Python

Osnove računalne grafike

Armando Slaviček

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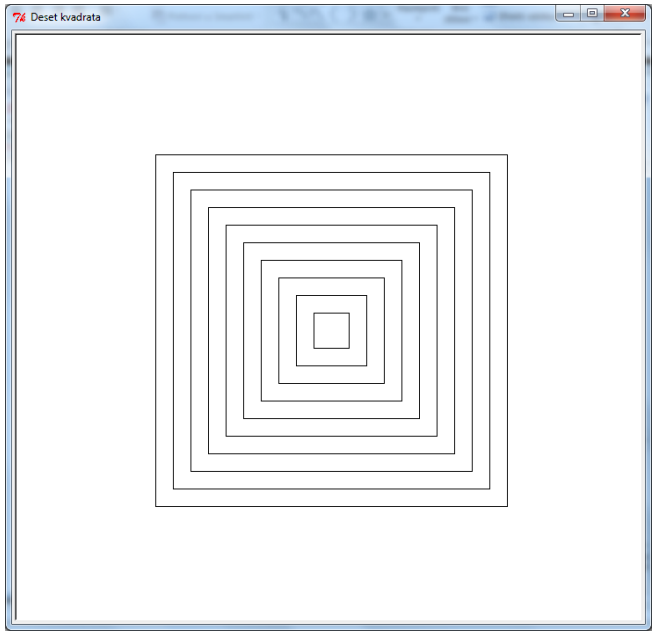
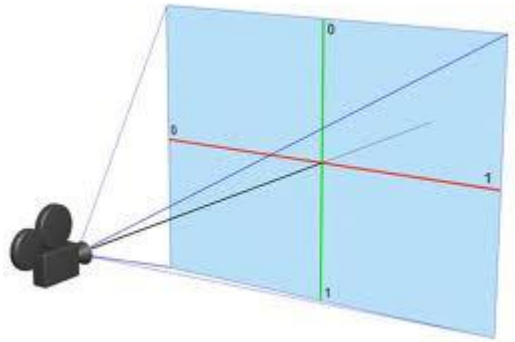
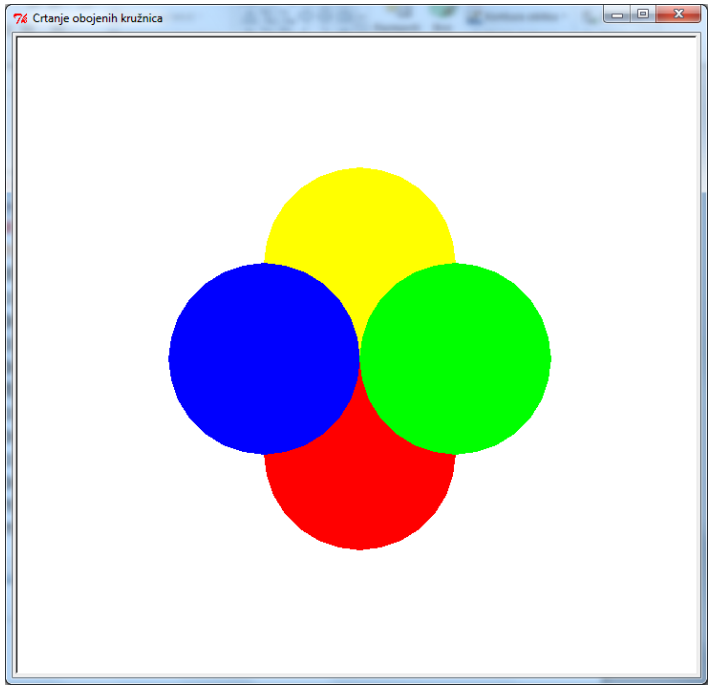
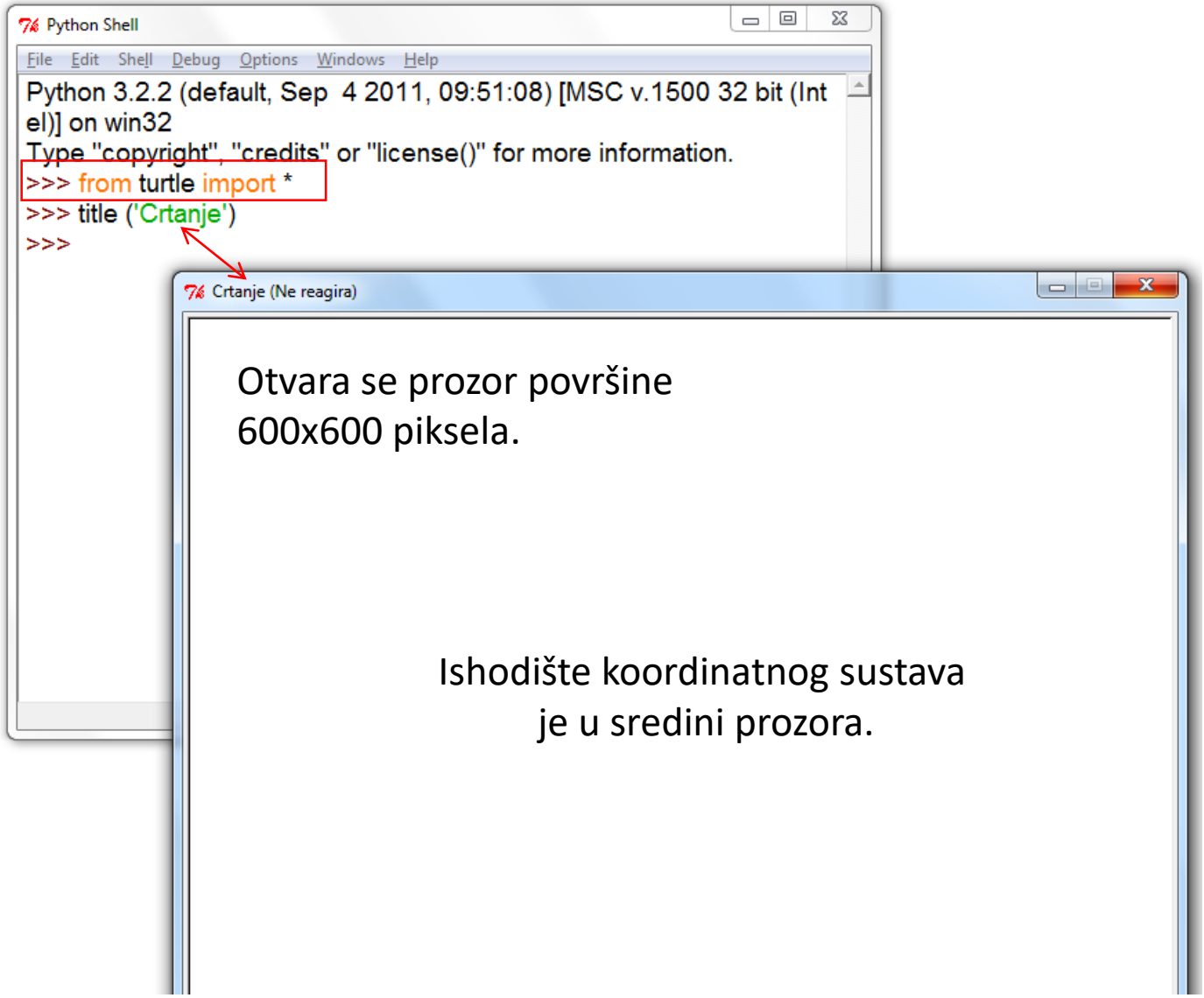
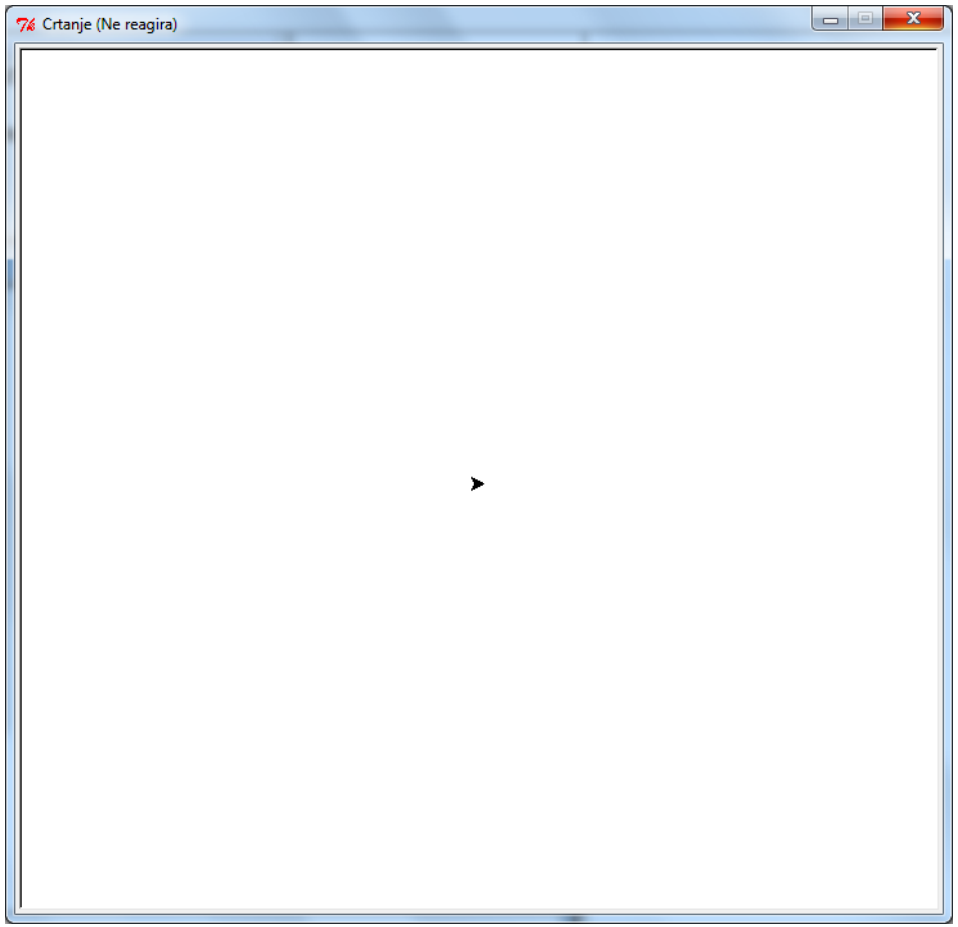






Grafički modul






```
>>> reset()
```

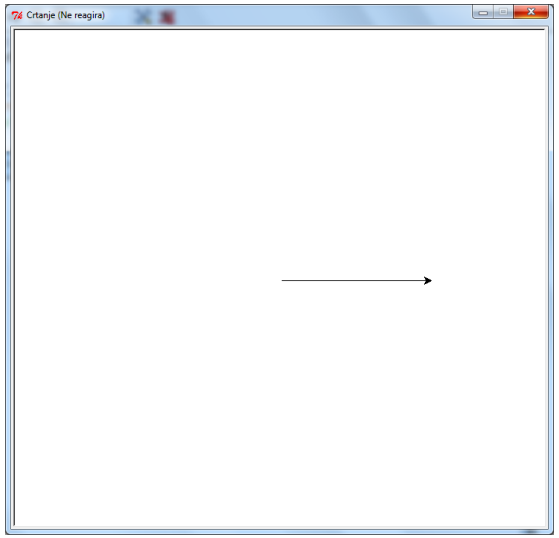
- Pojavit će se u ishodištu pero (strelica glave kornjače) usmjerena u smjeru pozitivne osi x.

