

1911

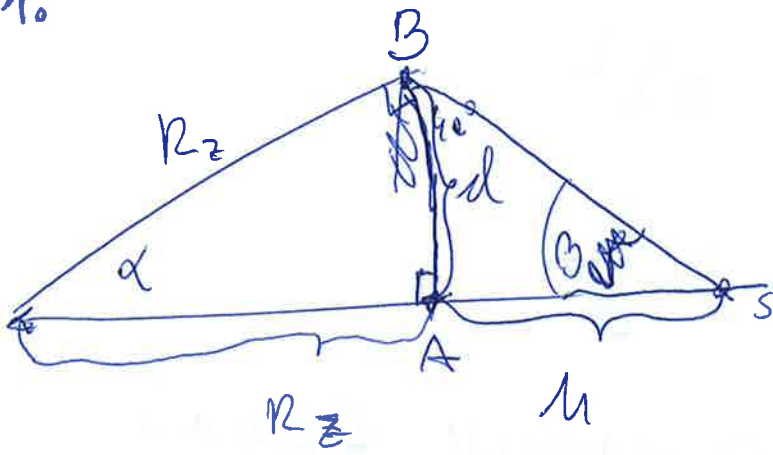
THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

RECEIVED

1911

1.



$$d = \frac{\sigma_z \alpha}{360^\circ}$$

$$d = \frac{2\pi R_z \alpha}{360^\circ}$$

$$d = \frac{6,28 \cdot 6400 \cdot 45 \cdot 800}{360}$$

$$\frac{6,28 \cdot 800}{5024,00}$$

$$d = \underline{\underline{5024 \text{ km} \approx 5000 \text{ km}}}$$

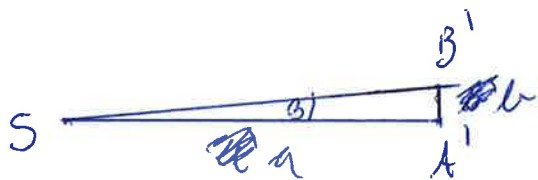
$$\alpha = 45^\circ$$

$$\alpha + B = 90^\circ$$

$$B = 90^\circ - 45^\circ$$

$$\underline{\underline{B = 45^\circ}}$$

RECIMO DAVJE JE ΔASB
PRAVAHOJEN



$$a = 5000000 \text{ m}$$

$$b = 5 \text{ mm}$$

$$\frac{a}{b} = \frac{M}{d}$$

$$\frac{5010}{5} = \frac{M}{5000 \text{ km}}$$

$$M = 10 \cdot 5000 \text{ km}$$

$$\underline{\underline{M \approx 50000 \text{ km} = 5 \cdot 10^7 \text{ m}}}$$

RES

$$110000 : 60 = 1833,3$$

$$\begin{array}{r} 50 \\ 21 \\ 20 \\ 2 \end{array}$$

$$1833,3 : 60 = 30,55$$

$$\begin{array}{r} 33 \\ 330 \\ 330 \end{array}$$

$$\frac{a^3}{t^2} = \frac{GM_z}{4\pi^2}$$

$$\frac{a^3}{t^2} = \frac{6,67 \cdot 10^{-11} \cdot 6 \cdot 10^{24}}{40}$$

$$\frac{a^3}{t^2} = \frac{40 \cdot 10^{13}}{40}$$

$$t = \sqrt{\frac{a^3}{10^{13}}}$$

$$\sqrt{125} \approx 11$$

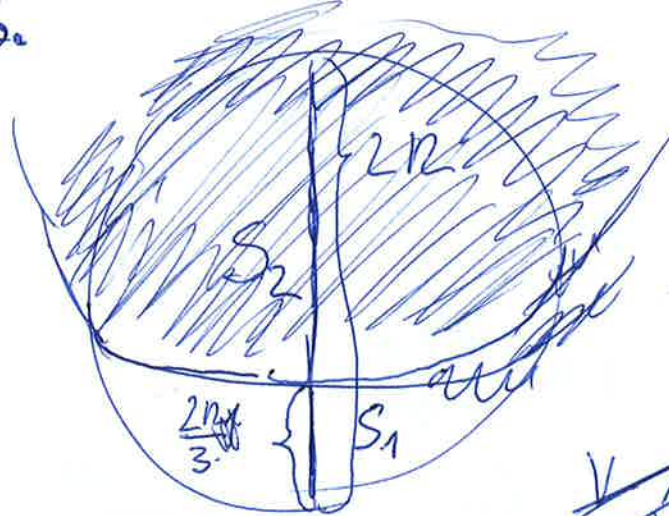
$$t = \sqrt{\frac{125 \cdot 10^{24} \cdot 10^3}{10^{13}}}$$

$$t = \sqrt{125 \cdot 10^6}$$

$$t = 10^9 \sqrt{125} = 11000000 \text{ s} = 311 \text{ days}$$



3.



~~S1~~
~~S2~~

$$S = S_1 + S_2$$

~~V ALEKSANDRIJI LUNA
 POKRIVJE OKOLI 2/3
 PLOŠTINE SONCA.~~



S1
~~S1~~
 $S_1 > S_2$

V ALEKSANDRIJI
 LUNA POKRIVJE
 MALO VIŠE KOT
 POLOVICU SONCA

1. naloga

Elon Musk sanja o tem, da bi bil internet dostopen vsem. V ta namen načrtuje, da bi v orbito okoli Zemlje izstrelil množico satelitov, ki bi bili vsi na enaki višini nad površjem Zemlje. Izračunaj obhodno dobo satelitov in njihovo najmanjše število, s katerim bi s signali pokrili vso Zemljo. Predpostavi, da je na tleh komunikacija s satelitom mogoča, če je satelit najmanj 40 stopinj nad obzorjem.

