Non-Accelerated Motion
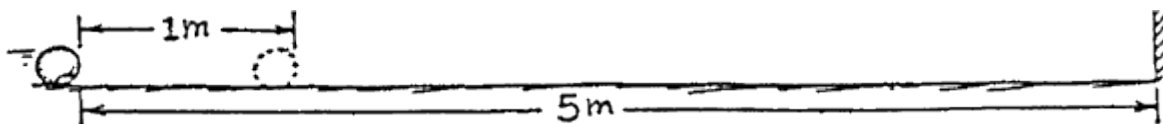
Refer to the following information for the next three questions.

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. Discuss and sketch the ball at successive 1-second intervals all the way to the wall (neglect resistance).

1. Would the successive ball positions be evenly spaced, farther apart, or closer together?

Why?

2. The ball reaches the wall with a speed of _____ m/s and takes a time of _____ seconds.

3. The table given below shows data of sprinting speeds of some animals. Make whatever computations are necessary to complete the table.

A =

B =

C =

animal	distance	time	speed
cheetah	75 m	3 sec	25 m/sec
greyhound	160 m	10 sec	C
gazelle	1 km	B	100 km/hr
turtle	A	30 sec	1 cm/sec

Accelerated Motion

**Refer to the following information for the next eight questions.**

4. An object, starting from rest, gains a speed **v = at** when it undergoes uniform acceleration. The distance it covers is **d = ½at²**. 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 m/s². The positions of the ball are shown for 1-second intervals. Fill in the blanks for total distance traveled, Δdistance traveled each second, and the final speed at the end of each interval.
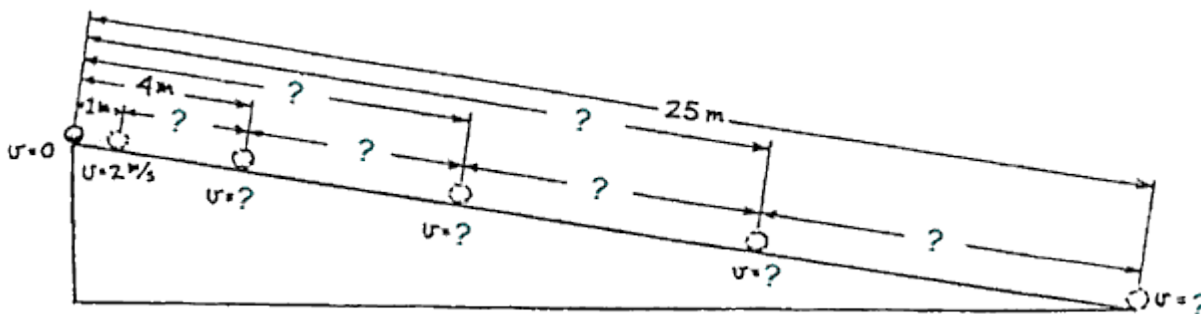
cumulative time (seconds)	cumulative distance traveled	Δdistance per second	final speed
0	0 meters	---	0 m/sec
1	1 meter	1 meter	2 m/sec
2	4 meters	3 meters	**I**
3	**D**	**F**	6 m/sec
4	**E**	**G**	**J**
5	25 meters	**H**	**K**

D=_____; E=_____; F=_____; G=_____; H=_____; I=_____; J=_____; K=_____
(Don't forget the Units)

5. 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.

6. 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.

7. Which vector diagram represents the greatest magnitude of displacement for an object?
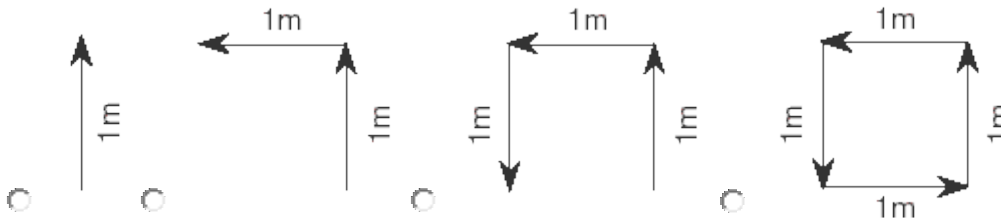
H 8. What would be the total displacement of a student who walks 3 blocks east, 2 blocks north, 1 block west, and then 2 blocks south?

H 9. A group of bike riders took a 4.0 hour trip. During the first 3.0 hours, they traveled a total of 50. kilometers but during the last hour they traveled only 10. kilometers. What was the group's average speed for the entire trip?

○ 13 km/hr   ○ 15 km/hr   ○ 30. km/hr   ○ 40. km/hr

H 10. Now, suppose a car travels 90. meters due north in 15 seconds. Then the car turns around and travels 40. meters due south in 5.0 seconds. What is the magnitude of the average velocity of the car during this 20.-second interval?

