

VAJE: Enakomerno pospešeno gibanje

str. 1

1) Auto spelje in pospešuje 5 sekund z pospeškom 1 m/s^2 .

a) Kolikšno hitrost doseže po 5 sekundah (izrazi v $\frac{\text{m}}{\text{s}}$ in $\frac{\text{km}}{\text{h}}$)? [R: $5 \frac{\text{m}}{\text{s}}$, $18 \frac{\text{km}}{\text{h}}$]

b) Kolikšno pot prevozi v tem času? [R: $12,5 \text{ m}$]

$$\Delta t = 5 \text{ s}$$

$$a = 1 \text{ m/s}^2$$

a) $v_k = ?$ ($\frac{\text{m}}{\text{s}}$ i $\frac{\text{km}}{\text{h}}$)

b) $s = ?$

a) Hitrost - končna:

$$v = v_0 + a \cdot t; v_0 = 0$$

$$v = 0 + a \cdot t$$

$$v = a \cdot \Delta t$$

$$v = 1 \frac{\text{m}}{\text{s}^2} \cdot 5 \text{ s}$$

$$v = 5 \frac{\text{m}}{\text{s}} = 18 \frac{\text{km}}{\text{h}}$$

b) Prevožena pot:

$$s = v_0 \cdot t + \frac{a \cdot t^2}{2}; v_0 = 0$$

$$s = 0 + \frac{1}{2} \cdot a \cdot t^2$$

$$s = \frac{1}{2} \cdot 1 \frac{\text{m}}{\text{s}^2} \cdot 25 \text{ s}^2$$

$$s = 12,5 \text{ m}$$

2) $a = 6 \frac{\text{m}}{\text{s}^2}$

$$\Delta t = 5 \text{ s}$$

a) $v_k = ?$

b) graf $v(t)$

c) $\bar{v} = ?$

a) Končna hitrost:

$$v = v_0 + a \cdot t; v_0 = 0$$

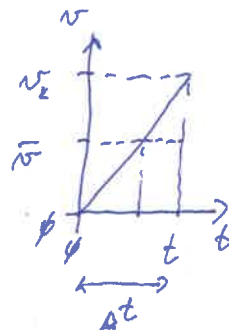
$$v = 0 + a \cdot t$$

$$v = a \cdot \Delta t$$

$$v = 6 \frac{\text{m}}{\text{s}^2} \cdot 5 \text{ s}$$

$$v = 30 \frac{\text{m}}{\text{s}}$$

b) graf $v(t)$:



c) Povprečna hitrost:

$$\bar{v} = \frac{v_0 + v_k}{2}; v_0 = 0$$

$$\bar{v} = \frac{0 + v_k}{2}$$

$$\bar{v} = \frac{v_k}{2} = \frac{30 \frac{\text{m}}{\text{s}}}{2}$$

$$\bar{v} = 15 \frac{\text{m}}{\text{s}}$$

3) $v_0 = 8 \frac{\text{m}}{\text{s}}$

$$v_k = 14 \frac{\text{m}}{\text{s}}$$

$$\Delta t = 6 \text{ s}$$

a) $a = ?$

b) $\bar{v} = ?$

a) Pospešek:

$$v_k = v_0 + a \cdot \Delta t$$

$$v_k - v_0 = a \cdot \Delta t \quad | : \Delta t$$

$$a = \frac{v_k - v_0}{\Delta t}$$

$$a = \frac{(14 - 8) \frac{\text{m}}{\text{s}}}{6 \text{ s}}$$

$$a = \frac{6}{6} \frac{\text{m}}{\text{s}^2}$$

$$a = 1 \frac{\text{m}}{\text{s}^2}$$

b) Povprečna hitrost:

$$\bar{v} = \frac{v_0 + v_k}{2}$$

$$\bar{v} = \frac{(8 + 14) \frac{\text{m}}{\text{s}}}{2}$$

$$\bar{v} = \frac{22}{2} \frac{\text{m}}{\text{s}}$$

$$\bar{v} = 11 \frac{\text{m}}{\text{s}}$$

4.) $v_0 = 72 \text{ km/h}$

$\Delta t = 3 \text{ s}$

$a = 2 \text{ m/s}^2$

$v_k = ?$

Končna hitrost

$v_k = v_0 + a \cdot \Delta t$

$v_k = 72 \frac{\text{km}}{\text{h}} + 2 \frac{\text{m}}{\text{s}^2} \cdot 3 \text{ s}$

