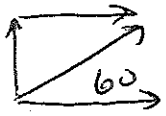
Name: _____ Class: _____ Date: _____ ID: A

#2 Motion Practice Test

Multiple Choice

Identify the choice that best completes the statement or answers the question.

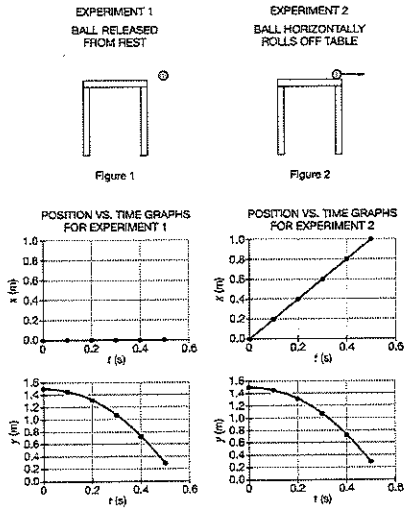


$\cos(60) \cdot 20 = 10$ m/s

B 1. A ball is thrown with an initial speed of 20 m/s at an angle of 60° to the ground. If air resistance is negligible, what is the ball's speed at the instant it reaches its maximum height from the ground?

a. zero b. 10 m/s c. 14 m/s d. 17 m/s

____ 2.



d (#1-1) A student wants to investigate the motion of a ball by conducting two different experiments, as shown in Figure 1 and Figure 2 above. In Experiment 1, the student releases a ball from rest and uses a slow-motion camera to film the ball as it falls to the ground. Using video analysis, the student is able to plot the ball's horizontal position x and vertical position y as a function of time t. In Experiment 2, the student horizontally rolls the same ball off a table, and uses video analysis to plot the ball's horizontal position x and vertical position y as a function of time t starting from the instant the ball leaves the table. The graphs from each experiment are shown above along with each graph's best-fit curve line.

Which of the following conclusions can the student draw from the graphs, and why?

a. The horizontally rolled ball travels a greater horizontal distance and takes a longer amount of time to reach the ground.

b. The released ball travels with a slower speed and takes a longer amount of time to reach the ground.

c. Since both balls have zero horizontal acceleration, they reach the ground at the same time.

d. Since the balls have the same vertical position at any given time, they reach the ground at the same time.

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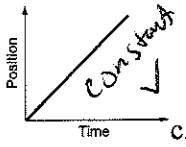
A

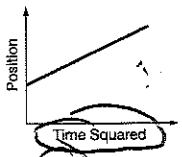
3. (#1-1) A student is provided with a battery-powered toy car that the manufacturer claims will always operate at a constant speed. The student must design an experiment in order to test the validity of the claim. Which of the following measuring tools can the student use to test the validity of the claim? Select two answers.
   (A.) Photogates placed at the beginning, end, and at various locations along the track that the car travels on
   (B.) A meter stick to measure the distance of the track that the car travels on
   C. A motion detector that is oriented perpendicular to the direction that the car travels.
   D. A mass balance to determine the mass of the car
   a. A and B
   b. B and C
   c. C and D
   d. A and D

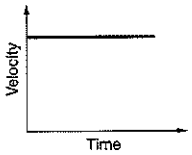
d/t = speed

___ 4. (#1-1) An object undergoes an acceleration as it travels along a straight, horizontal section of a track. Which of the following graphs could represent the motion of the object? Select two answers.

a. 

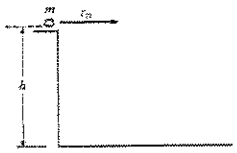
b. 

c. 

d. 

a. A and B
b. A and C
c. B and D
d. B and C

___ 5.

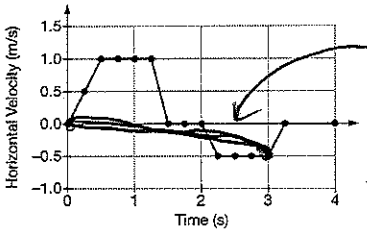


(#1-1) A rock of mass m is thrown horizontally off a building from a height h, as shown above. The speed of the rock as it leaves the thrower's hand at the edge of the building is vo
How much time does it take the rock to travel from the edge of the building to the ground?