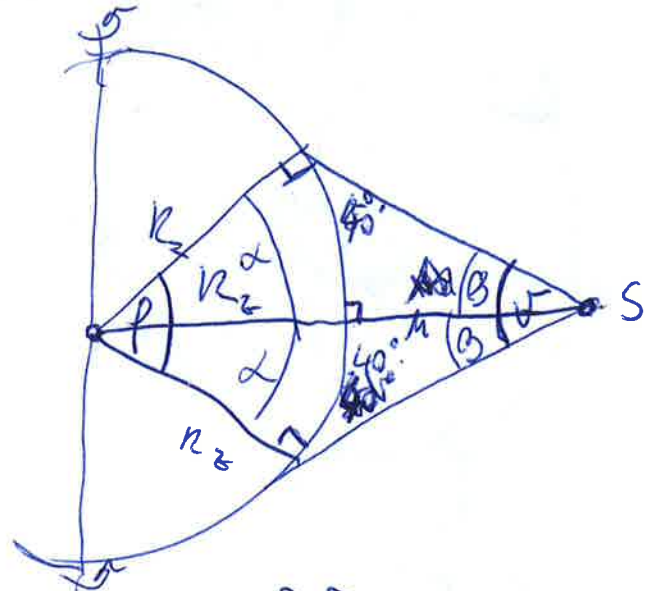
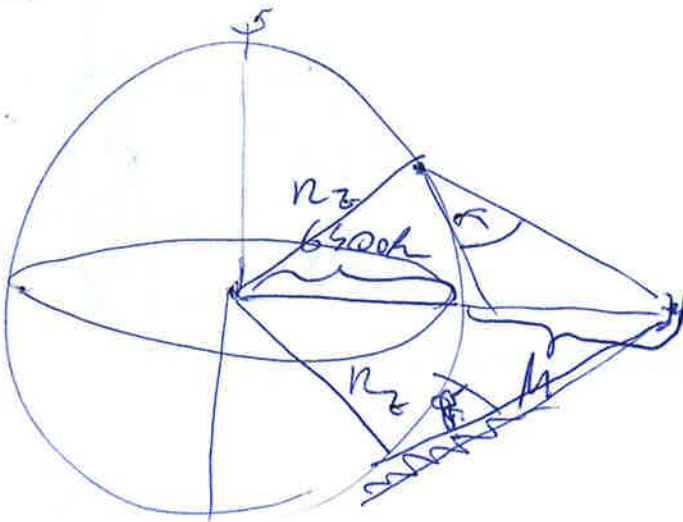
$\delta = 40^\circ$

$R_z = 6400 \text{ km}$

$\mu = k_0$

$T =$

$n =$



$\gamma + \rho + 2(\alpha + 90^\circ) = 360^\circ$

$\gamma + \rho + 260^\circ = 360^\circ$

$\gamma + \rho = 100^\circ$

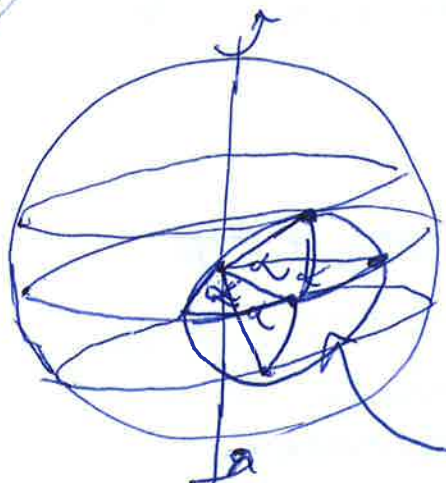
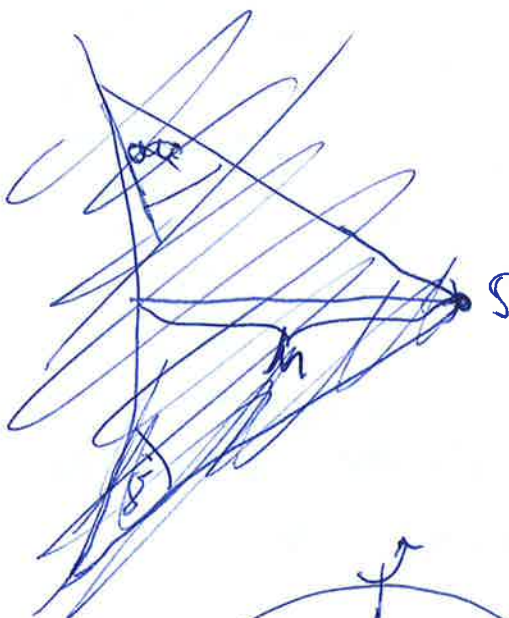
$\alpha = \frac{\gamma}{2}$

