

# **MATEMATIKA**

## **viša razina**

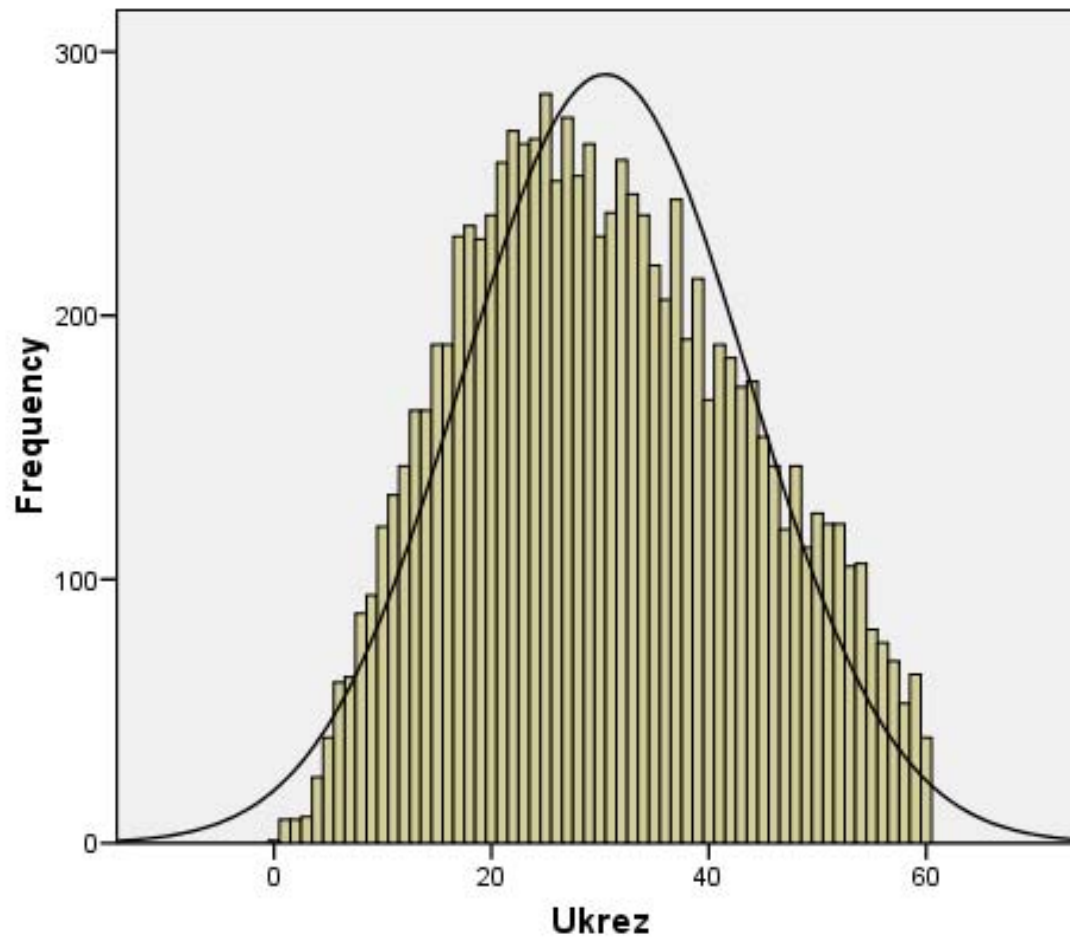
# **Rezultati državne mature 2010.**

# Deskriptivna statistika ukupnog rezultata

PARAMETAR		VRIJEDNOST
N		9626
k		45
M		30,5
St. pogreška mjerenja		3,95
Medijan		29
Mod		25
St. devijacija		13,18
Raspon		60
Minimum		0
Maksimum		60
Percentili	25	20
	50	29
	75	40
Cronbachov $\alpha$		0,91

# Deskriptivna statistika ukupnog rezultata

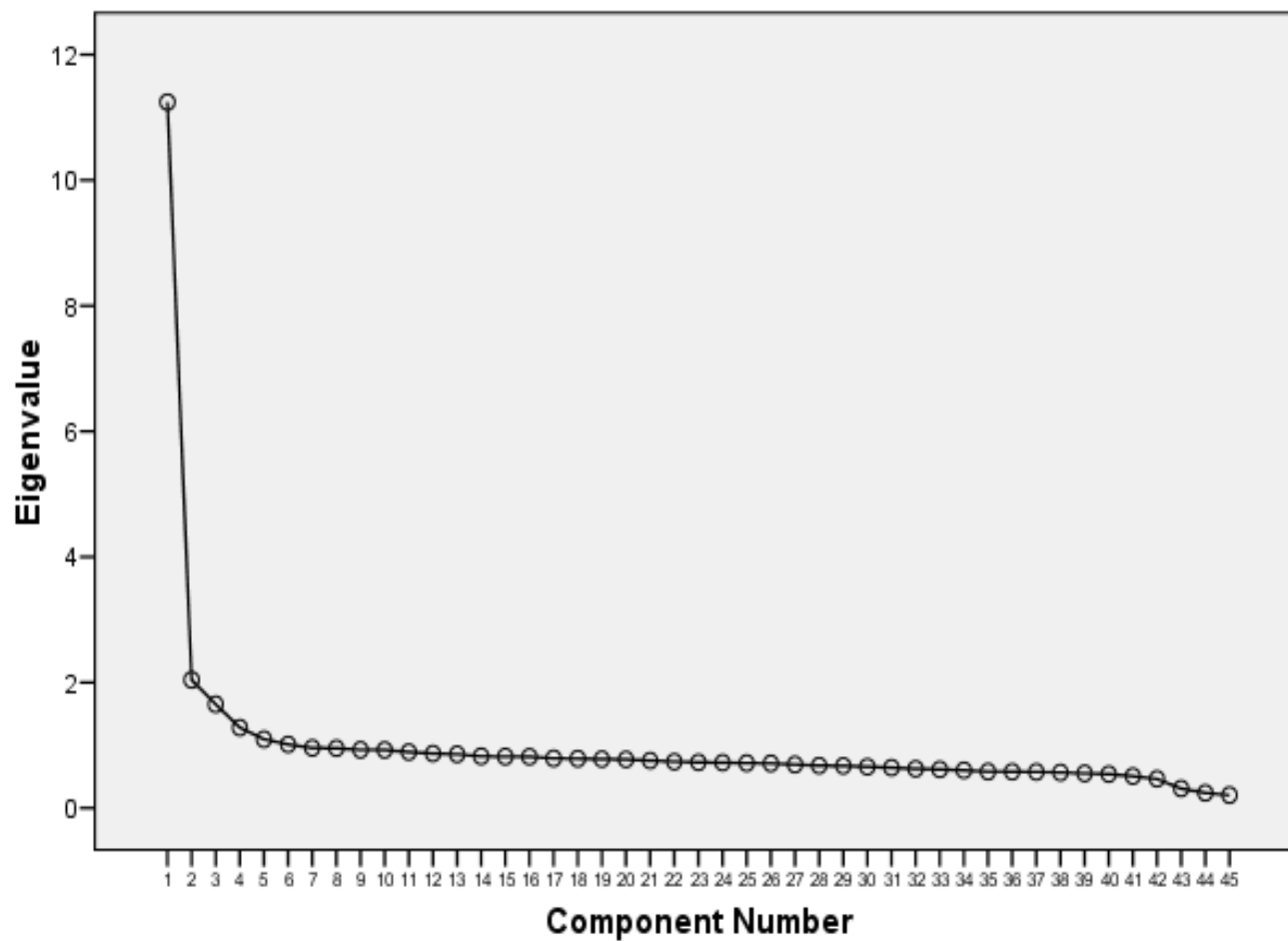
Histogram



## Pragovi ocjena i postotak učenika koji su dobili pojedinu ocjenu

	1	2	3	4	5
Prag	-	13	26	39	50
%	8,3	30,96	32,4	18,45	9,89

## Scree Plot



1. faktor: 25 % varijance

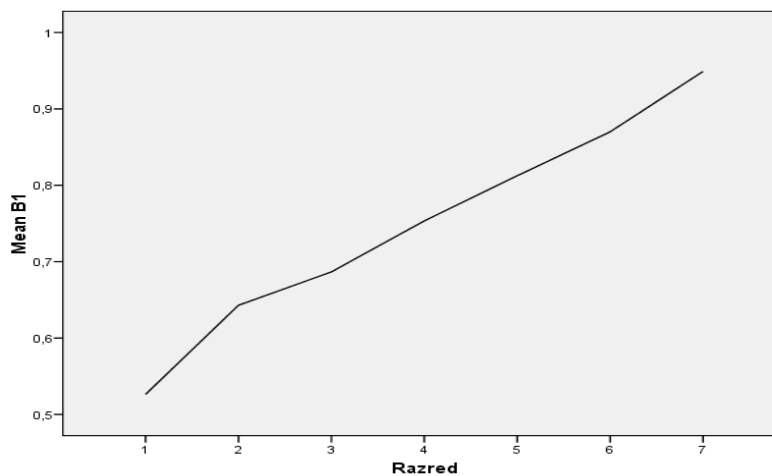
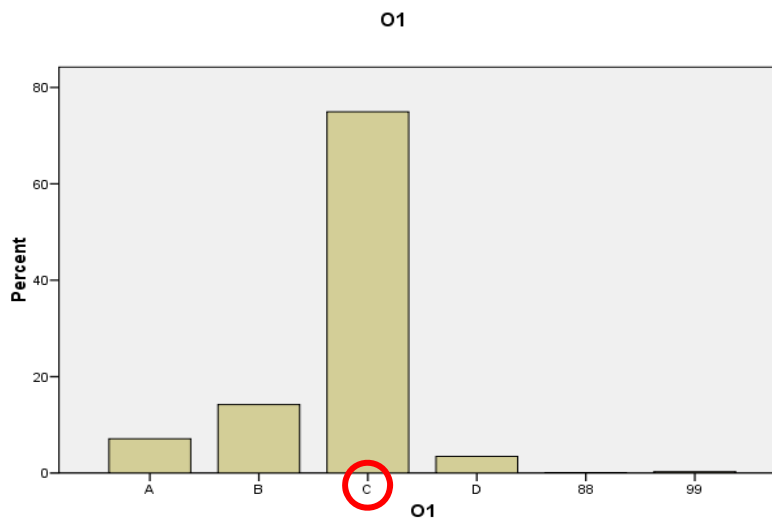


Težina zadatka	Redni broj zadatka
<b>Vrlo težak (0 – 0,2)</b>	20.2, 23.2, 27
<b>Težak (0,21 – 0,4)</b>	11, 15, 18.2, 24.2, 25.2, 25.3, 26, 29.3, 29.4, 29.5, 30
<b>Srednje težak (0,41 – 0,6)</b>	13, 14, 20.1, 22.1, 23.1, 28.3, 29.1, 29.2
<b>Lagan (0,61 – 0,80)</b>	1, 2, 4, 5, 7, 8, 9, 10, 12, 16, 17, 18.1, 19.2, 21.2, 22.2, 24.1, 25.1, 28.1
<b>Vrlo lagan (0,81 –1)</b>	3, 6, 19.1, 21.1, 28.2

# I. Zadatki višestrukoga izbora

## 1. Koja je od navedenih tvrdnji istinita?

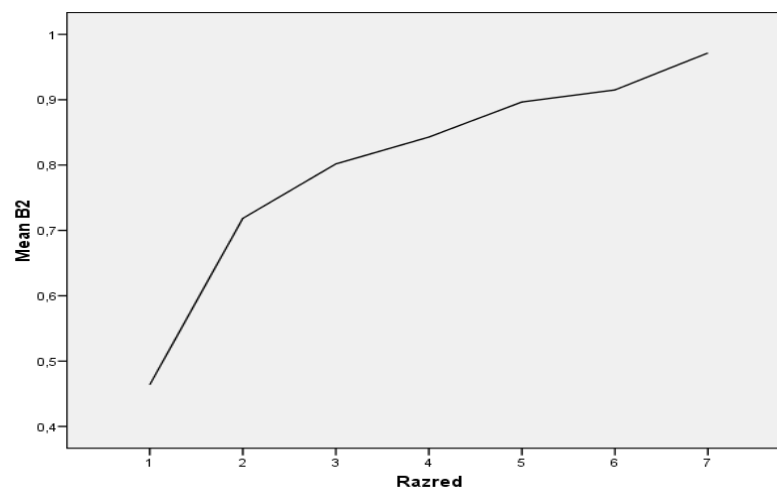
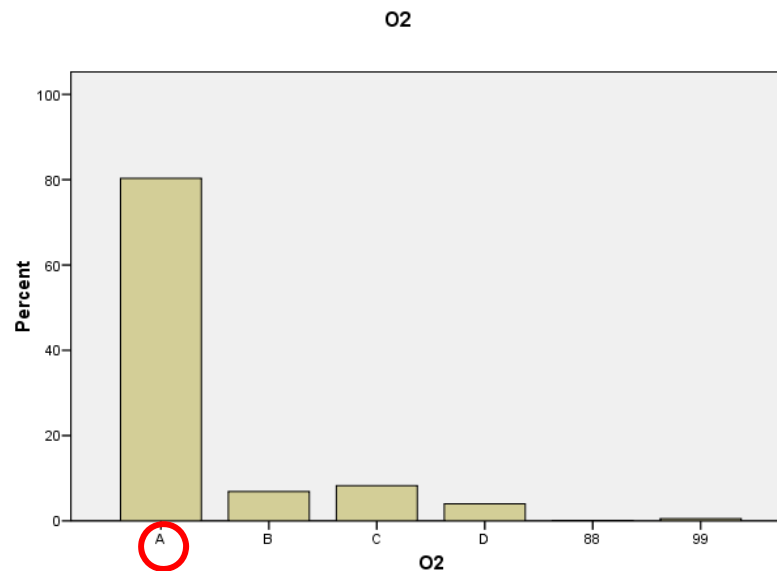
M	0,75
M (O)	
ID	0,28





## 2. Mjera kuta je $162^\circ$ . Koliko je to radijana?

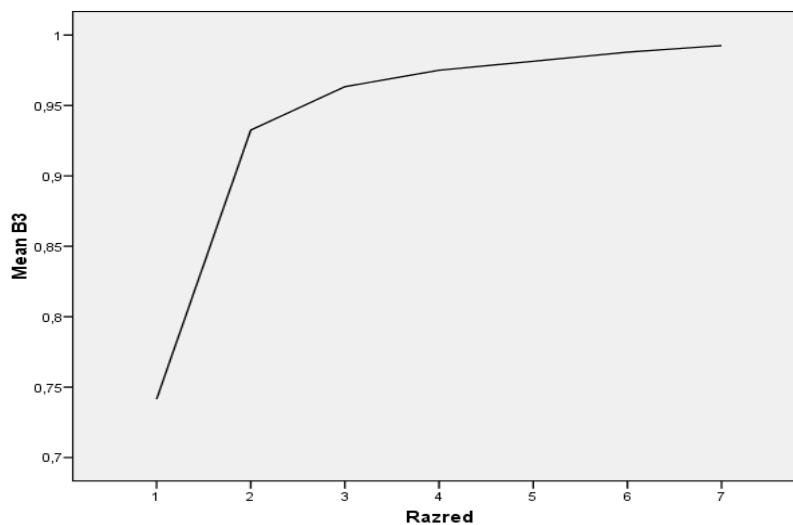
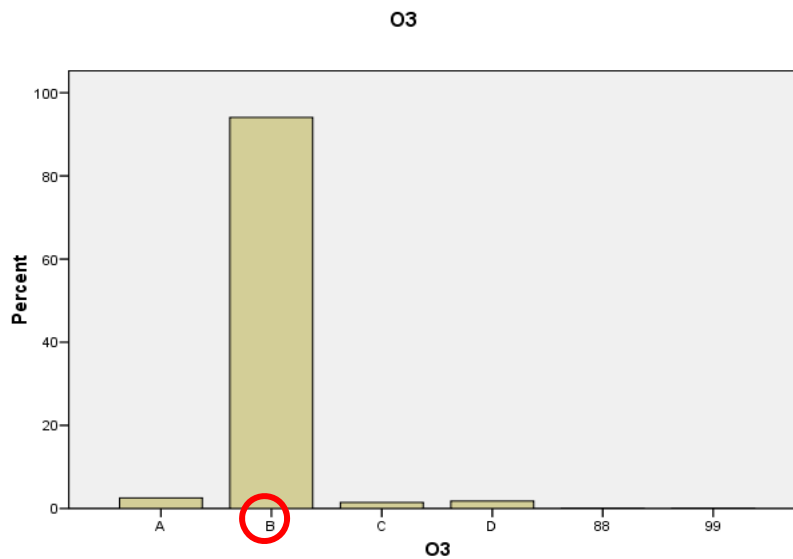
M	0,80
M (O)	
ID	0,33





