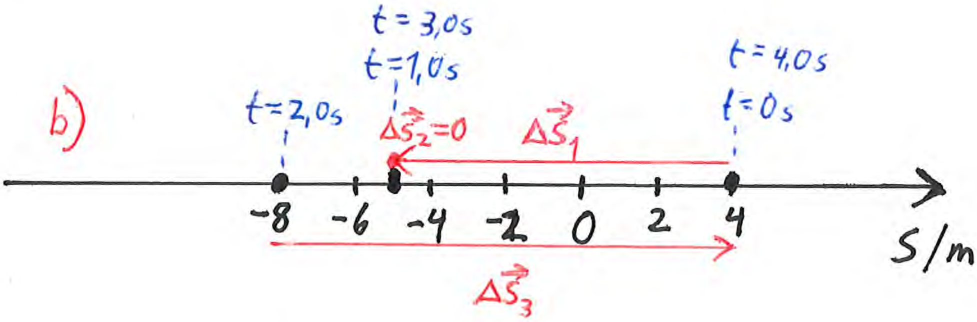
1.310 +

a) b)



b) [0, 1,0 s]

$\Delta s_1 = -5{,}0\,m - 4{,}0\,m = \underline{-9{,}0\,m}$

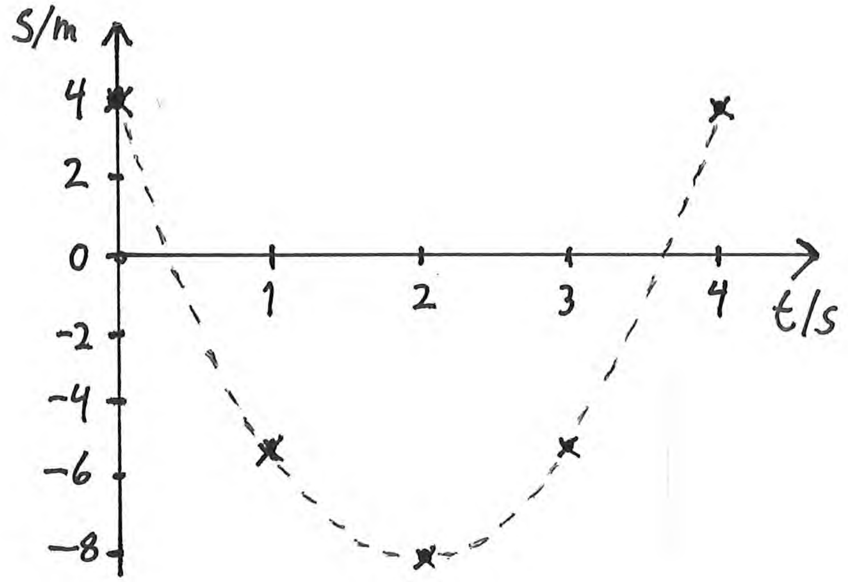
[1,0 s, 3,0 s]

$\Delta s_2 = -5{,}0\,m - (-5{,}0\,m) = \underline{0}$

[2,0 s, 4,0 s]

$\Delta s_3 = 4{,}0\,m - (-8{,}0\,m) = \underline{12{,}0\,m}$

c)



d) Banelengden er $2 \cdot 12\,m = \underline{24\,m}$ (Fra +4 m til −8 m og tilbake)

(Forflytningen er $4\,m - 4\,m = \underline{0}$)

1.318+

$v_{T1} = 60\,km/h \rightarrow$ $\qquad$ $v_{T2} = 40\,km/h \leftarrow$

$s = 80\,km$

Lev. $\rightarrow v_{A1} = 50\,km/h$ $\qquad$ $v_{A2} = 50\,km/h$ Tron. $\leftarrow$

$s_{tot} = 2 \cdot s \qquad v = \frac{s}{t}$

$v \cdot t = s$

$t = \frac{s}{v}$

$$t_{T1} = \frac{s}{v_{T1}} = \frac{80\,km}{60\,\frac{km}{h}} = \frac{4}{3}\,h \qquad t_{T2} = \frac{s}{v_{T2}} = \frac{80\,km}{40\,\frac{km}{h}} = 2\,h$$

$$t_{T\,total} = t_{T1} + t_{T2} = \left(\frac{4}{3} + 2\right)h = 3\,h \text{ og } 20\,min$$

$$t_{A1} = t_{A2} = \frac{s}{v_{A2}} = \frac{80\,km}{50\,\frac{km}{h}} = 1\,h \text{ og } 36\,min \text{ og } t = 2 \cdot t_{A1}$$
$$= 3\,h \text{ og } 12\,min$$

Dvs Anita kommer først tilbake til Levanger.