$\beta = \frac{\rho}{2}$

$\alpha + \beta = 50^\circ$

$\alpha < 50^\circ$

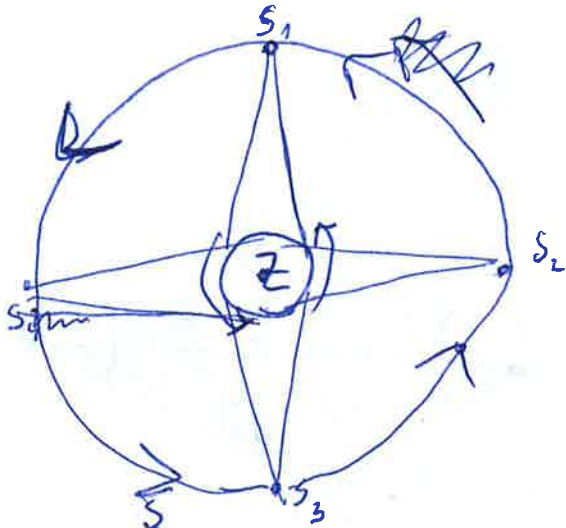
$\rho < 100^\circ$



OBMOČJE, KI GA POKRIDE EN SATELIT

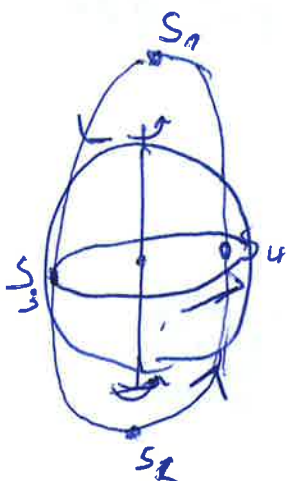
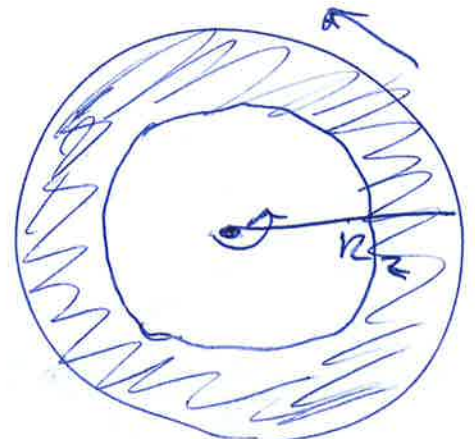
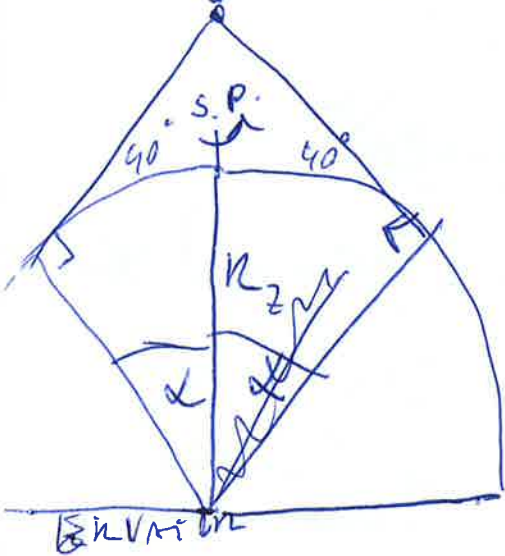
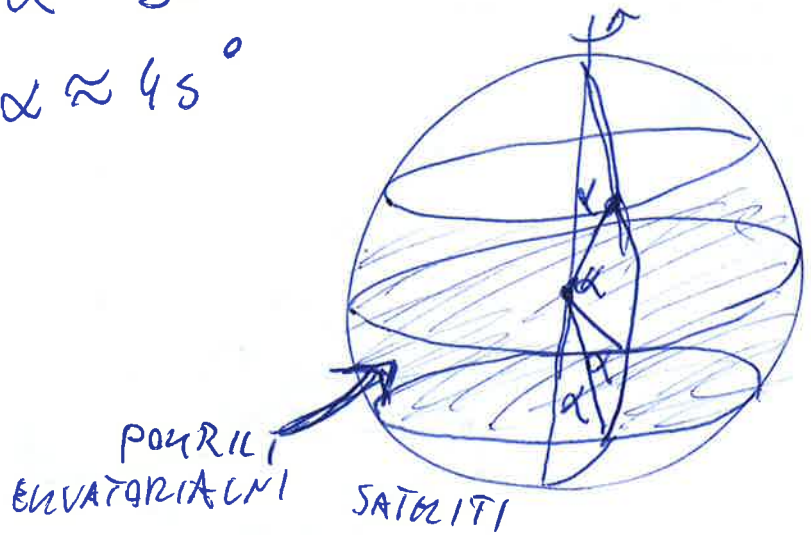
M_E ... ŠTEVILO SATELITOV, KI KROŽIJO OKOLI EKVA TORIJA

$$M_E = \frac{360^\circ}{\varphi} = \frac{360^\circ}{\approx 100^\circ} = \approx 3,6 = 4$$



$$\alpha < 50^\circ$$

$$\alpha \approx 45^\circ$$



DVA SATELITA NE MORETA STALNO POKRIVATI POLOV ZATO BI MORALI TO POČETI VSAJ 4.

