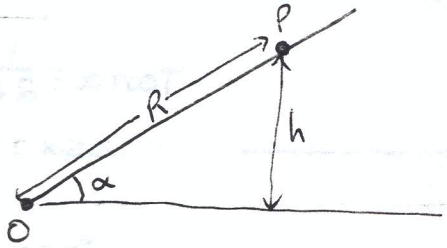
SHOW ENERGIES SAME at O and P.



$\frac{h}{\text{Range}} = \sin\alpha$

$\Rightarrow h = \text{Range}\sin\alpha$

$\Rightarrow h = \text{Range}\frac{1}{\sqrt{13}}$

Energy at O

PE+KE

$0 + \frac{1}{2}mu^2$

$0 + \frac{1}{2}m(u\cos\alpha)^2 + (u\sin\alpha)^2$

$0 + \frac{1}{2}m(u^2\cos^2\alpha + u^2\sin^2\alpha)$

$= \frac{1}{2}mu^2$

Energy at P

KE+PE

$\frac{1}{2}m|\vec{v}(t)|^2 + mgh$

$\frac{1}{2}m\left[0^2 + \left(\frac{u\sqrt{3}}{2}\right)^2\right] + mg\left(\text{Range}\frac{1}{\sqrt{13}}\right)$

$\frac{1}{2}m\left(\frac{u^2 3}{4}\right) + mg\frac{u^2\sqrt{13}}{8g}\left(\frac{1}{\sqrt{13}}\right)$

$\frac{3}{8}mu^2 + \frac{1}{8}mu^2$

$= \frac{1}{2}mu^2$

Need Range $= R(A)\vec{i}$

$= u\cos 60[T] - \frac{g\sin\alpha}{2}T^2$

$= \frac{u}{2}\left[\frac{u\sqrt{13}}{2g}\right] - g\left(\frac{1}{\sqrt{13}}\right)\left[\frac{u\sqrt{13}}{2g}\right]^2$

$\frac{u^2\sqrt{13}}{4g} - \frac{u^2\sqrt{13}}{8g}$

$= \frac{u^2\sqrt{13}}{8g}$.