Osnovne funkcije za gibanje pera

Funkcija	Alternativni naziv	Opis djelovanja funkcije
forward (d)	fd(d)	Pomiče pero za d jedinica naprijed
backward (d)	back (d), bk (d)	Pomiče pero za d jedinica unatrag
right(kut)	rt(kut)	Zakreće pero za kut stupnjeva udesno
left(kut)	lt(kut)	Zakreće pero za kut stupnjeva ulijevo

Funkcije za relativna gibanja pera (vektorska grafika)

```
>>> from turtle import *
>>> title ('Crtanje')
>>> pd()
>>> fd(200)
>>>
```



Modul turtle ima i funkcije za gibanje pera određeno apsolutnim koordinatama

Funkcija	Alternativni naziv	Opis djelovanja funkcije
goto(x,y)	setpos(x,y)	Pomiče pero na točku s koordinatama (x,y)
goto (t)	setpos(t)	Pomiče pero na točku s koordinatama t, gdje je t par brojeva (koordinate)
setx(x)		Postavlja prvu koordinatu na x, druga koordinata ostaje nepromijenjena
sety(y)		Postavlja prvu koordinatu na y, druga koordinata ostaje nepromijenjena
setheading(kut)	seth(kut)	Usmjerava pero tako da pokazuje u smjer kuta kut

Upravljanje perom i crtežom

Funkcije upravljanja perom

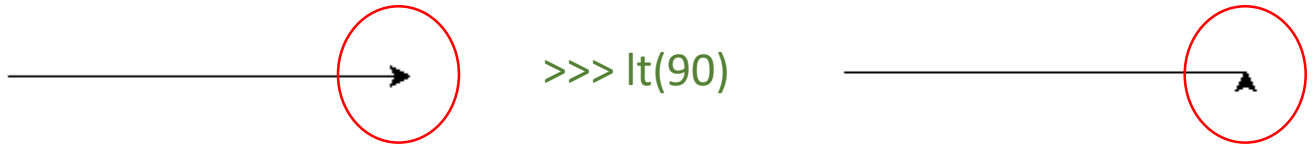
Funkcija	Alternativni naziv	Opis djelovanja funkcije
pendown ()	pd(), down()	Pero se spušta i ostavlja trag
penup()	pu(), up()	Pero se podiže i ne ostavlja trag
pensize(d)	width (d)	Pero ima debljinu *d* jedinica
showturtle()	st ()	Pero postaje vidljivo
hideturtle()	ht ()	Pero postaje nevidljivo
home()		Postavlja pero u početni položaj
undo()		Poništava zadnju akciju pera; ta se funkcija može upotrijebiti višekratno

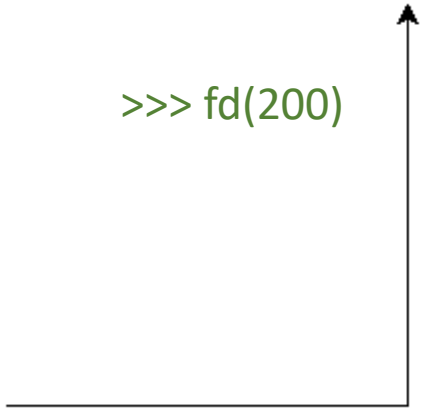
Funkcije upravljanja crtežom

Funkcija	Opis djelovanja funkcije
reset()	Briše sve crteže u grafičkom prozoru; postavlja pero u početni položaj s početnim atributima
clear()	Briše se crtež u grafičkom prozoru; pero ostaje nepromijenjeno

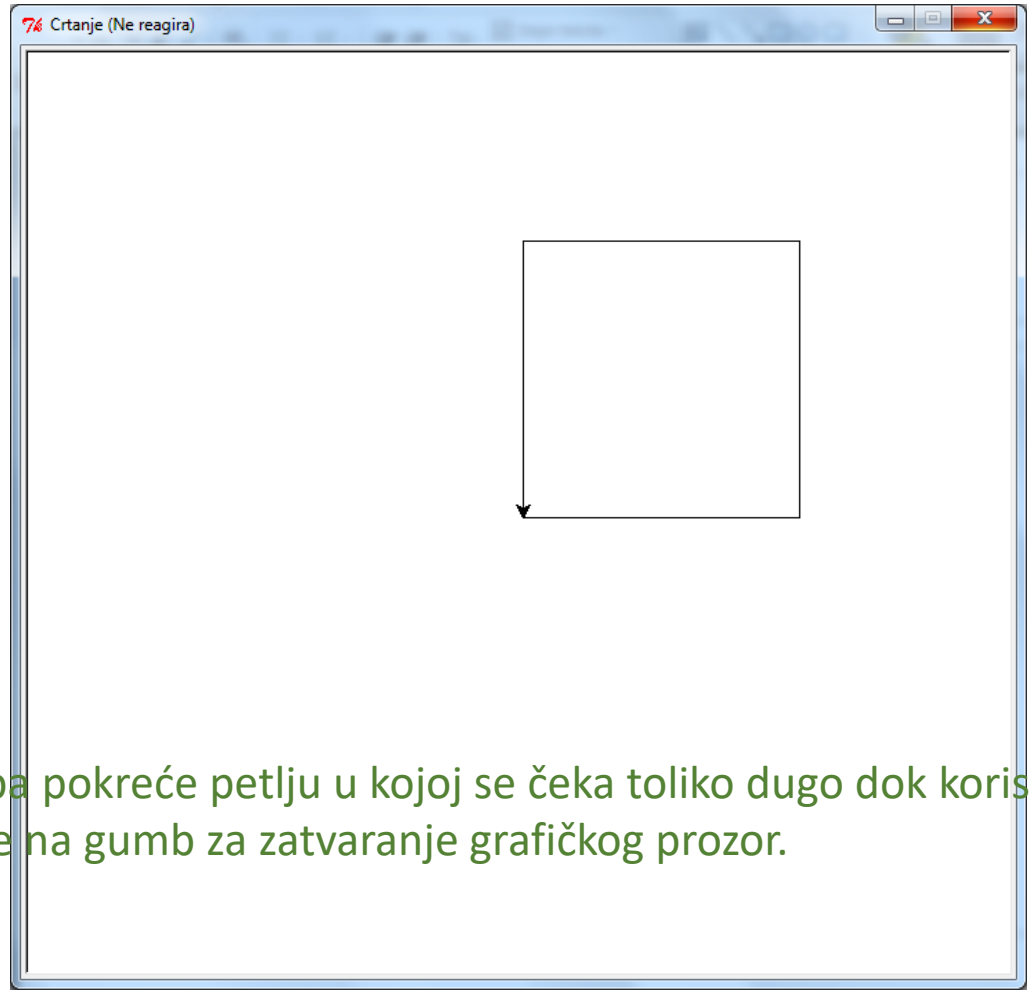
Gibanje pera

```
>>> from turtle import *
>>> title ('Crtanje')
>>> pd()
>>> fd(200)
>>>
```



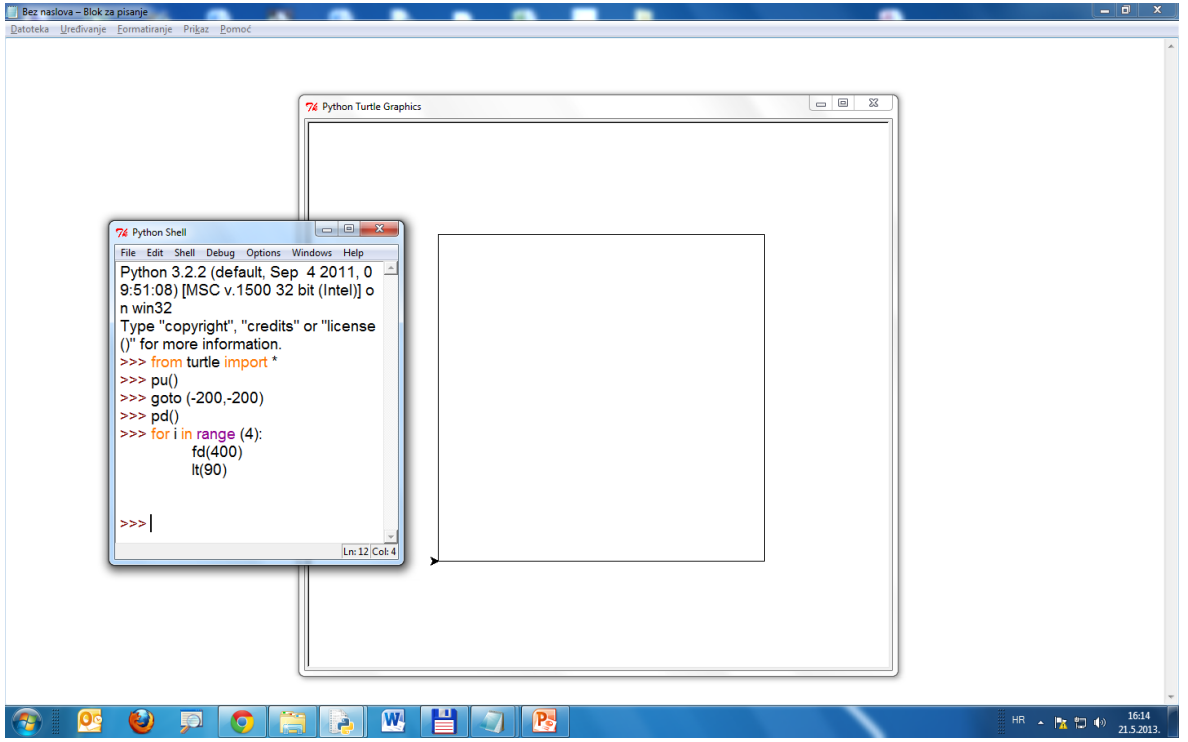


```
>>> from turtle import *
>>> title ('Crtanje')
>>> pd()
>>> fd(200)
>>> lt(90)
>>> fd(200)
>>> lt(90)
>>> fd(200)
>>> lt(90)
>>> fd(200)
>>> mainloop()   # ta naredba pokreće petlju u kojoj se čeka toliko dugo dok korisnik
                 ne klikne na gumb za zatvaranje grafičkog prozor.
```