a. $\sqrt{hv_0}$
b. h/v_0
c. $2h/g$
d. $\sqrt{2h/g}$

Solve using d. standard formula

___ 6.

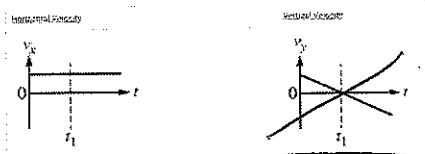


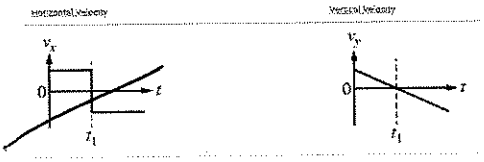
negative slope
- area under curve is distance traveled

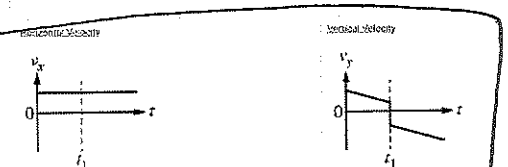
(#1-1) A motion sensor is used to create the graph of a student's horizontal velocity as a function of time as the student moves toward and away from the sensor, as shown above. The positive direction is defined as the direction away from the sensor. Which of the following describes the student's final position xf in relation to the starting position x0 and the student's average horizontal acceleration ax between 0.0?s and 3.0s?

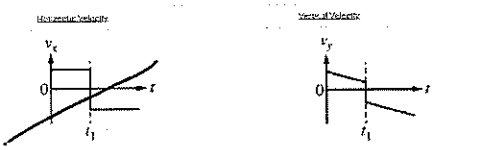
a. Position x_f is farther away from the sensor than x_0, and ax is positive.
b. Position x_f is farther away from the sensor than x_0, and ax is negative.
c. Position x_f is closer to the sensor than x_0, and ax is positive.
d. Position x_f is closer to the sensor than x_0, and ax is negative.

____ 7. (#1-1) In a classroom at time t = 0 , a sphere is thrown upward at a 45° angle to the horizontal. At time t1, while the sphere is still rising, it bounces off the ceiling elastically and with no friction. Which of the following pairs of graphs could represent the sphere's horizontal velocity and vertical velocity as functions of time t?

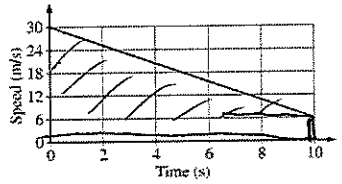
a. 

c. 

b. 

d. 

Sharp change in direction in the y direction, Not in x.

____ 8. 

$a=0$

$X_f = X_i + v_i t + \frac{1}{2}at^2$

$X_f = v_i t$

(#1-1) The graph above shows the speed of a truck as it moves along a straight, level road. Which of the following describe a method to determine the distance d the truck travels during the 10 s time interval shown? Select two answers.

a. Multiply the average speed of 18 m/s by the 10 s travel time.

b. Multiply half the initial speed of 30 m / s by the 10 s travel time.

c. Calculate the slope of the line in the graph to determine the acceleration a and then use d = (1/2)at2 , where t is the travel time.

(d.) Calculate the area under the line in the graph.

____ 9. (#1) Two objects, X and Y, accelerate from rest with the same constant acceleration. Object X accelerates for twice the time as object Y. Which of the following is true of these objects at the end of their respective periods of acceleration?

a. Object X is moving at the same speed as object Y.

b. Object X is moving four times faster than object Y.

c. Object X has traveled the same distance as object Y.

d. Object X has traveled four times as far as object Y.

X: $v_f = v_i + at$ ($v_i = 0$, $t \to 2t$)

Y: $v_f = v_i + at$ ($v_i = 0$, $\times 2\ v_f$)

$X_f = v_i t + \frac{1}{2}at^2$ ($v_i = 0$)

$X_f = \frac{1}{2}at^2$, $2^2 = 4$, $\times 4$

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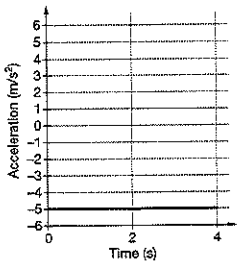
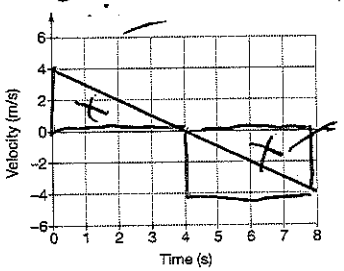
___ 10.



