03-3

2022年6月12日 星期日 14:56

29 (1) 小石を投げ上げた時 $y=0\,m$ とする.

4.0s 后，小石の y = 気球の y

$= v\ 4.4\,m/s \cdot t\ 4.0\,s = 17.6\,m$

小石： $y = v_0 t + \frac{1}{2}at^2$

$17.6 = 4.0 v_0 - \frac{1}{2}\cdot 9.8 \cdot (4.0)^2$

$= 4v_0 - 78.4$

$v_0 = (78.4 + 17.6)/4$

$= 24\,m/s$ （鉛直上向）

(2) $V_{人石} = V_{石} - V_{人}$

$= (24 - 9.8\cdot 4.0) - 4.4$

$= -19.6$

$\fallingdotseq 20m$ （鉛直下向）

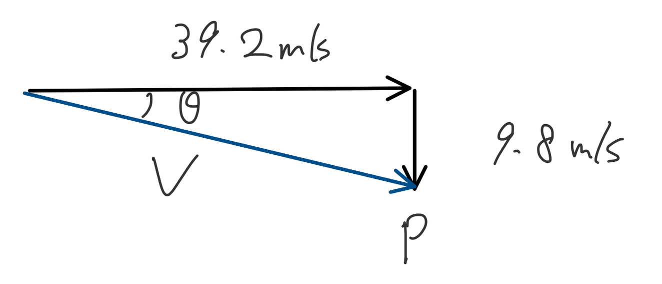
(3) $y_{石} = v_0 t + \frac{1}{2}at^2$

$= 24\cdot 6.0 + \frac{1}{2}\cdot(-9.8)\cdot 6.0^2$

$= -32.4$

$\therefore 32.4 \fallingdotseq 32\,m$

30 ~~(1)~~ $V = V_{飞} + V_b$



$\tan\theta = 1/4 = 0.25$

(1) 地上から见ると，荷物は $v_0 = 39.2\,m/s$ の

水平投射と同じ

t:= 落下时间，鉛直下向：+

$y = v_0 t + \frac{1}{2}at^2$

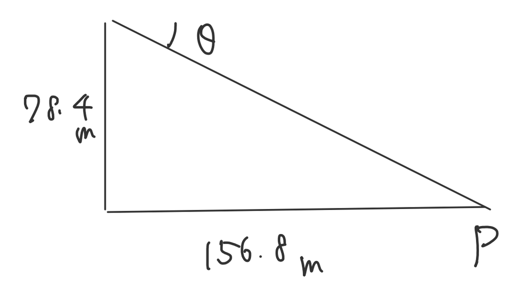
$\rightarrow 78.4 = 0 + \frac{1}{2}\cdot 9.8 t^2$

