

# Solutions

## Chi-squared statistic

The following script and functions solves the problem both ways:

```
% Compute chi-squared statistic with G01AF
nobs_d = [0 2 2 3 2; 0 6 1 7 0; 3 2 1 3 0];
nobs = int32(nobs_d)
num = int32(0);

[nobsOut, num, pred, chis, p, npos, ndf, m1, n1, ifail] = ...
    g01af(nobs, num);

tail = 'U';
df = double(ndf);
[p, ifail] = g01ec(tail, chis, df);

fprintf('Chi-squared statistic using G01AF gives p = %g \n',p)
test_p(p)

nsim = 2000;
rows = int32( sum(nobs,2) );
cols = int32( sum(nobs,1) );

p = monte_chi(chis, rows, cols, nsim);
fprintf('Chi-squared statistic using Monte Carlo gives p = %g \n',p)
test_p(p)
```

```
function p = monte_chi(ochis, rows, cols, nsim)
% Compute chi-squared statistic with Monte Carlo method
mode = int32(2);
igen = int32(1);
iseed = [int32(1762543);
         int32(9324783);
         int32(42344);
         int32(742355)];
r = zeros(100, 1);

num = int32(0);

cnt = 0;

for i = 1:nsim
    [nobs, iseed, r, ifail] = ...
        g05qd(mode, rows, cols, igen, iseed, r);
    [nobs, num, pred, chis, p, npos, ndf, ml, nl, ifail] = ...
        g01af(nobs, num);

    if chis > ochis
        cnt = cnt + 1;
    end
end

p = (cnt+1) / (nsim+1);

end

function test_p(p)
% Test the null hypothesis
if p < 0.05
    fprintf('Reject null hypothesis, there is an association\n\n')
else
    fprintf('Accept null hypothesis, there is no association\n\n')
end
end
```