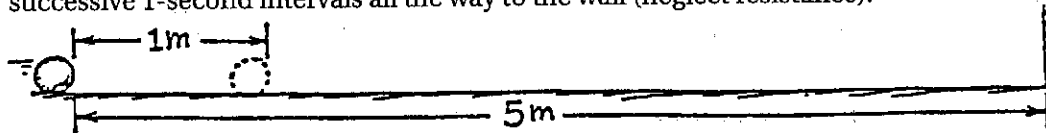


# Concept-Development Practice Page

# 2-1

## Non-Accelerated Motion

1. The sketch shows a ball rolling at constant velocity along a level floor. The ball rolls from the first position shown to the second in 1 second. The two positions are 1 meter apart. Sketch the ball at successive 1-second intervals all the way to the wall (neglect resistance).



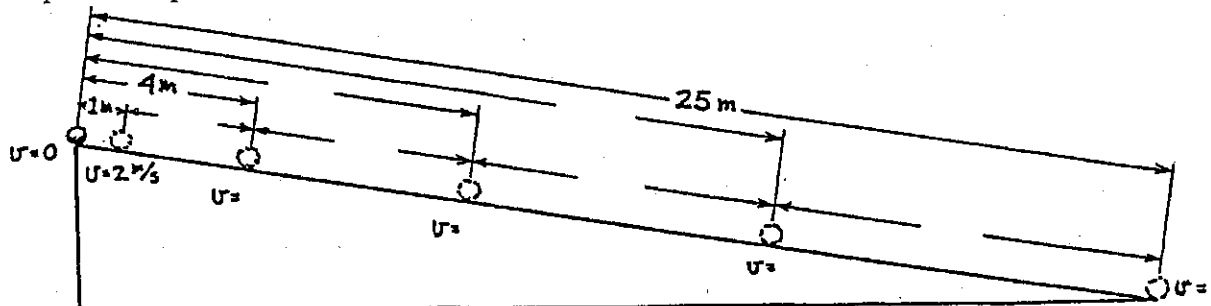
- a. Did you draw successive ball positions evenly spaced, farther apart, or closer together? Why?
- b. The ball reaches the wall with a speed of \_\_\_\_\_ m/s and takes a time of \_\_\_\_\_ seconds.
2. Table I shows data of sprinting speeds of some animals. Make whatever computations are necessary to complete the table.

ANIMAL	DISTANCE	TIME	SPEED
CHEETAH	75 m	3 s	25 m/s
GREYHOUND	160 m	10 s	
GAZELLE	1 km		100 km/h
TURTLE		30 s	1 cm/s

Table I

## Accelerated Motion

3. An object starting from rest gains a speed  $v = at$  when it undergoes uniform acceleration. The distance it covers is  $d = 1/2 at^2$ . Uniform acceleration occurs for a ball rolling down an inclined plane. The plane below is tilted so a ball picks up a speed of 2 m/s each second; then its acceleration  $a = 2 \text{ m/s}^2$ . The positions of the ball are shown for 1-second intervals. Complete the six blank spaces for distance covered, and the four blank spaces for speeds.



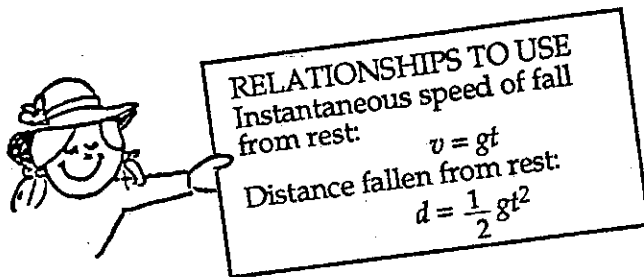
- a. Do you see that the total distance from the starting point increases as the square of the time? This was discovered by Galileo. If the incline were to continue, predict the ball's distance from the starting point for the next 3 seconds.
- b. Note the increase of distance between ball positions with time. Do you see an odd-integer pattern (also discovered by Galileo) for this increase? If the incline were to continue, predict the successive distances between ball positions for the next 3 seconds.

Now you're ready for "Merrily We Roll Along!" in the lab manual!

**Conceptual PHYSICS**

## Free Fall

4. A rock dropped from the top of a cliff picks up speed as it falls. Pretend that a speedometer and odometer are attached to the rock to show readings of speed and distance at 1-second intervals. Both speed and distance are zero at time = zero (see sketch). Note that after falling 1 second the speed reading is 10 m/s and the distance fallen is 5 m. The readings for succeeding seconds of fall are not shown and are left for you to complete. So draw the position of the speedometer pointer and write in the correct odometer reading for each time. Use  $g = 10 \text{ m/s}^2$  and neglect air resistance.



- The speedometer reading increases by the same amount, \_\_\_\_\_ m/s, each second. This increase in speed per second is called \_\_\_\_\_.
- The distance fallen increases as the square of the \_\_\_\_\_.
- If it takes 7 seconds to reach the ground, then its speed at impact is \_\_\_\_\_ m/s, the total distance fallen is \_\_\_\_\_ m, and its acceleration of fall just before impact is \_\_\_\_\_  $\text{m/s}^2$ .

