

Kinematika přímého pohybu 1)

214/A1

$$t_1 = 0,5 \text{ h} = 30 \text{ min} = 1800 \text{ s}$$

$$v_1 = 50 \text{ km h}^{-1}$$

$$t_2 = 1 \text{ h} = 3600 \text{ s}$$

$$v_2 = 110 \text{ km h}^{-1}$$

a) $s = ?$ (m, km)

b) $v_p = ?$ (m s^{-1} , km h^{-1})

$$\begin{aligned} \text{a) } s &= s_1 + s_2 = \\ &= v_1 t_1 + v_2 t_2 = \\ &= 50 \cdot 0,5 + 110 \cdot 1 \text{ km} \\ &= 25 + 110 \text{ km} = \underline{\underline{135 \text{ km}}} \end{aligned}$$

$$\begin{aligned} \text{b) } v_p &= \frac{s}{t} = \frac{135}{1,5} \text{ km h}^{-1} \\ v_p &= \underline{\underline{90 \text{ km h}^{-1}}} \end{aligned}$$

214/A2

$$t = 15 \text{ s}$$

$$v = 60 \text{ m s}^{-1}$$

a) $a = \frac{\Delta v}{\Delta t} = \frac{v}{t} = \frac{60}{15} \text{ m s}^{-2} = \underline{\underline{4 \text{ m s}^{-2}}}$

a) $a = ?$ (m s^{-2})

b) $s = \frac{1}{2} a t^2 = \frac{1}{2} \cdot 4 \cdot 15^2 \text{ m}$

b) $s = ?$ (m)

$$= \underline{\underline{450 \text{ m}}}$$

214/A3

$$v_1 = 25 \text{ m s}^{-1}$$

$$v_2 = 15 \text{ m s}^{-1}$$

a) $v = ?$ ke směru

b) $v = ?$ v protisměru

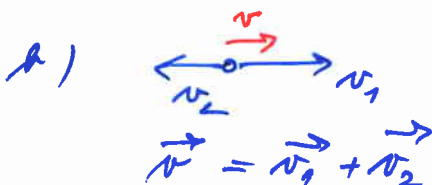
c) $v = ?$ \perp ke směru, jedy



$$\vec{v} = \vec{v}_1 + \vec{v}_2$$

$$v = v_1 + v_2 = 25 + 15 \text{ m s}^{-1}$$

$$v = \underline{\underline{40 \text{ m s}^{-1}}}$$

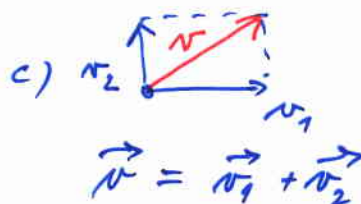


$$\vec{v} = \vec{v}_1 + \vec{v}_2$$

$$v = v_1 - v_2$$

$$v = 25 - 15 \text{ m s}^{-1}$$

$$v = \underline{\underline{10 \text{ m s}^{-1}}}$$



$$\vec{v} = \vec{v}_1 + \vec{v}_2$$

$$v = \sqrt{v_1^2 + v_2^2} = \sqrt{25^2 + 15^2}$$

$$v = \sqrt{850} \text{ m s}^{-1}$$

$$v = \underline{\underline{29 \text{ m s}^{-1}}}$$

214/4

a) $v_1 = 90 \text{ km h}^{-1}$ po doku $\frac{A}{2}$
 $v_2 = 30 \text{ km h}^{-1}$ -1- $\frac{A}{2}$

$v_p = ?$ (ms^{-1} , km h^{-1})

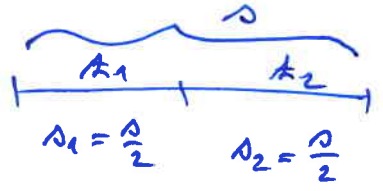
$s_1 + s_2 = s$

$v_p = \frac{v_1 + v_2}{2} = \frac{90 + 30}{2} \text{ km h}^{-1}$

$v_1 \cdot \frac{A}{2} + v_2 \cdot \frac{A}{2} = v_p \cdot A$

$v_p = 60 \text{ km h}^{-1}$

b) $v_1 = 90 \text{ km h}^{-1}$ na $\frac{s}{2}$ po doku A_1
 $v_2 = 30 \text{ km h}^{-1}$ na $\frac{s}{2}$ po doku A_2 $A_1 \neq A_2$