$$M_P = 4$$

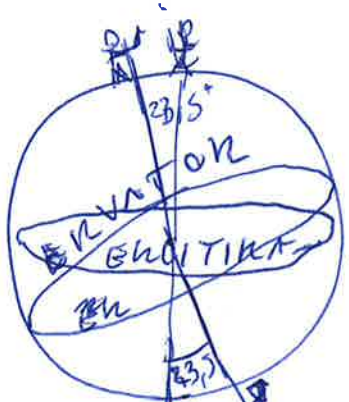
$$M = M_E + M_P$$

$$M = 8 \text{ SATELITOV}$$

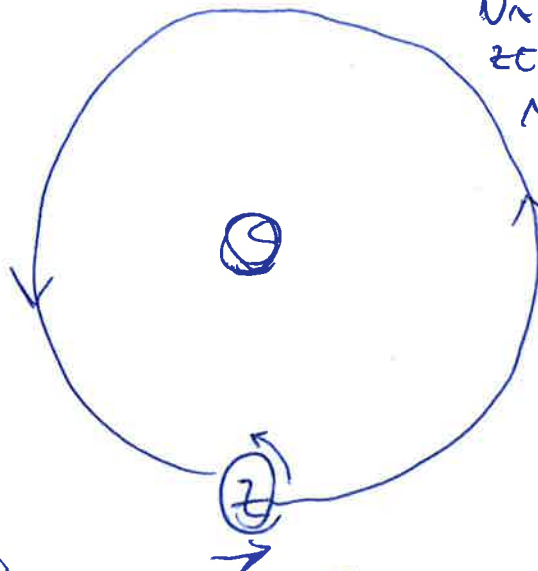
MINIMALNO

2. naloga

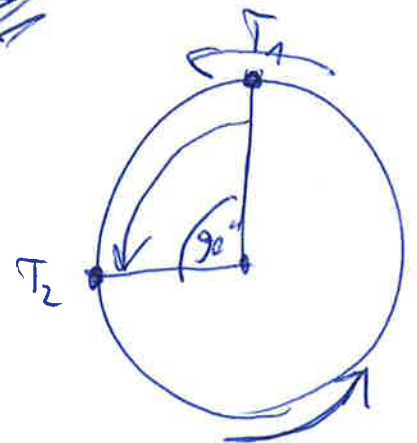
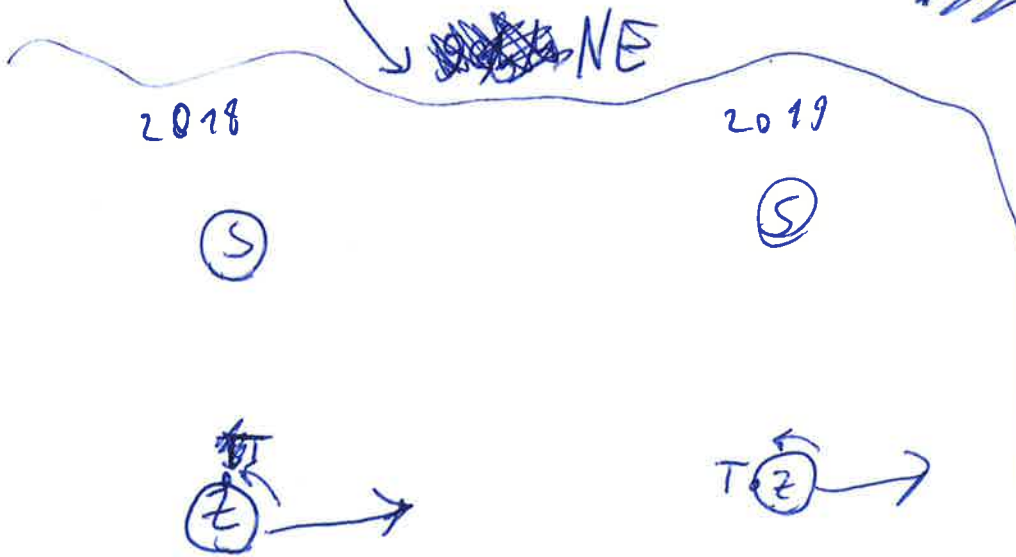
Raziskovalec je leta 2018 na severnem polu Zemlje opazoval vzhod Sonca in ugotovil, da se je zgornji rob ploskvice Sonca pokazal prav na določeni točki obzorja. Se bo leta 2019 zgornji rob Sonca pokazal na isti točki obzorja ali ne? Če ne, kolikšen bo kot med smerjo proti točki iz leta 2018? V katero stran od točke iz leta 2018 bo v tem primeru točka pojavljanja roba Sonca leta 2019? Vplive ozračja zanemari.



$T_Z = 365,25$ DNI



Vrtnost Zemljine osi na ekvatorialni odvisna od vrtenja Zemlje



$\omega_Z = \frac{360^\circ}{T}$

$f = \omega_Z \cdot t$

$\omega_Z = \frac{360^\circ}{24h}$

$f = 15^\circ/h \cdot 6h$

$\omega_Z = 15^\circ/h$

$f = 90^\circ$

Pokazalo se bo 90° zahodno (desno) kot leta 2018.