(#1) An object is released from rest near a planet's surface. A graph of the acceleration as a function of time for the object is shown for the 4s after the object is released. The positive direction is considered to be upward. What is the displacement of the object after 2s?

a. -20m b. -10m c. 0m d. 20m

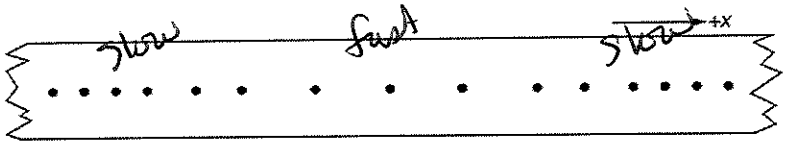
___ 11.



(#1) An object is sliding to the right along a straight line on a horizontal surface. The graph shows the object's velocity as a function of time. What is the object's displacement during the time depicted in the graph?

a. 0m b. 1m c. 8m d. 16m

___ 12.



A student performs an experiment in which the horizontal position of a toy car is recorded on ticker tape from a device that places dots on the tape in equal time intervals. The series of dots in the figure represents the motion of an object moving from the negative direction to the positive direction along the horizontal direction. The time interval between each recorded dot is 1s. Which of the following experiments could the student have conducted to create the data shown on the ticker tape?

a. A toy car that initially increases its speed, travels at a constant speed, and then increases its speed again.

b. A toy car that initially increases its speed, travels at a constant speed, and then decreases its speed.

c. A toy car that initially decreases its speed, stops, and then increases its speed.

d. A toy car that initially decreases its speed, travels at a constant speed, and then increases its speed.

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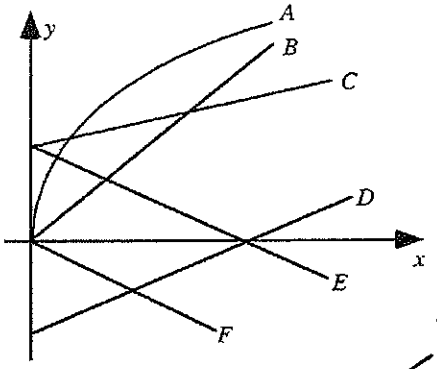
Short Answer

13.

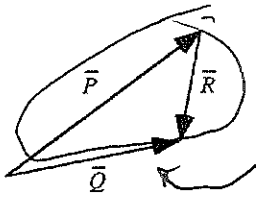
Six y- versus x- graphs are shown on a single set of axes.



Which, if any, of these graphs is consistent with the statement *"If x doubles, then y also doubles?"* B

Explain your reasoning.

14.

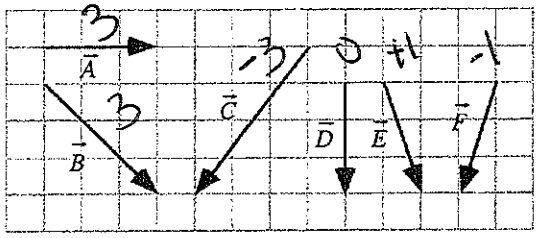


Which of the following vector equations correctly describes the relationship among the vectors shown in the figure?

A	B	C	D	E
$\vec{P}+\vec{Q}=\vec{R}$	$\vec{P}=\vec{Q}+\vec{R}$	$\vec{P}+\vec{R}=\vec{Q}$	$\vec{P}+\vec{Q}+\vec{R}=0$	None of equations $A-D$ is correct.

Explain your reasoning.

15.



(a) Rank the magnitudes of the x-components of each vector.

A = B = C	E = F	D	OR			
1 Greatest	2	3	4	5	6 Least	All the same	All zero	Cannot determine

Explain your reasoning.

