Program 17a

```
data compoundpoisson;

   t=0;
   p=0;
   lambda=1;
   delta=0.01;
   s=0;
   a=1;
   output;

       do i = 1 to 1000;
        t =t+delta;
        p = rand('Poisson',delta*lambda);
        if p>=1 then s=s+Rand('gamma',a);
        output;
       end;
   run;

Symbol value=none interpol=sms line=1  width=2;
title"Poisson";
proc gplot data=compoundpoisson;
plot s*t  /overlay ;
run;
```

Program 39

```
data first;
   x=0;
   z=0;
   a=0.5;
   output;
   delta=0.01;
   n=1000;


       do i = 1 to n;
```

```
        x =x+delta;
        z = z+ rand('normal')*sqrt(delta);
        y=a;
        output;
      end;
  run;


Symbol value=none interpol=sms line=1  width=2;
title"Wiener process";
proc gplot data=first;
plot z*x y*x/overlay;
run;
```

Program 40a

```
data stopa;

/* barrier a*/

   delta=0.01;
   n=50000;
   m=500; /*a number of observations=trajectories*/
   t=10;
   a=0.5;
   Time=n*delta; /* Time is a time in which we observe the process*/
   suma=0;
   p=0.4;

   do j=1 to m;
    x=0;
    z=0;
    znacz =0;
      do i = 1 to n;
        x =x+delta;
        z = z+ rand('normal')*sqrt(delta);
        if z>=a and znacz=0 then r=x;
        if z>=a and znacz=0 then  znacz=1;
      end;
    if znacz=0 then t=Time;
    else   t=r;
```

```
    suma=suma+t;
   end;

expected=suma/m**(1/p);
run;



proc print data=stopa;
var expected;
run;
```

Program 40

```
data stop;

/* barrier a*/

delta=0.01;
n=1000;
t=10;
a=0.5;


   do j=1 to 1000;
    x=0;
   z=0;
   znacz =0;
       do i = 1 to n;
          x =x+delta;
          z = z+ rand('normal')*sqrt(delta);
          if z>=a and znacz=0 then r=x;
          if z>=a and znacz=0 then  znacz=1;
        end;
       if znacz=0 then t=10;
       else   t=r;
     output;
```

```
 end;

 title 'Distribution of stoping time';
proc univariate data=stop;
var t;
histogram / midpoints=0.05 to 10 by 0.5
beta
vaxis = axis1
name = 'MyHist';
inset n mean(5.3) std='Std Dev'(5.3) skewness(5.3)
/ pos = ne header = 'Summary Statistics';
axis1 label=(a=90 r=0);
run;
```

Program 41

```
data stop1;
/*bariera a=*/
x=0;
a=0.5;
delta=0.01;
pi=3.14;


do j=1 to 1000;
    y=a/sqrt(2*pi)*(x)**(-1.5)*exp(-a**2/(2*x));
    x=x+delta;
output;
end;


Symbol value=none interpol=sms line=1 width=2;
proc gplot data=stop1;
plot y*x ;
run;
```

Program 42

```
data doublestop;

/* barrier a*/
   delta=0.01;
   n=1000;
  t=10;
  a=-1.1;
  b=0.4;
  s=0;




   do j=1 to 5000;
    x=0;
   z=0;
   za =0;
   zb=0;
   r1=0;
   r2=0;
       do i = 1 to n;
         x =x+delta;
         z = z+ rand('normal')*sqrt(delta);
          if z<=a and za=0 then r1=x;
          if z<=a and za=0 then  za=1;
          if z>=b and zb=0 then r2=x;
          if z>=b and zb=0 then  zb=1;
       end;
     if  za=0 then r1=10;
     if zb=0 then r2=10;
     if r1<r2 then s=s+1;
 output;
    th=b/(b-a);
    emp=s/5000;
  end;

/* theoretical value th, em empirical value */

proc print data=doublestop;
var r1 r2 th emp ;
run;
```

Program 43

```
data doublestop1;

/* barrier a*/
   delta=0.01;
   n=1000;
  t=10;
  a=-1.1;
  b=0.4;
  s=0;




   do j=1 to 5000;
    x=0;
   z=0;
   za =0;
   zb=0;
   r1=0;
   r2=0;
       do i = 1 to n;
         x =x+delta;
         z = z+ rand('normal')*sqrt(delta);
         if z<=a and za=0 then r1=x;
         if z<=a and za=0 then  za=1;
         if z>=b and zb=0 then r2=x;
         if z>=b and zb=0 then  zb=1;
       end;

     if  za=0 then r1=10;
     if zb=0 then r2=10;
     if r1<r2 then r=r1;
       else r=r2;
 output;
 end;

proc univariate data=doublestop1;
var r;
```

```
histogram / midpoints=0.05 to 4 by 0.2
vaxis = axis1
name = 'MyHist';
inset n mean(5.3) std='Std Dev'(5.3) skewness(5.3)
/ pos = ne header = 'Summary Statistics';
axis1 label=(a=90 r=0);
run;
```