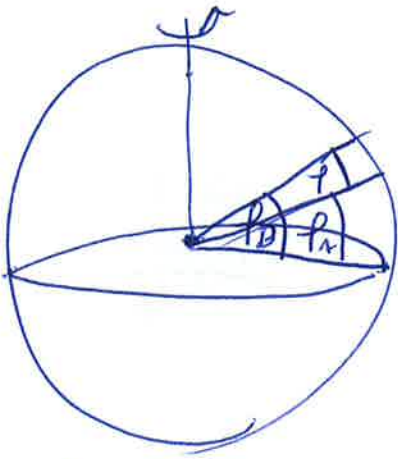
1900
1901
1902
1903
1904



1905
1906
1907
1908
1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920

3. naloga

Agatoklov Sončev mrk, eden najznamenitejših opisanih antičnih mrkov, je bil 15. avgusta 310 pred našim štetjem. Kot popolni je bil viden nad morsko ožino Dardanele (40 stopinj severne zemljepisne širine, 30 stopinj vzhodne zemljepisne dolžine). Znano je, da so ta mrk videli tudi učenjaki v Aleksandriji (30 stopinj severne zemljepisne širine, 30 stopinj vzhodne zemljepisne dolžine), ki so opazili, da se je Lunina senca gibala pravokotno na nebesni poldnevnik. Oцени največjo fazo tega Sončevega mrka v Aleksandriji.



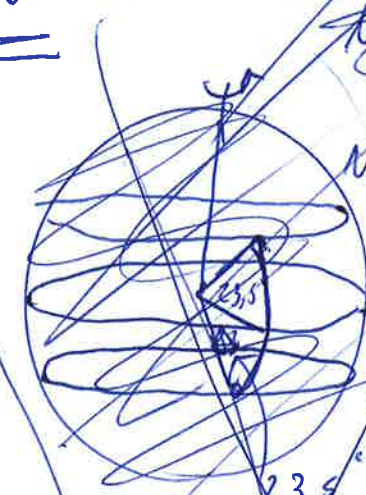
$$l = l_0 - l_A$$

$$l = 40^\circ - 30^\circ$$

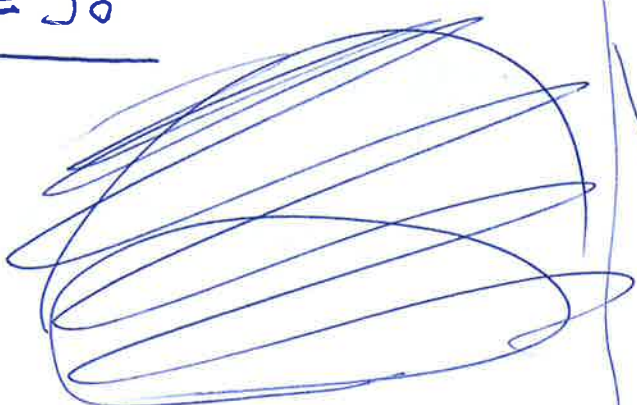
$$l = \underline{\underline{10^\circ}}$$

$l_0 = 40^\circ$
 $l_A = 30^\circ$

~~27. JUNIJ~~ ~~15. AVGUST~~
~~13. MESSICA~~
PRIBL.
~~11. MESSICA~~

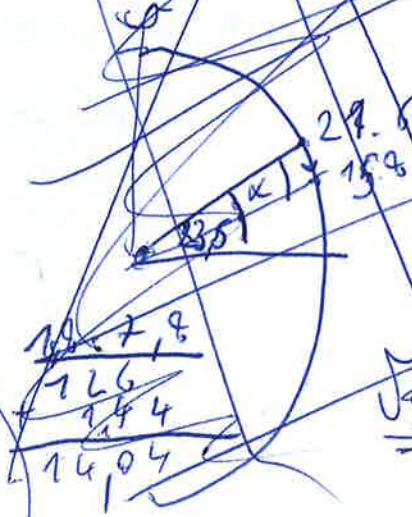
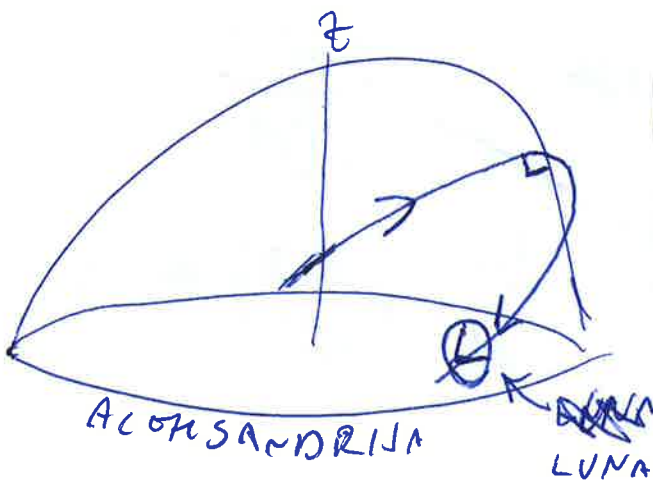


