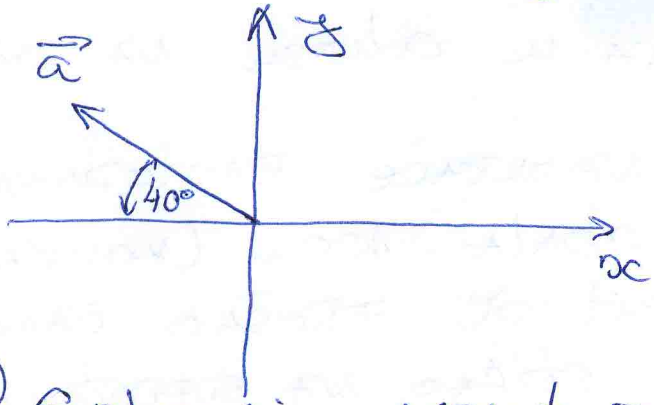
Pismeni ~~zadatak~~ iz ~~fizike~~

Grupa $\underline{I_g}$ $\boxed{\underline{I_3}}$ Učenik _____

1. a) Razloziti vektor $\vec{a}$ na ~~komponente~~ duž x, y ose.

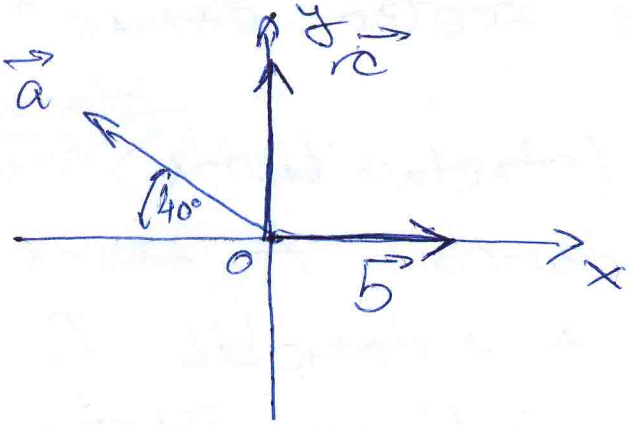


$a = 4$

$\sin 40° = 0{,}643$

$\cos 40° = 0{,}766$

b) Sabrati vektore $\vec{a}, \vec{b}, \vec{c}$



$a = 4$

$b = 3$

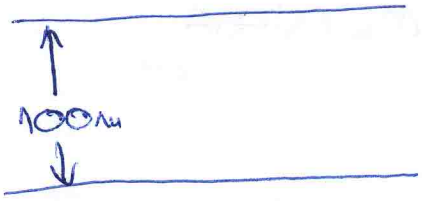
$c = 4$

2. Automobil se ~~kreće~~ brzinom $54 \frac{km}{h}$ nailazi na semafor i počinje da ~~koči~~ i ~~zaustavlja~~ se posle 10s. Kolikо je ubrzanje automobila? Kolikи put je automobil prešao pri kočenju? Nacrtati ~~grafik~~ zavisnosti ubrzanja od vremena i brzine od vremena.

3. Brzina čamca u odnosu na vodu je $12\frac{km}{h}$, a brzina rečnog toka je $4\frac{km}{h}$. Čamac se kreće uvijek normalno na tok reke.

a) Naći brzinu čamca u odnosu na obalu

b) Ako je najkraće rastojanje između obala 100m (konstantno), koliki put je prešao čamac dok nije stigao na suprotnu obalu

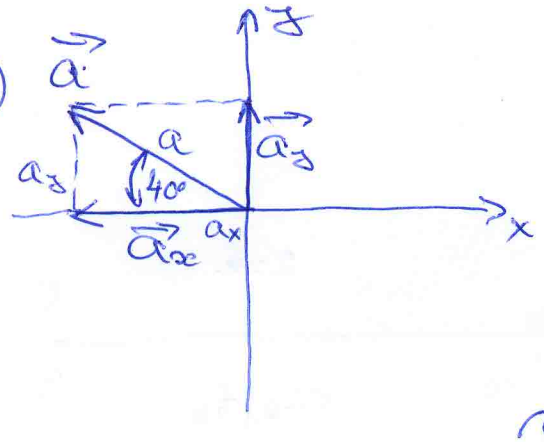


c) Koliko vremena se kretao čamac?

4. Sa istog mjesta (startne linije) istovremeno krenu dva automobila. Automobil A kreće se sa ubrzanjem $2\frac{m}{s^2}$, a automobil B brzinom $72\frac{km}{h}$. Na kolikom rastojanju i poslije koliko vremena se sustižu? Kolike su brzine automobila u tom trenutku?