$v_k = 72 \frac{\text{km}}{\text{h}} + 6 \frac{\text{m}}{\text{s}}$

$v_k = 72 \frac{\text{km}}{\text{h}} + 6,36 \frac{\text{km}}{\text{h}}$

$v_k = 72 \frac{\text{km}}{\text{h}} + 21,6 \frac{\text{km}}{\text{h}}$

$v_k = 93,6 \frac{\text{km}}{\text{h}}$

5) $v_0 = 54 \text{ km/h}$

$a = 3 \text{ m/s}^2$

(pojemek)

$\Delta t = ?$

čas do ustavitve:

$v = v_0 + (-a) \cdot t, v = 0$

$0 = v_0 - a \cdot \Delta t$

$a \cdot \Delta t = v_0 \quad | : a$

$\Delta t = \frac{v_0}{a} = \frac{54 \text{ km/h}}{3 \text{ m/s}^2} = \frac{15 \frac{\text{m}}{\text{s}}}{3 \frac{\text{m}}{\text{s}^2}} = \frac{15}{3} \text{ s} = 5 \text{ s}$

6) Graf $v(t)$

a) $\Delta t = ?$

b) $v_0 = ?$

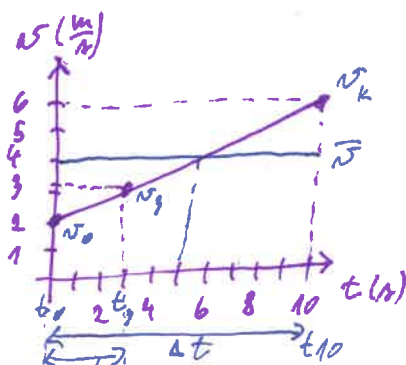
c) $v_k = ?$

d) $\bar{v} = ?$

e) $a = ?$

f) vrsta gibanja = ?

g) $v(t=3\text{s}) = ?$



e) Pospešek:

$v_k = v_0 + a \cdot \Delta t$

$v_k - v_0 = a \cdot \Delta t$

$a = \frac{v_k - v_0}{\Delta t} = \frac{(6-2) \frac{\text{m}}{\text{s}}}{10 \text{ s}} = \frac{4}{10} \frac{\text{m}}{\text{s}^2} = 0,4 \frac{\text{m}}{\text{s}^2}$

f) Gibanje: Enakomerno pospešeno gibanje.

g) Hitrost (t_3): $v_3 = v_0 + a \cdot \Delta t$

$v_3 = v_0 + a \cdot (t_3 - t_0)$

$v_3 = 2 \frac{\text{m}}{\text{s}} + 0,4 \frac{\text{m}}{\text{s}^2} \cdot (3-0) \text{ s} = 2 \frac{\text{m}}{\text{s}} + (0,4 \frac{\text{m}}{\text{s}^2} \cdot 3 \text{ s})$

$v_3 = (2 + 1,2) \frac{\text{m}}{\text{s}} = 3,2 \frac{\text{m}}{\text{s}}$

a) Telo se giblje: $\Delta t = 10 \text{ s}$.