~~23,5~~
~~MS = 7,8 MESSICA~~
~~MS = 7,8 MESSICA~~



~~23,5~~
~~23,5 * 3 = 70,5 MESSICA~~

~~DECLINACIJA~~
~~SONCA~~



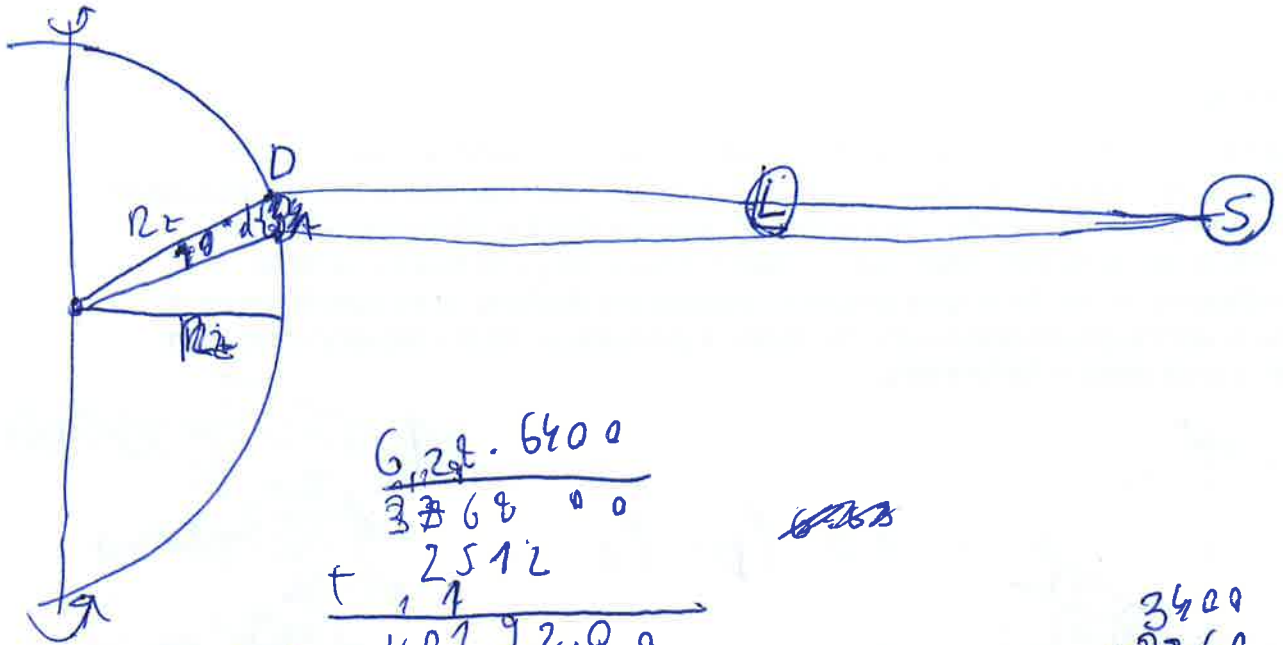
~~alpha = 7,8 MESSICA~~
~~alpha = 7,8 MESSICA~~
~~alpha = 14~~

10,78
- 126

1144

114,04

~~MS = 9,5~~



$$\begin{array}{r}
 6,28 \cdot 6400 \\
 \hline
 336800 \\
 + 2512 \\
 \hline
 4019200
 \end{array}$$

$$\begin{array}{r}
 3400 \\
 - 3360 \\
 \hline
 040
 \end{array}$$

$$d = \frac{O_2 \cdot l}{360^\circ}$$

$$d = \frac{2\pi r \cdot \alpha}{360 \cdot 36}$$

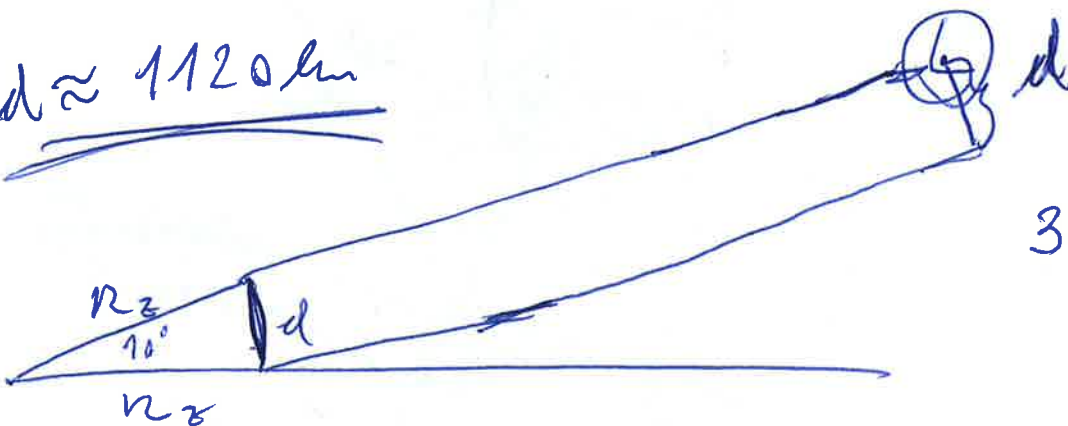
$$d = \frac{6,28 \cdot 6400}{36}$$

$$40192 : 36 = 1116,4$$

$$\begin{array}{r}
 41 \\
 59 \\
 232 \\
 \hline
 160
 \end{array}$$

~~3360~~

$$d \approx 1120 \text{ km}$$



$$\begin{array}{r}
 3400 \\
 40 \\
 \hline
 1120 = 3
 \end{array}$$

DARDANELE

ALEKSANDRIJA



$$\frac{2R_2}{d} = \frac{3400}{1120} \approx 3$$

4. naloga

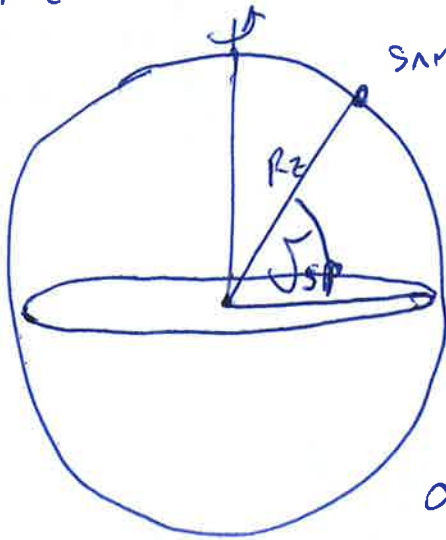
Oceni, kolikšen delež vseh zvezd, ki kadarkoli pridejo nad obzorje v Sankt Peterburgu, pride v zgornjo kulminacijo severno od zenita.

