```
* KHOONG WEI HAO ST2137 Tutorial 8 T03;

*Q1;
data pareto;
    n = 30;
    a = 4;
    b = 2;
    do i = 1 to n;
    x = b/(1-rand("uniform"))**(1/a);
    output;
    end;
    keep x;
run;

proc print data=pareto;
run;

*Q2;
data q2;
    seed=1234;
    call streaminit(seed);
    a=3;
    b=5;
    do i = 1 to 1000;
        x1=rand("chisquare",2*a);
        x2=rand("chisquare",2*b);
        y=x1/(x1+x2);
    output;
    end;
run;

proc univariate data=q2;
    histogram y/midpoints=0 to 1 by 0.05 beta(theta=0, sigma=1, alpha=3, beta=5);
run;

*Q3(a);
data simu_a;
    seed=1234;
    call streaminit(seed);
    ns=1000; n=9; sigma=2;
    do mu= -1 to 1 by 0.5;
        do mcrep = 1 to ns;
            do i = 1 to n;
                x = rand("normal", mu,sigma);
            output;
            end;
        keep mu mcrep x;
        end;
    end;
run;

proc sort data=simu_a;
    by mu mcrep;
run;

* Perform the t-test for each sample. Output the p-value "probt" in the SAS dataset "outtest";
proc univariate data=simu_a noprint mu0 = 0;
    by mu mcrep;
    var x;
    output out = outtest probt=p;
run;

* Count how many samples have "probt" < 0.05;
data outtest;
    set outtest;
    reject = (p<0.05);
run;

* "reject" is the number of the samples with "probt" < 0.05. Hence the mean of "reject" is the rejection rate, "rejrate";
proc means data=outtest nway noprint;
    by mu;
    var reject;
    output out = results mean =rejrate;

proc print data = results;
    var mu _freq_ rejrate;
run;

*Ans (Comments on results): The power is getting bigger as mu moves away from the value under the null hypothesis where mu=0.;


*Q3(b);
data simu_b;
    seed=1234;
    call streaminit(seed);
    ns=1000; n=25; sigma=2;
```

```
    do mu= -1 to 1 by 0.5;
        do mcrep = 1 to ns;
            do i = 1 to n;
                x = rand("normal", mu,sigma);
            output;
            end;
        keep mu mcrep x;
        end;
    end;
run;

proc sort data=simu_b;
    by mu mcrep;
run;

* Perform the t-test for each sample. Output the p-value "probt" in the SAS dataset "outtest";
proc univariate data=simu_b noprint mu0 = 0;
    by mu mcrep;
    var x;
    output out = outtest probt=p;
run;

* Count how many samples have "probt" < 0.05;
data outtest;
    set outtest;
    reject = (p<0.05);
run;

* "reject" is the number of the samples with "probt" < 0.05. Hence the mean of "reject" is the rejection rate, "rejrate";
proc means data=outtest nway noprint;
    by mu;
    var reject;
    output out = results mean =rejrate;

proc print data = results;
    var mu _freq_ rejrate;
run;
```