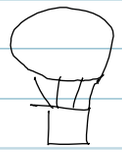
3.56 (GS) +ve ↑



↑ g/4

After Δt, sandbag dropped. Time to hit ground.

(DP) (1) Calc height ascended in Δt $\left(s = ut + \frac{1}{2}at^2\right)$

(2) Calc initial upward speed of sandbag $(v = u + at)$

(3) Calculate time of descent $\left(s = ut + \frac{1}{2}at^2\right)$

(Ex) Up $\quad s = 0 + \frac{g(\Delta t)^2}{8} \qquad v = 0 + \frac{g\Delta t}{4}$

Down

$u = \frac{g\Delta t}{4}$ ↑ • ↓ $-g$

$$-\left(\frac{g\Delta t^2}{8}\right) = \frac{g\Delta t}{4}t - \frac{1}{2}gt^2$$

$$\tfrac{1}{2}t^2 - \frac{\Delta t}{4}t - \frac{\Delta t^2}{8} = 0$$

$a = \frac{1}{2} \quad b = -\frac{\Delta t}{4} \quad c = -\frac{\Delta t^2}{8}$

$a = 1 \quad b = -\frac{\Delta t}{2} \quad c = -\frac{\Delta t^2}{4}$

$$t = \frac{\frac{\Delta t}{2} \pm \sqrt{\frac{\Delta t^2}{4} + 4 \times 1 \times \frac{\Delta t^2}{4}}}{2} \qquad \frac{1}{4}\sqrt{\frac{5\Delta t^2}{4}}$$

$$t = \frac{\Delta t}{4} \pm \sqrt{5\Delta t} \;/4$$

$$= \frac{\Delta t}{4} + \sqrt{\frac{5\Delta t}{4}}$$

$$= \frac{\Delta t}{4}\left(1 + \sqrt{5}\right)$$

Ev $t < \Delta t$ ✓

3.92 GS Const acc^{n} problem $s = ut + \frac{1}{2}at^2$

DI Find expression for time of flight.

Write expression for dist. travelled in last s.

Ex. $h = \frac{g}{2}t^2 \qquad t = \sqrt{\frac{2h}{g}}$

~~In last second~~ Up to last second ($t \to 0$ ... is before impact)

$$(h - 29) = 0 + \frac{g}{2}\left(\sqrt{\frac{2h}{g}} - 1\right)^2$$

$$\frac{2h - 58}{g} = \frac{2h}{g} + 1 - 2\sqrt{\frac{2h}{g}}$$

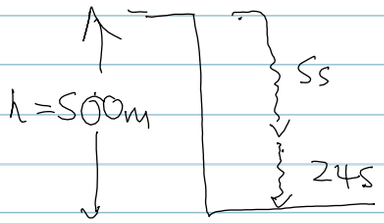
$$\frac{-\frac{58}{g} - 1}{-2} = \sqrt{\frac{2h}{g}}$$

$$\left(\frac{58}{2g} + \frac{1}{2}\right)^2 = \frac{2h}{g}$$

$$h = \frac{g}{2} \times \left(\frac{58}{2g} + \frac{1}{2}\right)^2 = \boxed{59\text{m}}$$

Ev .....

3.108



$a = 0.64g$

↓ +ve

Const acc^{n} problem.

DP ① Dist fallen in 5s. $s = ut + \frac{1}{2}at^2$

② Calc. speed at this point $v = u + at$

③ Calc new acc^{n} using jet pack

④ Final laing speed. $s = ut + \frac{1}{2}at^2$

↳ $v = u + at$

① $s = 0 - \frac{1}{2}\frac{64}{100}gt^2$

$s = \underline{78.4m}$

② $v = 0 + \frac{64}{100}gt = \underline{31.4 ms^{-1}}$

③ After jet pack fires

$(500 - s) = (v \times 24) + \frac{1}{2}a' \times 24^2$

$a = \underline{-1.15 ms^{-2}}$ ↑

④ $v' = v - 1.15 \times 24$

$= \boxed{3.77 ms^{-1}}$ downwards.