$A_1 + A_2 = A$

$s = v \cdot A$

$s_1 = \frac{s}{2}$

$\frac{s_1}{v_1} + \frac{s_2}{v_2} = \frac{s}{v_p}$

$s_2 = \frac{s}{2}$

$\frac{\frac{s}{2}}{v_1} + \frac{\frac{s}{2}}{v_2} = \frac{s}{v_p}$

$\frac{s}{2v_1} + \frac{s}{2v_2} = \frac{s}{v_p}$ $/: s$

$\frac{1}{2v_1} + \frac{1}{2v_2} = \frac{1}{v_p}$

$\frac{v_2 + v_1}{2v_1v_2} = \frac{1}{v_p}$

$v_p = \frac{2v_1v_2}{v_1 + v_2} = \frac{2 \cdot 90 \cdot 30}{90 + 30} \text{ km h}^{-1} = \underline{\underline{45 \text{ km h}^{-1}}}$

214/5

$$v_1 = 12 \text{ ms}^{-1}$$

$$v_{02} = 0 \text{ ms}^{-1}$$

$$a_2 = 2 \text{ ms}^{-2}$$

$$k = ? (\text{s})$$

$$a) v_1 = v_2$$

$$v_1 = a_2 k$$

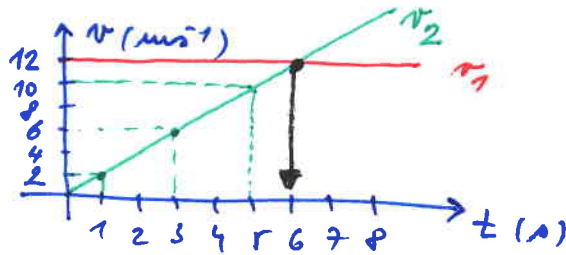
$$12 = 2 \cdot k$$

$$v_2 = v_{02} + a_2 t$$

$$v_2 = a_2 \cdot k$$

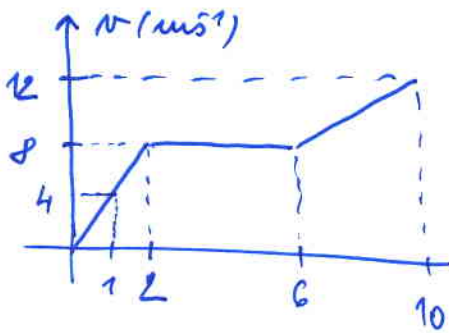
$$k = 6 \text{ s}$$

b) graficky



k	1	3	5
v	2	6	10

214/6



$$a) k = 1 \text{ s} \quad v = 4 \text{ ms}^{-1}$$

$$\frac{\Delta v}{\Delta t} = a = \frac{4-0}{1-0} = 4 \text{ ms}^{-2}$$

$$k) k = 4 \text{ s} \quad v = 8$$

jedna k ale o pohyb rovnomerny'

$$a = 0 \text{ ms}^{-2}$$

$$c) k = 8 \text{ s} \quad v = 10 \text{ ms}^{-1}$$

$$a = \frac{\Delta v}{\Delta t} = \frac{10-8}{8-6} = \frac{2}{2} \text{ ms}^{-2} = 1 \text{ ms}^{-2}$$

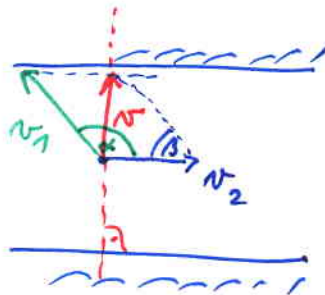
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$$v_1 = 5,5 \text{ ms}^{-1}$$

$$v_2 = 1,5 \text{ ms}^{-1}$$

$$\alpha = ? (^\circ)$$

$$v = ? (\text{ms}^{-1})$$



$$\alpha + \beta = 180^\circ$$

$$\cos \beta = \frac{1,5}{5,5}$$

$$\beta = 74^\circ$$

$$\alpha = 180 - 74 = 106^\circ$$

plyne a obr.: $v = \sqrt{v_1^2 - v_2^2}$

(Pyth. v.)