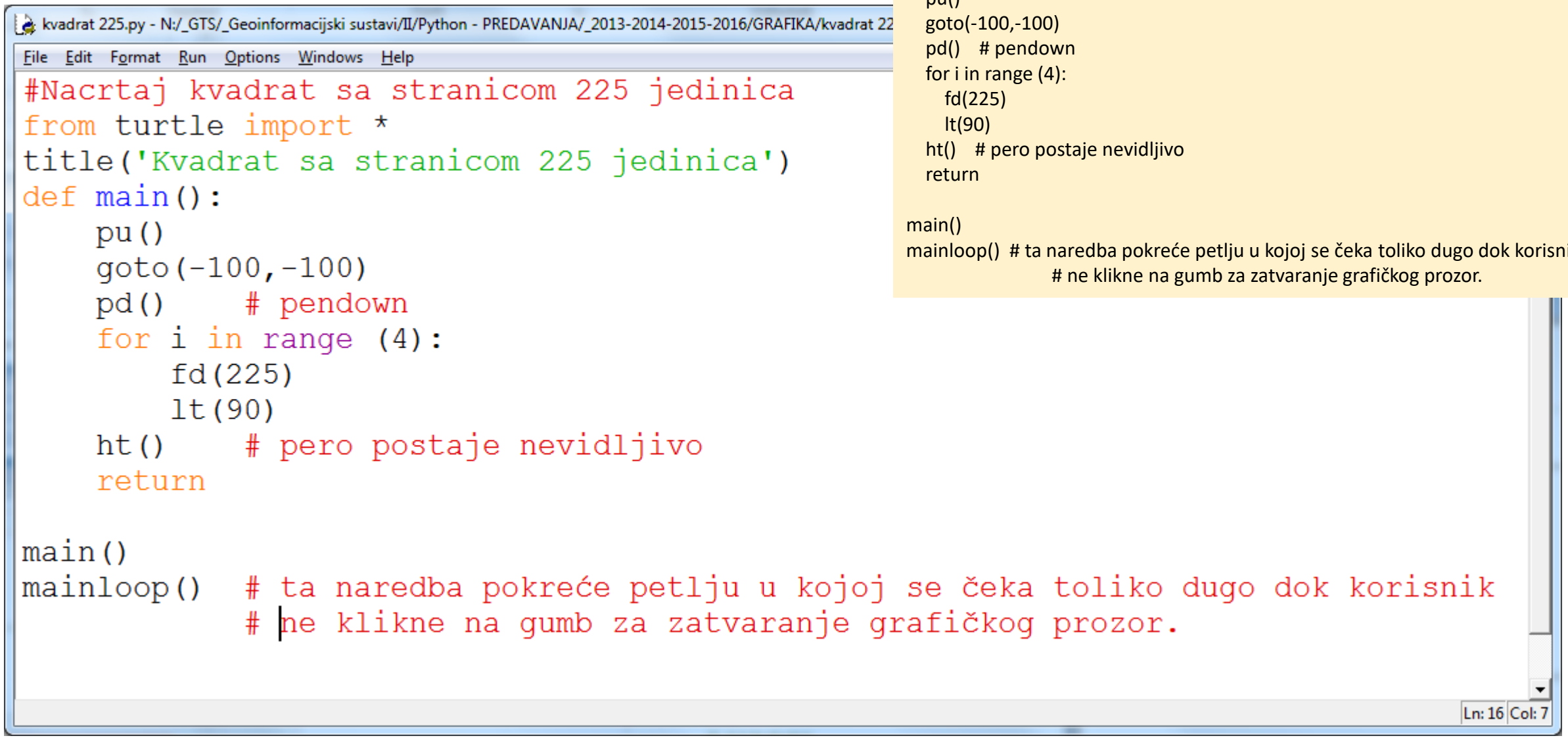
```
>>> from turtle import *
>>> pu()
>>> goto (-200,-200)
>>> pd()
>>> for i in range (4):
        fd(400)
        lt(90)


>>>
```



```
#Nacrtaj kvadrat sa stranicom 225 jedinica
from turtle import *
title('Kvadrat sa stranicom 225 jedinica')
def main():
   pu()
   goto(-100,-100)
   pd()    # pendown
   for i in range (4):
      fd(225)
      lt(90)
   ht()    # pero postaje nevidljivo
   return

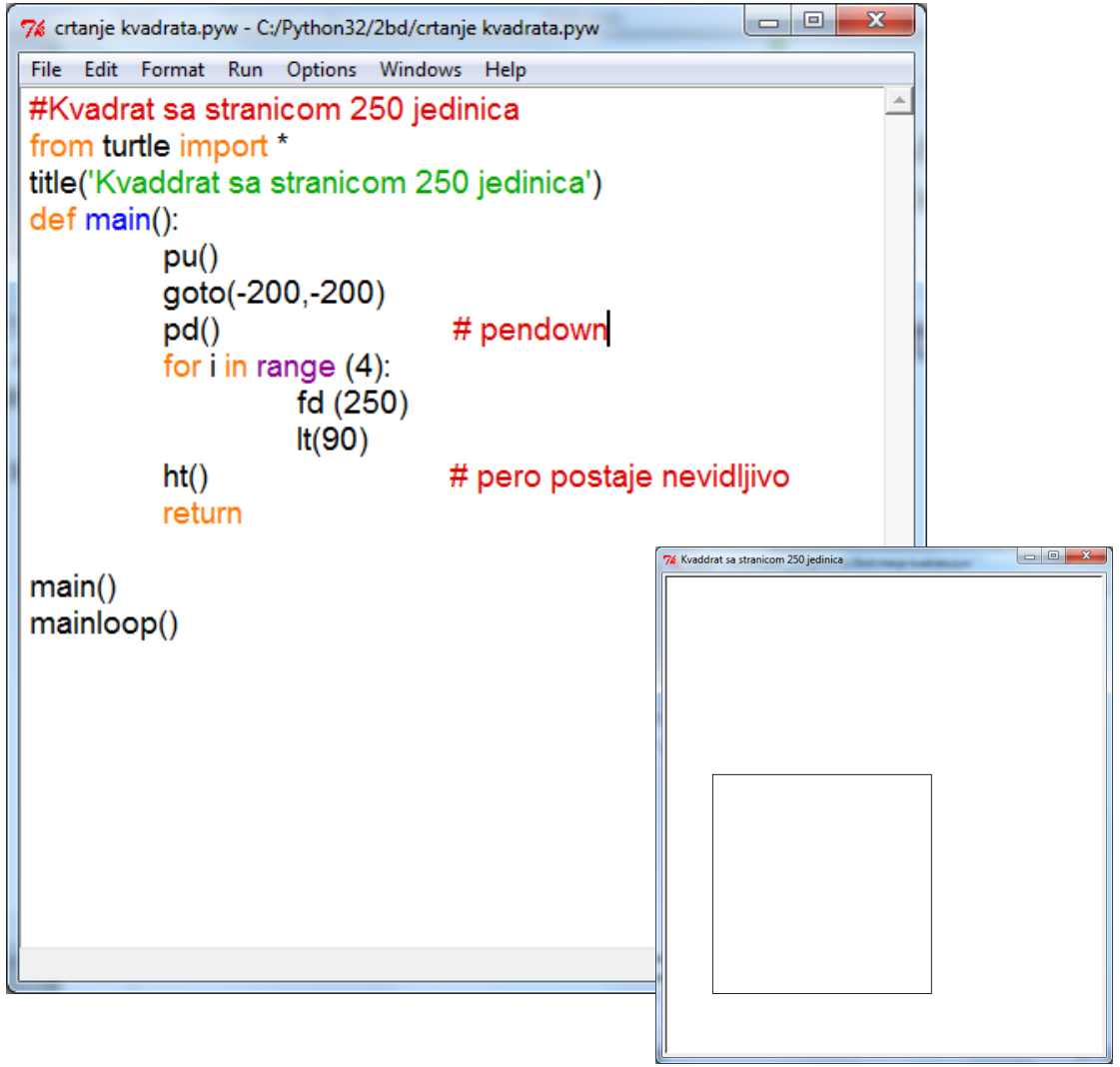
main()
mainloop()  # ta naredba pokreće petlju u kojoj se čeka toliko dugo dok korisnik
                    # ne klikne na gumb za zatvaranje grafičkog prozor.
```



Napiši program koji će crtati kvadrat stranice duljine 250 i dodati mu naslov: „Kvadrat sa stranicom 250 jedinica”, a na kraju će sakriti kornjaču.

```
#Kvadrat sa stranicom 250 jedinica
from turtle import *
title('Kvaddrat sa stranicom 250 jedinica')
def main():
        pu()
        goto(-200,-200)
        pd()                    # pendown
        for i in range (4):
                fd (250)
                lt(90)
        ht()                    # pero postaje nevidljivo
        return


main()
mainloop()
```



*Python 3.4.2 Shell

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Python 3
tel)] on
Type "co
>>> ====
>>>
Gotovo!