$t = \sqrt{78.4\cdot 2/9.8} = 4.0s$

$x = v_0 t + \frac{1}{2}at^2$

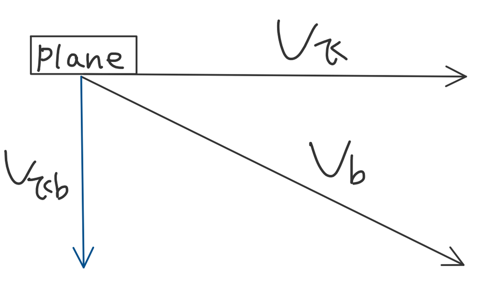
$= 39.2 \cdot 4.0 + 0$

$= 156.8\ m$



$\tan\theta = \frac{y}{x} = 0.50$

(2) $V_{飞b} = V_b - V_{飞}$



自由落下

~~(3)~~ 落下时间 $t = 4.0s$

$v_x = v_{0x} + a_x t$

$= 39.2 + 0\ m/s$

× $v_y = 39.2 \cdot \tan\theta$

$= 19.6\ m/s$

$v = \sqrt{39.2^2 + 19.6^2}$

$= 43.8\cdots$

$\fallingdotseq 44\,m/s$

$v_y = v_{0y} + a_y t$

$= 0 - 9.8\cdot 4.0$

$= -39.2$

$v = \sqrt{39.2^2 + (-39.2)^2}$

$= 55.4\cdots \fallingdotseq 55\,m/s$

求めた $\tan\theta$ は v とは无关系

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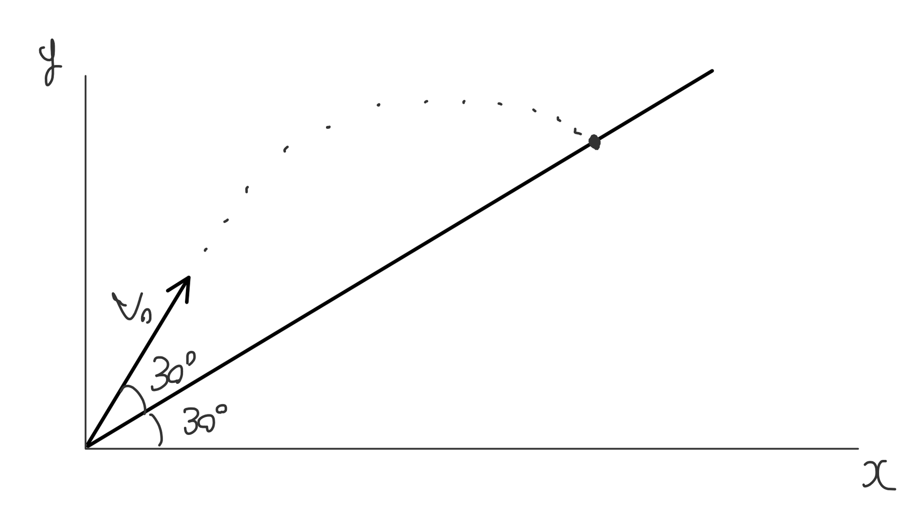

(1) $y = \frac{1}{\sqrt{3}}x$ となる.

$x = v_{0x}t + \frac{1}{2}a_x t^2$

$= v_0 \cos 60° t + 0$

$= v_0 \cdot \frac{1}{2} t = \frac{1}{2}v_0 t$

$y = \frac{1}{\sqrt{3}}x = v_{0y}t + \frac{1}{2}a_y t^2$

$= v_0 \sin 60° t - \frac{1}{2}gt^2$

$= \frac{\sqrt{3}}{2}v_0 t - \frac{1}{2}gt^2$

$x = \frac{3}{2}v_0 t - \frac{\sqrt{3}}{2}gt^2$

$\frac{1}{2}v_0 t = \frac{3}{2}v_0 t - \frac{\sqrt{3}}{2}gt^2$

$v_0 t = 3v_0 t - \sqrt{3}gt^2$

$2v_0 \cancel{t} = \sqrt{3}gt^{\cancel{2}}$

$t = \frac{2v_0}{\sqrt{3}g} = \frac{2\sqrt{3}v_0}{3g}$

(2) $x = \frac{1}{\cancel{2}}\cdot v_0 \cdot \frac{\cancel{2}\sqrt{3}v_0}{3g} = \frac{\sqrt{3}v_0^2}{3g}$

$y = \frac{1}{\sqrt{3}}x = \frac{1}{\sqrt{3}}\cdot\frac{\sqrt{3}}{3}\cdot\frac{v_0^2}{g} = \frac{v_0^2}{3g}$

$d = \sqrt{x^2+y^2} = \sqrt{\frac{(\sqrt{3}v_0^2)^2}{(3g)^2} + \frac{(v_0^2)^2}{(3g)^2}}$

$= \frac{1}{3g}\sqrt{3v_0^4 + v_0^4}$

$= \frac{1}{3g}\cdot 2(v_0^4)^{\frac{1}{2}}$

$= \frac{1}{3g}\cdot 2v_0^2$

$= \frac{2v_0^2}{3g}$

32 (1) $P.y = L\sin\theta + (v_{0y}t + \frac{1}{2}a_y t^2)_P$

$= L\sin\theta + 0 - \frac{1}{2}\cdot gt^2$

$= L\sin\theta - \frac{1}{2}gt^2$

$Q.y = (v_{0y}t + \frac{1}{2}a_y t^2)_Q$

$= v_0\sin\theta\, t - \frac{1}{2}gt^2$

(2) $Q.x = L\cos\theta$ となるまでの t

$Q.x = v_0 \cancel{\cos}\theta\, t = L\cancel{\cos}\theta$

$t = L/v_0$

(3) $P.y = L\sin\theta - \frac{1}{2}g\cdot\frac{L}{v_0}\cdot\frac{L}{v_0}$

$= L\sin\theta - \frac{gL^2}{2v_0^2}$

$Q.y = \cancel{v_0}\sin\theta\cdot\frac{L}{\cancel{v_0}} - \frac{1}{2}g\cdot\frac{L}{v_0}\cdot\frac{L}{v_0}$

$= L\sin\theta - \frac{gL^2}{2v_0^2}$

P, Q の坐标が一致する為,

P と Q が衝突する.