1.331 $\quad a = \dfrac{-17\,\frac{km}{h}}{s} = \dfrac{-17 \cdot \frac{1000\,m}{3600\,s}}{s} = -4{,}722\,\frac{m}{s^2}$

a) $V_0 = 27\,\frac{m}{s} \qquad V = 0 \qquad t = ?$ $\qquad \overset{+}{\Rightarrow}$

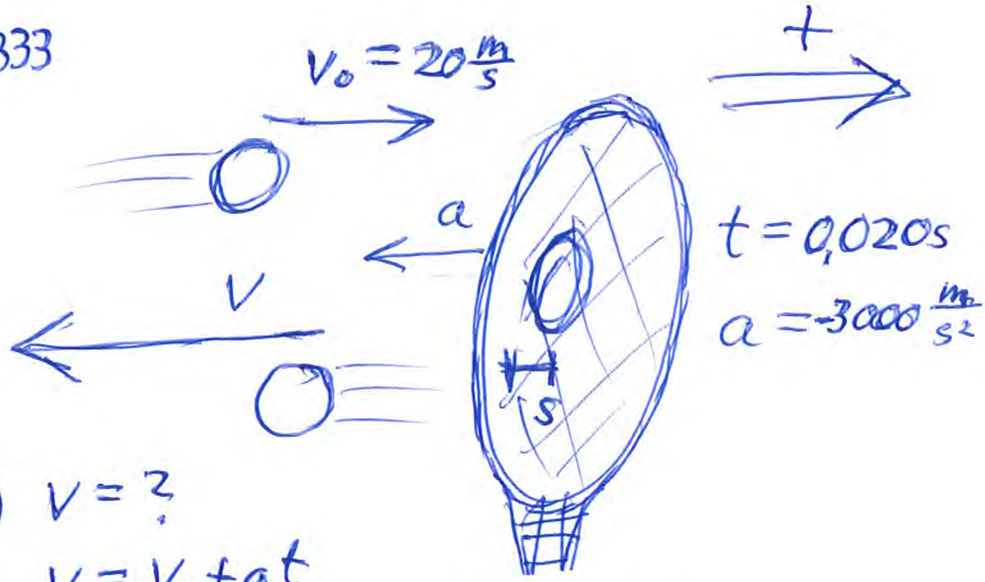
$$V = V_0 + at$$
$$V - V_0 = at$$
$$\frac{V - V_0}{a} = t$$
$$t = \frac{0 - 27\,\frac{m}{s}}{-4{,}722\,\frac{m}{s^2}} = 5{,}717\,s \approx \underline{5{,}7\,s}$$

b) $s = ? \qquad s = V_0 t + \frac{1}{2}at^2 \qquad 2as = \cancel{V^2} - V_0^2$

$$s = \frac{-V_0^2}{2a}$$

$$s = \frac{-(27\,\frac{m}{s})^2}{2 \cdot (-4{,}722\,\frac{m}{s^2})} = \underline{77\,m}$$

1.333



a) $v = ?$

$$v = v_0 + at$$

$$v = 20\frac{m}{s} + \left(-3000\frac{m}{s^2}\right) \cdot 0{,}020s$$

$$= 20\frac{m}{s} - 60\frac{m}{s} = \underline{-40\frac{m}{s}} \qquad |v| = \underline{40\frac{m}{s}}$$

b) $s = v_0 t + \frac{1}{2}at^2$

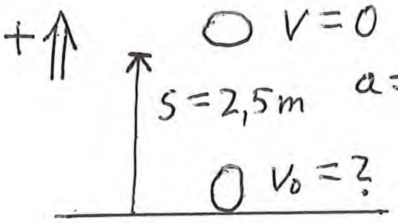
$$s = 20\frac{m}{s} \cdot 0{,}020s + \frac{1}{2}\left(-3000\frac{m}{s^2}\right) \cdot (0{,}020s)^2$$

$$= 0{,}40m - 0{,}60m = \underline{-0{,}20m}$$

$$s = \frac{(v_0 + v)}{2} \cdot t$$

$$s = \frac{\left(20\frac{m}{s} - 40\frac{m}{s}\right)}{2} \cdot 0{,}020s = \underline{-0{,}20m}$$