I_3 I_g (1 str.)

1.

a) 

$a = 4$

$\sin 40° = \frac{a_y}{a}$

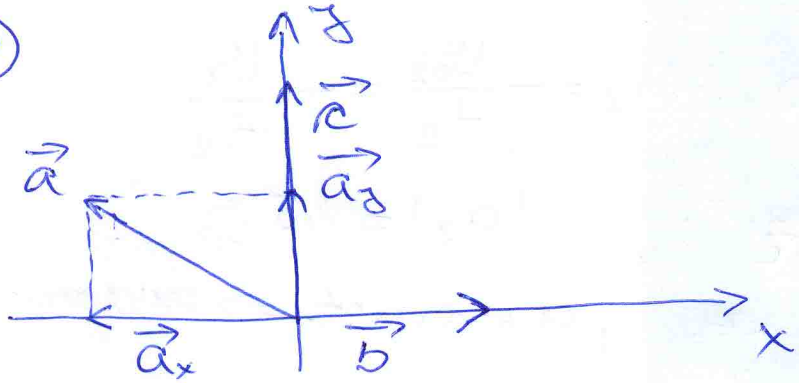
$a_y = a \sin 40°$

$a_y = 4 \cdot \sin 40° = 2{,}572$

$\cos 40° = \frac{a_x}{a} \Rightarrow a_x = a \cos 40°$

$a_x = 4 \cdot \cos 40° = 3{,}064$

$a_x = 3{,}064$; $a_y = 2{,}572$

b) 

$a = 4$

$b = 3$

$c = 4$

$\vec{d} = \vec{a} + \vec{b} + \vec{c} = \vec{a_x} + \vec{a_y} + \vec{b} + \vec{c}$

$\vec{d} = (\vec{a_x} + \vec{b}) + (\vec{a_y} + \vec{c})$

$\vec{d_x} = \vec{a_x} + \vec{b}$; $\vec{d_y} = \vec{a_y} + \vec{c}$

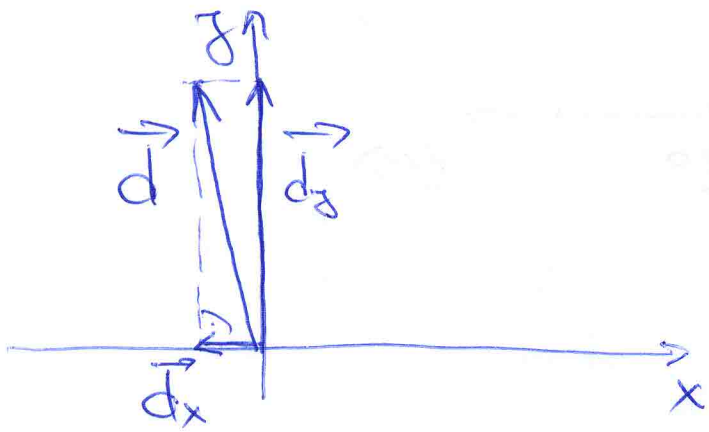
$d_y = a_y + c$

$d_y = 6{,}572$

$d_x = a_x - b$

smer vektorja $\vec{a_x}$

$d_x = 0{,}064$



$d^2 = d_x^2 + d_y^2$

$d = \sqrt{d_x^2 + d_y^2}$

$d = \sqrt{(0{,}064)^2 + (6{,}572)^2}$

$d = 6{,}5723$

2.

$t_1 = 10s$

$v_1 = 54 \frac{km}{h} = 54 \cdot \frac{1000m}{3600s} = 15 \frac{m}{s}$

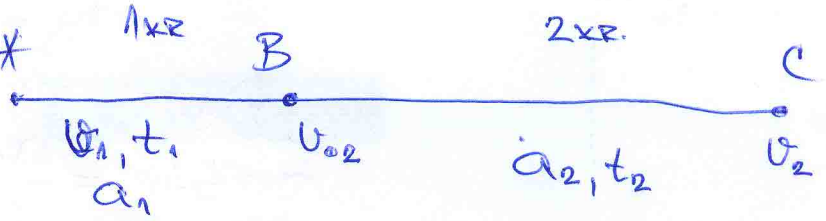
$t_2 = 10s$

$v_2 = 0 \frac{m}{s}$

$s_2 = ?$

$a(t) = ?$

$v(t) = ?$



PRVO kretanje je RAVNOMJERNO $v_1 = 15 \frac{m}{s}$

DRUGO kretanje je USPORENO ; $v_1 = v_{02}$

$$a_2 = \frac{v_2 - v_{02}}{t_2} \Rightarrow a_2 = -\frac{v_{02}}{t_2} = -\frac{v_1}{t_2}$$

$$a_2 = -\frac{15 \frac{m}{s}}{10s} = -1,5 \frac{m}{s^2} \quad ; \quad |a_2| = 1,5 \frac{m}{s^2}$$