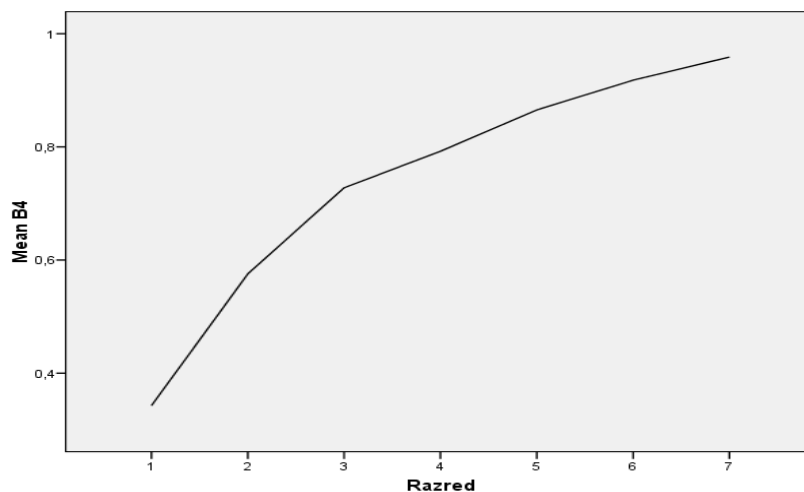
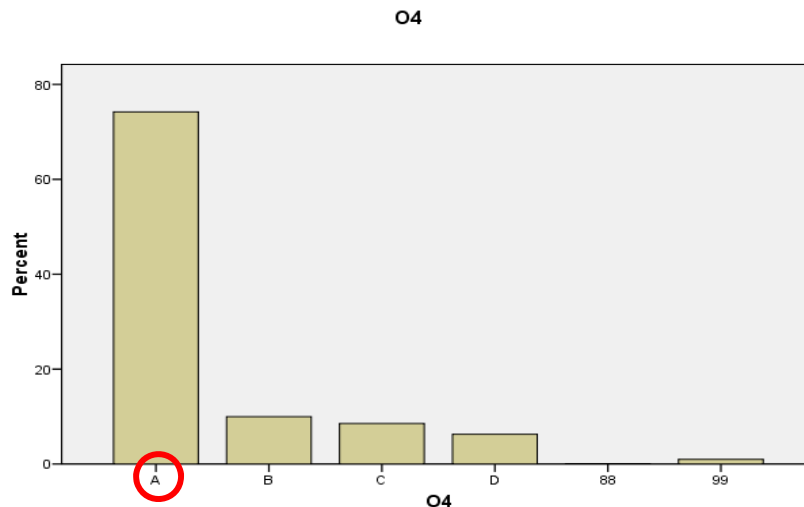
3. Koje je rješenje jednačbe  $x - [3x - (5 + x)] - 8 = 3(x + 2) - 1$  ?

M	0,94
M (O)	
ID	0,26



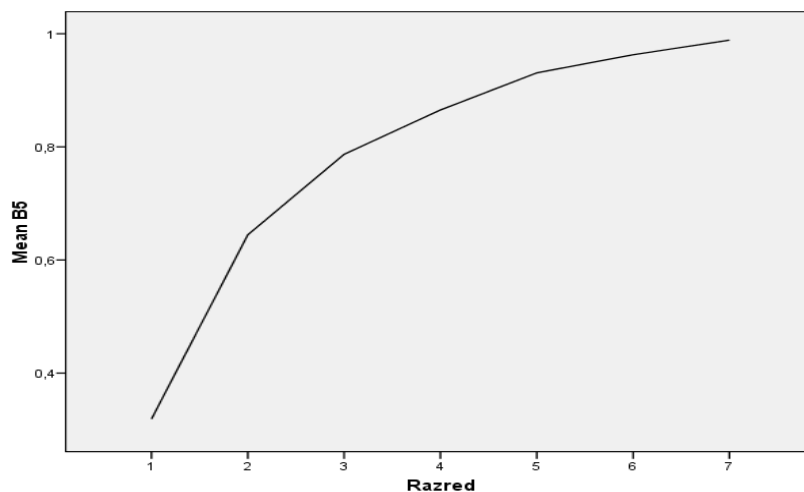
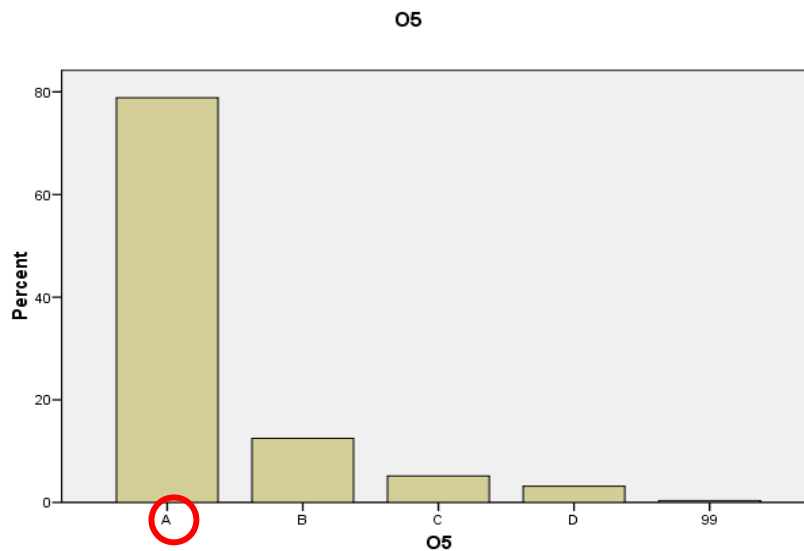
4. Duljine stranice trokuta  $ABC$  su  $a=12$  cm i  $c=9$  cm, a kut između njih je  $\beta=82^{\circ}17'$   
Kolika je duljina stranice  $b$ ?

M	0,74
M (O)	
ID	0,40



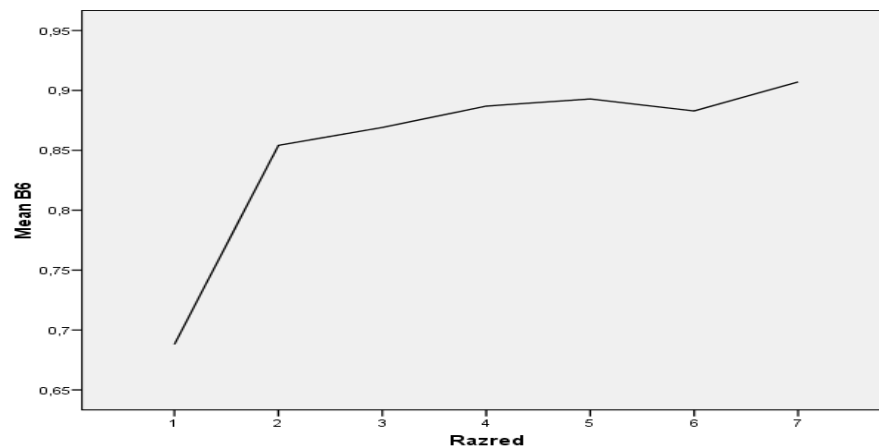
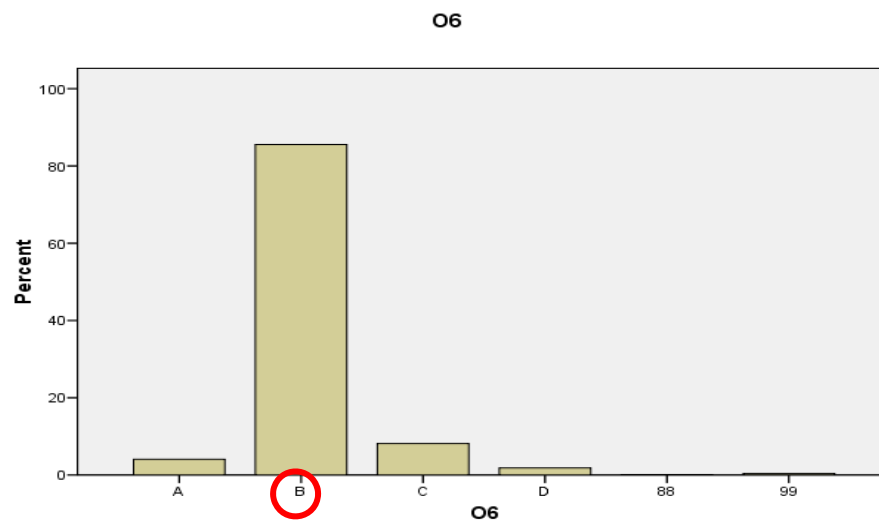
5. Točka  $S(-2,3)$  je središte kružnice koja prolazi ishodištem koordinatnoga sustava. Kako glasi jednadžba te kružnice?

M	0,79
M (O)	
ID	0,45



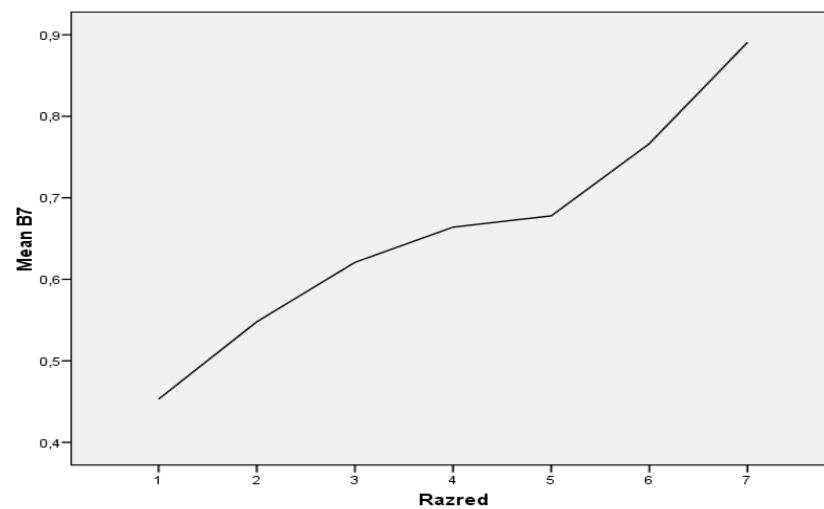
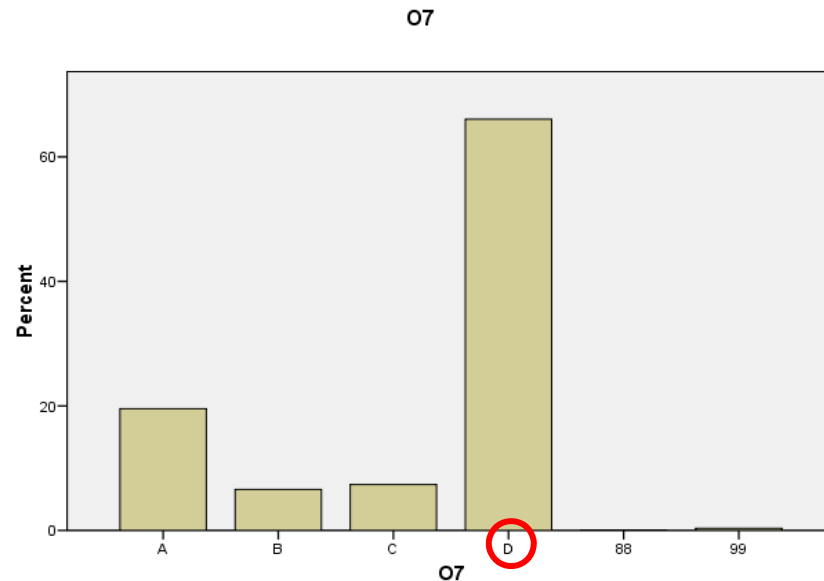
6. Pri penjanju na neku planinu izmjereno je da na svakih 100 metara visine temperatura zraka pada za  $0.7^{\circ}\text{C}$ . Na vrhu planine temperatura je iznosila  $14.8^{\circ}\text{C}$ . Istodobno je bila  $26^{\circ}\text{C}$  pri tlu na 0 m nadmorske visine. Kolika je visina te planine?

M	0,86
M (O)	
ID	0,13



## 7. Koji odnos vrijedi za površine $P$ , $Q$ , $R$ osjenčanih likova?

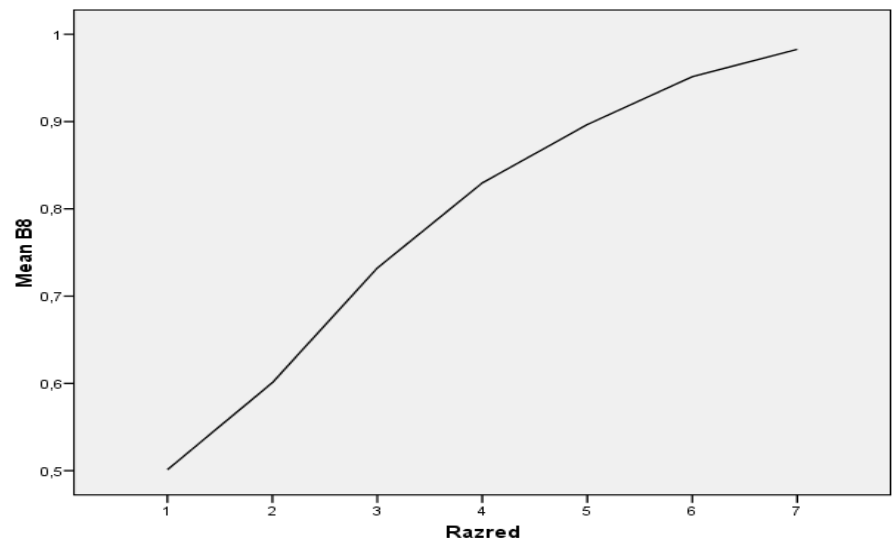
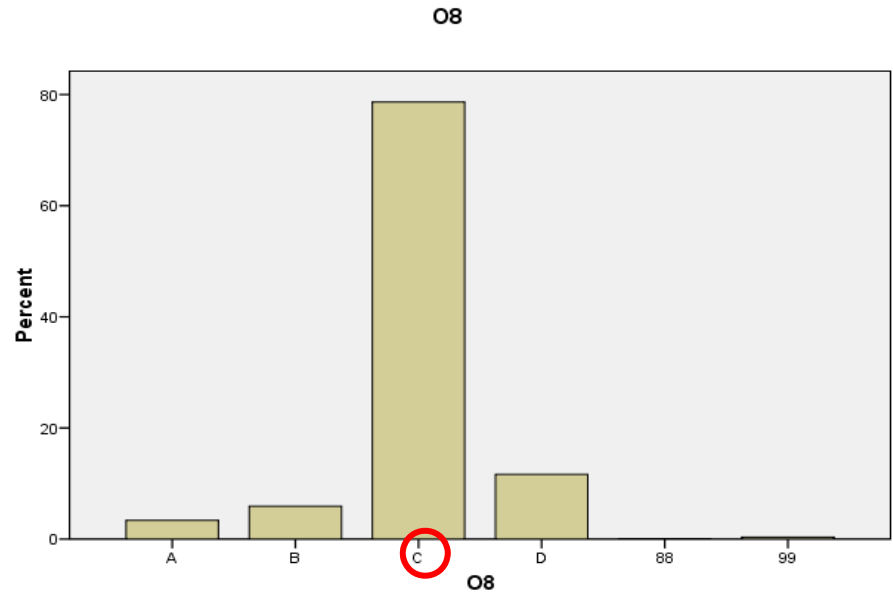
M	0,66
M (O)	
ID	0,25





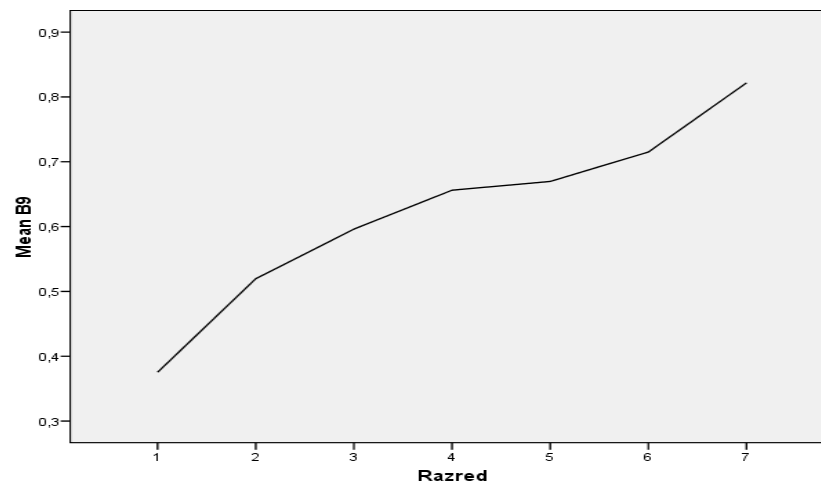
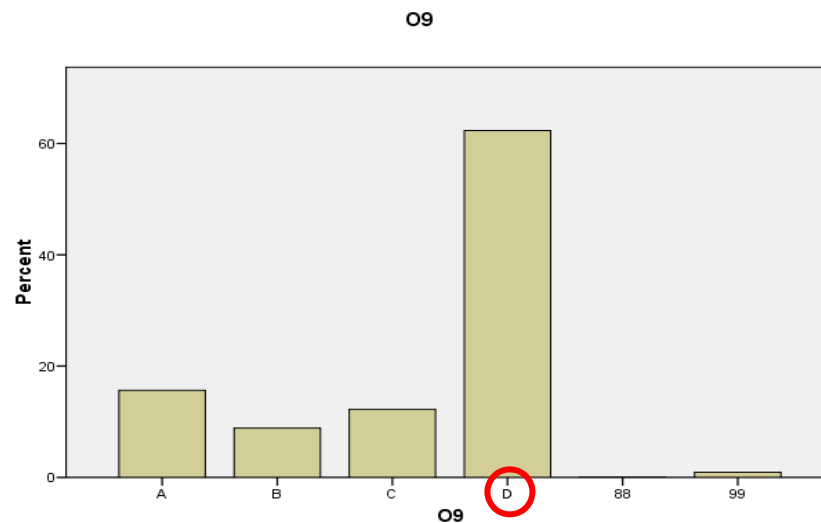
## 8. Koji je skup domena funkcije $f(x) = \log(2x + 4)$ ?