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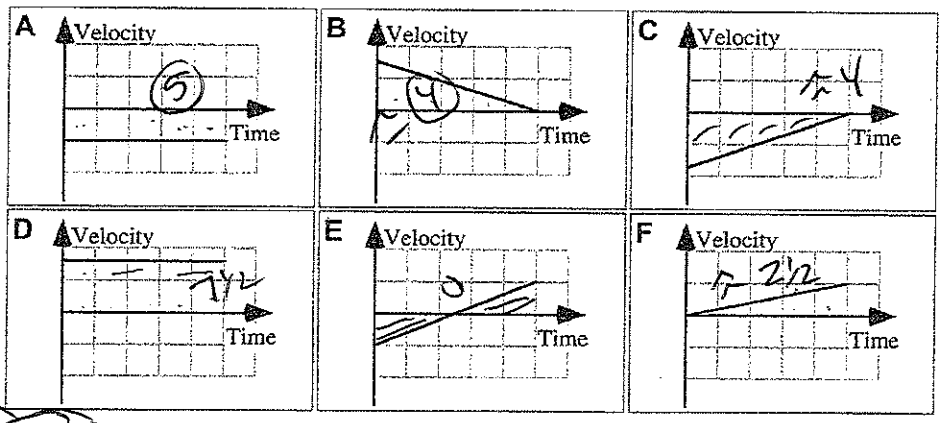
16.

Velocity-time graphs for six toy robots that are traveling along a straight hallway are shown. All graphs have the same time and velocity scales.



Rank the distance traveled during these intervals.

D | A | B = C | F | E OR ☐ All the same ☐ All zero ☐ Cannot determine

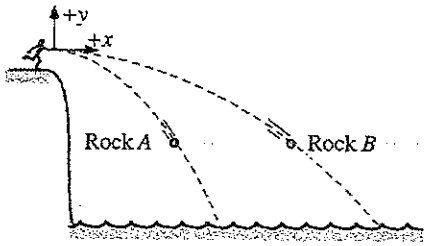
1 Greatest 2 3 4 5 6 Least

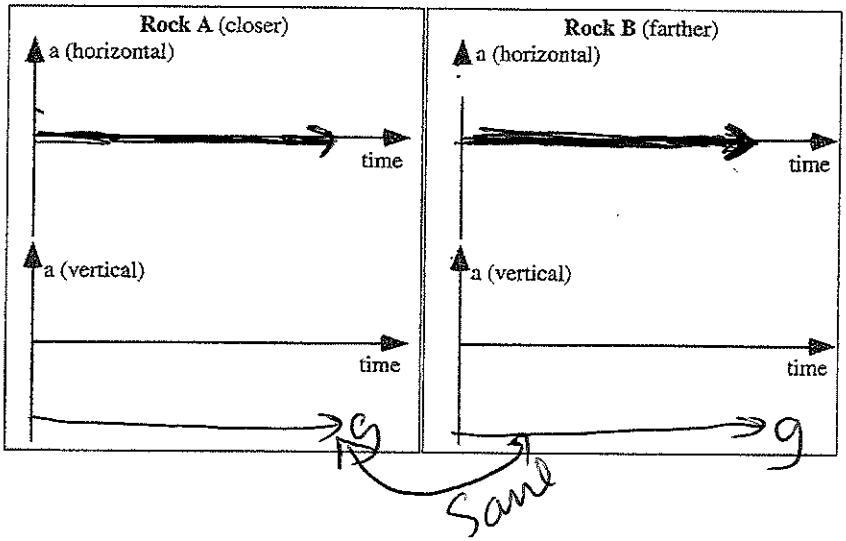
Explain your reasoning.

17.

Two students throw two rocks horizontally from a cliff with different velocities. Both rocks hit the water below at the same time, but Rock B hits farther from the base of the cliff. Use coordinates where up is the positive direction, away from the cliff is the positive horizontal direction, and the origin is at the top of the cliff at the point of release.

Sketch the acceleration versus time graphs for each rock.