$$v = \sqrt{5,5^2 - 1,5^2} = \sqrt{28} \text{ ms}^{-1} = 5,3 \text{ ms}^{-1}$$

217/31

$$v = 20 \text{ m s}^{-1}$$

$$f = 5 \text{ Hz}$$

$$s = ? \text{ (m)}$$

$$v = 2\pi r f \quad f = \frac{1}{T}$$

$$T = \frac{1}{f} \quad \dots \text{ doba jedné otáčky}$$

$$T = \frac{1}{5} \text{ s} = 0,2 \text{ s}$$

$$s = v \cdot t = 20 \cdot 0,2 \text{ m} = \underline{\underline{4 \text{ m}}}$$

217/32

$$r = 1,5 \text{ m}$$

$$v = 12 \text{ m s}^{-1}$$

a) $\omega = ? \text{ (rad s}^{-1}\text{)}$

b) $f = ? \text{ (Hz)}$

c) $a_d = ? \text{ (m s}^{-2}\text{)}$

$$v = \omega \cdot r$$

$$a_d = \frac{v^2}{r}$$

$$v = 2\pi r f$$

a) $\omega = \frac{v}{r} = \frac{12}{1,5} \text{ s}^{-1} = \underline{\underline{8 \text{ rad s}^{-1}}}$

b) $f = \frac{v}{2\pi r} = \frac{12}{2\pi \cdot 1,5} = \underline{\underline{1,3 \text{ Hz}}}$

c) $a_d = \frac{v^2}{r} = \frac{12^2}{1,5} \text{ m s}^{-2} = \underline{\underline{96 \text{ m s}^{-2}}}$

217/3

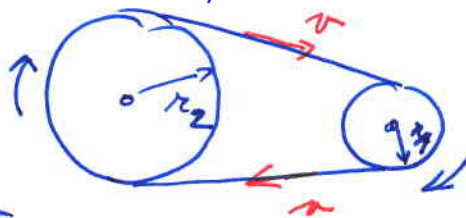
$d_1 = 16 \text{ cm} \Rightarrow r_1 = 8 \text{ cm}$ obvodová rychlost v u obou kol stejná

$$f_1 = 15 \text{ Hz}$$

$$d_2 = 40 \text{ cm} \Rightarrow r_2 = 20 \text{ cm}$$

$$v = ? \text{ (m s}^{-1}\text{)}$$

$$f_2 = ? \text{ (Hz)}$$



$$v_1 = v_2$$

$$2\pi r_1 f_1 = 2\pi r_2 f_2$$

$$r_1 f_1 = r_2 f_2$$

$$f_2 = \frac{r_1 f_1}{r_2} = \frac{8 \cdot 15}{20} \text{ Hz} = \underline{\underline{6 \text{ Hz}}}$$