○ 2.5 m/s   ○ 5.0 m/s   ○ 6.5 m/s   ○ 7.0 m/s

11. Which set of terms pairs up an initial vector quantity with its associated scalar quantity?

○ acceleration and velocity

○ displacement and distance

○ speed and time

○ instantaneous velocity and instantaneous speed

H 12. A baseball pitcher throws a fastball at 42 meters per second. If the batter is 18 meters from the pitcher, approximately how much time does it take for the ball to reach the batter?

○ 0.43 sec   ○ 0.86 sec   ○ 1.0 sec   ○ 2.3 sec

13. The position of two blocks at successive 0.20 second time intervals are represented by the numbered squares in the diagram below. The blocks are moving toward the right. Do the blocks ever have the same speed?
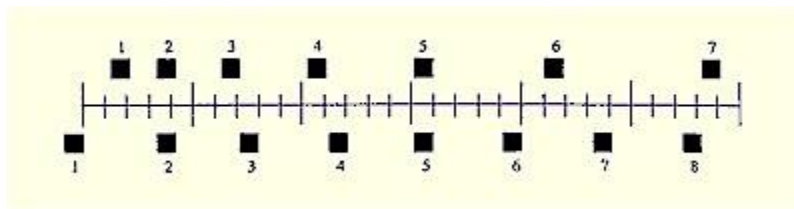
○ No.

○ Yes, at exactly 2.

○ Yes, at exactly 2 and then again at 5.

○ Yes, some time during interval from 3 to 4.

H 14. A motorist travels 400 km at 80 km/h and 400 km in at 100 km/h. What is the average speed of the motorist on this trip?

○ 84 km/hr   ○ 89 km/hr   ○ 90 km/hr   ○ 91 km/hr   ○ 95 km/hr

H 15. A toy car moves 0.80 m in 0.5 s at the constant velocity. If it continues, how far will it travel in a total of 3.0 s?

16. At a uniform speed you travel a distance of 72 cm in a time of 12 seconds. What was your average speed?

H 17. Your speed is uniform at 45 kilometers per hour. What distance did you travel in 20 minutes?

H 18. Your speed is uniform at 36 m/min. How much time would be needed to move 9.0 meters?

Refer to the following information for the next two questions.

19. This chart indicates three positions of an object as it traveled at a constant speed.

$P_1 = 0$	$t_1 = 0$
$P_2 = 15$ cm	$t_2 = 5$ sec
$P_3 = 30$ cm	$t_3 = 10$ sec

H a. How fast were it traveling at exactly 8.0 seconds?

H b. Where was the object located at exactly 8.0 seconds?

20. You drive a total of 300 kilometers in 6 hours. What was your average speed?

Refer to the following information for the next two questions.

21. Suppose you were able to drive 300 kilometers in 6 hours at a constant speed.

a. How fast were you traveling precisely 4.0 hours into your trip?

b. Where were you located precisely 4.0 hours into your trip?

22. Your average speed is 76 cm/sec, computed over a distance of 418 cm. How much time was required to travel 418 cm?

23. Your average speed is 44 m/sec, computed over a time interval of 0.20 sec . What total distance was traveled during 0.20 seconds?

H 24. You run 100 meters at a speed of 5.0 m/sec and then you walk 100 meters at a speed of 1.0 m/sec. What is your average speed for this entire exercise period?

H 25. You run for 100 seconds at a speed of 5.0 m/sec and then you walk for 100 seconds at a speed of 1.0 m/sec. What is your average speed?

26. The following table represents a group's data for the motion of their ball down a hill.

t	position
sec	m
0	0
0.5	0.25
1	1
1.5	2.25
2	4
2.5	6.25
3	9
3.5	12.25
4	16
4.5	20.25
5	25

H What was the ball's acceleration?

27. The following table represent a group's data for the motion of their car down the hallway.

t	position
sec	m
2	5
2.8	9.8
3.6	16.2
4.4	24.2
5.2	33.8
6	45
6.8	57.8
7.6	72.2
8.4	88.2
9.2	105.8
10	125

R

**H** What acceleration did the cart experience?

28. REVIEW: What will happen when two objects with opposite electric charges are moved closer together?

○ A. The objects will attract each other with a greater force.

○ B. The objects will attract each other with a smaller force.

○ C. The objects will repel each other with a greater force.

○ D. The objects will repel each other with a smaller force.

29. REVIEW: A current of 2 A passes through an 8 V load. What is the potential difference across the load?

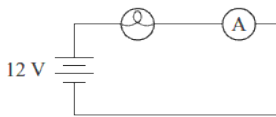 A.   B.   C.   D.
0.25 V 4.0 V   10 V   16 V

30. REVIEW: The circuit shown below has two resistors in series.
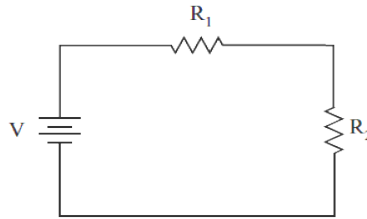
Which of the following equations represents the current flowing through the two resistors?