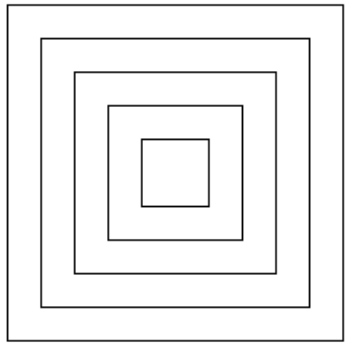


>>> ====
>>>
Gotovo!
```

Pet kvadrata

```
# Nacrtaj pet kvadrata
from turtle import *
title('Pet kvadrata')
def kvadrat(stranica):
    pu()
    goto(-stranica//2,-stranica//2)
                    # // cjelobrojno dijeljenje
    pd()
    for i in range (4):
        fd(stranica)
        lt(90)
    return
def main():
    for i in range (5):
        stranica=(i+1)*40
        kvadrat (stranica)
    ht()
    return 'Gotovo!‘

poruka=main()
print(poruka)
mainloop()
```



5 kvadrata.py - N:/_GTS/_Geoinformacijski sustavi/II/Python - PREDAVANJA/_2013-2014-2015-...

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```
# Nacrtaj pet kvadrata
from turtle import *
title('Pet kvadrata')
def kvadrat(stranica):
    pu()
    goto(-stranica//2,-stranica//2)
    pd()
    for i in range (4):
        fd(stranica)
        lt(90)
    return
def main():
    for i in range (5):
        stranica=(i+1)*40
        kvadrat (stranica)
    ht()
    return 'Gotovo!'
poruka=main()
print(poruka)
mainloop()
```

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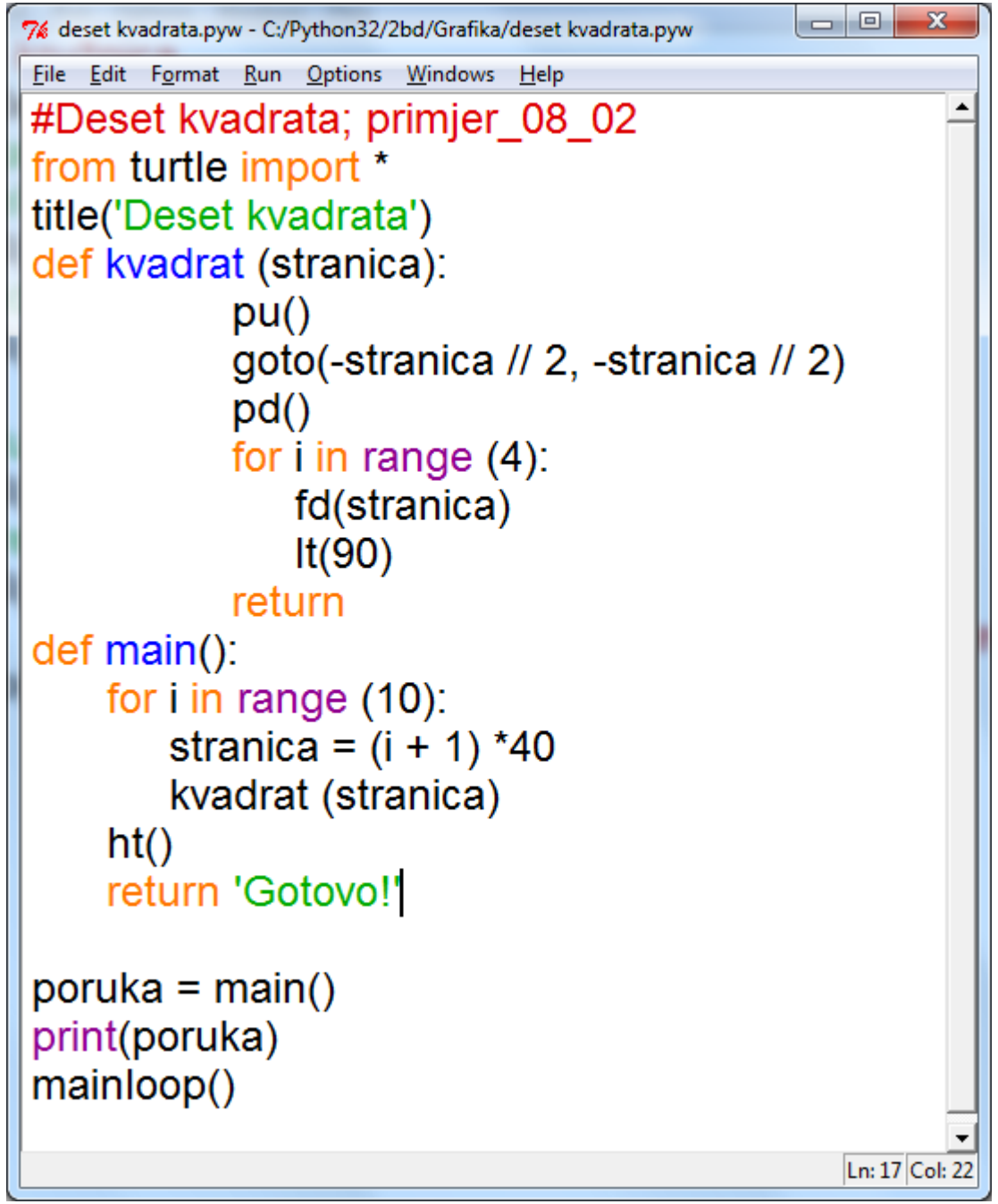
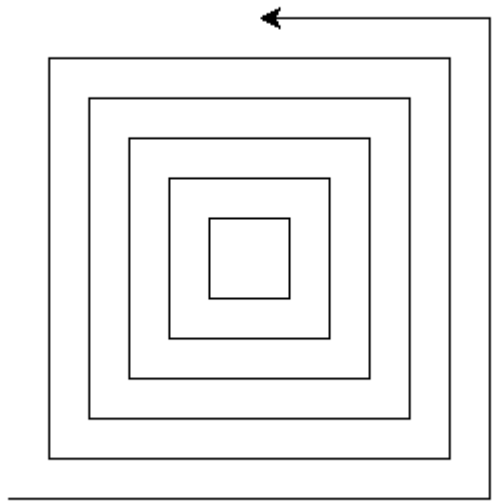
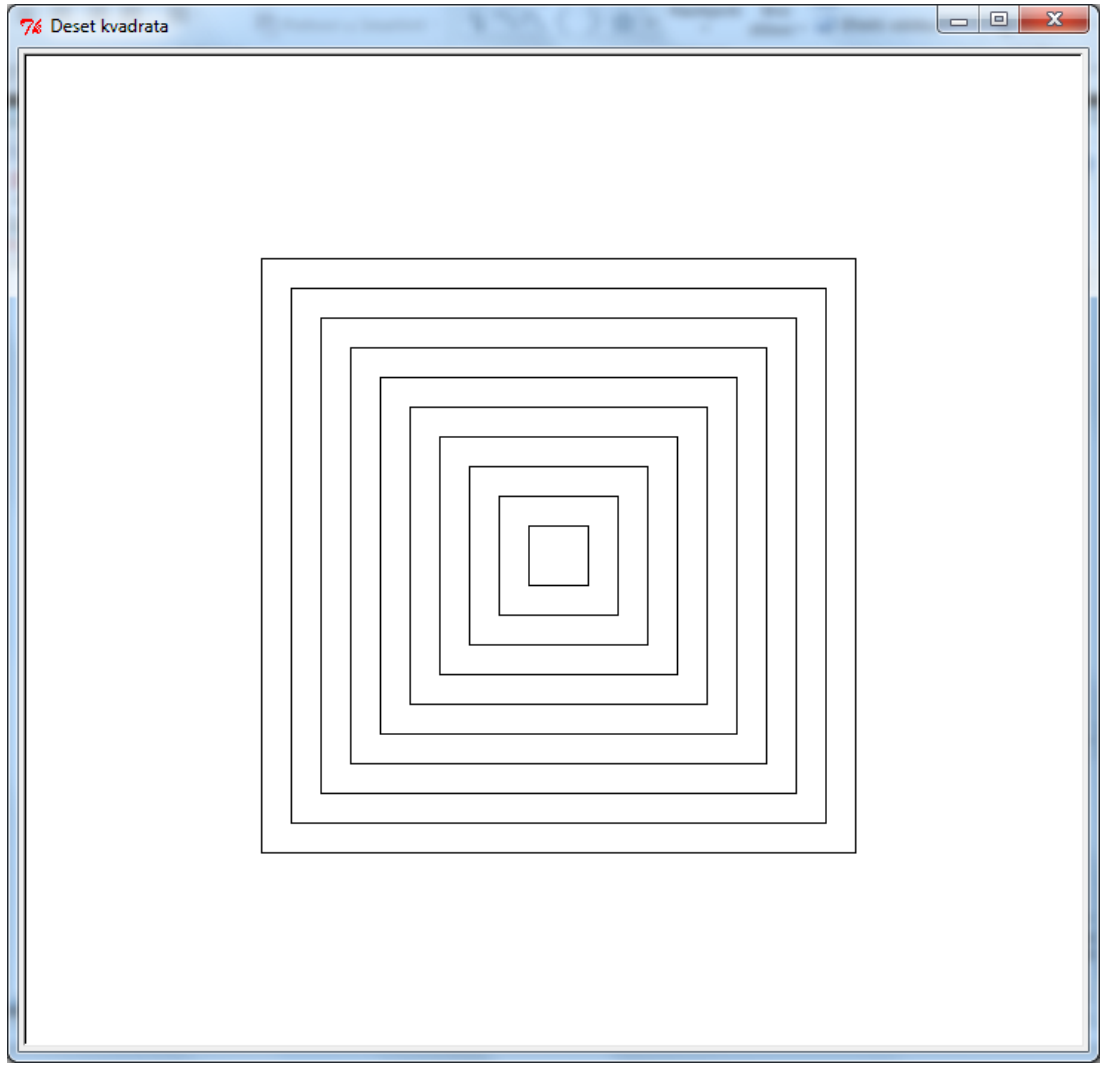
```
#Deset kvadrata; primjer_08_02
from turtle import *
title('Deset kvadrata')
def kvadrat (stranica):
            pu()
            goto(-stranica // 2, -stranica // 2)
            pd()
            for i in range (4):
                fd(stranica)
                lt(90)
            return
def main():
    for i in range (10):
        stranica = (i + 1) *40
        kvadrat (stranica)
    ht()
    return 'Gotovo!'

poruka = main()
print(poruka)
mainloop()
```