$$v = 2\pi r_1 f_1 = 2 \cdot 3,14 \cdot 0,08 \cdot 15 \text{ m s}^{-1}$$

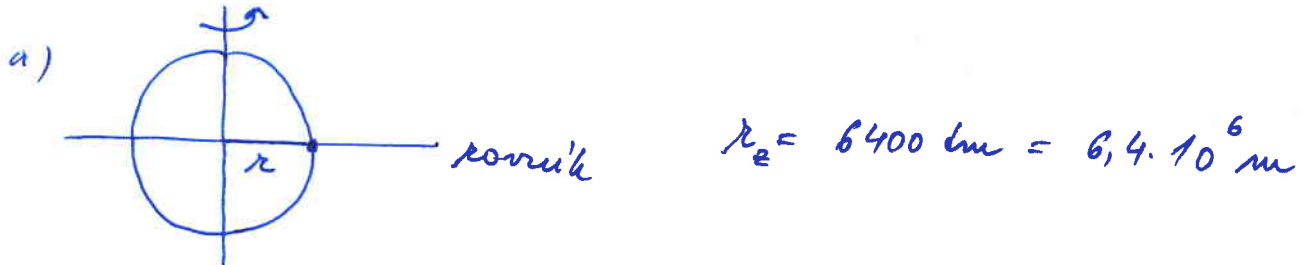
$v =$

$$277/4 \quad \omega = 7,29 \cdot 10^{-5} \text{ rad s}^{-1}$$

$$R_2 = 6400 \text{ km}$$

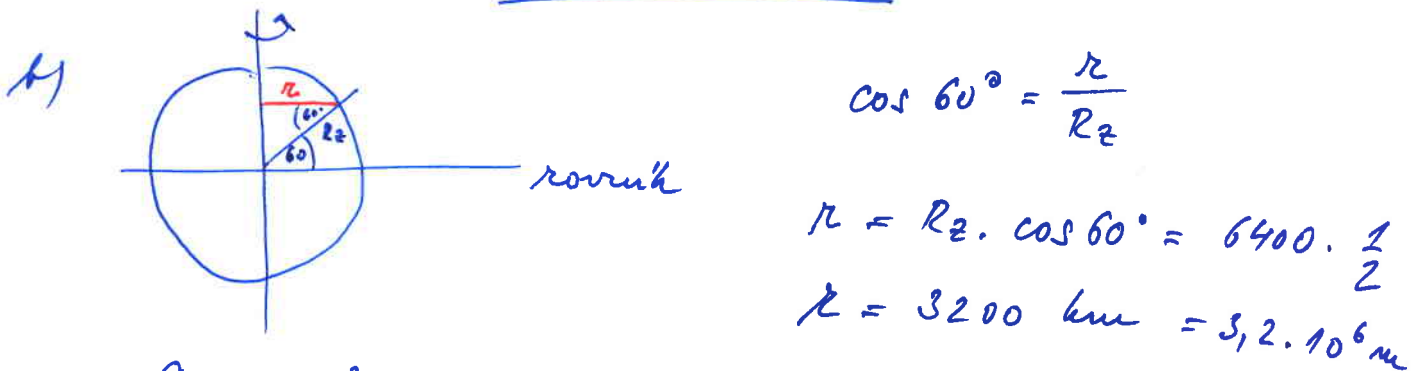
a) $a_d = ?$ (ms^{-2}) na rovníku

b) $a_d = ?$ (ms^{-2}) na 60° S.Z.S.



$$a_d = \omega^2 \cdot R_2 = (7,29 \cdot 10^{-5})^2 \cdot 6,4 \cdot 10^6 \text{ ms}^{-2}$$

$$\underline{\underline{a_d = 0,034 \text{ ms}^{-2}}}$$



$$a_d = \omega^2 \cdot r = (7,29 \cdot 10^{-5})^2 \cdot 3,2 \cdot 10^6 \text{ ms}^{-2}$$

$$\underline{\underline{a_d = 0,017 \text{ ms}^{-2}}}$$

212/5

$$r = 149,6 \cdot 10^6 \text{ km} = 149,6 \cdot 10^9 \text{ m}$$

$$T = 1 \text{ rok} = 365 \text{ dní} = 3\,153\,600 \text{ s}$$

$$v = ? \text{ (km s}^{-1}\text{)}$$

$$v = \frac{2\pi r}{T} = \frac{2\pi \cdot 149,6 \cdot 10^9}{3\,153\,600} \text{ ms}^{-1}$$

$$a = ? \text{ (ms}^{-2}\text{)}$$

$$v = 29\,797 \text{ ms}^{-1} \doteq \underline{\underline{29,8 \text{ km s}^{-1}}}$$

$$a = \frac{v^2}{r} = \frac{29\,797^2}{149,6 \cdot 10^9} \text{ ms}^{-2} = \underline{\underline{0,0059 \text{ ms}^{-2}}}$$