M	0,79
M (O)	
ID	0,37



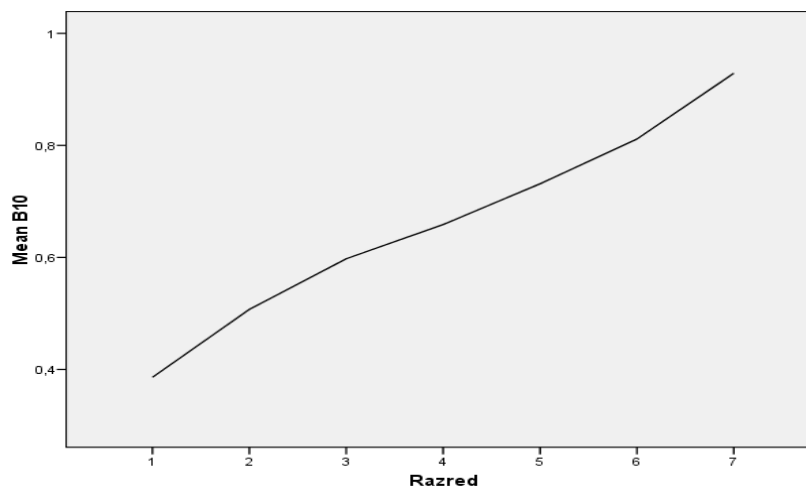
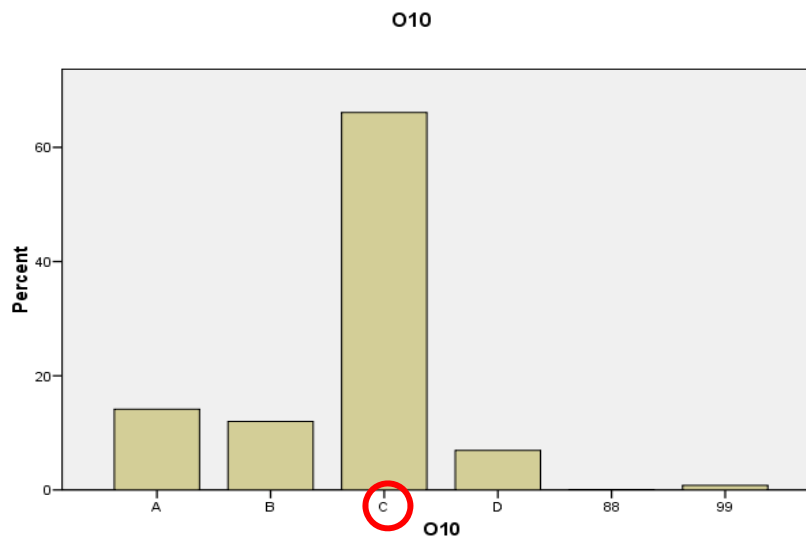
9. Promjer kružnice  $k$  hipotenuza je trokuta  $ABC$ . U trokut  $ABC$  upisana je kružnica  $k_1$  sa središtem  $M$ . Kolika je mjera kuta  $AMB$  ?

M	0,62
M (O)	
ID	0,24



## 10. Koliko iznosi modul (apsolutna vrijednost) kompleksnoga broja $(1 - i)^6$ ?

M	0,66
M (O)	
ID	0,33

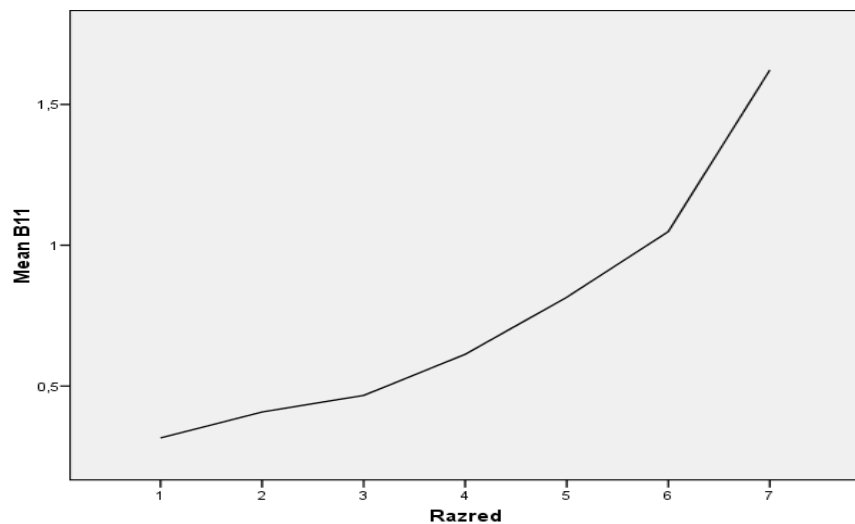
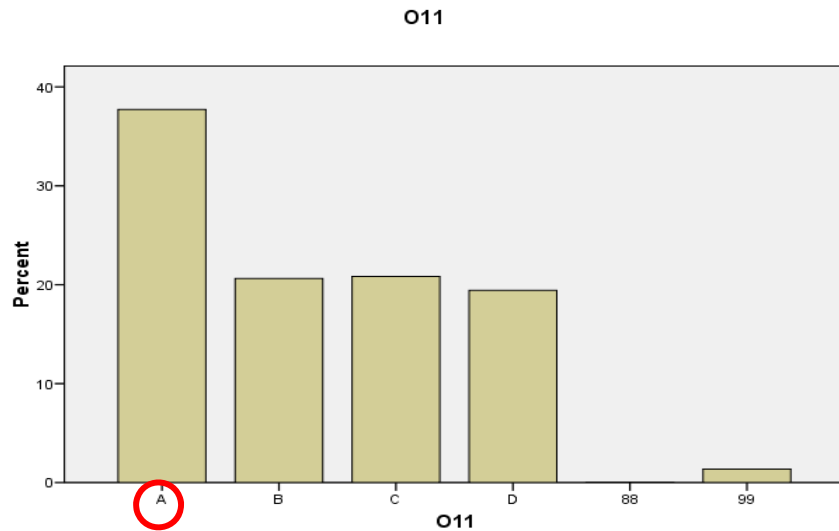




# 11. Koliki je zbroj rješenja jednadžbe

$$5^{x+2} + \left(\frac{1}{5}\right)^{x+1} = 6 \quad ?$$

M	0,75 (0,38)
M (O)	
ID	0,36

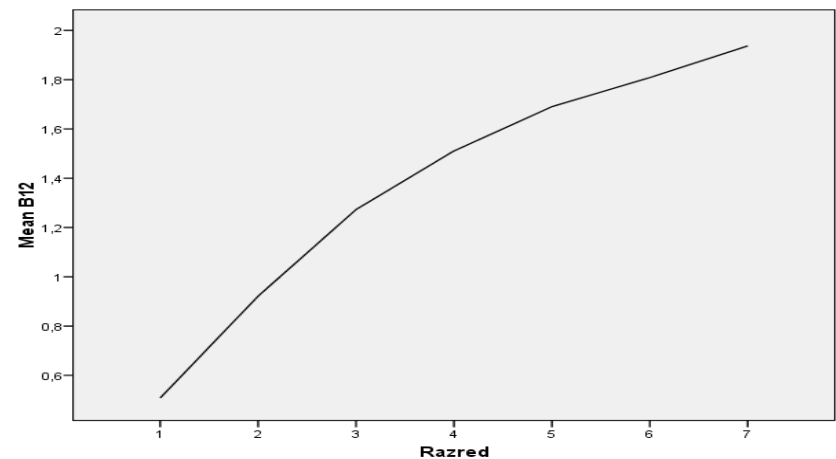
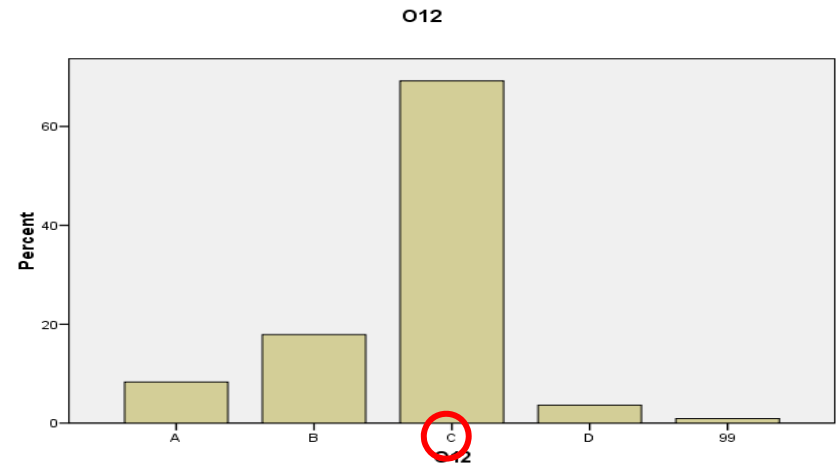


12. U trokutu  $ABC$  sa slike omjer kutova je  
 $\alpha : \beta : \gamma = 3 : 2 : 13$

Za duljine stranica vrijedi  $a - b = 3$  cm.

Kolika je duljina najkraće stranice toga trokuta?

M	1,38 (0,69)
M (O)	
ID	0,44

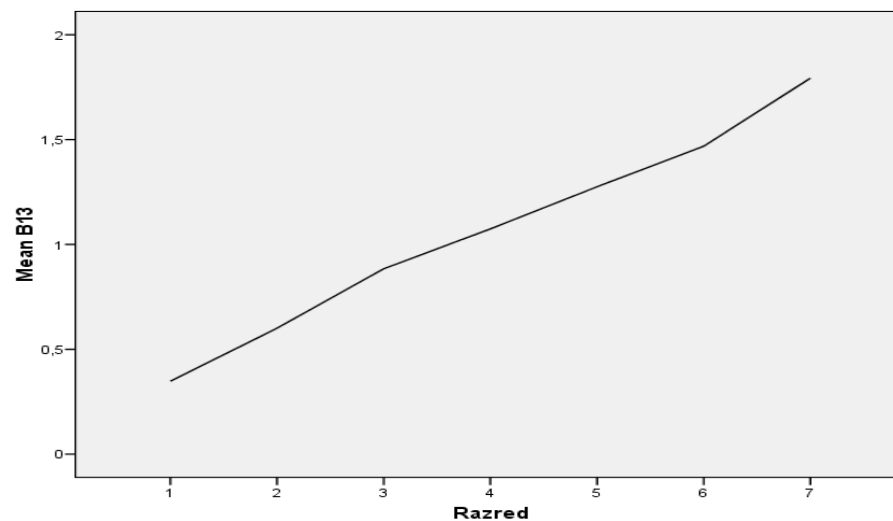
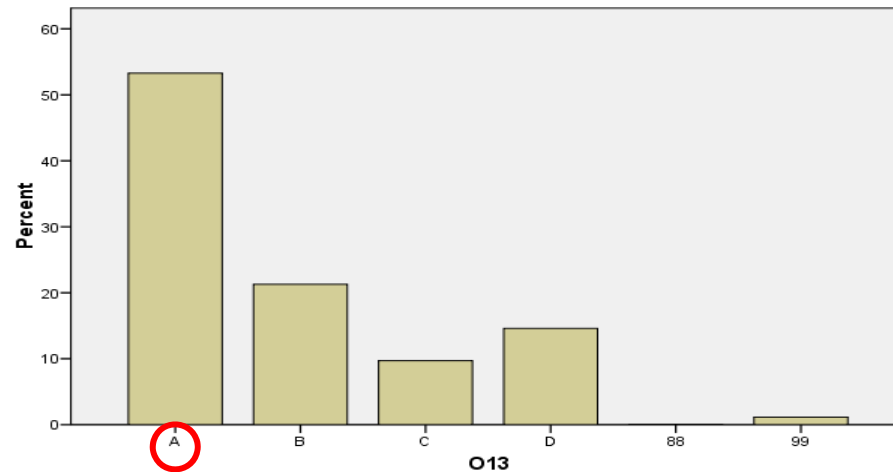


### 13. Što je rezultat sređivanja izraza

$$\left( \frac{1+a^{-1}+a^{-2}+a^{-3}}{a} - \frac{1}{a-1} \right) : \frac{a}{1-a^3} \quad \text{za } a \neq 0, 1 ?$$

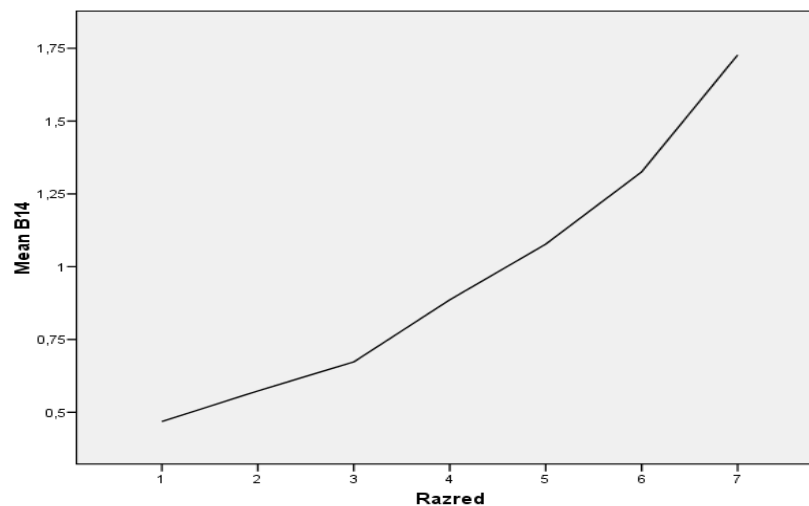
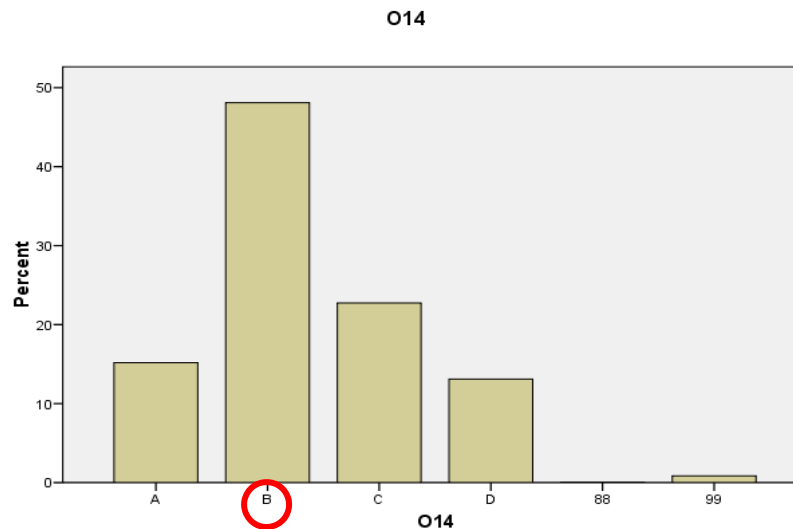
M	1,07 (0,54)
M (O)	
ID	0,40

O13



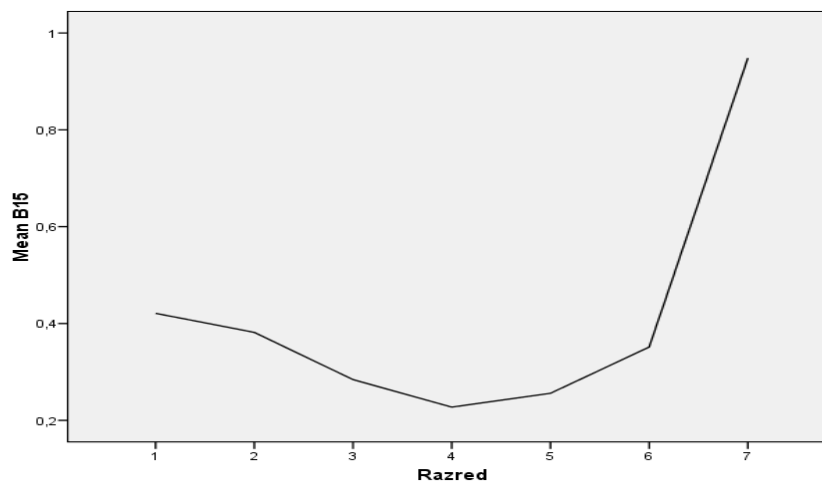
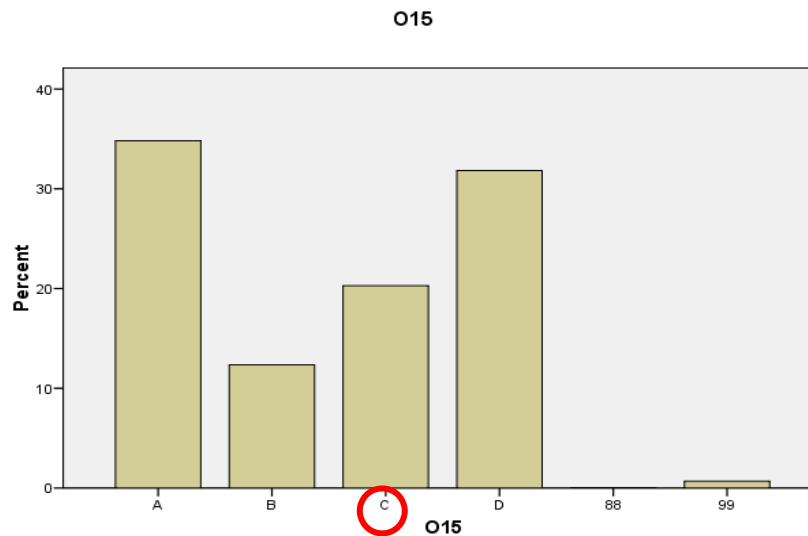
**14.** Puna metalna kocka brida  $a$  pretopljena je u kuglu. Koliki je promjer te kugle?