b) Začetna hitrost: $v_0 = 2 \frac{\text{m}}{\text{s}}$

c) Končna hitrost: $v_k = 6 \frac{\text{m}}{\text{s}}$

d) Povprečna hitrost: $\bar{v} = \frac{v_0 + v_k}{2}$

$\bar{v} = \frac{(6+2)}{2} \frac{\text{m}}{\text{s}}$

$\bar{v} = \frac{8}{2} \frac{\text{m}}{\text{s}}$

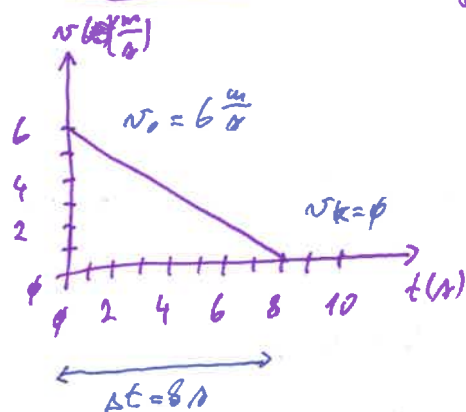
$\bar{v} = 4 \frac{\text{m}}{\text{s}}$

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7) Graf $v(t)$ / Zaustavljanje



a) Opravljena put:

$$v_k^2 = v_0^2 - 2 \cdot a \cdot s ; v_k = 0$$

$$0 = v_0^2 - 2 \cdot a \cdot s$$

$$v_0^2 = 2 \cdot a \cdot s \quad | : (2a)$$

$$s = \frac{v_0^2}{2 \cdot a} = \frac{36 \frac{\text{m}^2}{\text{s}^2}}{2 \cdot 0,75 \frac{\text{m}}{\text{s}^2}}$$

$$s = \frac{36}{1,5} \text{ m} = 24 \text{ m}$$

b) Pojemek:

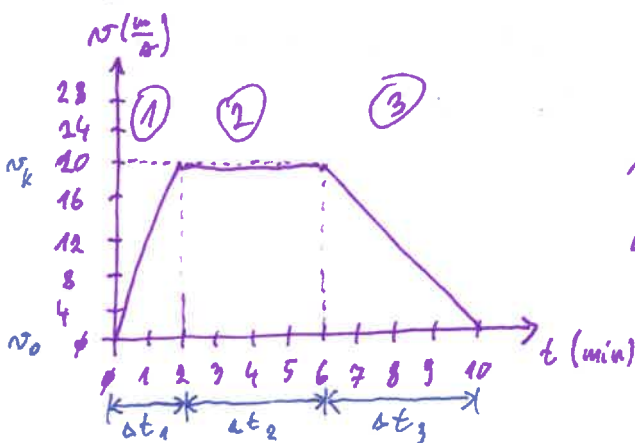
$$v_k = v_0 - a \cdot t ; v_k = 0$$

$$0 = v_0 - a \cdot t$$

$$v_0 = a \cdot t \quad | : t$$

$$a = \frac{v_0}{\Delta t} = \frac{6 \frac{\text{m}}{\text{s}}}{8 \text{ s}} = 0,75 \frac{\text{m}}{\text{s}^2}$$

8) Graf $v(t)$:



a) $t = ?$

b) gibanje = ?

c) $s(t=10 \text{ min}) = ?$

d) $a_1, a_2, a_3 = ?$

e) graf $a(t) = ?$

a) Auto se giblje $t = 10 \text{ min}$.

b) ① enakomerno pospešeno gib.

② premo enakomerno gibanje

③ enakomerno pojemojće gib.

d) Pospešek/Pojemek:

①

$$a_1 = \frac{\Delta v_1}{\Delta t_1} = \frac{v_k - v_0}{t_1 - t_0} = \frac{(20 - 0) \frac{\text{m}}{\text{s}}}{(2 - 0) \cdot 60 \text{ s}} = \frac{20 \frac{\text{m}}{\text{s}}}{120 \text{ s}} = 0,17 \frac{\text{m}}{\text{s}^2}$$

$$a_2 = \frac{\Delta v_2}{\Delta t_2} = \frac{v_k - v_0}{t_2 - t_1} = \frac{0 \frac{\text{m}}{\text{s}}}{(6 - 2) \cdot 60 \text{ s}} = 0 \frac{\text{m}}{\text{s}^2}$$