1.343+



$$v^2 - v_0^2 = 2as$$

$$0 - v_0^2 = 2as$$

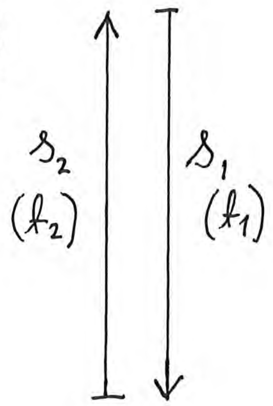
$$v_0^2 = -2as$$

$$v_0 = \sqrt{-2as}$$

$$v_0 = \sqrt{-2 \cdot (-9{,}81) \cdot 2{,}5}\ \frac{m}{s} = \underline{7{,}0\frac{m}{s}}$$

1.345 + a) Jeg trenger å vite tyngdens akselerasjon og lydfarten. Jeg forutsetter at luftmotstanden har liten betydning

b)



$g = 9{,}81\,\frac{m}{s^2}$ og $v_l = 340\,\frac{m}{s}$ og $t = t_1 + t_2$
$= 3{,}5\,s$

$s_2 = v_l \cdot t_2 = v_l \cdot (t - t_1)$ og $s_1 = \frac{1}{2} g t_1^2$ når $v_0 = 0$

$$s_1 = s_2$$

$$\frac{1}{2} g t_1^2 = v_l \cdot (t - t_1)$$

$$\frac{1}{2} \cdot 9{,}81 \cdot t_1^2 = 340 \cdot (3{,}5 - t_1)$$

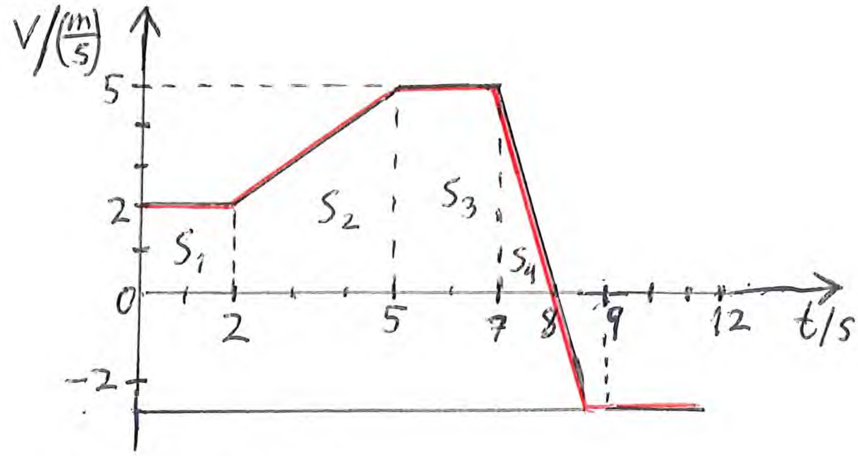
$$4{,}905 \cdot t_1^2 = 1190 - 340 \cdot t_1$$ alt i SI-enheter

$$4{,}905 \cdot t_1^2 + 340 \cdot t_1 - 1190 = 0$$

$$t_1 = 3{,}339 \quad \vee \quad t_1 = -72{,}65$$

$$s_1 = \frac{1}{2} g t_1^2 = \frac{1}{2} \cdot 9{,}81\,\frac{m}{s^2} \cdot (3{,}339\,s)^2 = 54{,}68\,m = \underline{55\,m}$$

1.347 b)



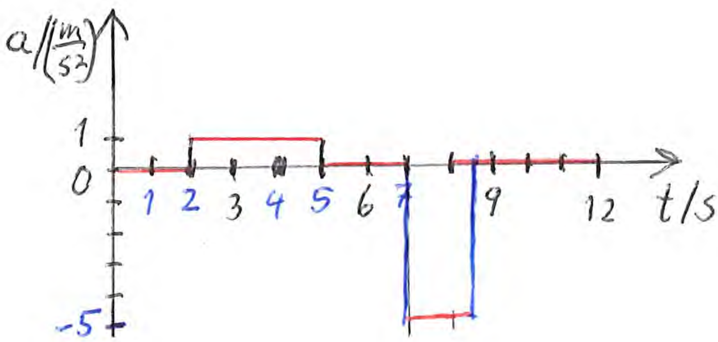
$t \in [0, 2s\rangle \quad a = 0$

$t \in [2s, 5s\rangle \quad a = \frac{\Delta v}{\Delta t} = \frac{(5-2)\frac{m}{s}}{(5-2)\,s} = 1\,\frac{m}{s^2}$