$J_{SP} = 60^\circ$
 $R_z = 6400 \text{ km}$

CE SO ZVEZDE
 RAZPOREJENE

ENA KOMBINA

SANKT PETERSBURG



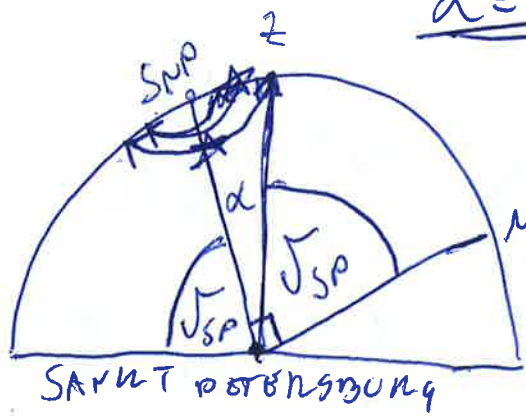
$J_{*} > J_{SP}$

~~$J_{*} > 60^\circ$~~

$J_{*} > 60^\circ$

$\alpha = 90^\circ - J_{SP}$

$\alpha = 30^\circ$

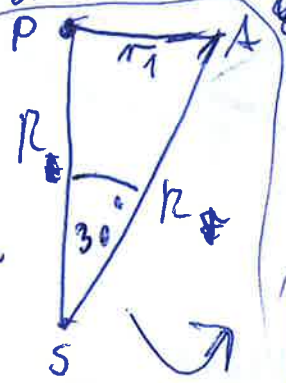
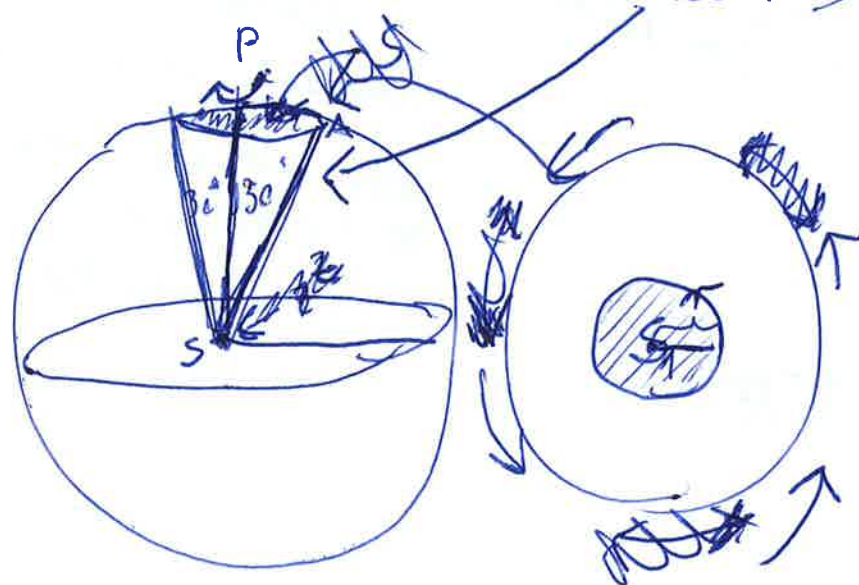


