

```

/* Exercice 1 */
proc iml;
X={1,2,3};
print (type(X));
print (t(X));
print (nrow(X));
print (ncol(X));
A=repeat(2,3,1)##X;
B=A##2;
C=A||B||A#B;
print A,B,C;
print (A*t(B));
D=A*t(B)-C;
print D;
print (D[<>]);print(max(D));
print (D[2,><]);
print (D[<>,{1,3}]);
print (D[<:,>,{1,3}]);
print ((D>C)[+,+]); print ((D>C)[+]);
print ((D=C)[+,+]); print ((D=C)[+]);
print ((D>C)[2,+]);
print (((D>C)[+,{1,3}])[+]);
quit;

/* Exercice 2 */
proc iml;
V = {};
/* Free V ; */
do i=1 to 100 ;
X=2*uniform(0)-1 ;
V=V//X ;
end ;
Stat=(V[+]/nrow(V)) || (((V[##]-V[+]/nrow(V))##2)/nrow(V))/nrow(V) ;
U=(V-3)/5 ;
print V stat U;
quit;

/* Exercice 3 */
proc iml;
g=1:20;
X=10*uniform(g)-5;
e=0.5*normal(g);
Y=2*X+1+e;
Z=J(20,1)||t(X);
c=inv(t(Z)*Z)*(t(Z)*t(Y));
print c;

start estmco(est,y_pred,res,y_dep,x_exp);
if nrow(y_dep)=1 then y_dep=t(y_dep);
if nrow(x_exp)<ncol(x_exp) then x_exp=t(x_exp);
n=nrow(y_dep);
k=ncol(x_exp);
x=repeat(1,n,1);
x=x||x_exp;
est=(t(x)*x)**(-1)*t(x)*y_dep;
y_pred=x*est;
res=y_dep-y_pred;
return(est,y_pred,res);
finish estmco;
quit;

/* Exercice 4 */
proc iml;
start test(n);
if ((n>=0)&(round(n)=n)) then r=1;
else r=0;
return(r);
finish;

```

```

print(test(7.2));

start nsum(n,k) ;
if ((test(n)=1) & (n>0) & (test(k)=1)) then
do ;
som=0 ;
do i=1 to n ;
som=som+(i##k) ;
end ;
end;
else som='erreur' ;
return(som) ;
finish ;

print(nsum(10,3));

start fact(n);
if test(n)=1 then
do ;
f=1;
if n>0 then
do i=1 to n;
f=f*i;
end;
end;
else f='erreur';
return(f);
finish;

print(fact(10)) ;

start combi(n,k);
if ((test(n)=1) & (test(k)=1) & (n>=k)) then r=(fact(n))/(fact(k)*fact(n-k));
else r='erreur';
return(r);
finish;

print(combi(20,15)) ;

start puiss(A,k);
if ((nrow(A)=ncol(A)) & (test(k)=1)) then
R=A**k ;
else R='erreur';
return(R);
finish;

A={1 2,0 1} ;
Print(puiss(A,3)) ;
quit;

/* Exercice 5*/
proc iml;
start xx(a,b);
u=uniform(0);
if u>=0.5 then x=b;
else x=a;
return(x);
finish;

/* NB : on peut vouloir traiter la question 1) à l'aide d'une fonction sans
paramètre. Cette fonction ne
retournera rien mais la variable globale x sera créée à l'issue de
l'exécution de cette fonction*/

start xx2;
u=uniform(0);

```

```
if u>=0.5 then x=1;
else x=-1;
finish;
call xx2;
print x;

start yy(a);
u=uniform(0);
if a>0 then y=-(1/a)*log(1-u);
else y='parametre negatif';
return(y);
finish;

start laplace(z,a,N);
if ((test(N)=1)&(a>0)&(N>0)) then
do i=1 to N;
y=yy(a);
x=xx(-1,1); /* avec la première def de la fonction xx*/
z=z/(x*y);
end; ;
else z='erreur';
finish;

free m;
call laplace(m,2,100);
print(m);
quit;
```