AP Physics Tennis Ball Lab

Setup:

* Given the following video determine the x(t) and y(t) for the ball between the two bounces.
* <http://moodle2.cherokee.k12.ga.us/creekview_hs/pluginfile.php/1186/mod_page/content/2/video_clip_tennis_ball.v3%20%281%29.mov>

Information:

* Video is 61 frames long
* 30frames/second
* 2.7m between the poles

Goal:

* Discover what:
	+ x(t) =
	+ y max is

Procedure:

Part one finding x(t)

Time at pole a is $16 frames ÷\frac{30frames}{second}=.5333 seconds$

Time at pole b is $36 frames ÷\frac{30frames}{second}=1.2 seconds$

$1.2-.5333=.6667 seconds$ = how long it takes the ball to go 2.7 meters

$$v\_{x}=\frac{2.7meters}{.6667seconds}=\frac{4.05meters}{second}$$

Time of bounce a is$4 frames ÷\frac{30frames}{second}=.1333seconds$

Time of bounce b is $43frames÷\frac{30frames}{second}=1.4333seconds$

$1.4333-.1333=1.2seconds=$ time of the motion of the projectile

$x\left(t\right)=\frac{4.05meters}{second}\*1.2seconds=4.86meters$

Part two finding y(t)

Y at max is at $\frac{t}{2}=\frac{1.2seconds}{2}=.6seconds$

$$a=g=-\frac{9.8meters}{second}$$

$$v\_{f}=0 since the velocity in the y direction of a projectile at its peak is equal to 0$$

$$v\_{f}= v\_{i}+ at$$

$$0= v\_{i}+ -\frac{9.8meters}{second^{2}}\*.6seconds$$

$$0= v\_{i}-\frac{5.88meters}{second}$$

$$\frac{5.88meters}{second}= v\_{i}$$

Y at max is equal to $y\_{f}$

$$y\_{f}= y\_{i}+v\_{i}\*t+\frac{1}{2}\*a\*t^{2}$$

$$y\_{f}=0+\frac{5.88meters}{second}\*.6seconds+\frac{1}{2}\*-\frac{9.8meters}{second^{2}}\*.6seconds^{2}$$

$$y\_{f}=3.528meters+ -2.94$$

$$y\_{f}=0.588meters$$

So y at max is equal to 0.588 meters

Conclusion:

 From the information given about the video it has been determined that the tennis ball at max height was .588 meters in the air. It has also been concluded that the distance the ball went in the x direction over the course of the bounce was 4.86 meters.