SANKT PETERSBURG

~~VSOMERBO~~
~~DEL KOTA~~
~~NIKA ZVODI~~
~~NAKATINJASO~~
~~SEVERNO OD ZENITA~~
 $S = 4\pi R^2$
 $S_1 \approx \pi r_1^2$

RECIMO DA JE ΔSPA

PRAVOKOTEN
 KOTAN



$\sin 30^\circ = \frac{r_1}{R}$

$r_1 = \frac{R}{2}$

$\frac{R}{\pi_1} = \frac{R}{2}$

~~$\frac{S}{S_1} = \frac{4\pi R^2}{\pi R^2}$~~

~~$\frac{S}{S_1} = \frac{4R^2}{(0,5R)^2}$~~

~~$\frac{S}{S_1} = \frac{4R^2}{0,25R^2}$~~

~~$\frac{S}{S_1} = 16$~~

~~$S_1 = \frac{S}{16}$~~

~~S_{SP}~~ ... VSE KUBE DZE
 VIDNE V SAK. P.
 VSO NETO

~~$S_{SP} = S - S_2$~~

~~$S_{SP} = 4\pi R^2 - \pi R^2$~~

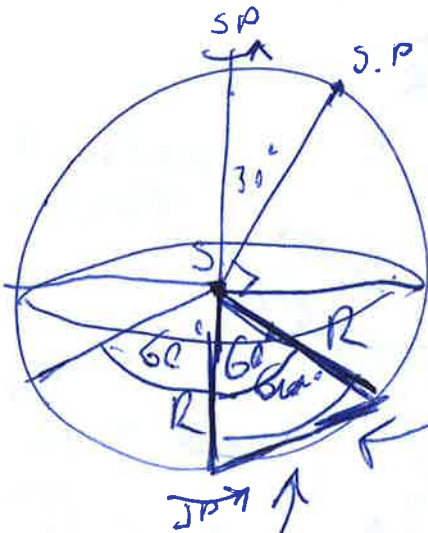
~~$S_{SP} = 3\pi R^2$~~

ZUGEDNI KULMIMINIRA
 JOVNE OD
 ZEMIT $S_1 = \pi R^2$
 $S_2 = \pi R^2$
 ZUGEDNI, NI JO
 SUT ME VIDI

$\frac{S_{SP}}{S_1} = \frac{3\pi R^2}{\pi R^2}$

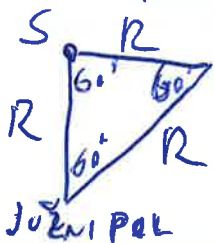
$\frac{S_{SP}}{S_1} = \frac{3R^2}{(0,5R)^2} = \frac{3R^2}{0,25R^2} = 12$

$S_1 = \frac{S_{SP}}{12}$



$\frac{1}{12}$ VSGH ZUGEDNI
 VIDNA V
 SAKUT PETORSURE
 KULMIMIRA
 SEVERNO
 OD ZEMIT

ENAKOSTRANIČNI
 TRIKOTNIK



$S_2 = \pi R^2$

5. naloga

Neka zvezda ima navidezno magnitudo +7, njeno lastno gibanje na nebu pa ni enako nič. Kolikšna bo njena navidezna magnituda, ko bo njeno lastno gibanje na nebu štirikrat manjše? Predpostavi, da se hitrost zvezde, s katero se giblje po vesolju, ne spreminja.

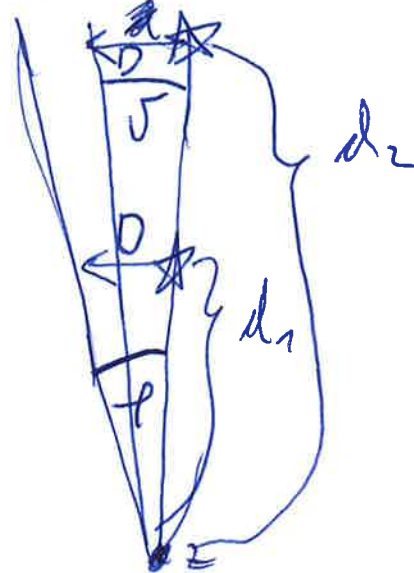
JE VEČNO
 ŽE PREDPOSTAVIMO DA SE GIBLJE
 V ISTO SMER.

~~$l_1 = +7$~~

$w_1 = 4w_2$

~~$l_2 =$~~

$v_1 = v_2$



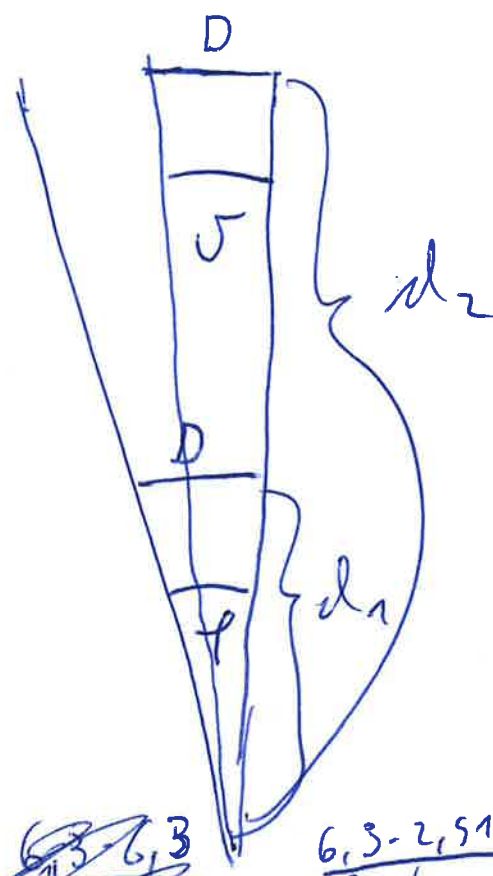
$\frac{l_1}{l_2} = \frac{\frac{K}{4\pi d_1^2}}{\frac{K}{4\pi (4d_1)^2}}$

$\frac{l_1}{l_2} = \frac{16 d_1^2}{d_1^2}$

~~$l_2 =$~~

$l = 45$

$l = 45$



$\frac{D}{d_1} = 4 \frac{D}{d_2}$

$d_1 = \frac{D d_2}{4D}$

$d_1 = \frac{d_2}{4}$

$\frac{l_1}{l_2} = 16$

$l_2 = \frac{l_1}{16}$

$l_2 \approx l_1 + 3m$

$l_2 = +10m$

~~$6,3 - 6,3$~~

$6,3 - 2,51$
 $\frac{126}{+ 316}$
 $\frac{163}{+ 163}$
 $15,913$

$2,51 - 2,51$
 $\frac{502}{+ 12551}$
 $\frac{1251}{+ 1251}$
 $6,3001$

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