($a < 0 \Rightarrow$ USPORENO kr. , $a = const \Rightarrow$ RAVNOMJER. USP.)

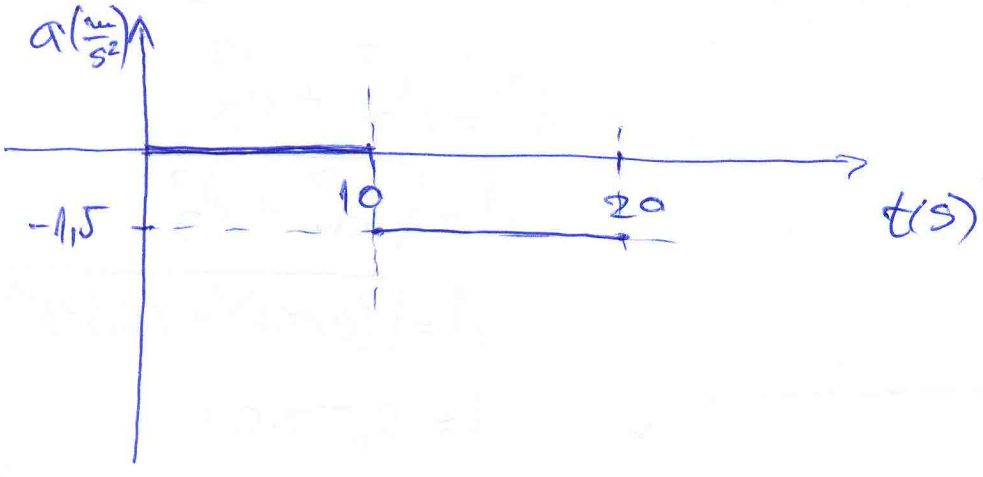
$$s_2 = v_{02} t_2 - \frac{|a_2| t_2^2}{2}$$

$$s_2 = 15 \frac{m}{s} \cdot 10s - \frac{1,5 \frac{m}{s^2} (10s)^2}{2}$$

$$s_2 = 75m$$

$v_1 = const \Rightarrow \Delta v = 0 \Rightarrow a_1 = \frac{\Delta v}{\Delta t} = 0 \frac{m}{s^2}$

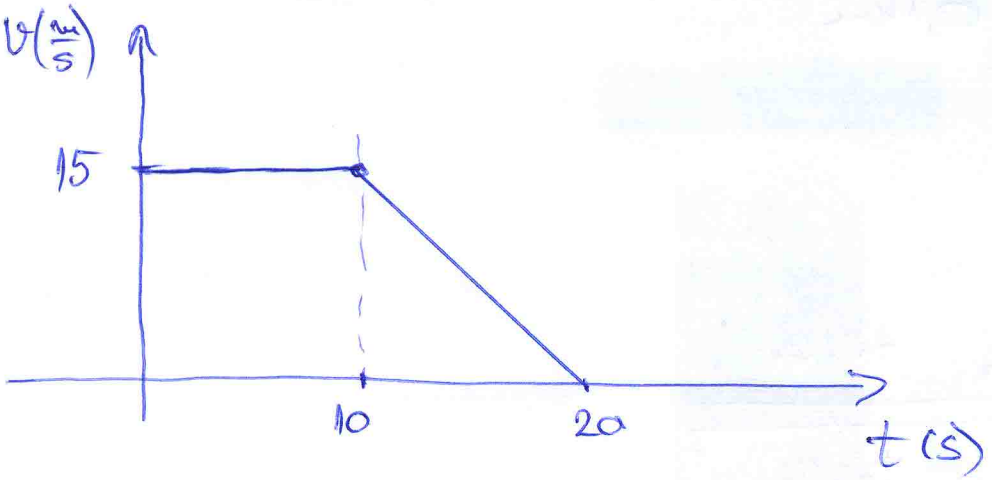
$a_1 = 0 \frac{m}{s^2}$



$v(t)$

Prvo kretanje $v_1 = 15\frac{m}{s} = const$; $t_1 = 10s$

Drugo kretanje $t_2 = 10s$; $v_{02} = 15\frac{m}{s}$; $v_2 = 0\frac{m}{s}$



3.