$t \in [5s, 7s\rangle \quad a = 0$

$t \in [7s, 8s\rangle \quad a = \frac{\Delta v}{\Delta t} = \frac{(0-5)\frac{m}{s}}{(8-7)\,s} = -5\,\frac{m}{s^2}$

$t \in [9s, 12s\rangle \quad a = 0$



c) $s = s_1 + s_2 + s_2 + s_4$

$= v_1 \cdot \Delta t_1 + \left(\frac{v_2 + v_5}{2}\right) \cdot \Delta t_2$

$+ v_3 \cdot \Delta t_3 + \left(\frac{v_4 + v_5}{2}\right) \cdot \Delta t_4$

$= 2\,\frac{m}{s} \cdot 2s + \frac{(2+5)\frac{m}{s}}{2} \cdot (5-2)s + 5\,\frac{m}{s} \cdot (7-5)s + \left(\frac{5+0}{2}\right)\frac{m}{s} \cdot 1s$

$= 4m + 3{,}5 \cdot 3\,m + 5 \cdot 2\,m + 2{,}5 \cdot 1\,m = 4m + 10{,}5m + 10m + 2{,}5m$

$= \underline{27m}$

d) $s_0 = 27m$ etter 8,0 sekunder.

Etter 8,5 sekunder har legemet flyttet seg strekningen

$s_1 = \left(\frac{-2{,}5 + 0}{2}\right)\frac{m}{s} \cdot 0{,}5s = -0{,}625\,m$

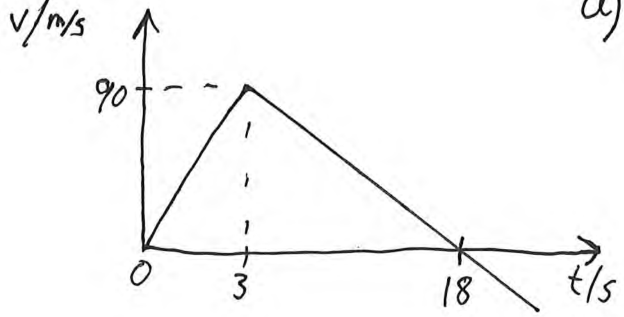
Gjenstående ryggestrekning etter 8,5 sekunder er $|s_0 - s_1| = 26{,}375m$

$v \cdot \Delta t = -s_0 + s_1$

$\Delta t = \frac{-s_0 + s_1}{v} = \frac{-26{,}375m}{-2{,}5\frac{m}{s}} = 10{,}55s$

Total tid: $8{,}5s + 10{,}55s = 19{,}05s$ dvs $\underline{19s}$

1.348



a) 1. $a = \frac{\Delta v}{\Delta t} = \frac{(90-0)\frac{m}{s}}{3{,}0\,s} = \underline{30\,\frac{m}{s^2}}$

2. $a = \frac{(0-90)\frac{m}{s}}{(18-3)s} = \underline{-6{,}0\,\frac{m}{s^2}}$

3. $a = \underline{-6{,}0\,\frac{m}{s^2}}$ uendret

b) $s = v_0 t + \frac{1}{2}at^2$ og $v_0 = 0$

$s = \frac{1}{2}at^2 = \frac{1}{2}\cdot 30\frac{m}{s^2}\cdot(3{,}0s)^2 = 135\,m$ dvs. $\underline{0{,}14\,km}$

c) $s_1 = 135\,m$

$s_2 = \frac{v_0+v}{2}\cdot t = \frac{(90\frac{m}{s}+0)}{2}\cdot 15\,s = 675\,m$

$s = s_1 + s_2 = 135\,m + 675\,m = \underline{810\,m}$ $\underline{0{,}81\,km}$

d) $t_1 = 18{,}0\,s$ opp

$h = 810\,m$

$s = v_0 t_2 + \frac{1}{2}a t_2^2$ og $v_0 = 0$ i toppen $\Uparrow +$

$s = \frac{1}{2}a t_2^2$

$\frac{2s}{a} = t_2^2$

$t_2 = \sqrt{\frac{2s}{a}} = \sqrt{\frac{2(-810\,m)}{-6{,}00\,\frac{m}{s^2}}} = 16{,}43\,s$