M	0,96 (0,48)
M (O)	
ID	0,35



15. Uz koji uvjet za realni broj  $m \neq 0$  jednažba  $m \sin x - 1 = 0$  ima rješenja?

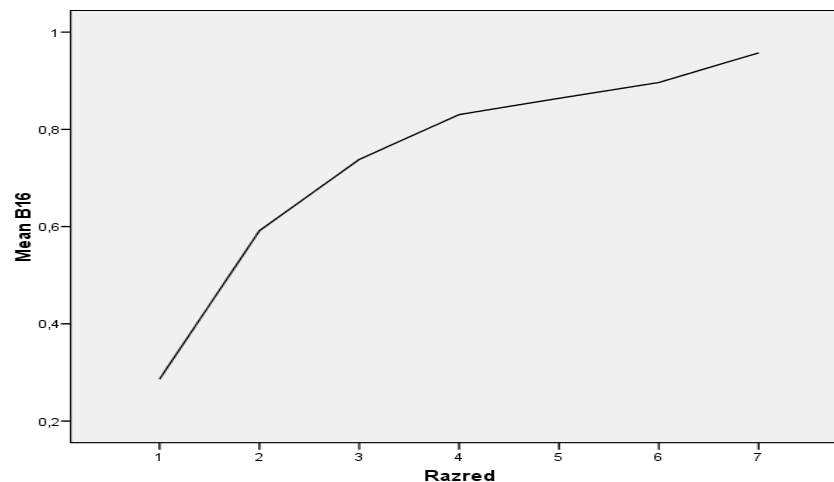
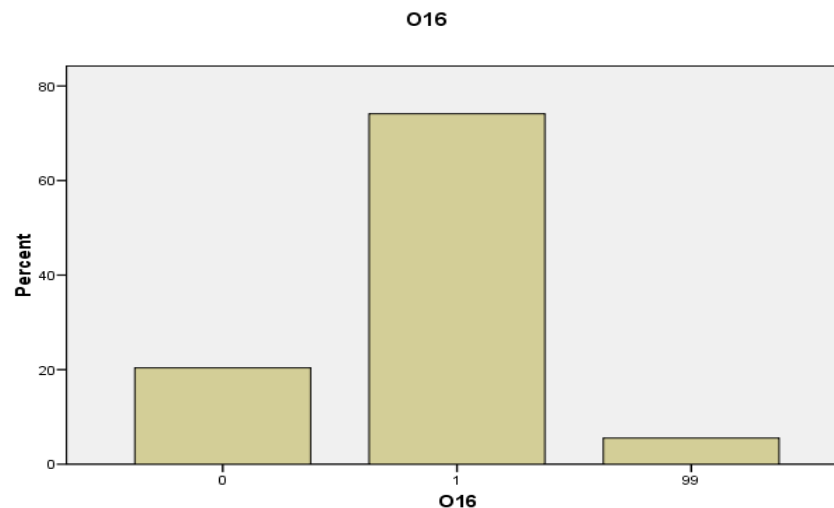
M	0,41 (0,21)
M (O)	
ID	0,11



## II. Zadatci kratkih odgovora

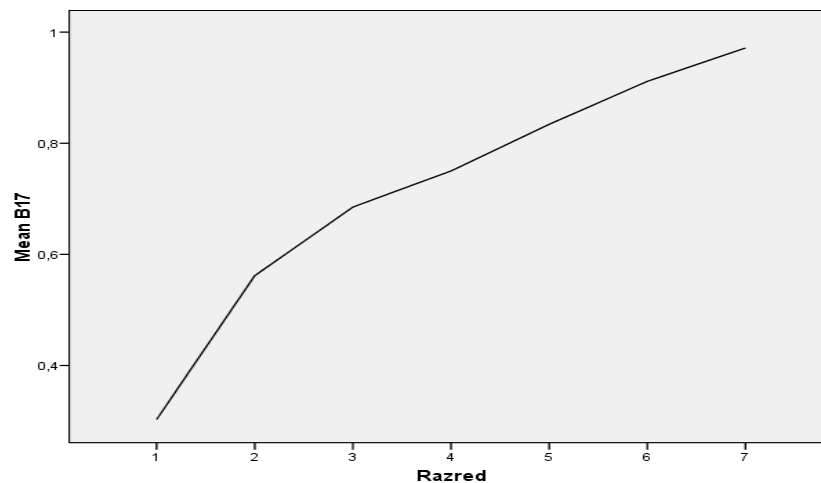
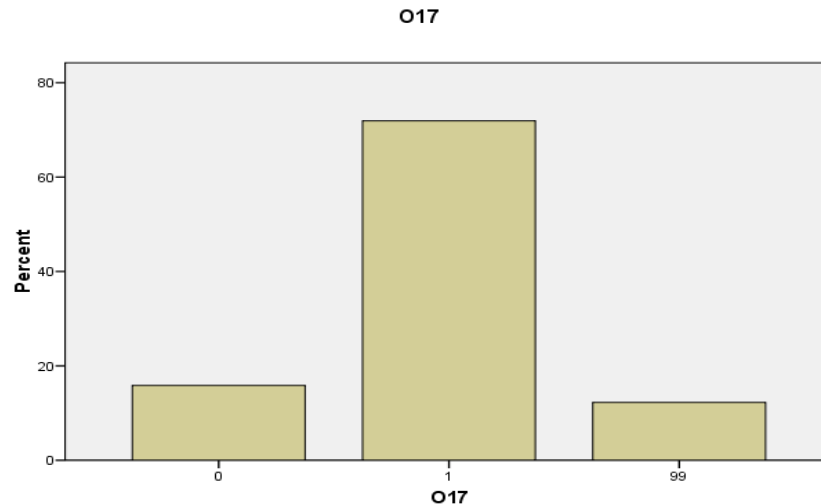
16. Izračunajte  $36^{\frac{1}{2}} + 27^{\frac{2}{3}} + 9^{\frac{1}{2}}$  i rezultat napišite kao razlomak.

M	0,74
M (O)	
ID	0,42



17. Na slici je graf funkcije  $f$ . U istome koordinatnome sustavu nacrtajte graf funkcije  $g$  takve da je  $g(x) = f(x) + 1$ .

M	0,72
M (O)	
ID	0,42

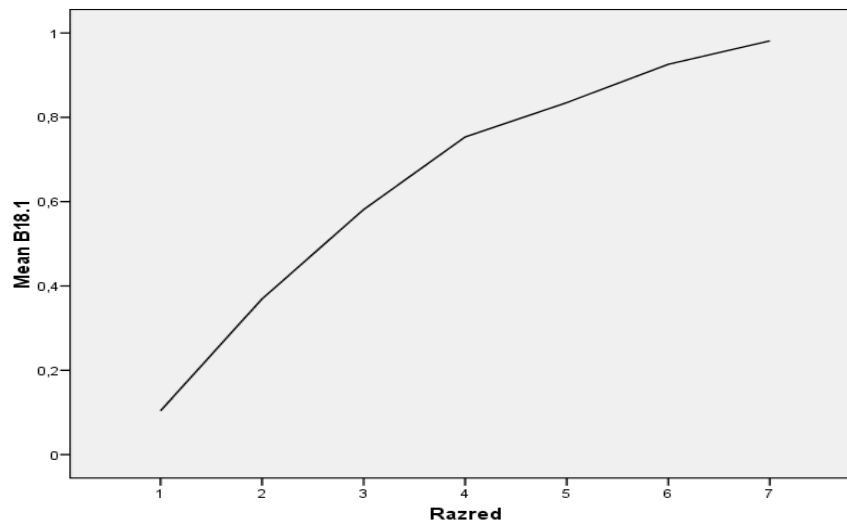
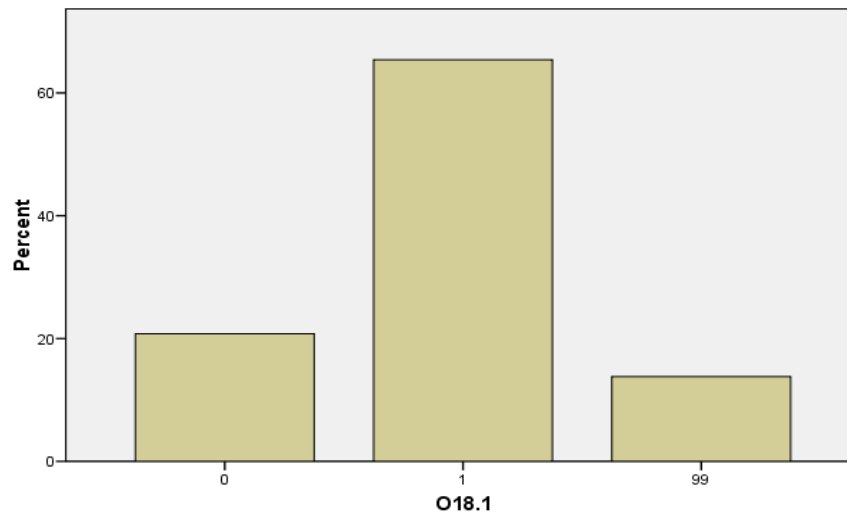


## 18.1. Odredite koeficijent smjera (nagib)

pravca  $\frac{x}{-2} + \frac{y}{3} = 1$ .

M	0,65
M (O)	
ID	0,56

O18.1

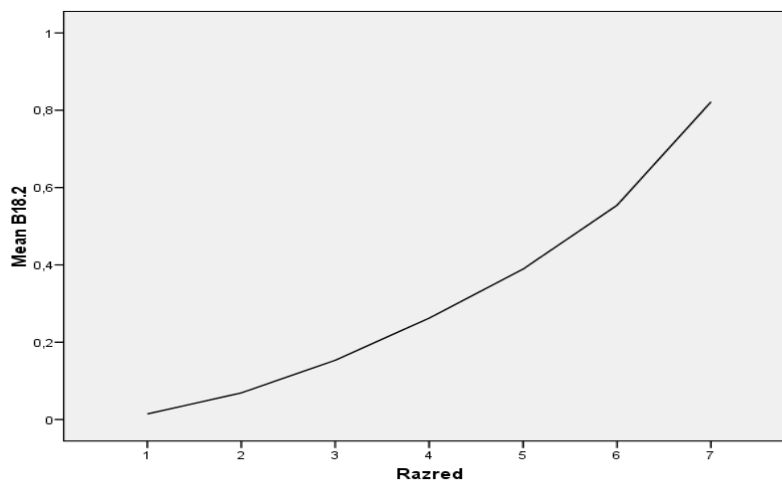
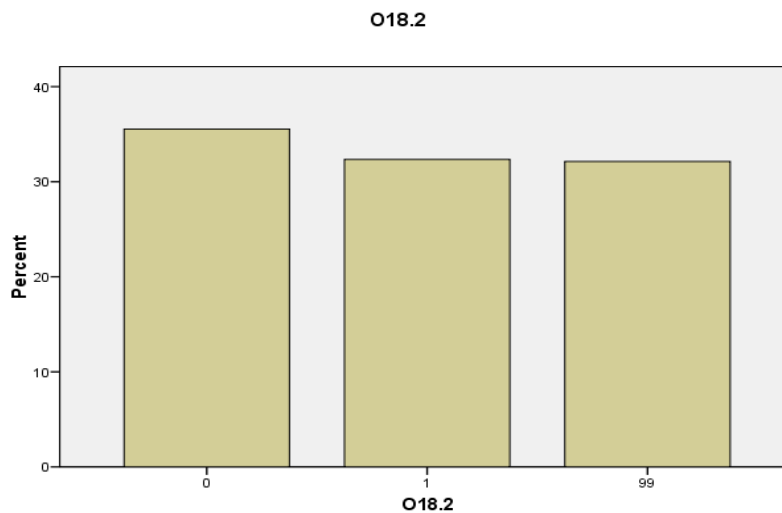




**18.2.** Zadana je točka  $A(1,2)$  i usmjerena dužina  $\vec{AB} = 4\vec{i} - 4\vec{j}$

Odredite jednadžbu pravaca kojemu pripada ta dužina.

M	0,32
M (O)	
ID	0,53

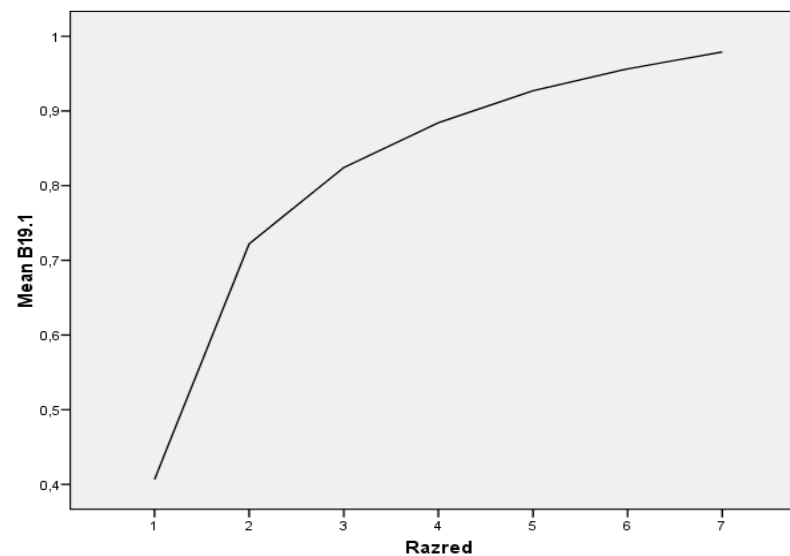
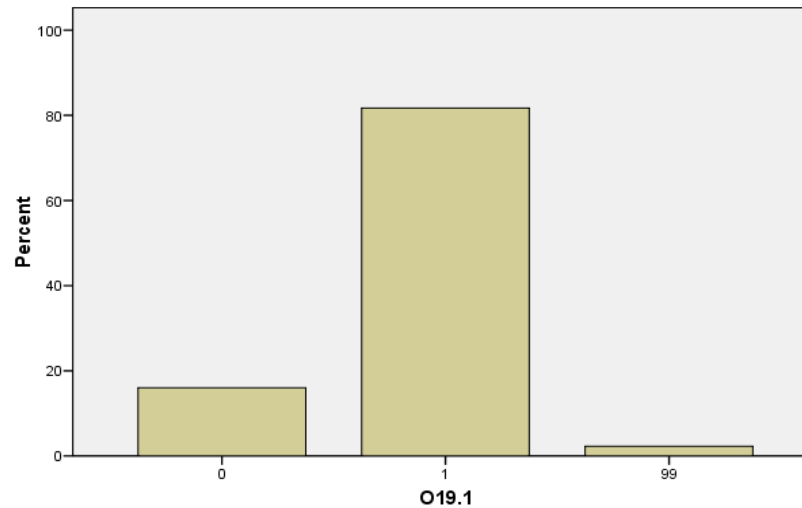