A. $I = V + R_1 + R_2$ B. $I = R_1 + R_2$ C. $I = V(R_1 + R_2)$ D. $I = \dfrac{V}{R_1 + R_2}$
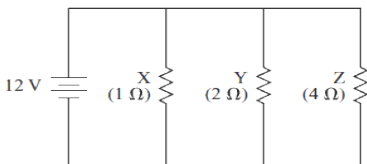
31. REVIEW: The diagram below shows a circuit with a light bulb, an ammeter, and a 12 V battery.

The light bulb is lit for 30 s. The ammeter displays a current of 0.60 A. What is the power rating for this circuit?

A. 1.5 W   B. 7.2 W   C. 18 W   D. 216 W

32. REVIEW: Which of the following statements best describes the current flowing through the resistors in this circuit?

A. Resistor Y has the least current.

B. Resistor X has the greatest current.

C. Resistor Z has twice the current of resistor Y.

D. Each resistor has the same amount of current flowing through it.

33. REVIEW: A student has a circuit that is missing a component at location X, as shown in the diagram below.
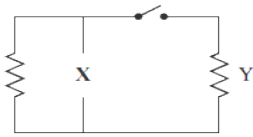
The student wants component Y to warm up after the switch is closed. Which of the following components should the student add to the circuit at location X?

A. (A)   B. ⊣⊢   C. (resistor)   D. (V)

34. REVIEW: A neutral balloon is rubbed with a piece of wool cloth. As a result, the balloon has a negative static charge. Which of the following statements best explains why the balloon has a negative charge?

A. The balloon is a conductor.

B. The balloon is an insulator.

C. The balloon transfers charges to the cloth.

D. The balloon receives charges from the cloth.

35. REVIEW: The human ear is most sensitive to sound that has a frequency of about 4000 Hz. Assume that the speed of sound in air is 340 m/s. What is the wavelength of a sound heard in the air with this frequency?

A. 0.043 m   B. 0.085 m   C. 12 m   D. 340 m

36. REVIEW: An appliance draws 4 A of current when connected to 120 V. What is the resistance of the appliance?

A. 0.03 ohms   B. 30 ohms   C. 124 ohms   D. 480 ohms

37. REVIEW: Which of the following graphs best represents how the force between two identical electric charges varies as the charges move away from each other?

A.   B.   C.   D.
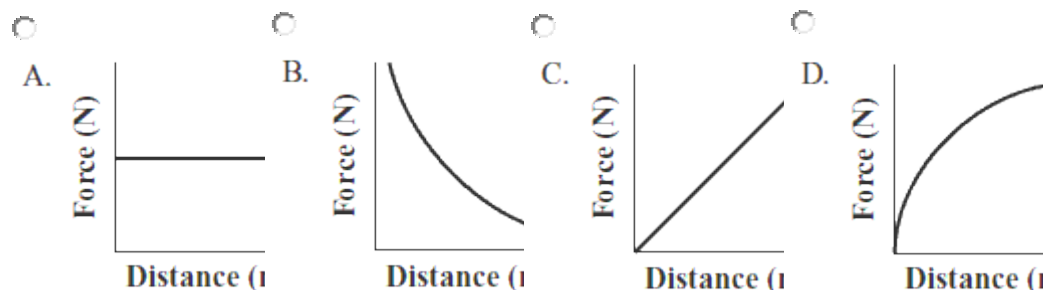
Refer to the following information for the next four questions.

38. REVIEW: A student performs an experiment to determine the relationships among voltage, current, and resistance. The student's procedure includes the following steps:

- Connect a 3.0 V battery to a 42-ohm resistor.
- Measure the current using an ammeter and record the value.
- Replace the 42-ohm resistor with a 54-ohm resistor, and then with a 66-ohm resistor, measuring and recording the current for each resistor.

The table below shows the data collected.

Student's Data

Resistance (Ω)	Current (A)
42	0.071
54	0.056
66	0.045

a. Draw a schematic diagram of the student's original circuit with the 42-ohm resistor. Be sure to label the battery and the resistor. INCLUDE THE AMMETER

b. Describe in words the relationship between current and resistance as voltage is held constant.

39. REVIEW: Two positively charged objects are separated by a large distance. One of the positively charged objects is replaced by a negatively charged object, and the two objects are moved closer to each other. Which of the following occurs in this situation?

○ A. The attractive force becomes a repulsive force, which increases as the objects move closer to each other.

○ B. The repulsive force becomes an attractive force, which increases as the objects move closer to each other.

○ C. The attractive force becomes a repulsive force, which decreases as the objects move closer to each other.

○ D. The repulsive force becomes an attractive force, which decreases as the objects move closer to each other