$t = t_1 + t_2 = 18{,}0\,s + 16{,}43\,s = 34{,}4\,s$ dvs. $\underline{t = 34\,s}$

1.349. a) Ta endringen Δv i fart på v-aksen og del den på tilhørende endring Δt i tid på t-aksen.

b) $\downarrow$ $v_0 = -4{,}0\,\frac{m}{s}$

$a = 10\,\frac{m}{s^2}$

$v = -10{,}0\,\frac{m}{s}$

$t = 0{,}60\,s$

$$s = \frac{v_0 + v}{2}\cdot t = \frac{(-4{,}0 - 10{,}0)\frac{m}{s}}{2}\cdot 0{,}60\,s = \underline{4{,}2\,m}$$

c) $v_0 = 8{,}0\,\frac{m}{s}$ oppover rett etter kollisjon med bakken i følge grafen.

$2as = v^2 - v_0^2$ og $v = 0$ i toppunktet

$$s = \frac{-v_0^2}{2a} = \frac{-(8{,}0\frac{m}{s})^2}{2\cdot 10\frac{m}{s^2}} = \underline{3{,}2\,m}$$

d) $$a = \frac{v_D - v_C}{t_D - t_C} = \frac{0 - 8{,}0\frac{m}{s}}{(1{,}4 - 0{,}6)s} = \underline{-10\,\frac{m}{s^2}} \quad (-9{,}8\,\frac{m}{s^2})$$

e) $s = v_0 t + \frac{1}{2}at^2$ og $s = 0$ når ballen treffer bakken

$0 = v_0 t + \frac{1}{2}at^2$

$0 = t\cdot(v_0 + \frac{1}{2}at)$ og $t \neq 0$

$-v_0 = \frac{1}{2}at$

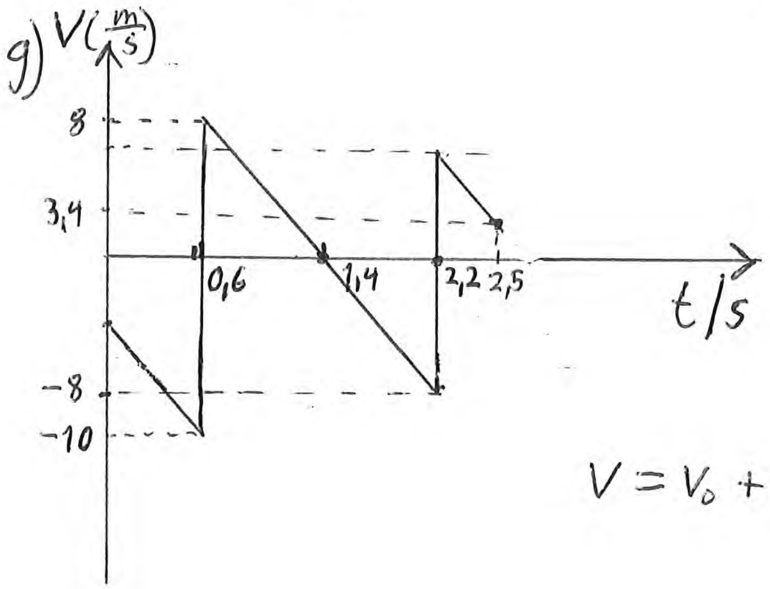
$-2v_0 = at$

$t = \frac{-2v_0}{a} = \frac{-2\cdot 8{,}0\frac{m}{s}}{-10\frac{m}{s^2}} = 1{,}6\,s$ er tiden for andre sprett.

Første sprett tok $0{,}6\,s$

Total tid $= 1{,}6\,s + 0{,}6\,s = \underline{2{,}2\,s}$

f) $$\frac{|v_{etter}|}{|v_{før}|} = \frac{8{,}0\frac{m}{s}}{10\frac{m}{s}} = 0{,}80 \quad \text{dvs. } |v_e| = 0{,}80|v_f| = 0{,}80\cdot 8{,}0\frac{m}{s} = \underline{6{,}4\,\frac{m}{s}}$$

g) 

Det er 0,3 s igjen fra 2,2 s ved bakken til vi når $t = 2{,}5\,s$.

$$v = v_0 + at = 6{,}4\,\frac{m}{s} - 10\,\frac{m}{s^2}\cdot 0{,}3\,s = 3{,}4\,\frac{m}{s}$$