

1. If there were no gravity, the cannonball would follow the dashed line, as shown in FIGURE 1. But there is gravity, and the cannonball falls beneath the dashed line.

a) Fill in the table below with the distances the cannonball would fall by the end of 1, 2, 3 and 4 seconds. Use

$g = 10 \text{ m/s}^2$, and ignore air resistance. Use the equation $d = v_i t + \frac{1}{2}at^2$, with $v_i =$

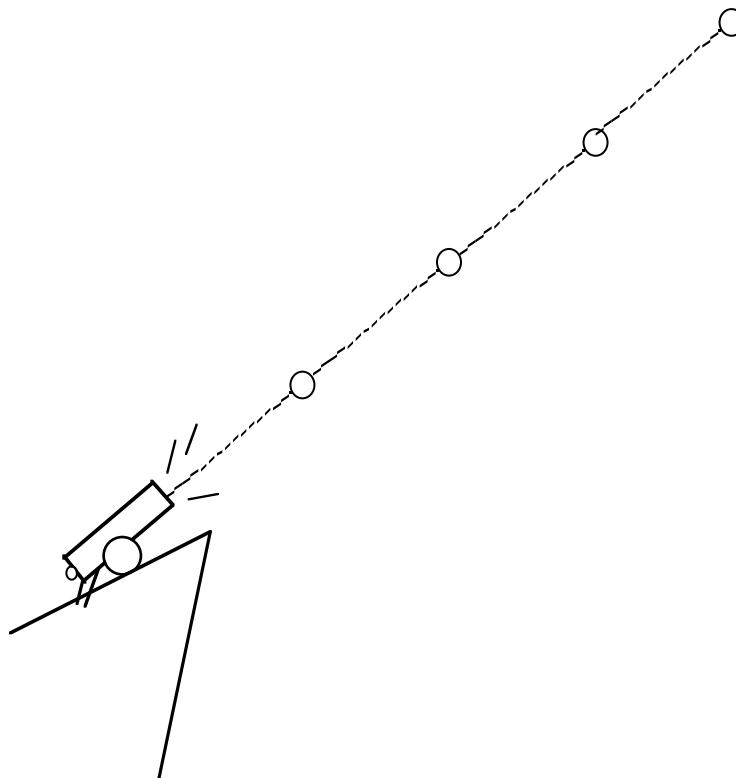
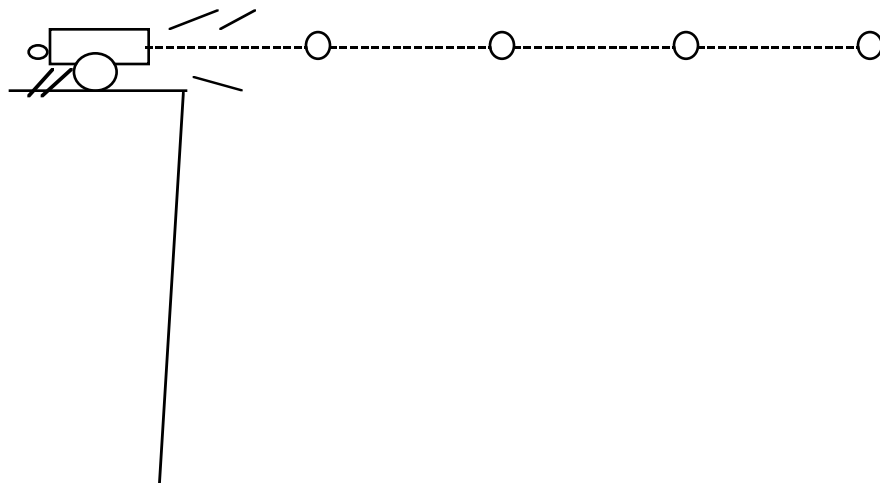
0. Notice that the distance fallen increases as the square of the time.

TIME (s)	1	2	3	4
POSITION (m)				

b) Using a scale of 1 cm = 10 m, draw the positions of the cannonball at these times on FIGURE 1.