## 19.1. Odredite zbroj rješenja jednadžbe

$$x^2 + x - 6 = 0.$$

M	0,82
M (O)	
ID	0,40

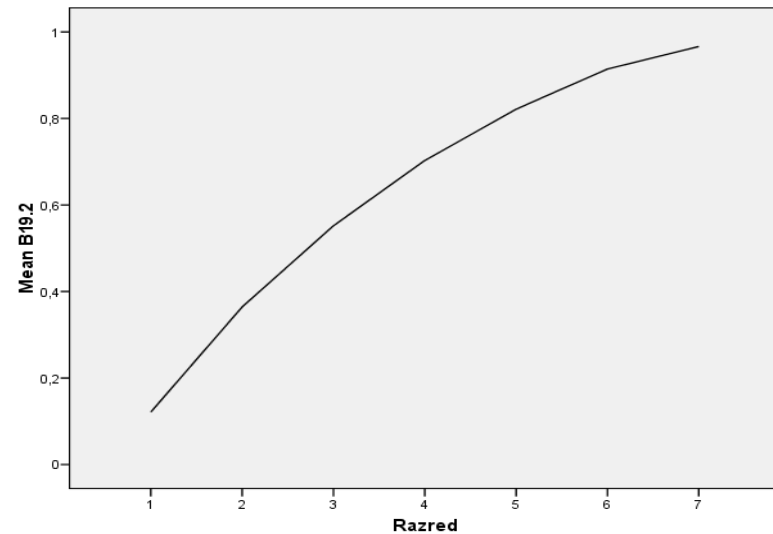
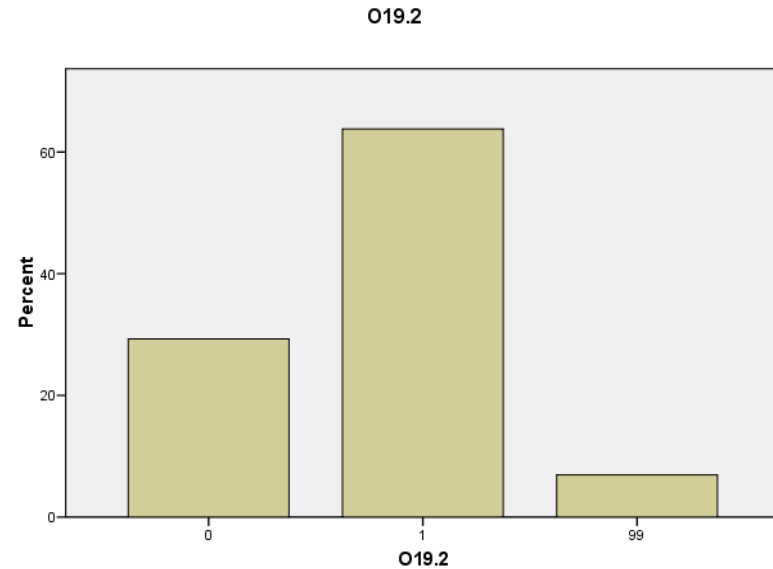
O19.1





## 19.2. Napišite oba rješenja jednadžbe $\left| \frac{2x-1}{5} \right| = 1$ .

<b>M</b>	<b>0,64</b>
<b>M (O)</b>	
<b>ID</b>	<b>0,54</b>



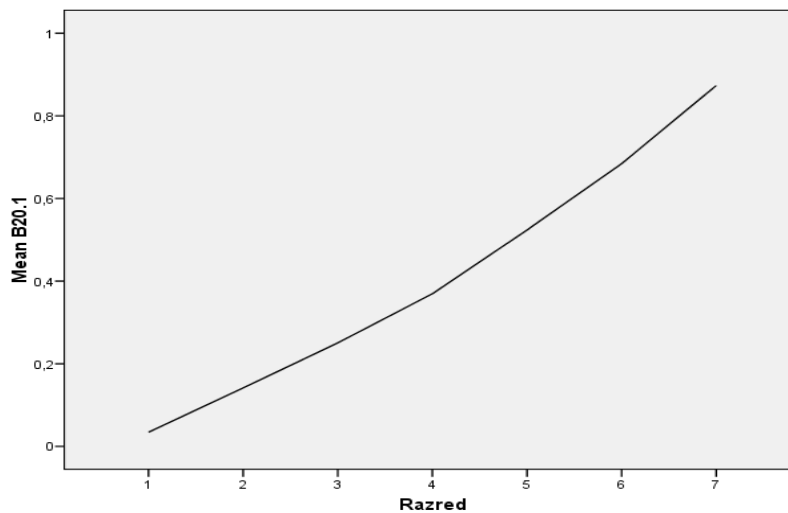
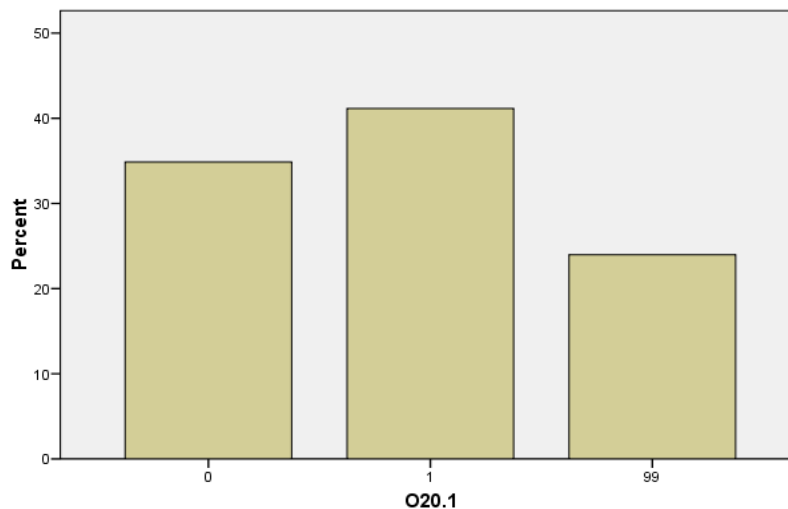


NACIONALNI CENTAR ZA VANJSKO  
VREDNOVANJE OBRAZOVANJA

20.1. Neka je  $z = 3 + 2i$  . Koliko je  $(iz\bar{z})^4$  ?

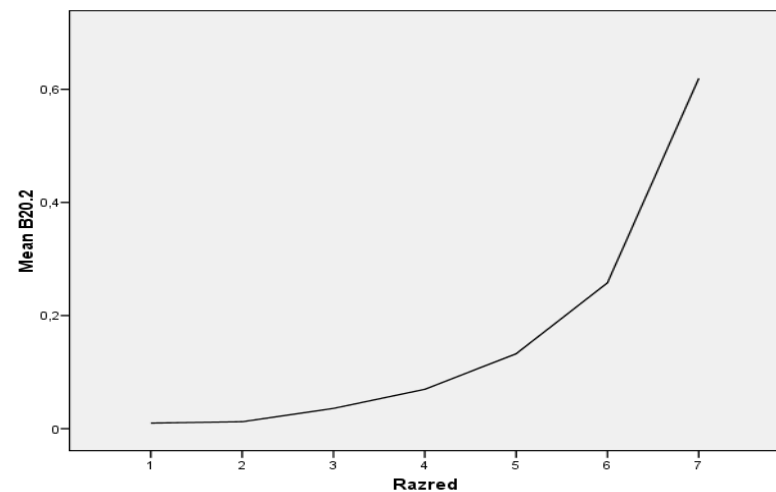
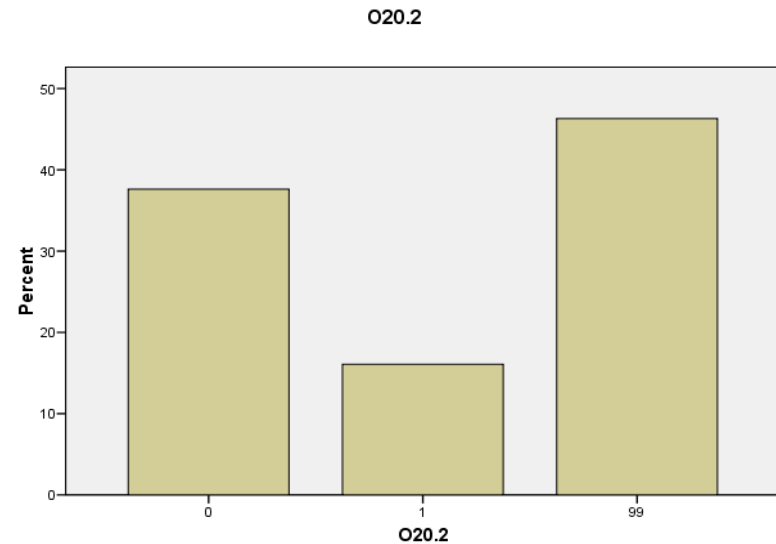
M	0,41
M (O)	
ID	0,54

O20.1



## 20.2. Kompleksan broj $z = 2i$ prikažite u trigonometrijskome obliku.

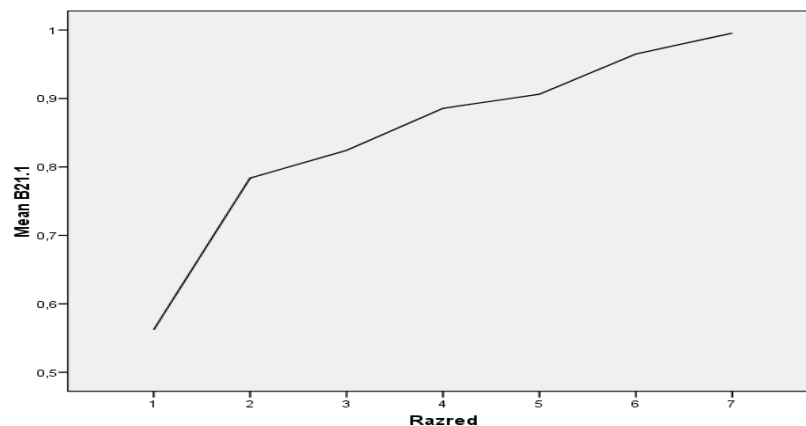
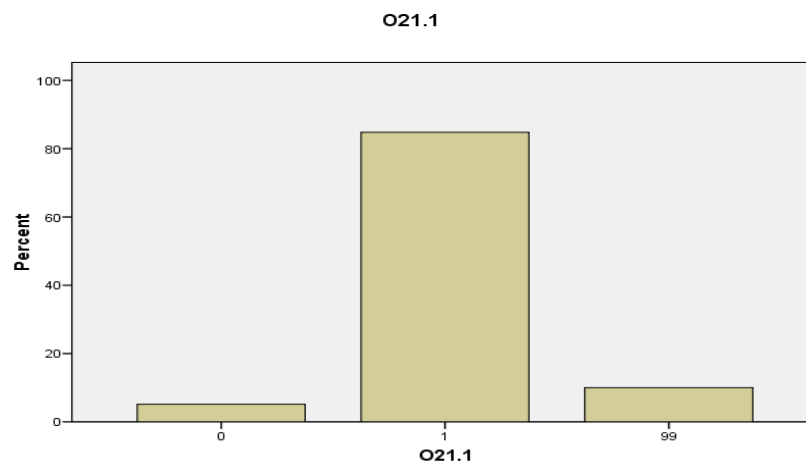
M	0,16
M (O)	
ID	0,48



**21.** Škola je za odlazak svojih 708 učenika na izlet osigurala 15 autobusa. Neki su autobusi imali 52, a neki 43 sjedala. U svim autobusima sva sjedala bila su popunjena i na svakome je sjedio samo jedan učenik.

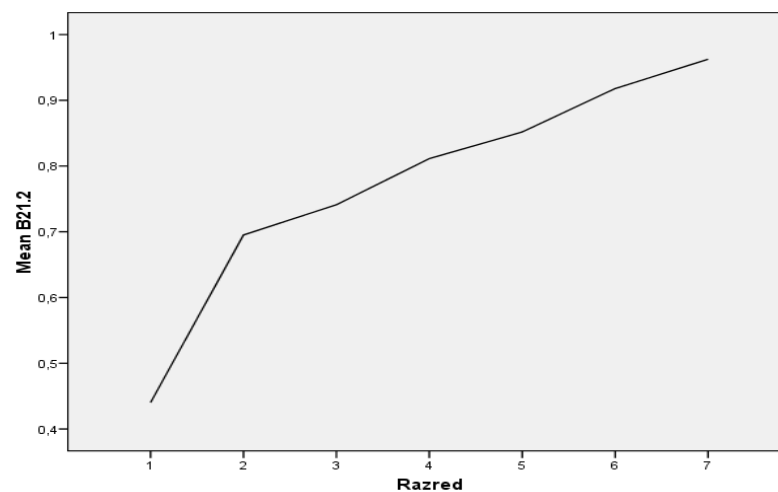
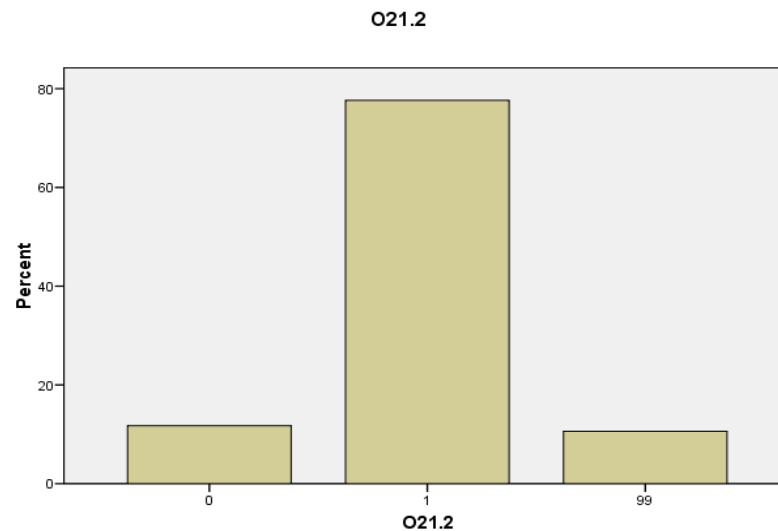
**21.1.** Koliko je bilo autobusa s 52 sjedala?

M	0,85
M (O)	
ID	0,33



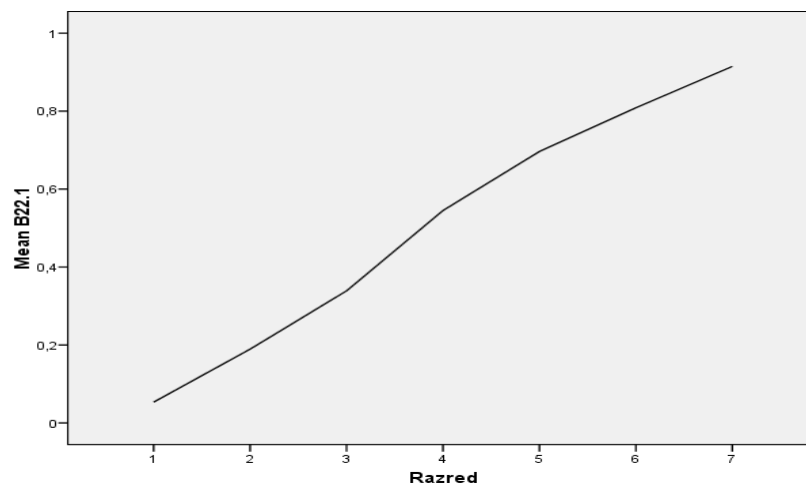
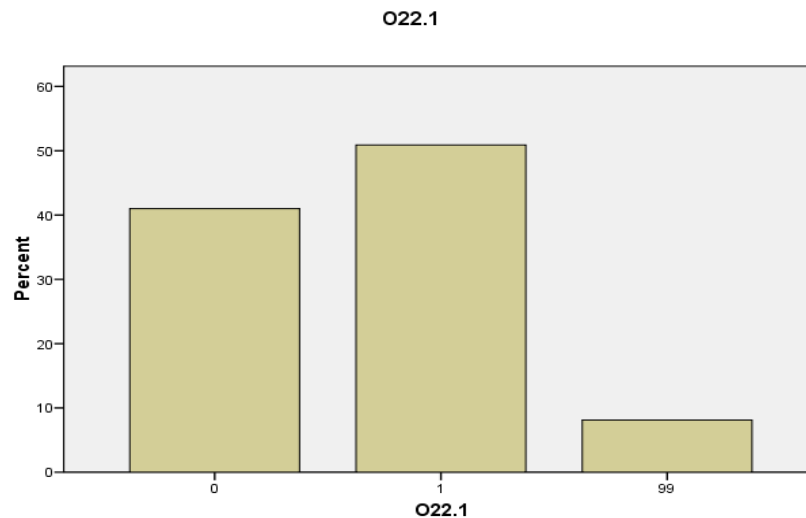
## 21.2. Koliko je ukupno učenika prevezeno autobusima s 43 sjedala?

