

624 Midterm 1

Arthur Lui

October 18, 2013

1 Harmonic Mean

The executable R script, “harmonic”, computes the harmonic mean of any number of values passed as command line arguments. Below is the content of “harmonic”.

```
#!/usr/bin/env Rscript

x <- as.numeric(commandArgs(T))

n <- length(x)
harmonicMean <- n / sum(1/x)

harmonicMean
```

2 Day Of Birth

The R file, “birthday.R”, contains the code for this problem.

2.1 Compute the χ^2 test statistic

The χ^2 statistic for this data is 12.625.

2.2 Compute the p-value based on the asymptotic distribution

The p-value based on the asymptotic distribution is 0.04939291.

2.3 Compute a finite-sample p-value based on Monte Carlo simulation

Monte Carlo p-value (.95 Confidence Interval): 0.04888 (0.04699007, 0.05076993)

2.4 Conclusion regarding the null hypothesis

As the Monte Carlo p-value (.04888) is less than 0.05, we reject the null hypothesis that local births are equally likely on all days of the week at the .05 significance level; and we conclude that local births are not equally likely on all days of the week.

2.5 Advantages and Disadvantages of the Monte Carlo approach

The Monte Carlo approach can be taken when there is no convenient or closed form solution to computing a test statistic. The data obtained from Monte Carlo simulations can be easily used to create graphs and infer distributions conveniently.

However, the Monte Carlo approach takes simulation time and computing resources. So it may not be the best choice when a closed form solution is known.

2.6 What are the power of the asymptotic and finite sample testing procedures?

Asymptotic Power (Confidence Interval): 0.4957000 (0.4859005, 0.5054995)

Finite Sample Testing Power (Confidence Interval): 0.4957000 (0.4859005, 0.5054995)

2.7 The Sampling Distribution of The Test Statistic