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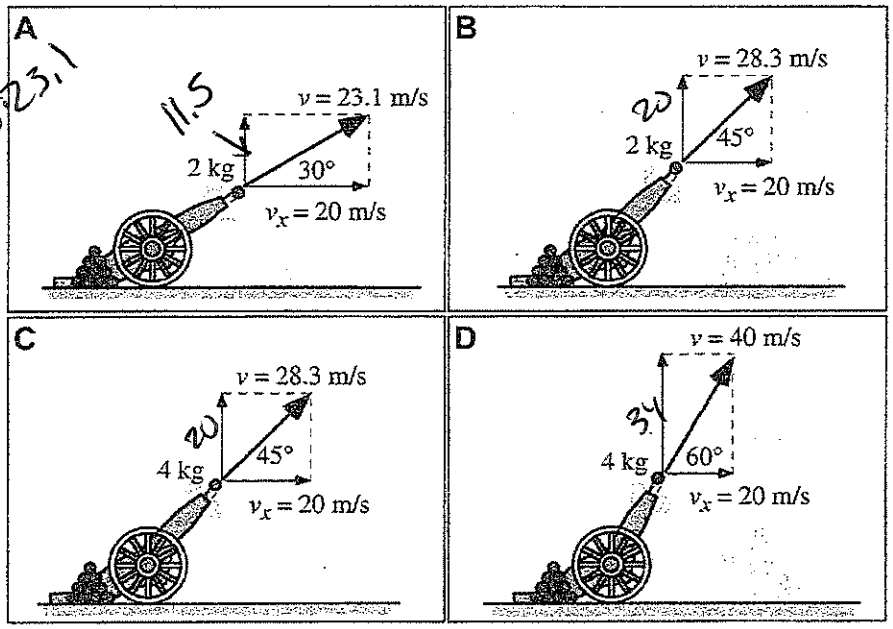
18.



Rank the horizontal distance traveled by the cannonballs.

D	C = B	A	OR			
1 Greatest	2	3	4 Least	All the same	All zero	Cannot determine

Explain your reasoning.

all had same x - so who ever is in the air longest will go the furthest.

Longest y = Longest time

*Mass means nothing

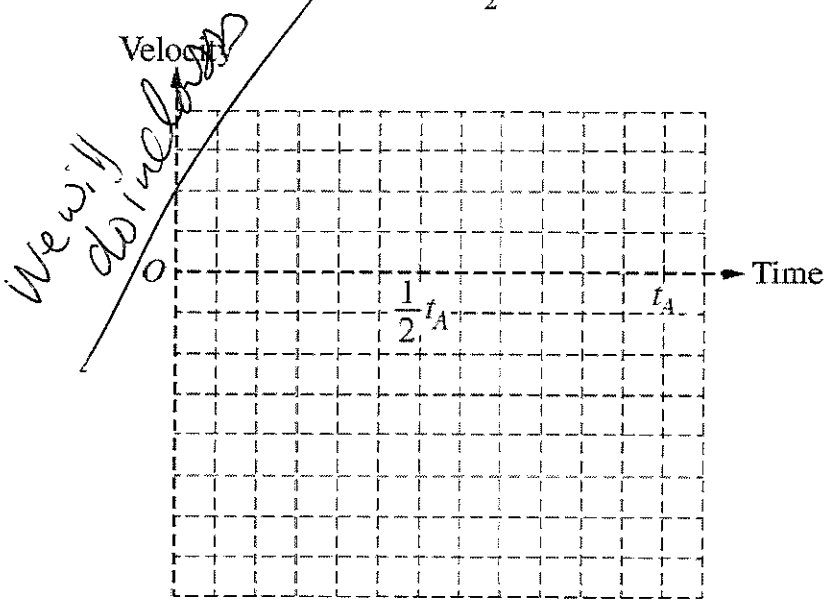
19.

(7 points, suggested time 13 minutes)

In an experiment two identical rocks are simultaneously thrown from the edge of a cliff a distance h_0 above the ground. Rock A is thrown vertically upward with speed v_0 and rock B is thrown vertically downward with speed v_0. Rock A and rock B strike the ground at times t_A and t_B, respectively. Consider the positive vertical direction to be upward.

(a) On the axes given below, sketch and label graphs of the velocity as a function of time for rock A and rock B.

Label the time t_B. Times t_A and $\frac{1}{2}t_A$ are given on the graph.



We will do in class

See Rubric in class

(b) Rock B hits the ground at time t_B. Derive an equation for the time t_A it takes rock A to hit the ground in terms of v_0, t_B, and physical constants, as appropriate.