M	0,78
M (O)	
ID	0,34



## 22.1. Riješite nejednadžbu $x^2 + 7x + 12 \geq 0$ . Rješenje zapišite pomoću intervala.

M	0,51
M (O)	
ID	0,56

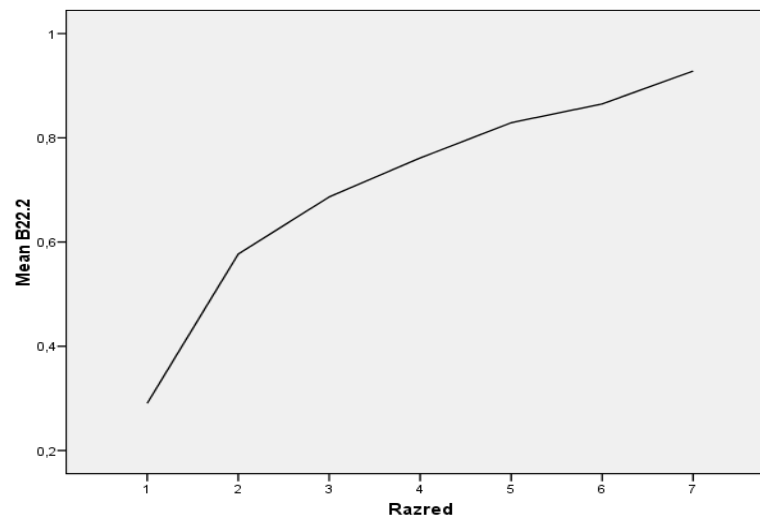
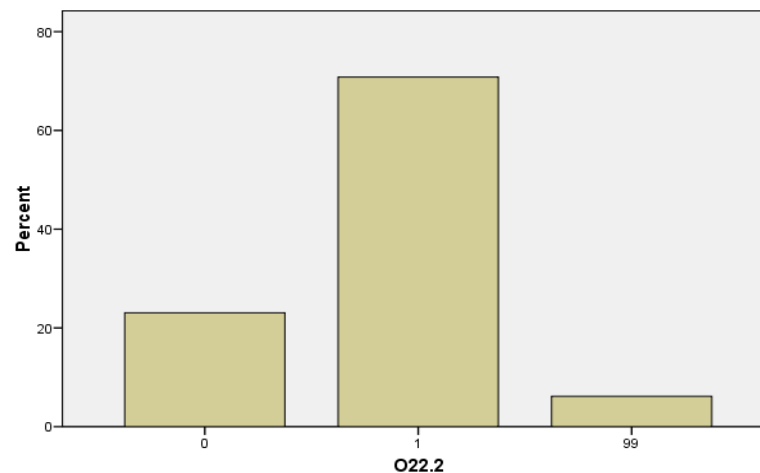




22.2. Neka je  $a$  zadani realni broj. U sustavu  
jednadžbi  $\begin{cases} 2x+3y=a \\ x+2y+2a=0 \end{cases}$  odredite  
nepoznanicu  $y$ .

M	0,71
M (O)	
ID	0,38

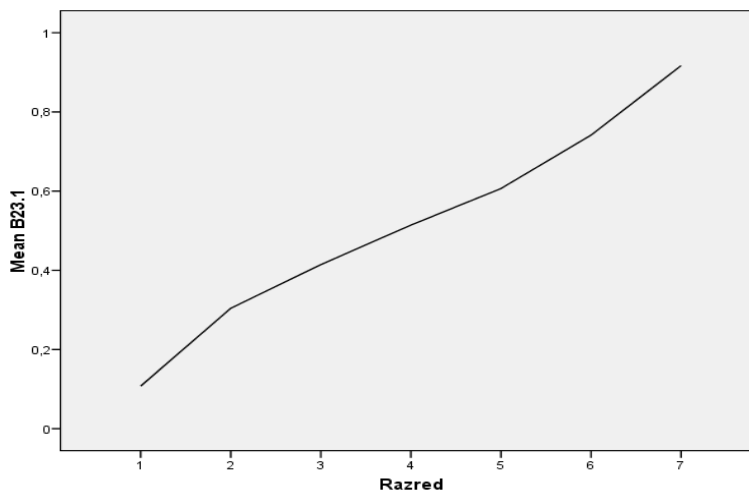
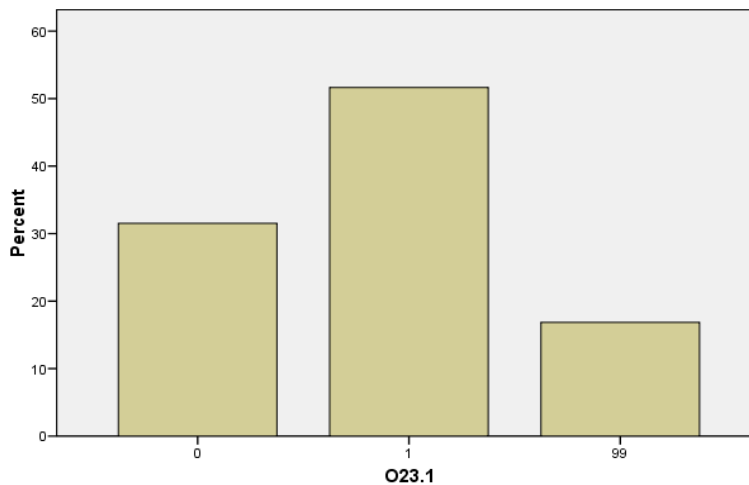
O22.2



**23.1.** Pojednostavnite  $\sin(3960^\circ + \alpha)$  .  
Odgovor:  $\sin(3960^\circ + \alpha) = \underline{\hspace{2cm}}$

M	0,52
M (O)	
ID	0,47

O23.1

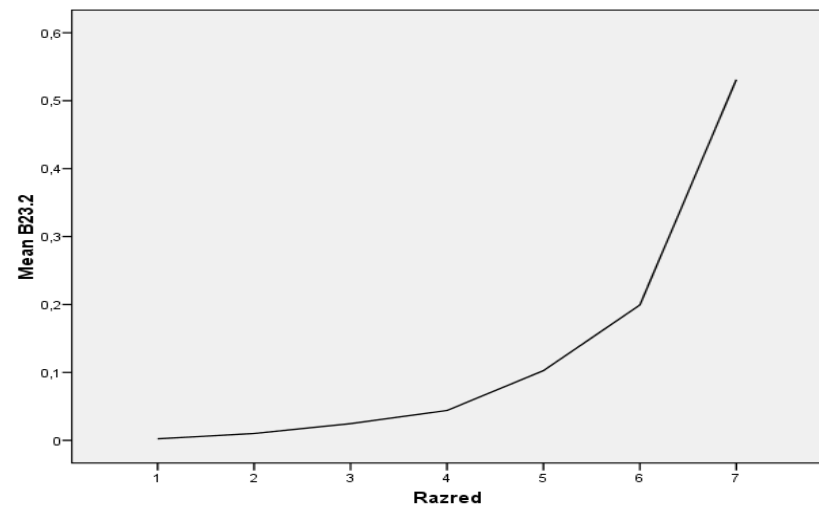
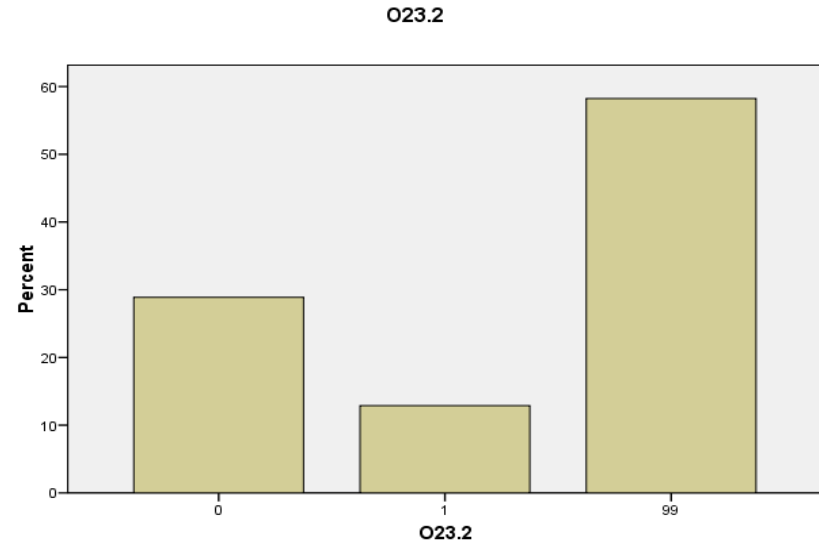


## 23.2. Koje je rješenje jednadžbe

$\sin(x - \pi)\sin(x + 2\pi) = 3\cos(x + 3\pi)\cos(x - 4\pi)$  iz intervala

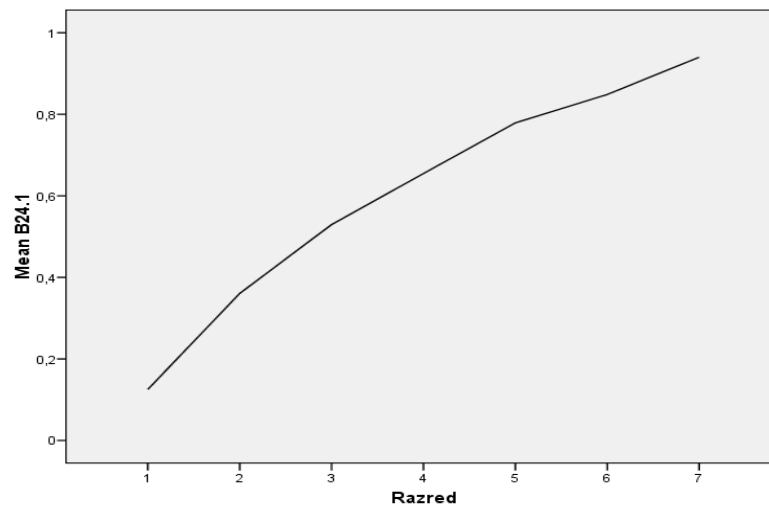
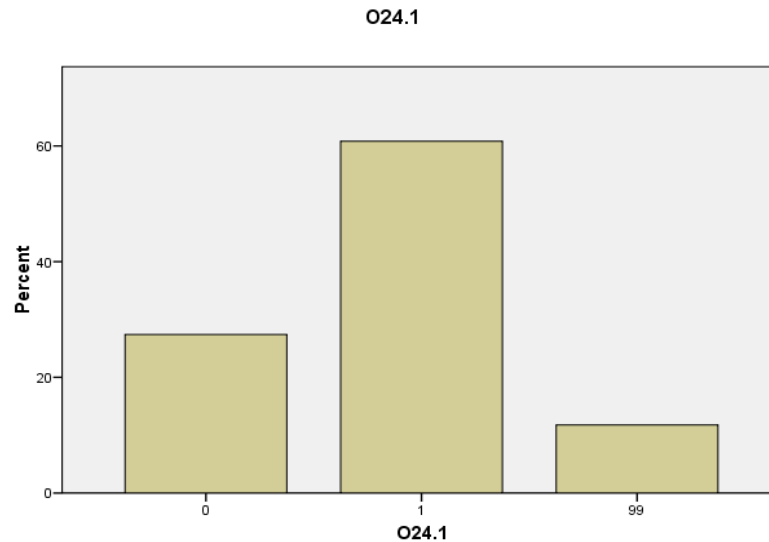
$$\left[ \frac{\pi}{2}, \pi \right] \text{ ?}$$

<b>M</b>	<b>0,13</b>
<b>M (O)</b>	
<b>ID</b>	<b>0,46</b>



**24.1.** U aritmetičkome nizu  $-12, -5, 2, \dots$   
odredite zbroj prvih 50 članova.

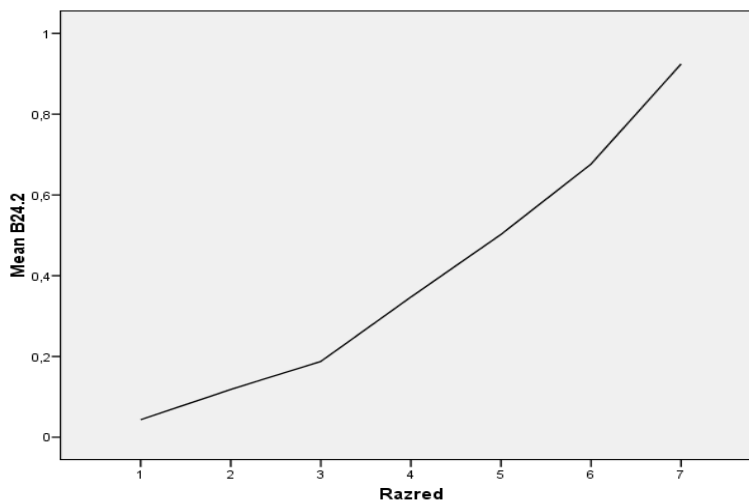
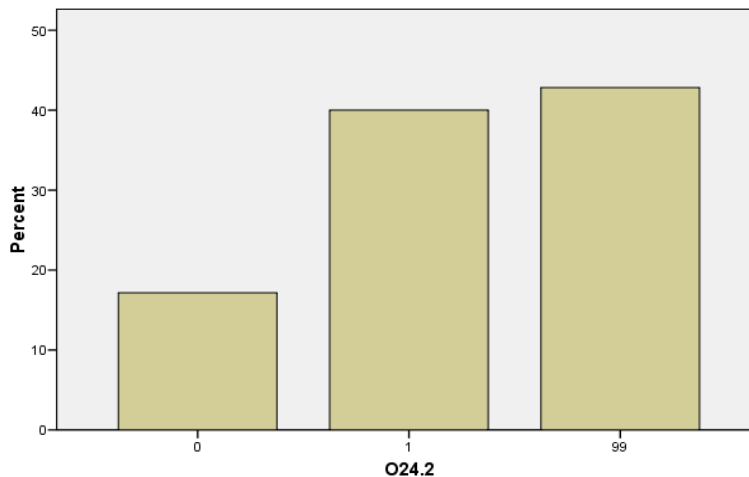
<b>M</b>	<b>0,61</b>
<b>M (O)</b>	
<b>ID</b>	<b>0,50</b>



**24.2.** Tri pozitivna broja čine geometrijski niz.  
Umnožak prvoga i trećega člana je 1.44. Koji  
je drugi član toga niza?

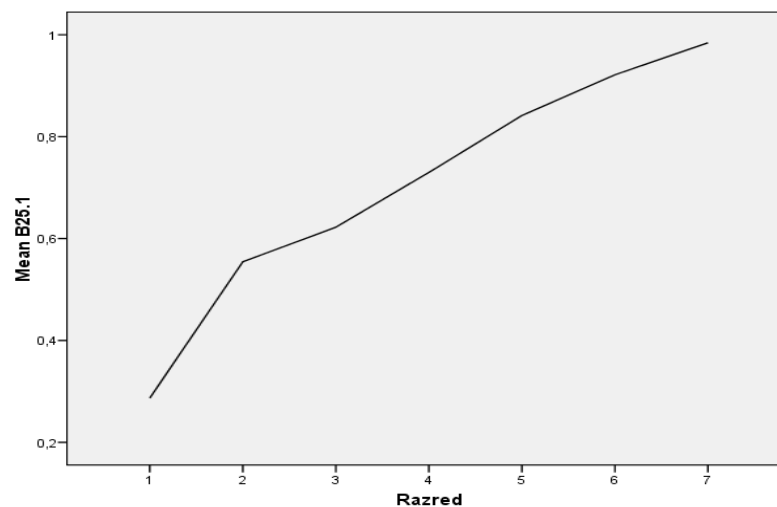
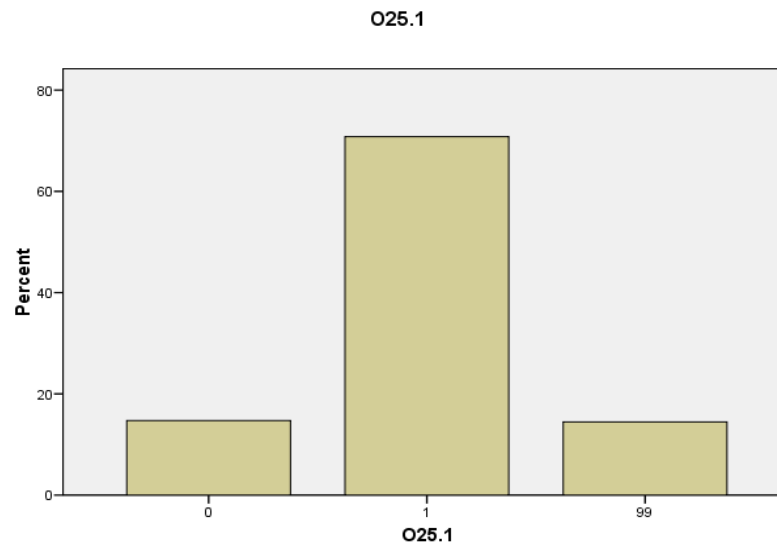
M	0,40
M (O)	
ID	0,57

O24.2



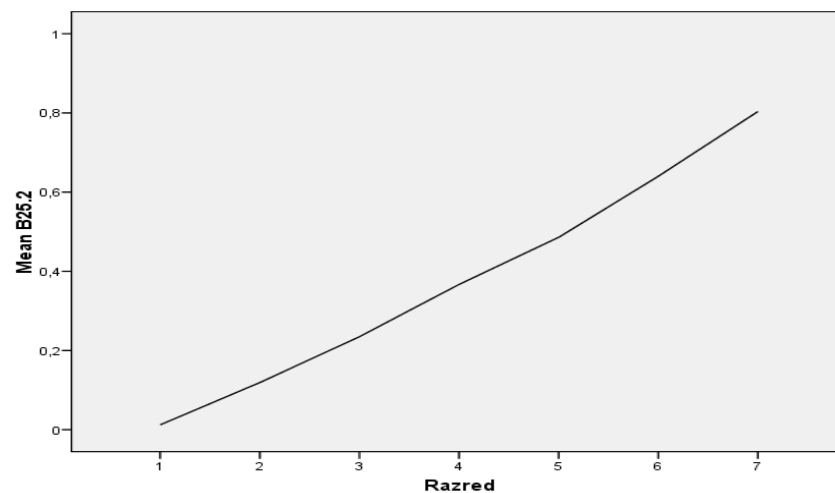
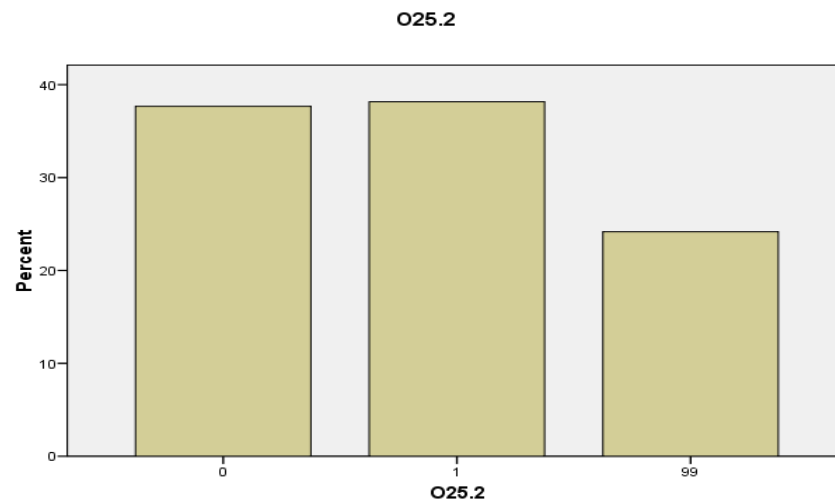
**25.1.** Parabola zadana jednađbom  $y^2 = 2px$  prolazi točkom  $T(3,3)$  . Odredite  $p$  .

