2D (Projectile Motion) Test Review

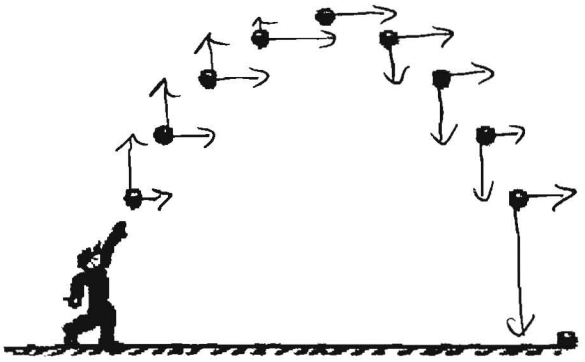
Name KEY

Assume all questions are on Earth and air resistance is zero.

.Date **Pd**

1. You throw a ball up..

   a. At each of the data points in the drawing, label the vertical and horizontal velocity vectors.
   b. In the space below, draw a force diagram for the ball during its trajectory when it is…
   c. Where is the vertical velocity zero? Circle that dot.



On the way up At the peak On the way down

2. You drop a tennis ball from the roof of Irondale. How fast will it be going after 1 second? 2 seconds?

After 1s = $-9.8\ m/s$

After 2s = $-19.6\ m/s$

$V_f = at + V_i$ $V_i = 0$ $a = -9.8\ m/s^2$

3. A potato is shot straight up from a sling shot (why not?) at 30 m/s. What is its velocity 2 seconds later? 3 seconds later? (you can approximate free fall acceleration as $-10 m/s^2$)

After 2s = $10\ m/s$

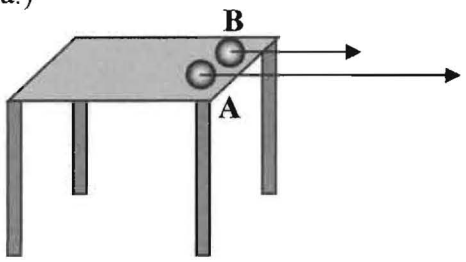
After 3s = $0\ m/s$

$V_f = at + V_i$ $V_i = 30\ m/s$ $a = -10\ m/s^2$

4. A toy rocket is launched straight up at 80 m/s. When it returns to starting position, will its speed be:
   a) greater than 80 m/s b) less than 80 m/s (c) equal to 80 m/s d) depends on time

5. Examine the following diagrams and answer the questions for each.

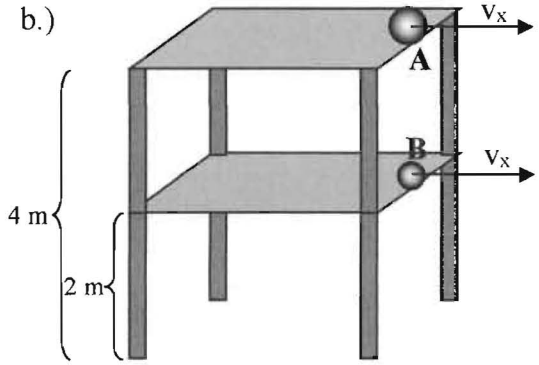
a.)



Two marbles of equal mass, A and B, are launched off a table. Marble A has twice the horizontal velocity.

Which marble will hit the floor first? Neither - same time
Which marble will travel farther? A
Why?
A has faster velocity - can travel farther in same amount of time

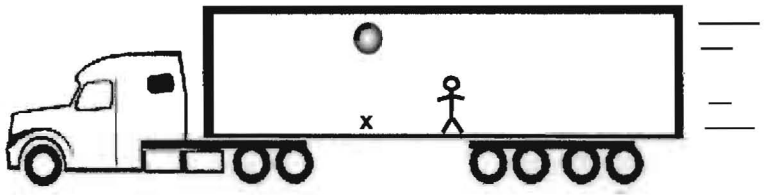
b.)



Marble A has twice the mass of Marble B.
Marble A is launched from twice the height as Marble B.
They are launched at the same horizontal velocity.

Which marble will hit the floor first? B
Which marble will travel farther? A
Why? A spends more time in the air so it will travel farther

6. A semi trailer drives at a constant velocity of 60 mi/hr. Inside the trailer, a ball is held directly above an "x" painted on the floor and dropped.



a.) Where will the ball land? Why?

On the x. The ball and trailer have the same horizontal velocity.

b.) What kind of a trajectory (shape) would the person inside the trailer see the ball follow? Why?

He or she would see it fall straight down. The person has the same horizontal velocity as the ball.

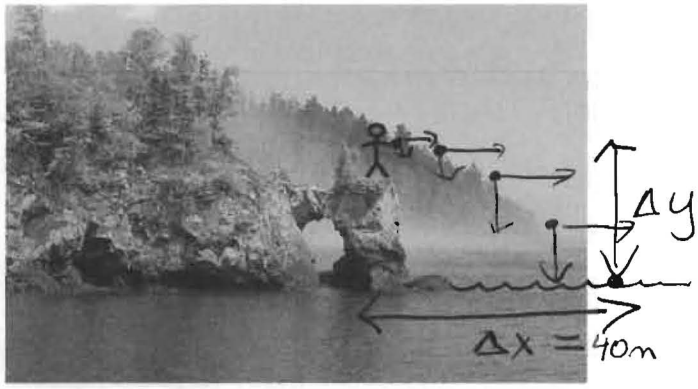
c.) A person with x-ray vision is standing on the side of the road watching this happen. Where would this person see the ball land? Why?

The ball would still land on the X. Same as question "a".

d.) What kind of trajectory (shape) would this person see the ball follow? Why?

A parabolic curve. From a perspective outside the trailer, the ball has a constant horizontal velocity and is accelerating downward due to gravity.

7. You throw a rock straight out from a 15 m high cliff. The rock lands 40 m from the base of the cliff.
   a.) Draw the rock's trajectory and label the picture with its Δx and Δy values.
   b.) Starting at t=0, draw several data points at equal intervals of time along the rock's trajectory.
   c.) At each data point, sketch the v_x and v_y vectors, as needed.



	horizontal	vertical
same	v_i =	$v_i = 0$
same	v_f =	v_f =
	$a = 0$	$a = -9.8\ m/s^2$
	$t = 1.75\ s$	$t = 1.75\ s$
	$\Delta x = 40\ m$	$\Delta y = -15\ m$

d.) How long did it take the rock to hit the water?

$\Delta y = \frac{1}{2}at^2 + v_i t$

$\frac{-15\ m}{\frac{1}{2}(-9.8\ m/s^2)} = \frac{\frac{1}{2}(-9.8\ m/s^2)t^2}{\frac{1}{2}(-9.8\ m/s^2)} + 0$ $\quad \sqrt{t^2} = \sqrt{3.06\ s^2}$

$t = 1.75\ s$

e.) How fast was the rock thrown?

$\Delta x = \frac{1}{2}at^2 + v_i t$

$\frac{40\ m}{1.75\ s} = \frac{\frac{1}{2}(0)(1.75\ s)^2}{1.75\ s} + \frac{v_i(1.75\ s)}{1.75\ s}$ $\quad v_i = 22.9\ m/s$