$v' = 12\frac{km}{h}$

$u = 4\frac{km}{h}$

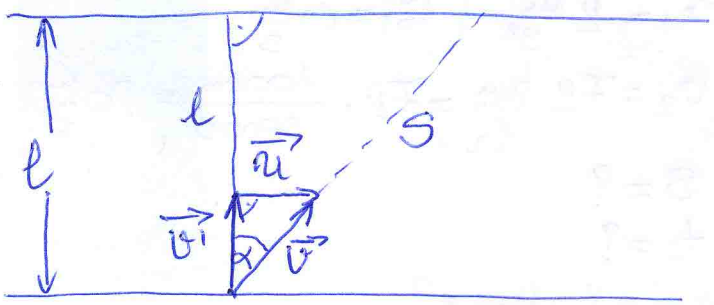
$\vec{v'} \perp \vec{u}$

$l = 100m = 0,1km$

$v = ?$

$s = ?$

$t = ?$



Iz zakona sabiranja (slaganja) brzina (transformacije brzine iz jednog u drugi referentni sistem)

$\vec{v} = \vec{v'} + \vec{u}$ (primjenimo Pitagorinu teoremu)

$v^2 = v'^2 + u^2 \Rightarrow v = \sqrt{v'^2 + u^2}$

$v = \sqrt{(12\frac{km}{h})^2 + (4\frac{km}{h})^2} = \sqrt{160(\frac{km}{h})^2} = 12,65\frac{km}{h}$

Iz sličnosti trouglova (brzine i rastojanja)

$\frac{s}{l} = \frac{v}{v'}$

Prethodno dobijamo pomoću $\cos\alpha$

$\cos\alpha = \frac{v'}{v}$; $\cos\alpha = \frac{l}{s} \Rightarrow \frac{v'}{v} = \frac{l}{s}$

$v's = vt$

$s = \frac{v}{v'} \cdot t$

$s = \frac{12{,}65 \frac{km}{h}}{12 \frac{km}{h}} \cdot 0{,}1 km$

$s = 0{,}105 km$

$s = 105 m$

4. A (1.) $v_{01} = 0 \frac{m}{s}$ → $a_1 = 2 \frac{m}{s^2}$ t_1, s_1

B (2.) → $v_2 = 72 \frac{km}{h}$ t_2, s_2

$t_1 = t_2 = t$

$s_1 = s_2 = s$

$a_1 = 2 \frac{m}{s^2}$; $v_{01} = 0 \frac{m}{s}$

$v_2 = 72 \frac{km}{h} = 72 \cdot \frac{1000 m}{3600 s} = 20 \frac{m}{s}$

$s = ?$

$t = ?$

$v_{1s} = ?$ $v_{2s} = ?$

$s_1 = s_2 = s$

$s_1 = \cancel{v_{01}^{0} t} + \frac{a_1 t^2}{2} = \frac{a_1 t^2}{2}$

$v_2 = \frac{s_2}{t} \Rightarrow s_2 = v_2 \cdot t$

$\frac{a_1 t^2}{2} = v_2 \cdot t \ / : t \Rightarrow \frac{a_1 t}{2} = v_2 \Rightarrow t = \frac{2 v_2}{a_1}$

ili Precizznije

$\frac{a_1 t^2}{2} - v_2 t = 0$

$t\left(\frac{a_1}{2} t - v_2\right) = 0$

$t = 0$ v $\frac{a_1}{2} t - v_2 = 0 \Rightarrow t = \frac{2 v_2}{a_1}$

Početak kretanja

$$t = \frac{2 \cdot 20 \frac{m}{s}}{2 \frac{m}{s^2}} = 20 s$$

$$\boxed{t = 20 s}$$

$$s = v_2 \cdot t$$

$$s = 20 \frac{m}{s} \cdot 20 s$$

$$\boxed{s = 400 m}$$

$v_2 = const \Rightarrow \boxed{v_{2s} = 20 \frac{m}{s}}$

$v_{1s} = v_{01}^{\nearrow 0} + a_1 t = a_1 t$

$v_{1s} = 2 \frac{m}{s^2} \cdot 20 s = 40 \frac{m}{s} \Rightarrow \boxed{v_{1s} = 40 \frac{m}{s}}$