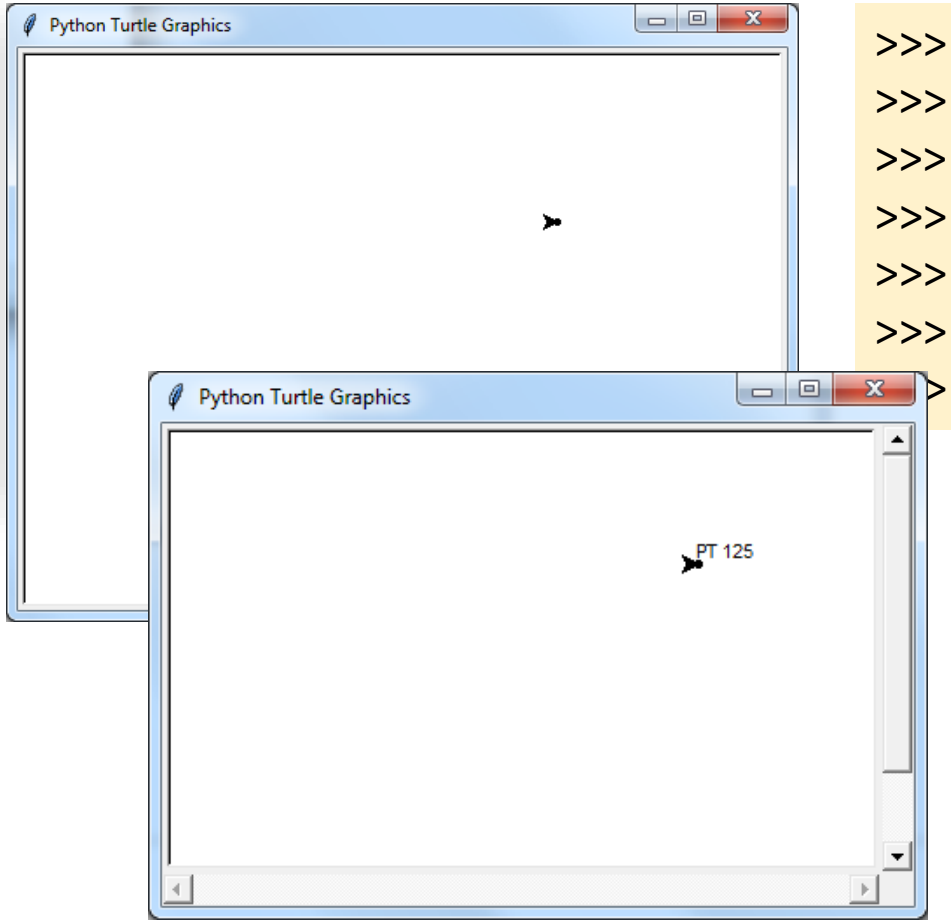





Deset kvadrata

Crtanje točaka po koordinatama

```
>>>
>>> from turtle import *
>>> x=100
>>> y=75
>>> pu()
>>> goto(x,y)
>>> dot(5)
>>> write('PT 125')
```

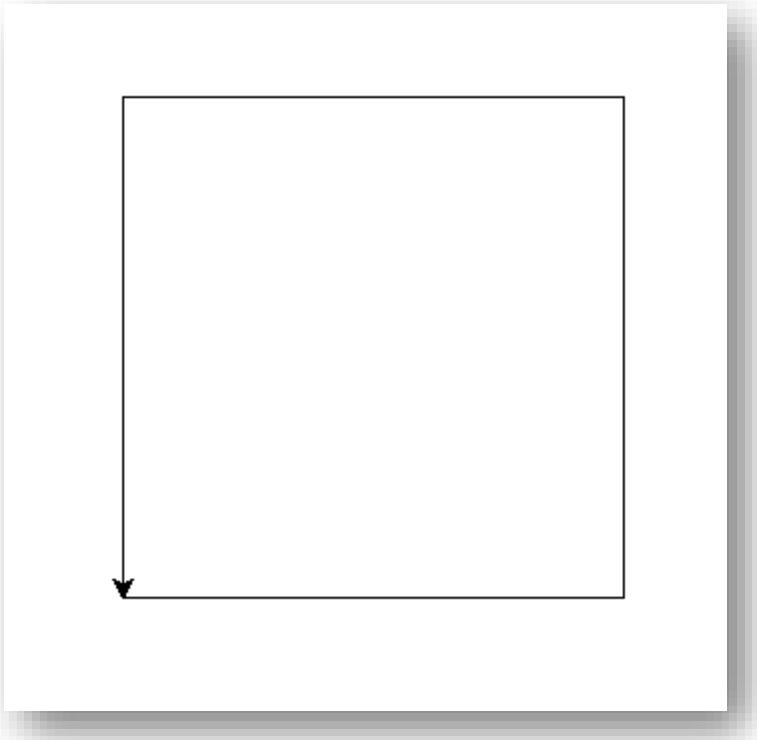



```
>>> from turtle import *
>>> x=100
>>> y=75
>>> pu()
>>> goto(x,y)
>>> dot(5)
```

ZADACI

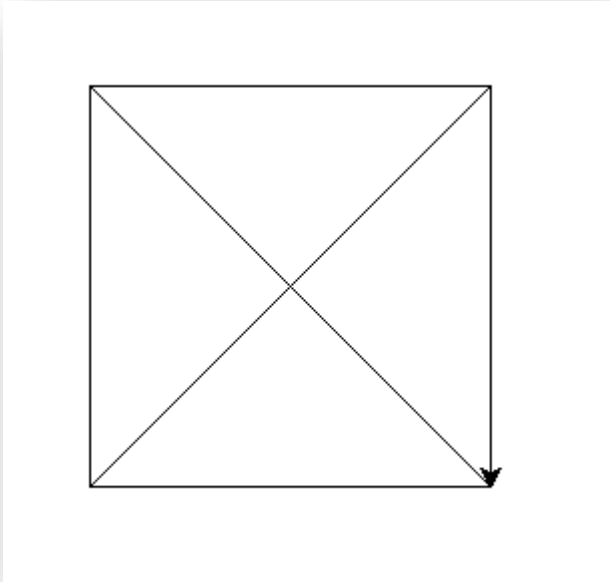
Nacrtaj kvadrat (a=250)

```
>>> from turtle import *
>>> pd()
>>> fd(250)
>>> lt(90)
>>> fd(250)
>>> lt(90)
>>> fd(250)
>>> lt(90)
>>> fd(250)
>>>
```

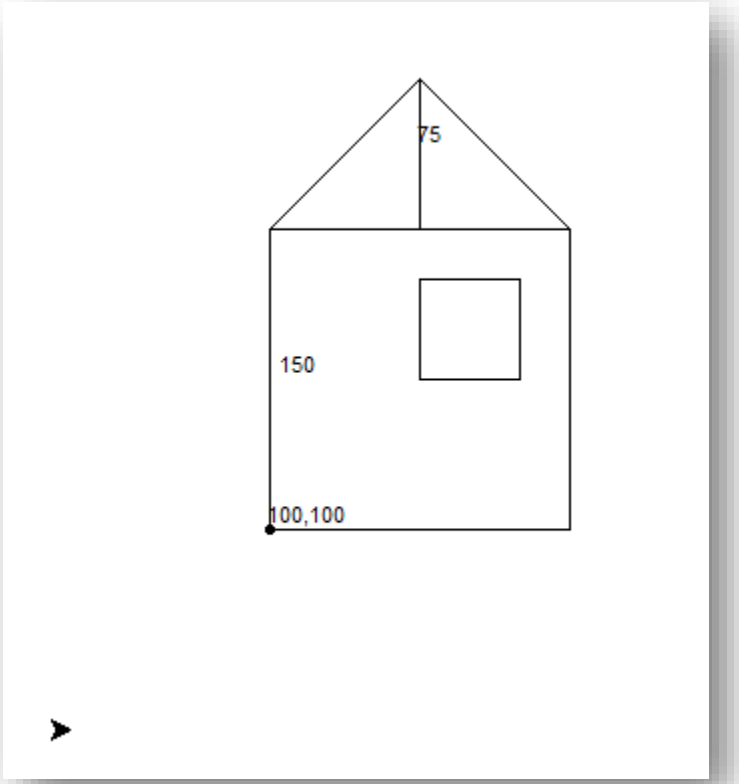


Nacrtaj kvadrat i dijagonale kvadrata

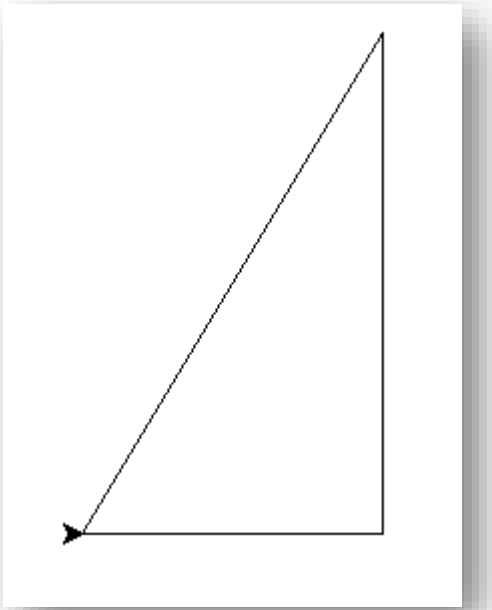
```
>>> from turtle import *
>>> pd()
>>> fd(200)
>>> lt(90)
>>> fd(200)
>>> lt(90)
>>> fd(200)
>>> lt(90)
>>> fd(200)
>>> goto(200,200)
>>> pu()
>>> goto(0,200)
>>> pd()
>>> goto(200,0)
>>>
```



Nacrtaj



```
>>> import turtle                          # modul turtle
>>> wn=turtle.Screen()                     # otvaranje prozora za crtanje
>>> strelica = turtle.Turtle()             # kreiranje kornjače,
pridodajemo strelici
>>> strelica=fd(150)
>>> strelica=lt(90)
>>> strelica=fd(250)
>>> home()
>>> wn.mainloop()                          # Čeka da se zatvori prozor
```



