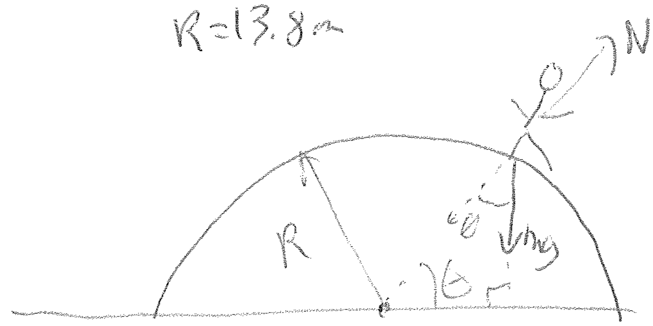
8-34

Kid is sliding on ice ball.



The net inward force (towards the middle) is $mg\cos\theta - N$

Going around in a circle, Centripital force is $\frac{mv^2}{R}$ = net inward force

When he leaves the ice, "N" disappears,

so $mg\cos\theta - N^{\to 0} = \frac{mv^2}{R}$

or $v^2 = gR\cos\theta$

Oh, but what's θ?

Conserve energy. at start $U = mgR$, $K=0$

at θ, $U = mgR\cos\theta$, $KE = \frac{1}{2}mv^2$

so: $\frac{1}{2}mv^2 + mgR\cos\theta = mgR$

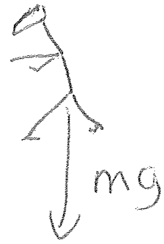
solve for v^2: $v^2 = 2gR(1-\cos\theta) = gR\cos\theta$

$2 - 2\cos\theta = \cos\theta$

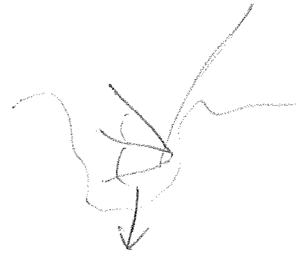
$\cos\theta = 2/3$

so $h = R\cos\theta = 2/3 R = 9.20\,m$

9-34



Closeup of foot:



$m_{foot} = 3.00g$

$v_{foot} = 1.5\ m/s$

$t_{step} = 0.600s$

a) foot slaps water, pushes down, pulls it back up before water comes in.

Foot slap: change momentum of foot going down enough to stop it as IT hits the water.

so: $\Delta p = 0 - m_{foot} v_{foot} = -(0.003kg)(-1.5m/s) = 4.50 \times 10^{-3}\ N \cdot s$

b) What's downward impulse during each step due to gravity?

Eq. 9-35: $\vec{J} = \vec{F}_{avg} \Delta t = mg\Delta t = (0.090kg)(9.8m/s^2)(0.60s)$

$\vec{J} = 0.529\ N \cdot s$

c) we know the lizard manages not to sink, so $\vec{J}_{grav}$ must be equalled by $\vec{J}_{slap} = \Delta p = 4.50 \times 10^{-3}\ N \cdot s$ plus $\vec{J}_{push}$.

we don't know anything about the push, but it somehow makes $(0.529 - 0.0045)\ N \cdot s$ of impulse,

Or nearly all is the push not the slap