M	0,71
M (O)	
ID	0,45



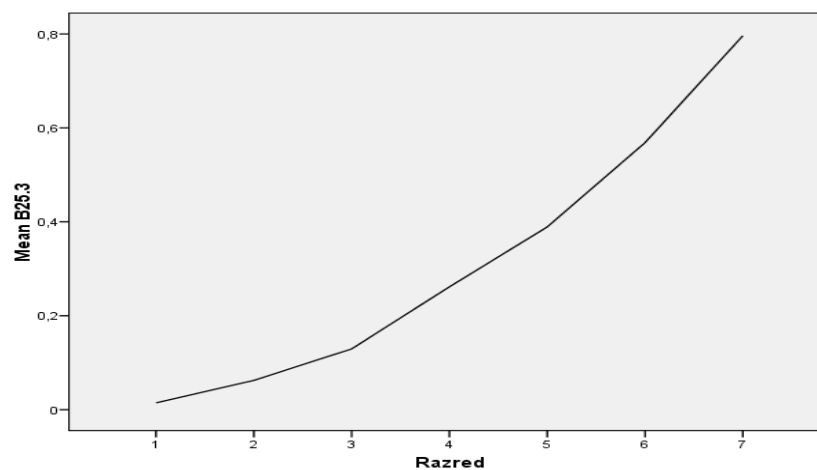
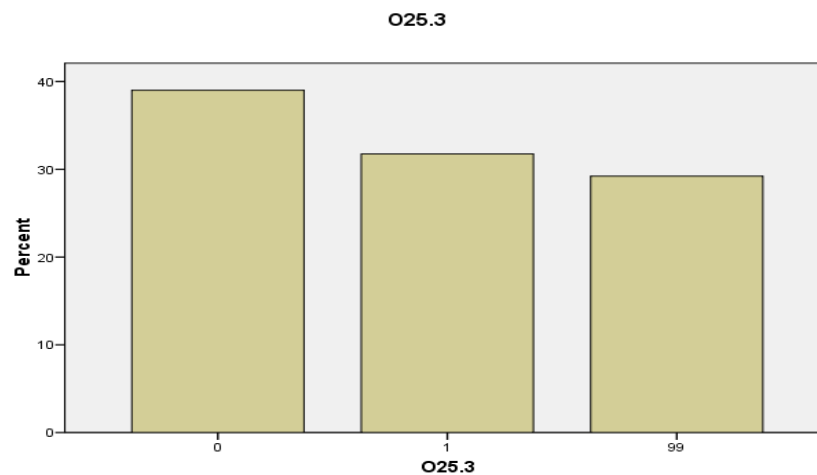
**25.2.** Parabola je zadana jednađbom  $y^2 = 12x$  .  
Kolika je udaljenost fokusa ta parabole od  
pravca  $y = 2x + 5$  ?

M	0,38
M (O)	
ID	0,51



**25.3.** Parabola zadana jednađbom  $y^2 = 2px$  ima fokus  $F(1,0)$  i prolazi točkom  $A(x,-3)$ .  
Odredite jednađbu tangenta na tu parabolu u njezinoj točki  $A$ .

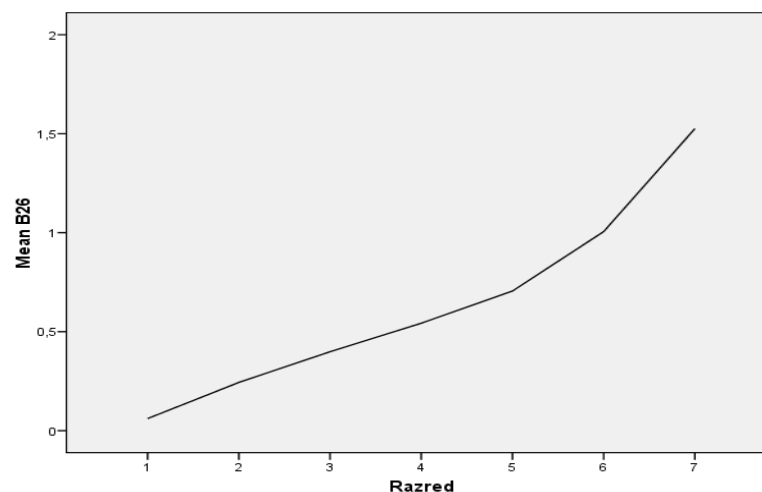
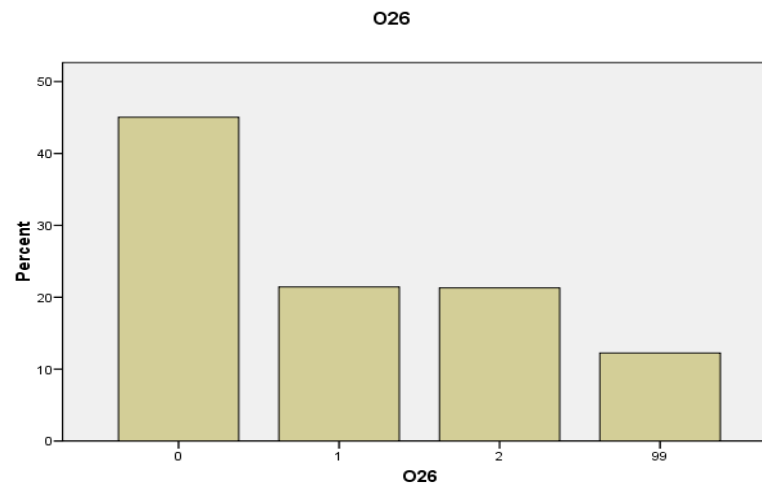
M	0,32
M (O)	
ID	0,54





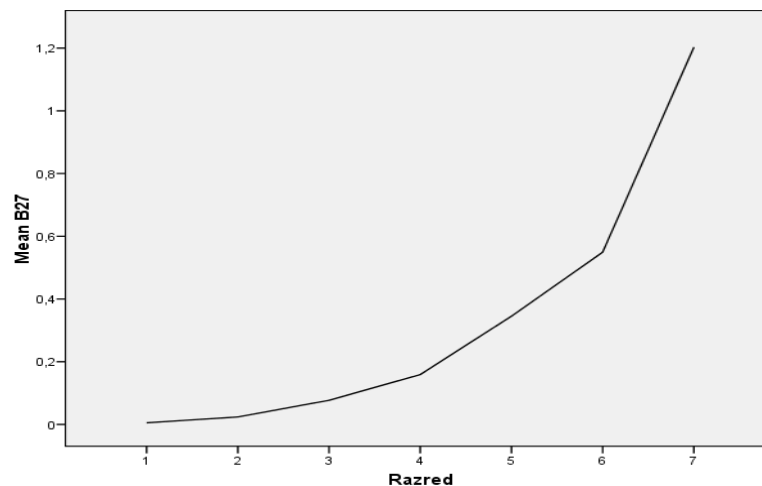
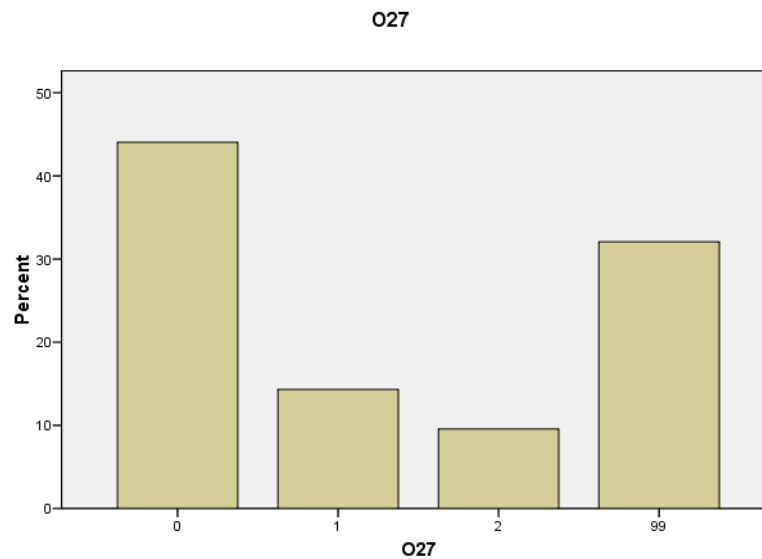
**26.** Povećanje troškova života u travnju u odnosu na ožujak je 4.2%, a u svibnju u odnosu na travanj je 3.5%. Koliki je postotak povećanja troškova života u svibnju u odnosu na ožujak?

M	<b>0,64</b> <b>(0,32)</b>
M (O)	
ID	<b>0,52</b>



27. Riješite nejednadžbu  $\log_2(x-1) + \log_2(x-3) \leq 3$ .  
Rješenje zapišite pomoću intervala.

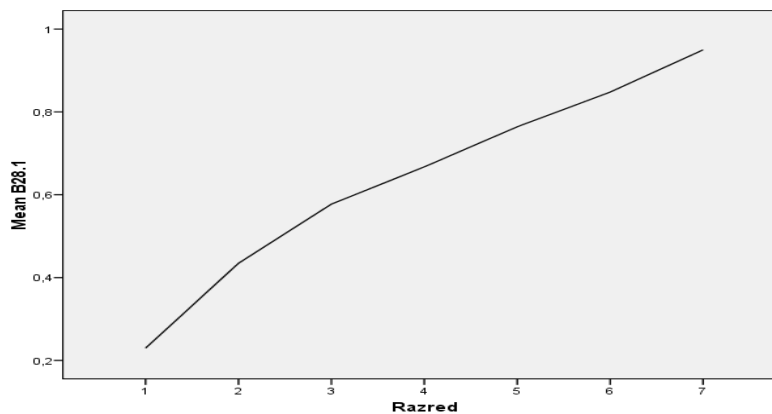
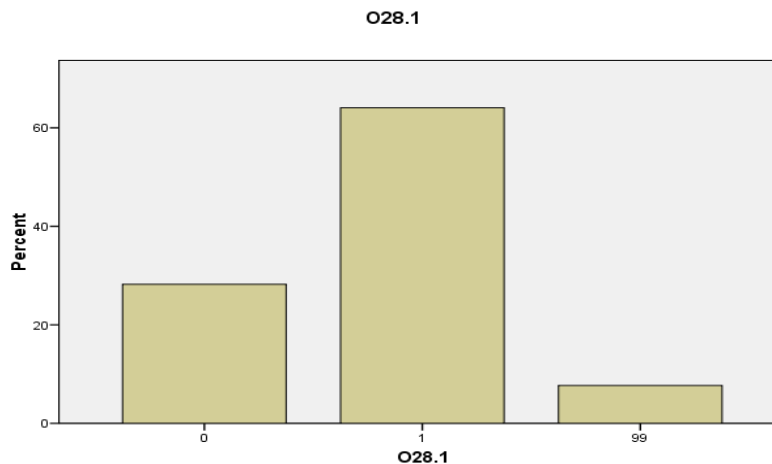
M	0,33 (0,17)
M (O)	
ID	0,54



28. Kabelska televizija započela je s radom. Pokazalo se da su prve godine rada broj njezinih korisnika  $K$  i broj mjeseci  $t$  od početka emitiranja povezani formulom  $K = \frac{20000(4t+1)}{t+1}$ .

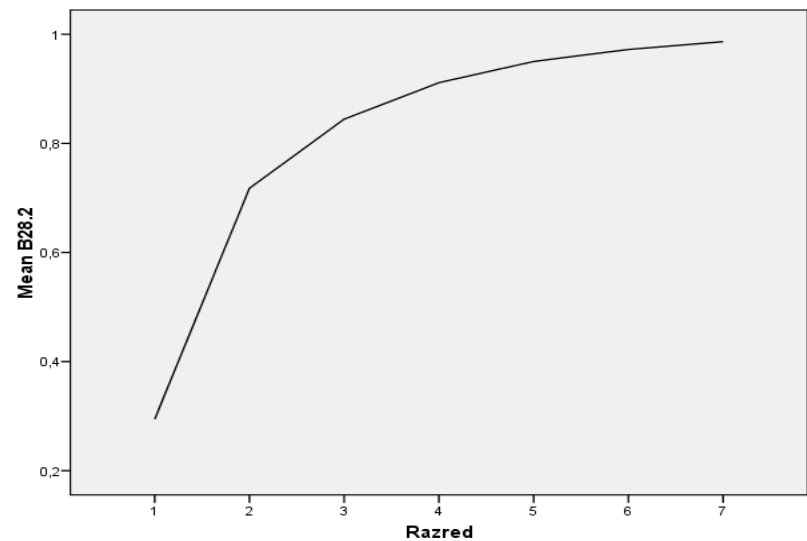
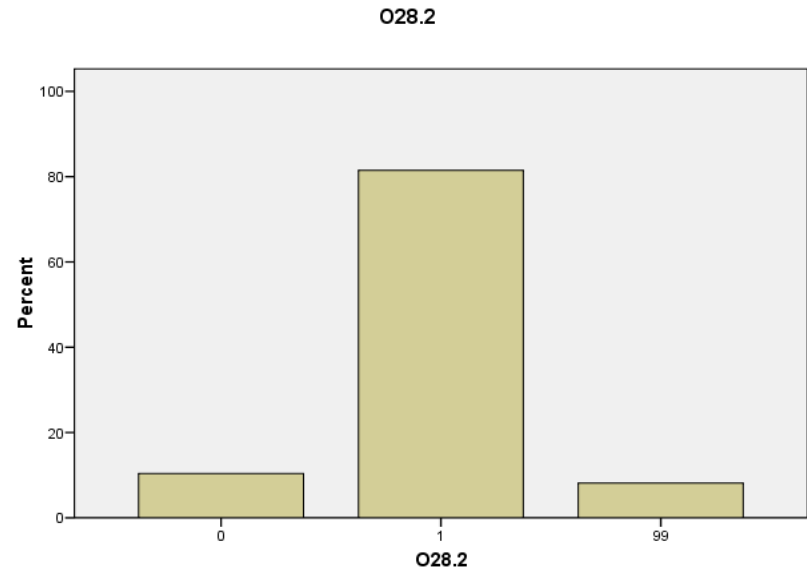
28.1. Koliki je broj korisnika bio u trenutku početka rada ove kableske televizije?