Nacrtaj skicu poligonskog vlaka

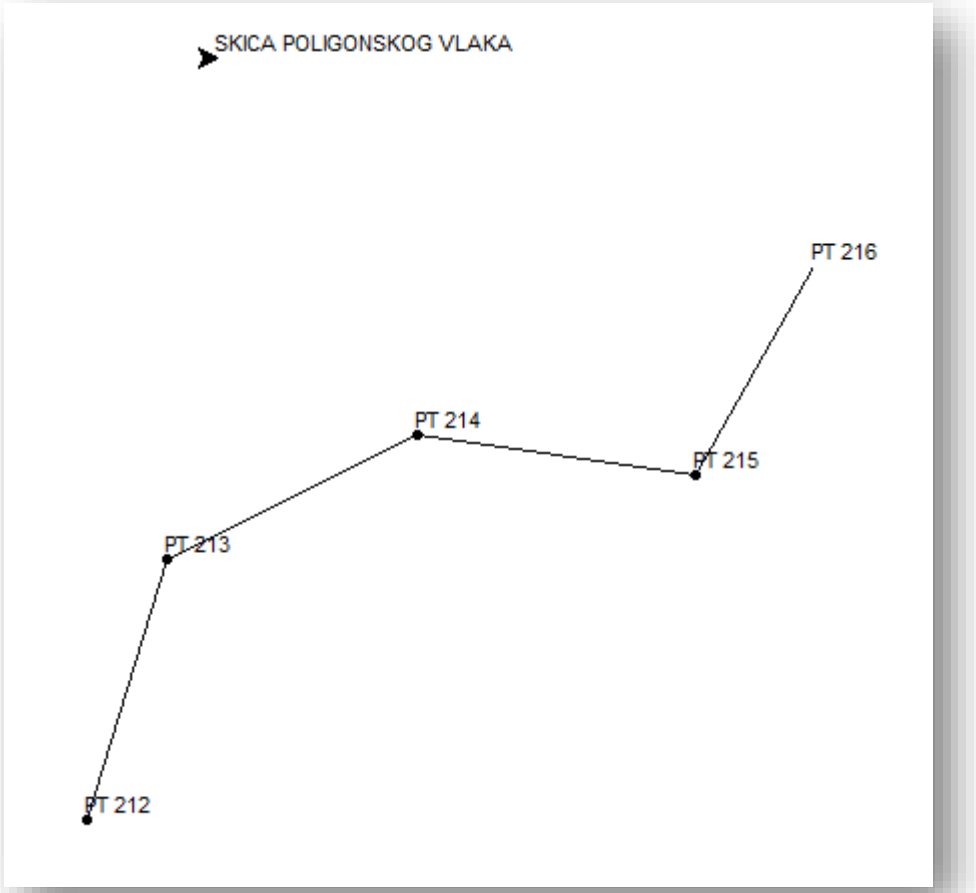
```
>>> from turtle import *
>>> pu()
>>> goto(10,20)
>>> pd()
>>> dot(5)
>>> write ('PT 212')

>>> goto(50,150)
>>> dot(5)
>>> write ('PT 213')

>>> goto(175,212)
>>> dot(5)
>>> write ('PT 214')

>>> goto(314,192)
>>> dot(5)
>>> write ('PT 215')

>>> goto(373,296)
>>> write ('PT 216')
>>>
>>> write ('SKICA POLIGONSKOG VLAKA')
```



Nacrtaj poligon s n-strana

lik s n broj strana.py - F:/_GTS/_Geoinformacijski sustavi/II/Python - PREDAVANJA/_2013-201...

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```
# Geodetska tehnička škola, Zagreb
# prof. A. Slaviček, 2016.
# ------------------------------
import turtle

poligon = turtle.Turtle()

broj_strana = int(input('Broj strana = '))
duljina_strane = 70
kut = 360.0 / broj_strana

for i in range(broj_strana):
    poligon.forward(duljina_strane)
    poligon.right(kut)

turtle.done()
main()
mainloop()
```

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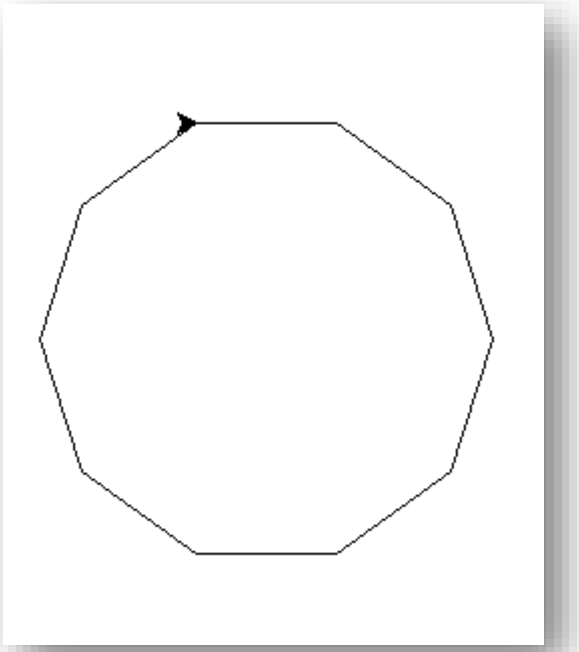
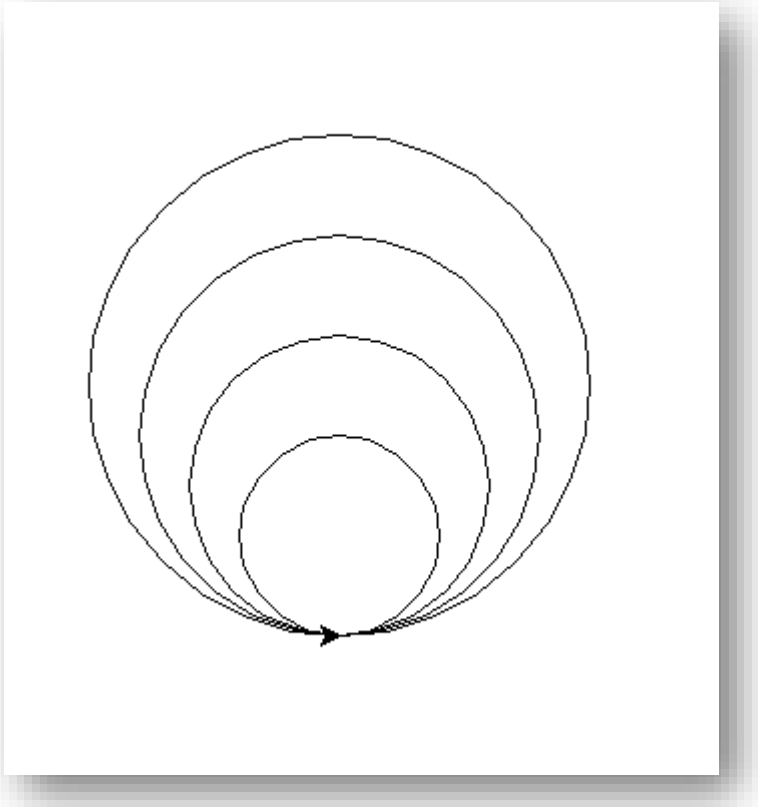


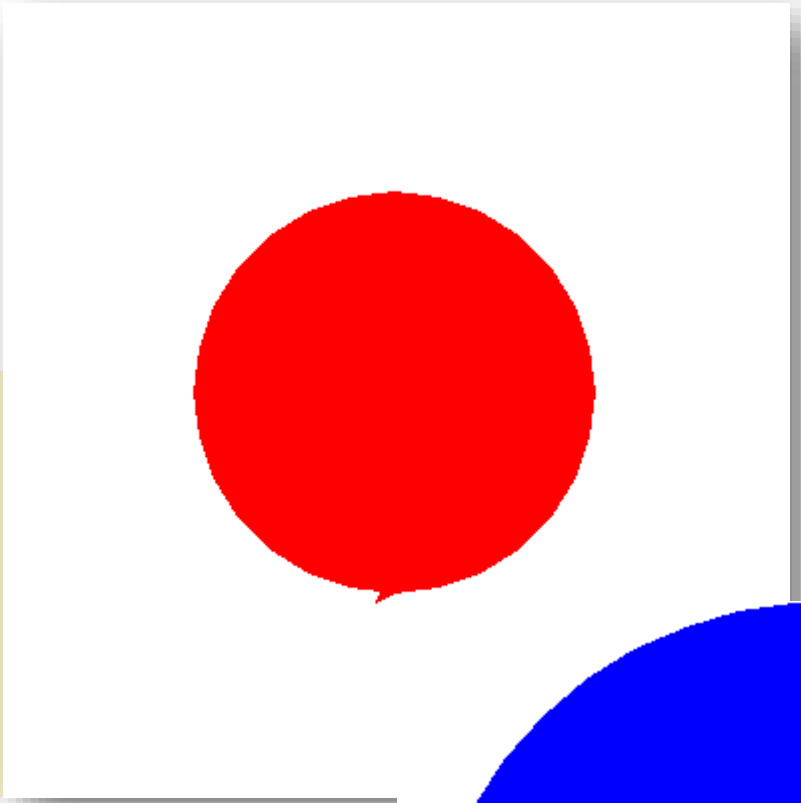
Nacrtaj kružnicu

- >>> from turtle import *
- >>> circle(50)
- >>> circle(75)
- >>> circle(100)
- >>> circle(125)
- >>>

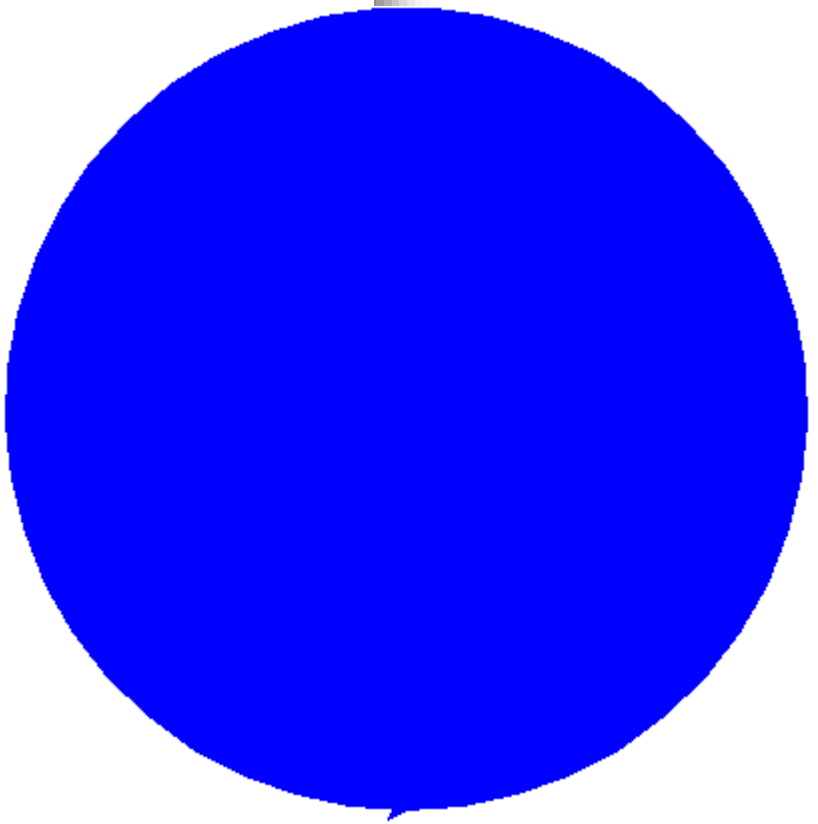


Oboji kružnicu