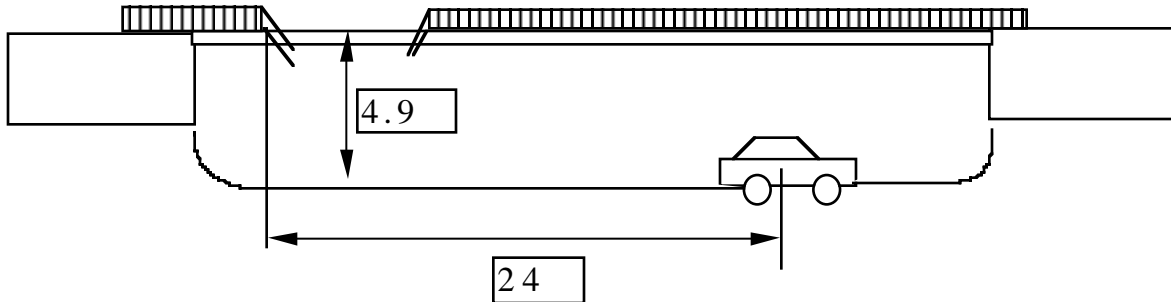
c) Connect the positions with a smooth curve to show the path of the cannonball.

2. On FIGURE 2, the same cannon is pointed above the horizontal. Using the same distances of fall, and the same scale of 1 cm = 10 m, draw the positions of the cannonball on FIGURE 2 as it falls below the dashed line. Then connect the positions with a smooth curve to show the path of the cannonball.



3) A zoo keeper devises a rubber band gun to shoot food to a monkey who is too shy to come down from the trees. If the monkey does not move, should the keeper aim above, at or below the monkey ?

4) Suppose that you are an accident investigator and you are asked to determine whether or not the car was speeding before it crashed through the rail of the bridge and into the mud bank as shown below. The speed limit on the bridge is $55\text{mph} = 24\text{ m/s}$. What is your conclusion ?



(Average falling speed)

5) If a rock falls for 1 second, what is its average speed during that second ?

- a) 0 ft/s b) 1 ft/s c) 4 ft/s d) 16 ft/s e) 32 ft/s

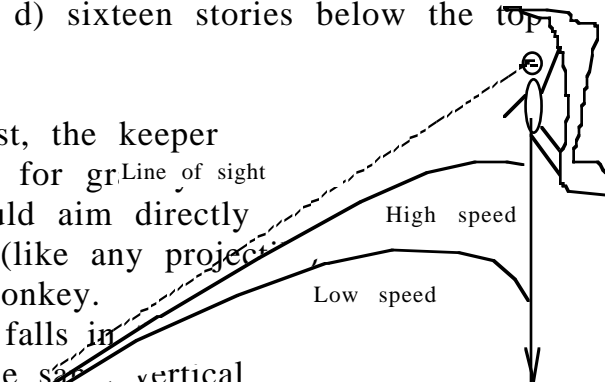
6) To be sure that you understood the previous answer, consider this: if a rock falls for 2 seconds what would be its average speed during the two seconds ?

- a) 1 ft/s b) 4 ft/s c) 16 ft/s d) 32 ft/s e) 64 ft/s

7) The carpenter at the top of a tall building drops his hammer. In one second it falls 1 story down from the top. In one more second it will be ...

- a) two stories below the top b) three stories below the top
 c) four stories below the top d) sixteen stories below the top
 e) none of the above

Answers: 3) When the monkey remains at rest, the keeper should aim above the monkey to compensate for g . Line of sight
 But when the monkey drops, the keeper should aim directly at the monkey. Because of gravity, the food (like any projectile) will fall below a direct/straight line to the monkey. How far below ? As far below as the monkey falls in the same time. So the monkey and the food will fall the same vertical distance in the same time, and mid air contact is made.



4) class discussion, 5) d, 6) d, 7) c