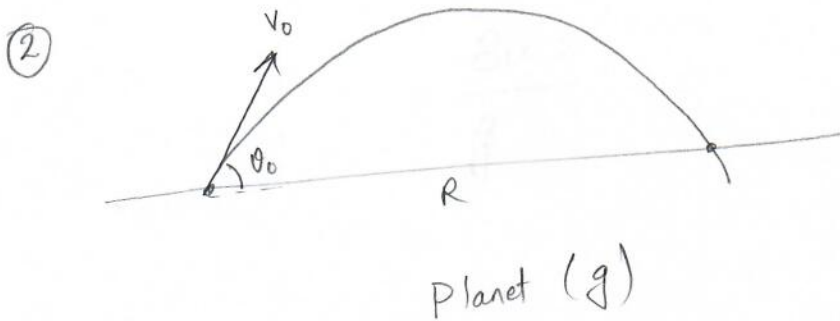


Date: 2023 Feb 11

Long jump

(Range of a projectile)

①
$$R = \frac{V_0^2 \sin 2\theta_0}{g}$$
 V_0, θ_0



③ $R =$ Long jump \rightarrow Norway 9.82 9.86
 \rightarrow Singapore 9.78 \rightarrow 9.76

$V_0 = 12 \text{ m/s}$ $\theta_0 = 45^\circ$
 $R = 14.6 \text{ m}$ ($g = 9.86$)
 $R = 14.8 \text{ m}$ ($g = 9.76$)
 8.95 m.

④ Human - ~~max~~ avg. 10. m/s \rightarrow 12 m/s jump - 10 m.
 Cheetah - 30. m/s. Stride = 7 m.
 Snow leopard -
 Dolphin (Spinner dolphins, our planet, netflix, 2.37 s) jump - 15 m (Bobcat jump (Asmeel Shah) YouTube)

⑤ Air resistance $r = \frac{v}{g} = \frac{60 \text{ m/s}}{g} \approx 6.0 \text{ s}$
 typical stride time $< 1 \text{ s} \Rightarrow$ less than 5%.

⑥ Royal penguins, South Pacific, YouTube,



$$\frac{mv^2}{r} = mg - N$$

$$N = mg - \frac{mv^2}{r}$$

$$b = \frac{\text{kg}}{\text{s}}$$

$$\frac{1500 \text{ N}}{6} \approx 250 \frac{\text{N}}{\text{m/s}}$$

$$\gamma = \frac{m}{b} = \frac{v}{g}$$

$$b = \frac{m}{\gamma}$$

$$bv = \frac{mv}{\gamma}$$

$$a = \frac{v}{\gamma}$$

①

g constant?

→ Long jump

②

Air resistance

$$mg = bv$$

$$\frac{m}{b} = \frac{v}{g} = \gamma = 6.0 \text{ s}$$

③

Long jump — Human