```
>>> from turtle import *
>>> color('red')
>>> begin_fill();circle(100);end_fill()
>>>
```



```
>>> color('blue')
>>>
begin_fill();circle(200);end_fill()
>>>
```



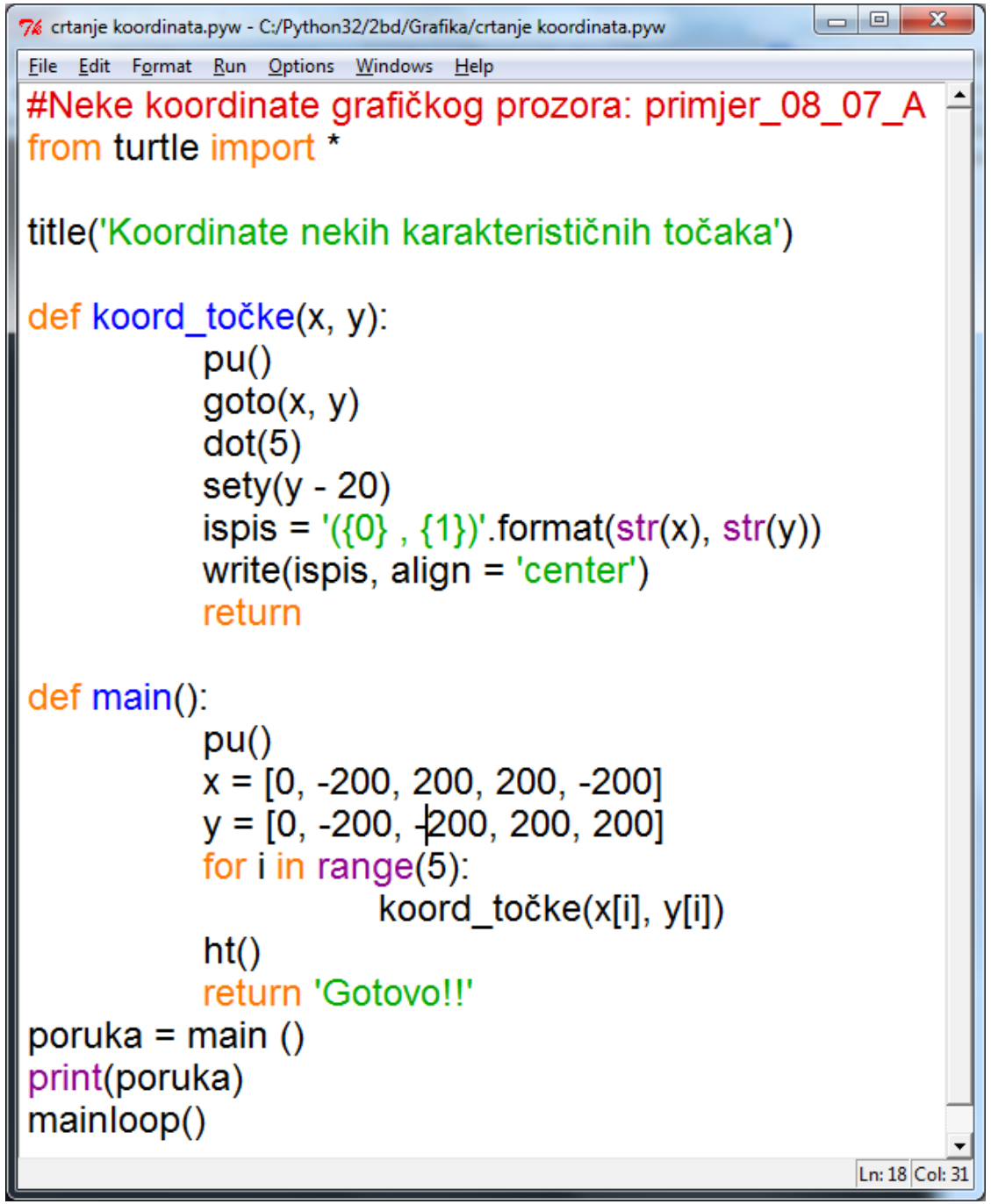
KOORDINATE GRAF. PROZORA

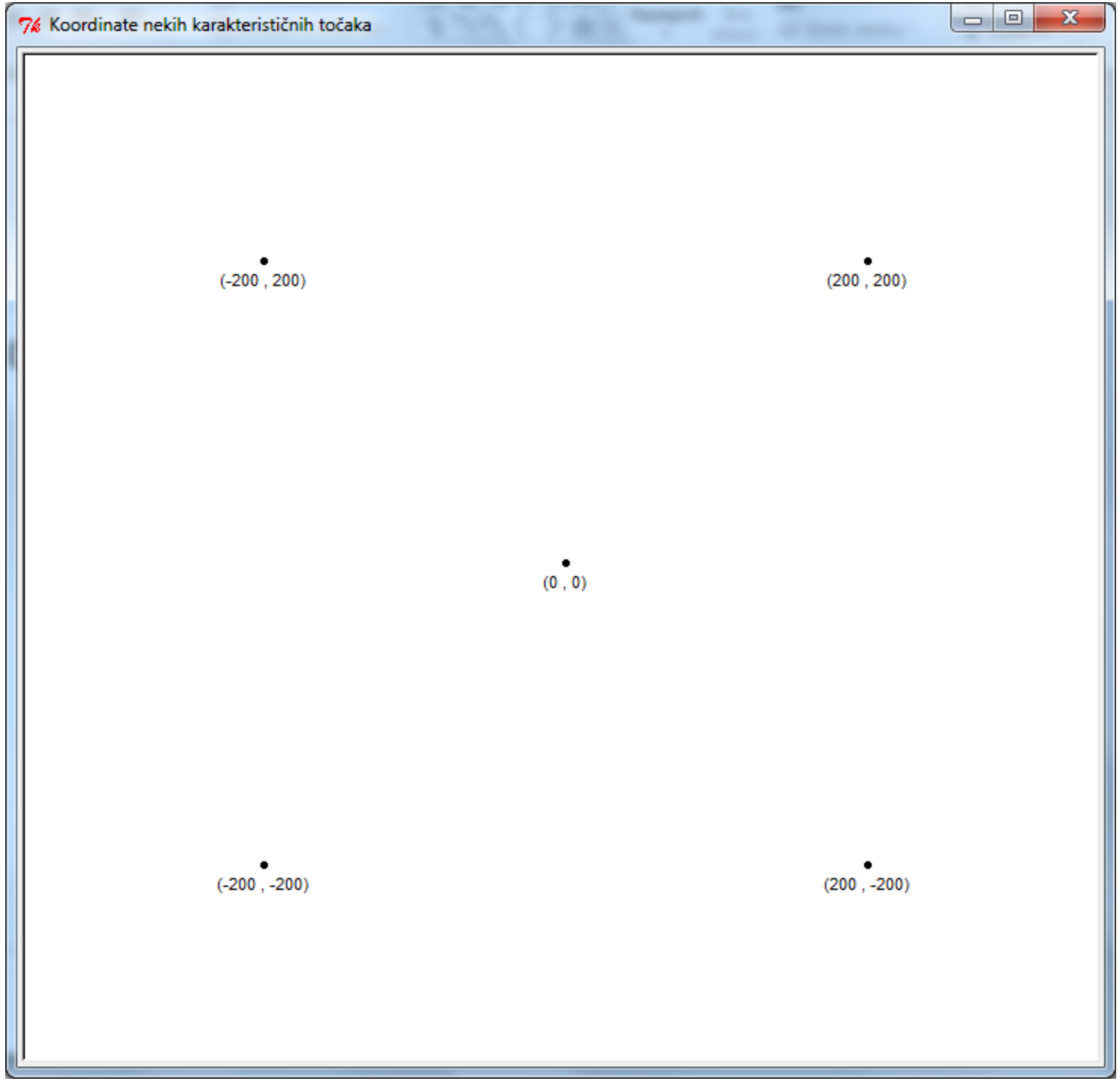
```
#Neke koordinate grafičkog prozora: primjer_08_07_A
from turtle import *