M	0,64
M (O)	
ID	0,44



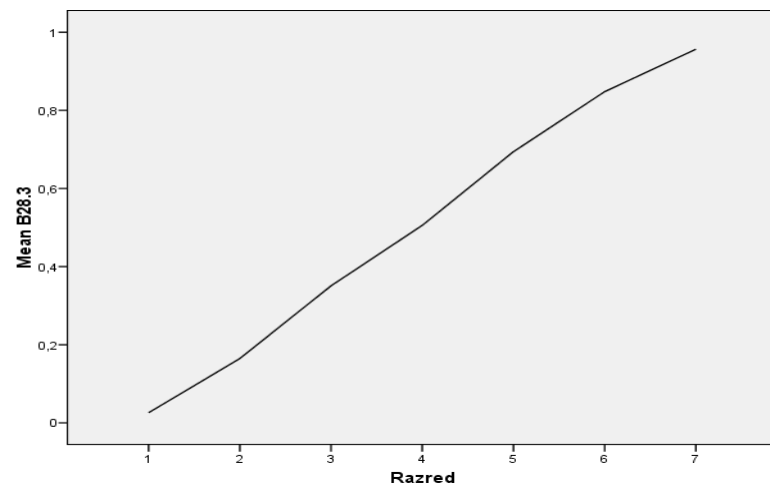
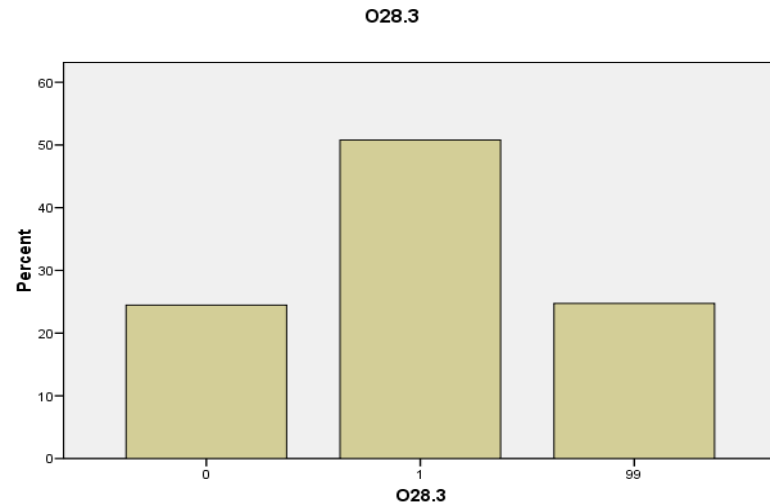
## 28.2. Nakon koliko je mjeseci broj korisnika bio 70 000?

M	0,81
M (O)	
ID	0,47



## 28.3. Napišite formulu ovisnosti broja mjeseci o broju korisnika. (Izrazite $t$ pomoću $K$ .)

M	0,51
M (O)	
ID	0,61

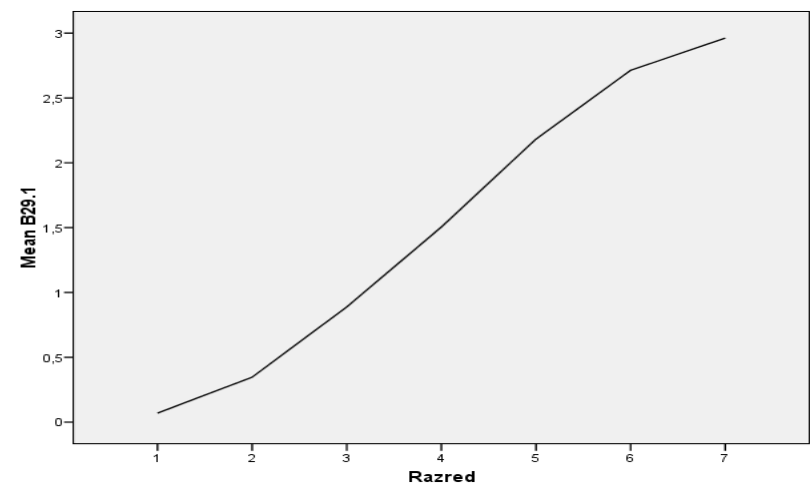
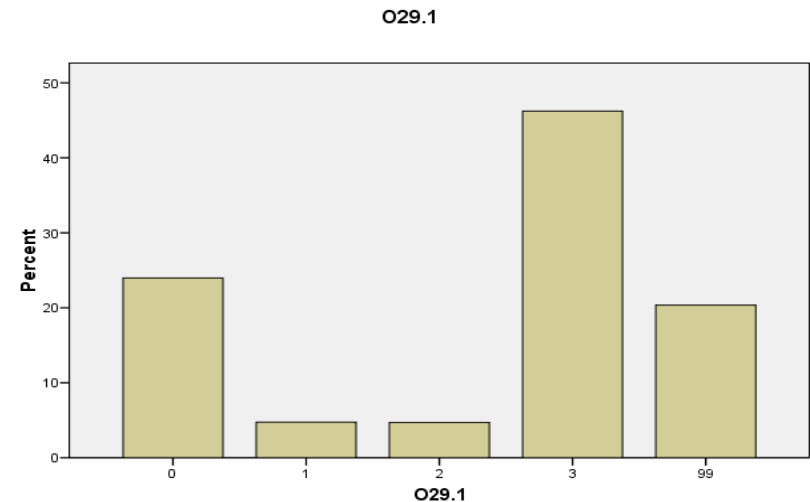


### III. Zadatci produženih odgovora

29.1. Zadana je funkcija  $f(x) = -\frac{1}{4}(x^2 - 16)(x + 1)$

Odredite koordinate sjecišta grafa funkcije s osi apcisa.

M	1,53 (0,51)
M (O)	
ID	0,66

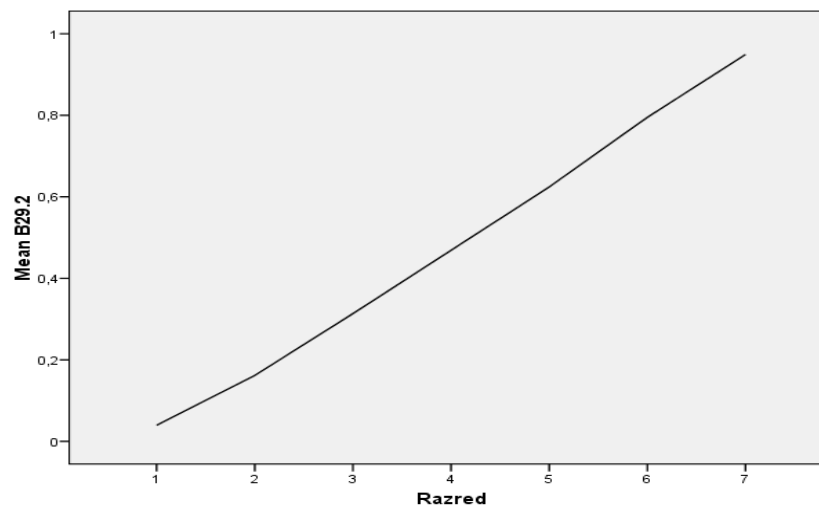
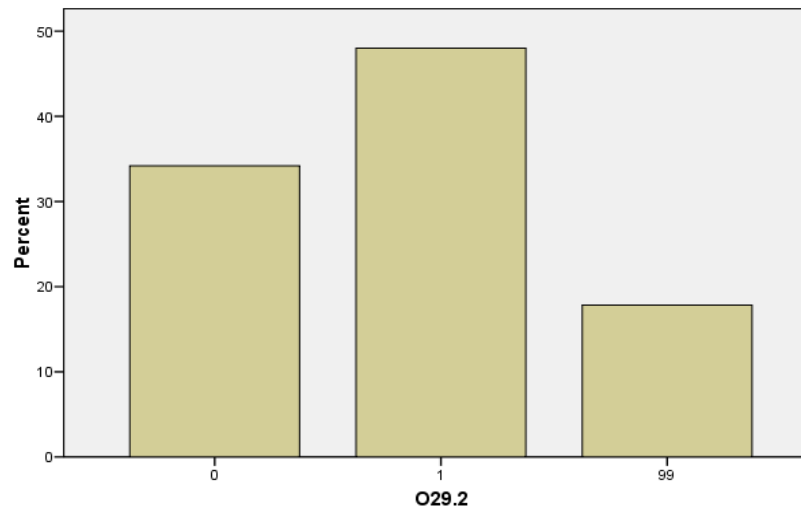




## 29.2. Derivirajte funkciju $f$ .

M	0,48
M (O)	
ID	0,58

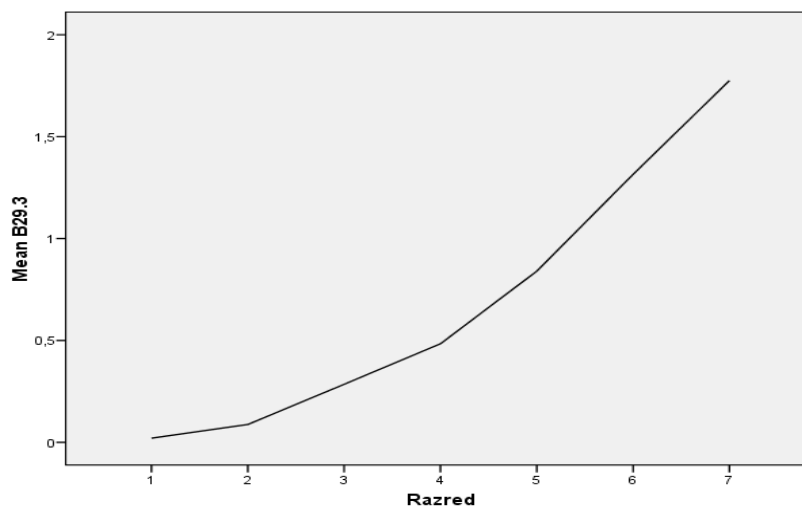
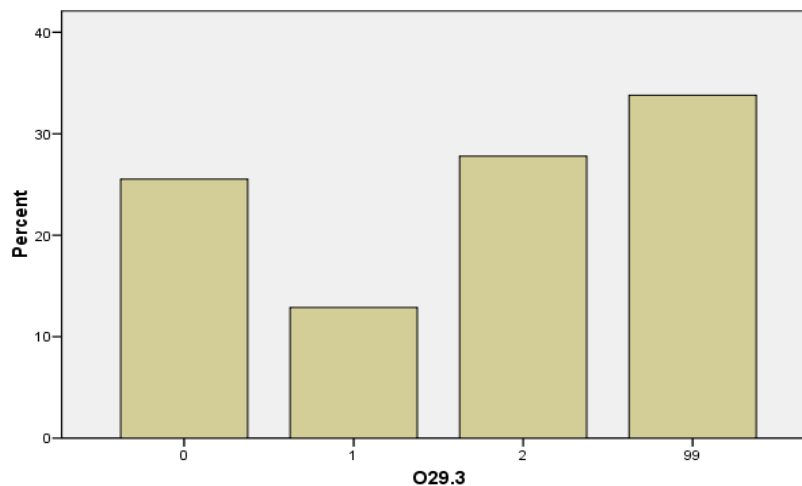
O29.2



## 29.3. Odredite interval/intervale rasta funkcije $f$ .

M	0,69 (0,35)
M (O)	
ID	0,64

O29.3

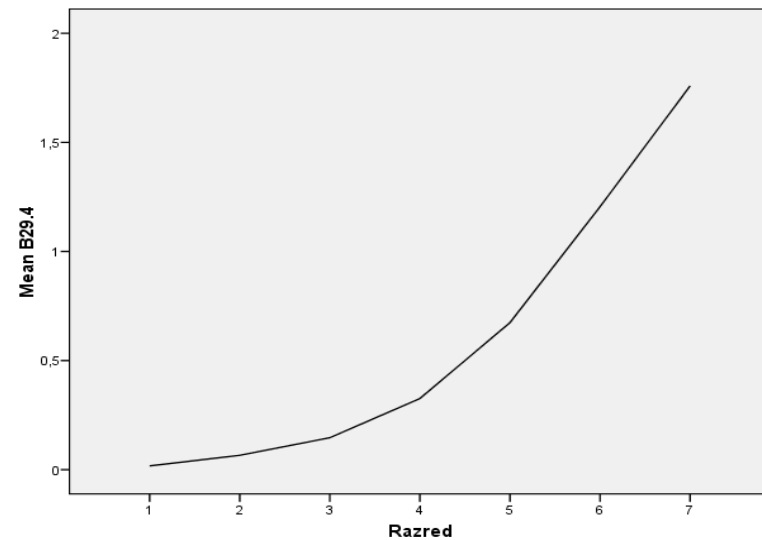
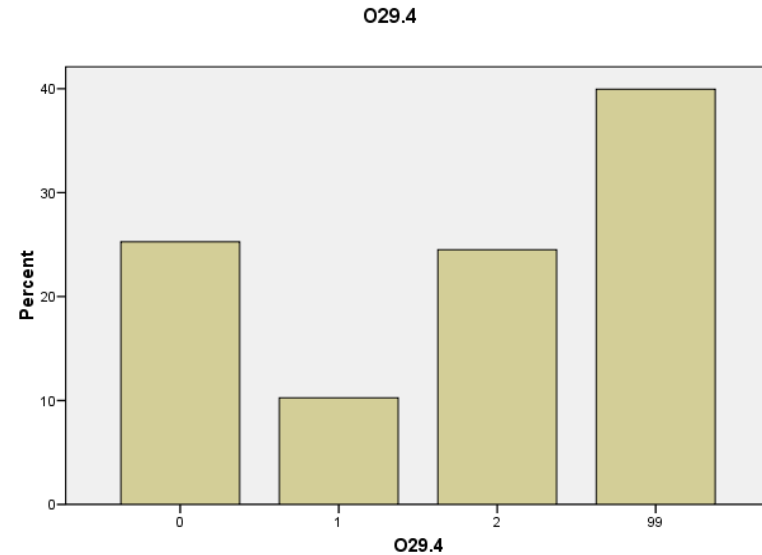






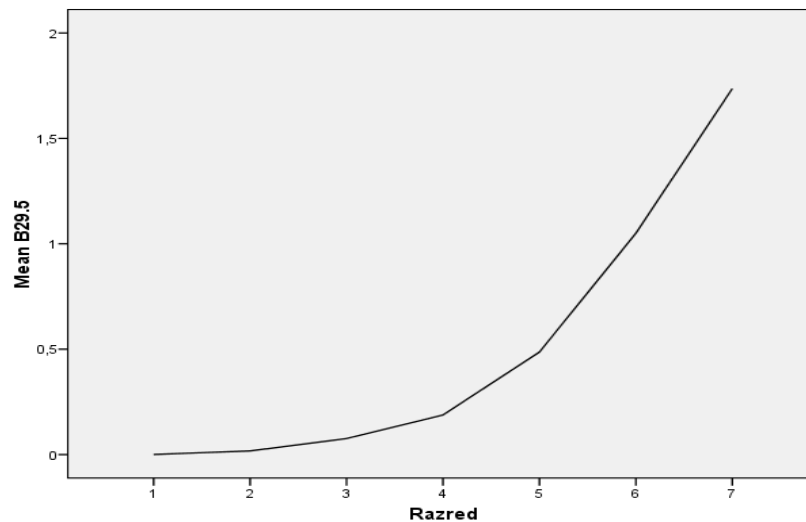
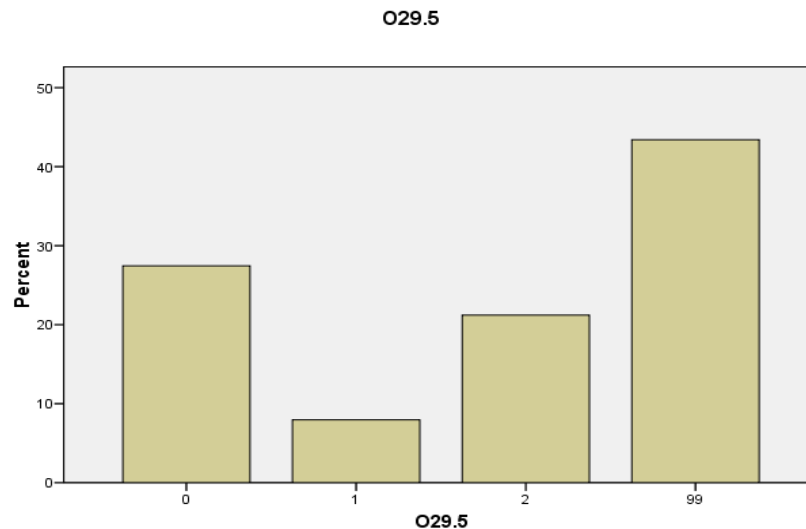
## 29.4. Odredite lokalne ekstreme funkcije $f$ .

M	0,60 (0,30)
M (O)	
ID	0,64



## 29.5. Nacrtajte lokalne ekstreme funkcije $f$ .

M	0,50 (0,25)
M (O)	
ID	0,66



**30.** Na panparalelnu staklenu ploču debljine  $d = 40$  mm pada zraka svjetlosti pod kutom prema okomici  $\alpha = 60^\circ$ . Indeks loma  $n$  iznosi  $\frac{3}{2}$ . Koliki je paralelni pomak  $p$  zrake svjetlosti?

M	1,19 (0,30)
M (O)	
ID	0,57