$$a_3 = \frac{\Delta v_3}{\Delta t_3} = \frac{v_k - v_0}{t_3 - t_2} = \frac{(0 - 20) \frac{\text{m}}{\text{s}}}{(10 - 6) \cdot 60 \text{ s}} = \frac{(-20) \frac{\text{m}}{\text{s}}}{240 \text{ s}} = -0,08 \frac{\text{m}}{\text{s}^2}$$

c) Pot ($t = 10 \text{ min}$):

$$s = s_1 + s_2 + s_3$$

$$s = (122,4 + 4800 + 2496) \text{ m}$$

$$s = 7418,4 \text{ m}$$

$$s = 7,4184 \text{ km}$$

($v_0 = 0$)

$$s_1 = \frac{a \cdot t_1^2}{2} = \frac{1}{2} \cdot 0,17 \frac{\text{m}}{\text{s}^2} \cdot 120^2 \text{ s}^2 = 122,4 \text{ m}$$

$$s_2 = v \cdot \Delta t_2 = 20 \frac{\text{m}}{\text{s}} \cdot 240 \text{ s} = 4800 \text{ m}$$

$$s_3 = v_0 \cdot \Delta t_3 - \frac{a \cdot \Delta t_3^2}{2} = (20 \frac{\text{m}}{\text{s}} \cdot 240 \text{ s}) - \left(\frac{1}{2} \cdot 0,08 \frac{\text{m}}{\text{s}^2} \cdot 240^2 \text{ s}^2 \right) = 4800 \text{ m} - 2304 \text{ m} = 2496 \text{ m}$$

g) $\Delta t_1 = 0,3 \text{ s}$
 $\Delta t_2 = 0,8 \text{ s}$

a) $s_1 (v_0 = 144 \text{ km/h}) = ?$

b) $s_2 (\Delta t_3 = 8 \text{ s}) = ?$

c) $s_c = ?$

$(144 \frac{\text{km}}{\text{h}} = 40 \frac{\text{m}}{\text{s}})$

a) Pot, pred začne zavirati:

$$\Delta s_1 = v \cdot \Delta t_1 = 144 \frac{\text{km}}{\text{h}} \cdot (0,3 + 0,8) \text{ s} = \frac{144}{3,6} \frac{\text{m}}{\text{s}} \cdot 1,1 \text{ s}$$

$$\Delta s_1 = 40 \frac{\text{m}}{\text{s}} \cdot 1,1 \text{ s}$$

$$\underline{\Delta s_1 = 44 \text{ m}}$$

b) ~~Začetna~~ zavorna pot

$$v_k^2 = v_0^2 - 2 \cdot a \cdot s$$

$$\phi = v_0^2 - 2 \cdot a \cdot s$$

$$v_0^2 = 2 \cdot a \cdot s \quad | \cdot \frac{1}{2 \cdot a}$$

$$s_2 = \frac{v_0^2}{2 \cdot a}$$

$$s_2 = \frac{(40 \frac{\text{m}}{\text{s}})^2}{2 \cdot 5 \frac{\text{m}}{\text{s}^2}}$$

$$s_2 = \frac{1600}{10} \text{ m}$$

$$\underline{s_2 = 160 \text{ m}}$$

Izračun pospeška po 8 sekundah:

$$v_k = v_0 - a \cdot \Delta t_3$$

$$\phi = v_0 - a \cdot \Delta t_3$$

$$v_0 = a \cdot \Delta t_3 \quad | \cdot \frac{1}{\Delta t_3}$$

$$a = \frac{v_0}{\Delta t_3} = \frac{40 \frac{\text{m}}{\text{s}}}{8 \text{ s}} = 5 \frac{\text{m}}{\text{s}^2}$$

c) Celotna pot zaviranja

$$s_c = s_1 + s_2 = (44 + 160) \text{ m}$$

$$\underline{s_c = 204 \text{ m}}$$