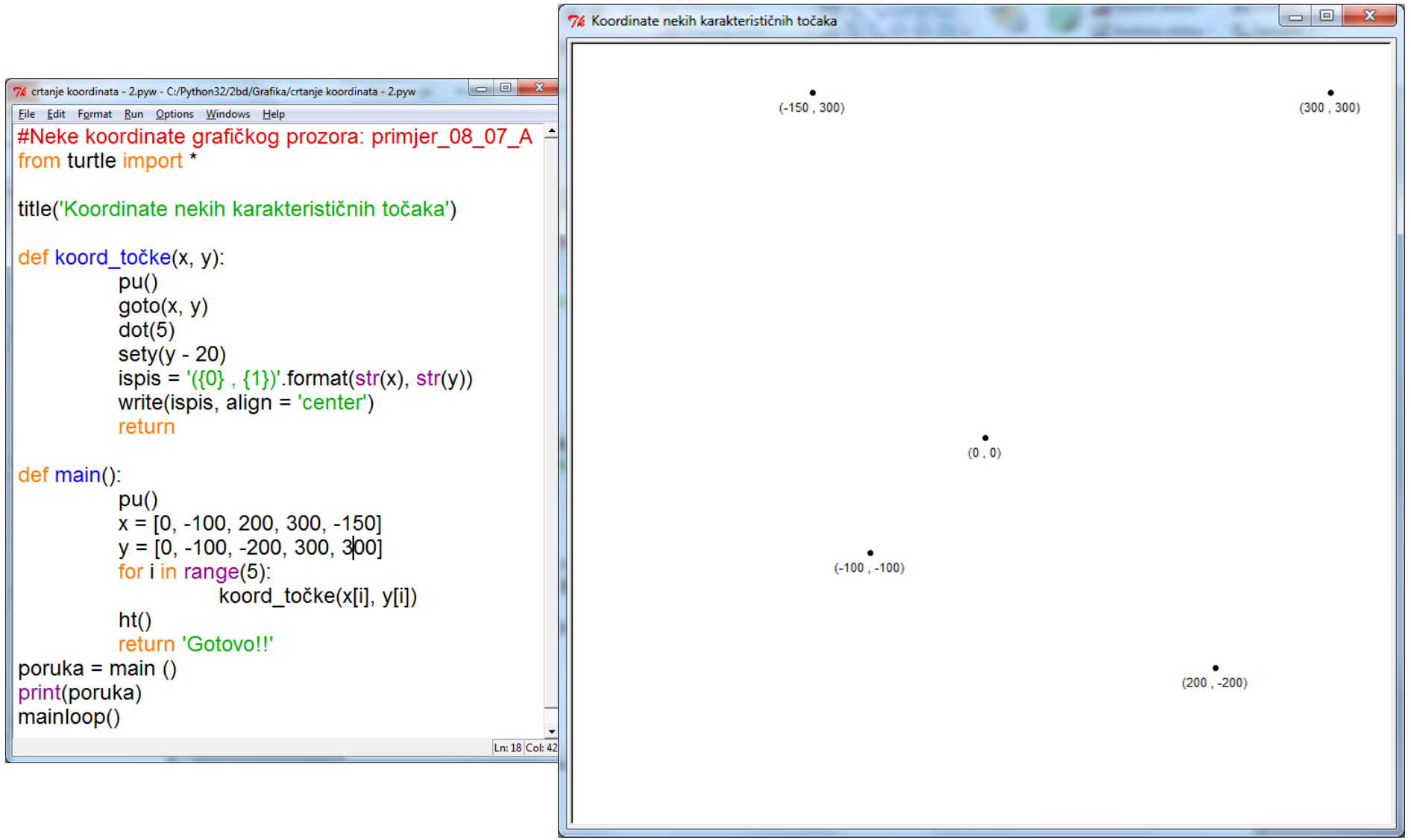
title('Koordinate nekih karakterističnih točaka')

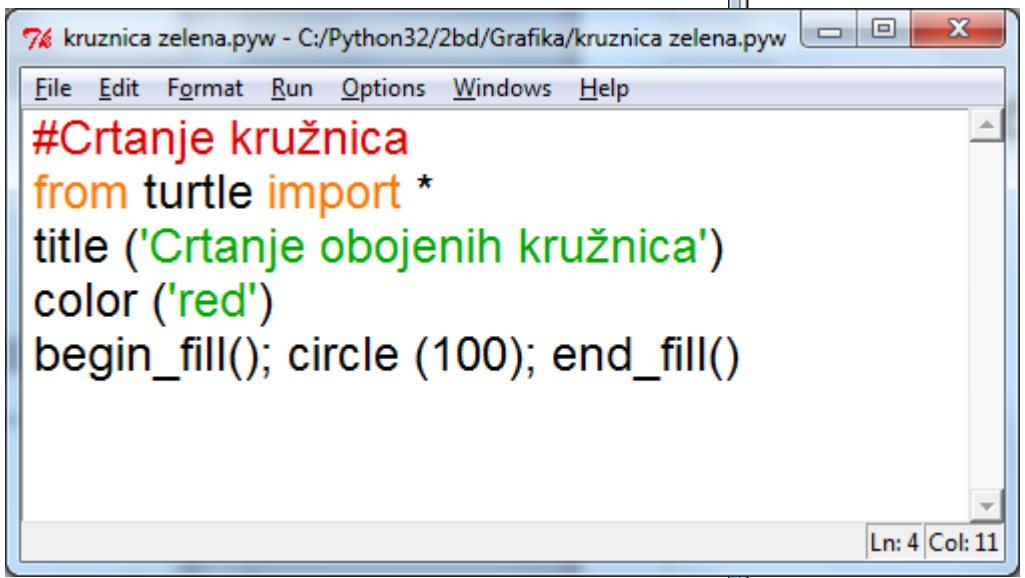
def koord_točke(x, y):
        pu()
        goto(x, y)
        dot(5)
        sety(y - 20)
        ispis = '({0} , {1})'.format(str(x), str(y))
        write(ispis, align = 'center')
        return

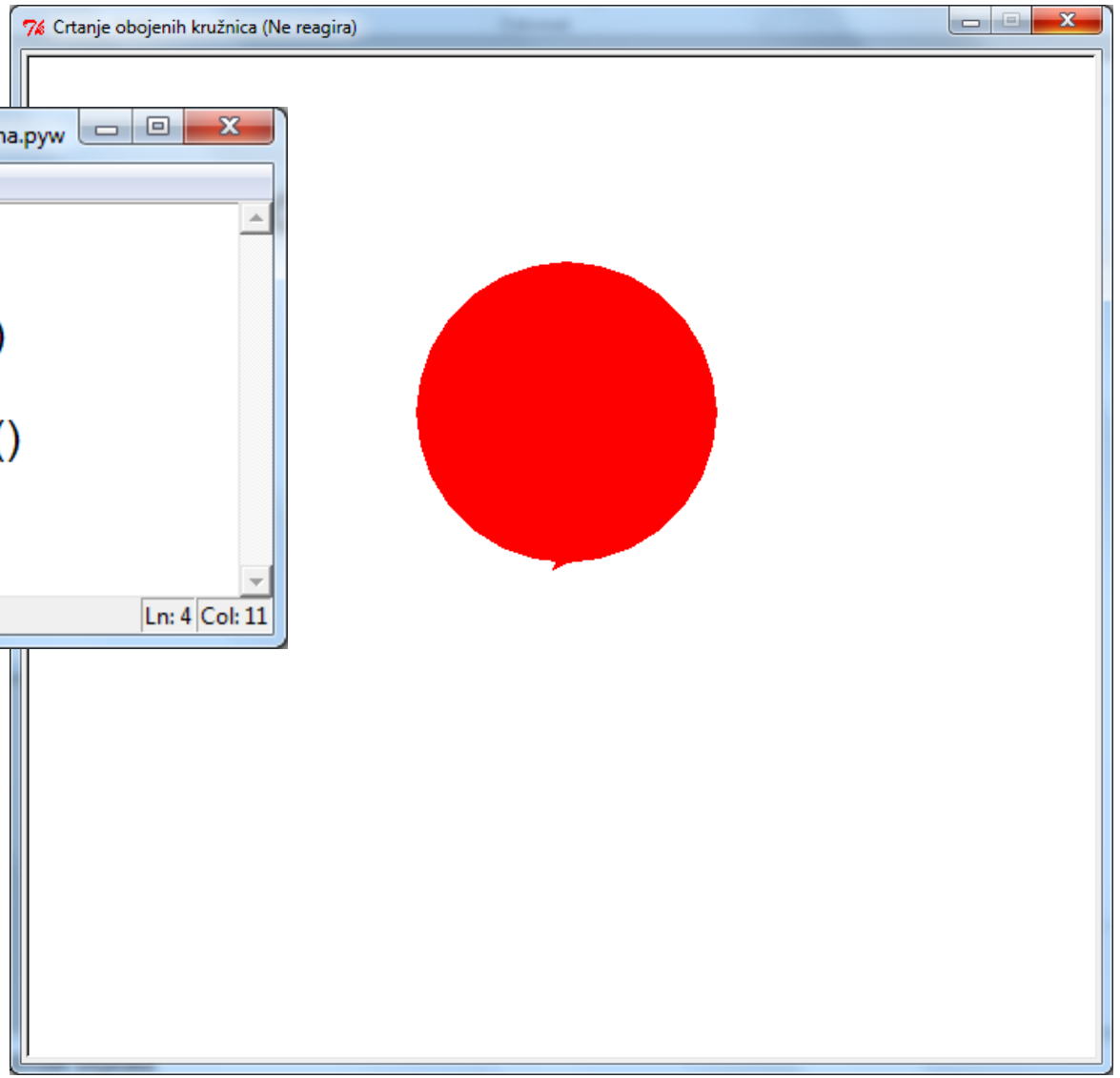
def main():
        pu()
        x = [0, -200, 200, 200, -200]
        y = [0, -200, -200, 200, 200]
        for i in range(5):
                koord_točke(x[i], y[i])
        ht()
        return 'Gotovo!!'
poruka = main ()
print(poruka)
mainloop()
```




Koordinate nekih karakterističnih točaka
(-200 , 200)
(200 , 200)
(0 , 0)
(-200 , -200)
(200 , -200)


crtanje koordinata - 2.pyw - C:/Python32/2bd/Grafika/crtanje koordinata - 2.pyw
File Edit Format Run Options Windows Help
#Neke koordinate grafičkog prozora: primjer_08_07_A
from turtle import *
title('Koordinate nekih karakterističnih točaka')
def koord_točke(x, y):
pu()
goto(x, y)
dot(5)
sety(y - 20)
ispis = '({0} , {1})'.format(str(x), str(y))
write(ispis, align = 'center')
return
def main():
pu()
x = [0, -100, 200, 300, -150]
y = [0, -100, -200, 300, 300]
for i in range(5):
koord_točke(x[i], y[i])
ht()
return 'Gotovo!!'
poruka = main ()
print(poruka)
mainloop()
Ln: 18 Col: 42
Koordinate nekih karakterističnih točaka
(-150 , 300)
(300 , 300)
(0 , 0)
(-100 , -100)
(200 , -200)






```
#Crtanje kružnica
from turtle import *
title ('Crtanje obojenih kružnica')
color ('red')
begin_fill(); circle (100); end_fill()
```

```
#Crtanje kružnica
from turtle import *
title ('Crtanje obojenih kružnica')
color ('yellow')
begin_fill(); circle (100); end_fill()
color ('red')
begin_fill(); circle (-100); end_fill()
lt(90)
color ('blue')
begin_fill(); circle (100); end_fill()
color ('green')
begin_fill(); circle (-100); end_fill()
ht()
# pero postaje nevidljivo
mainloop()
```