ball hits the ground 2 seconds later. What was the initial velocity of the ball when thrown? What is the velocity of the ball when it hits the ground?

7. A ball is thrown vertically from the ground at a velocity 30 m/s, when another ball is dropped along the same line, simultaneously from the top of a tower 120 m in height. Find the time when the two balls meet (same place at the same time).