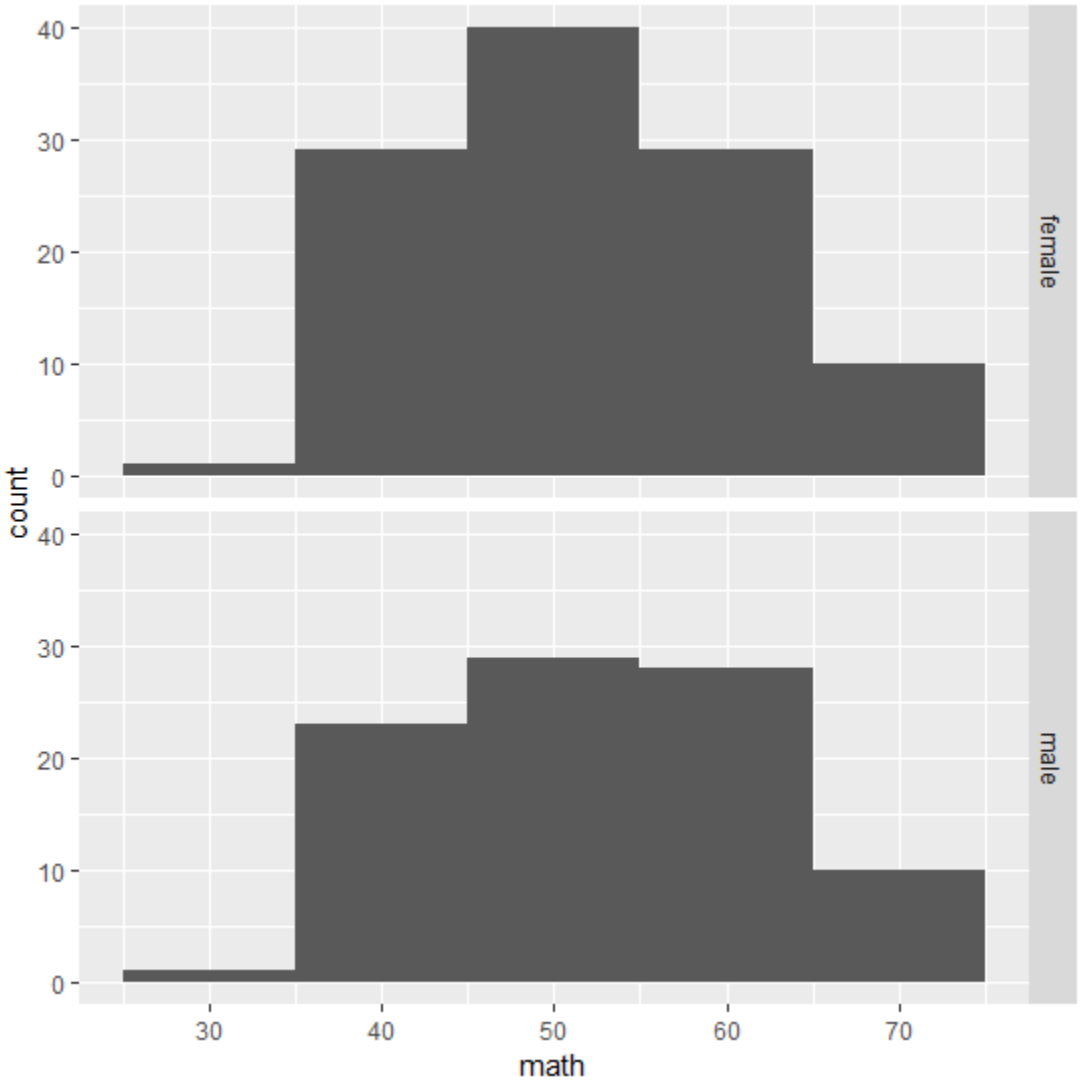
Question 1

Part 1: Describe in graphs and numbers the distribution of math scores between male and female

Table

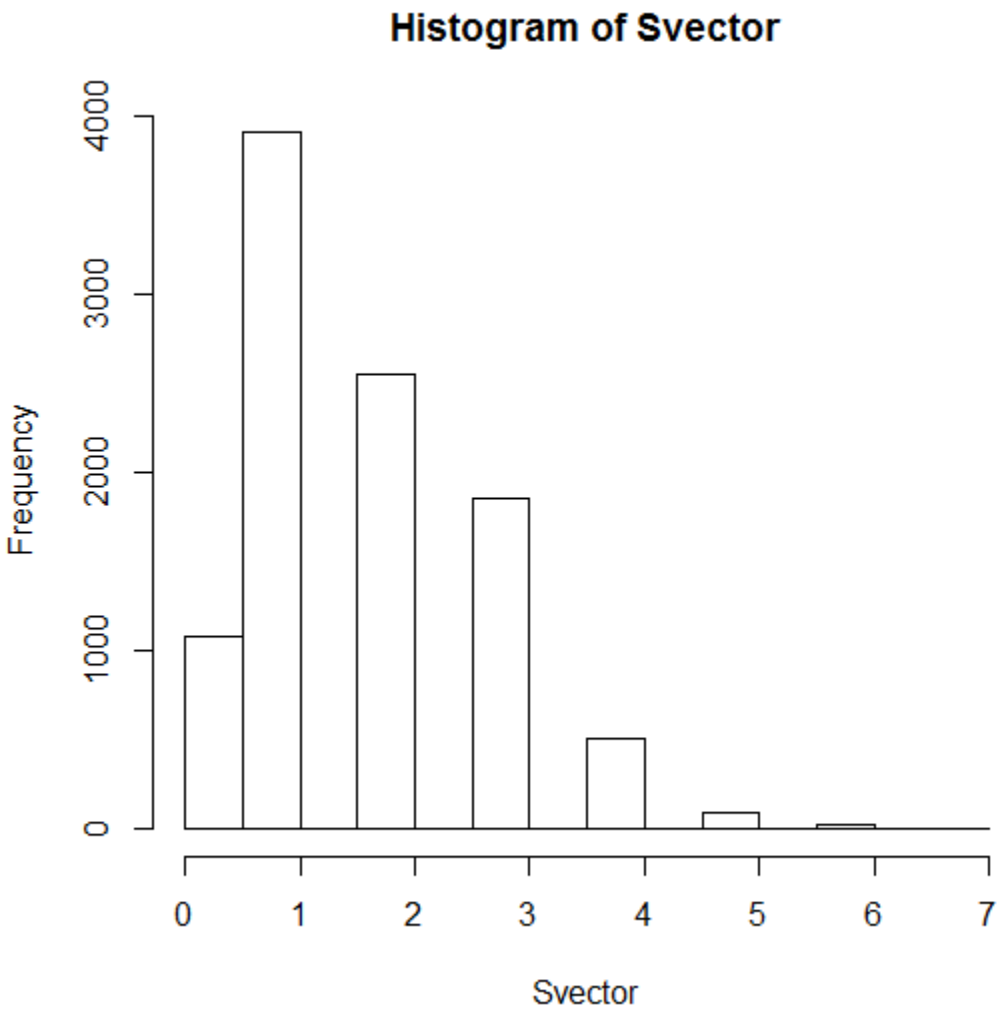
	20-39	40-59	60-69	Above 70
Female	5	78	22	4
Male	6	62	16	7

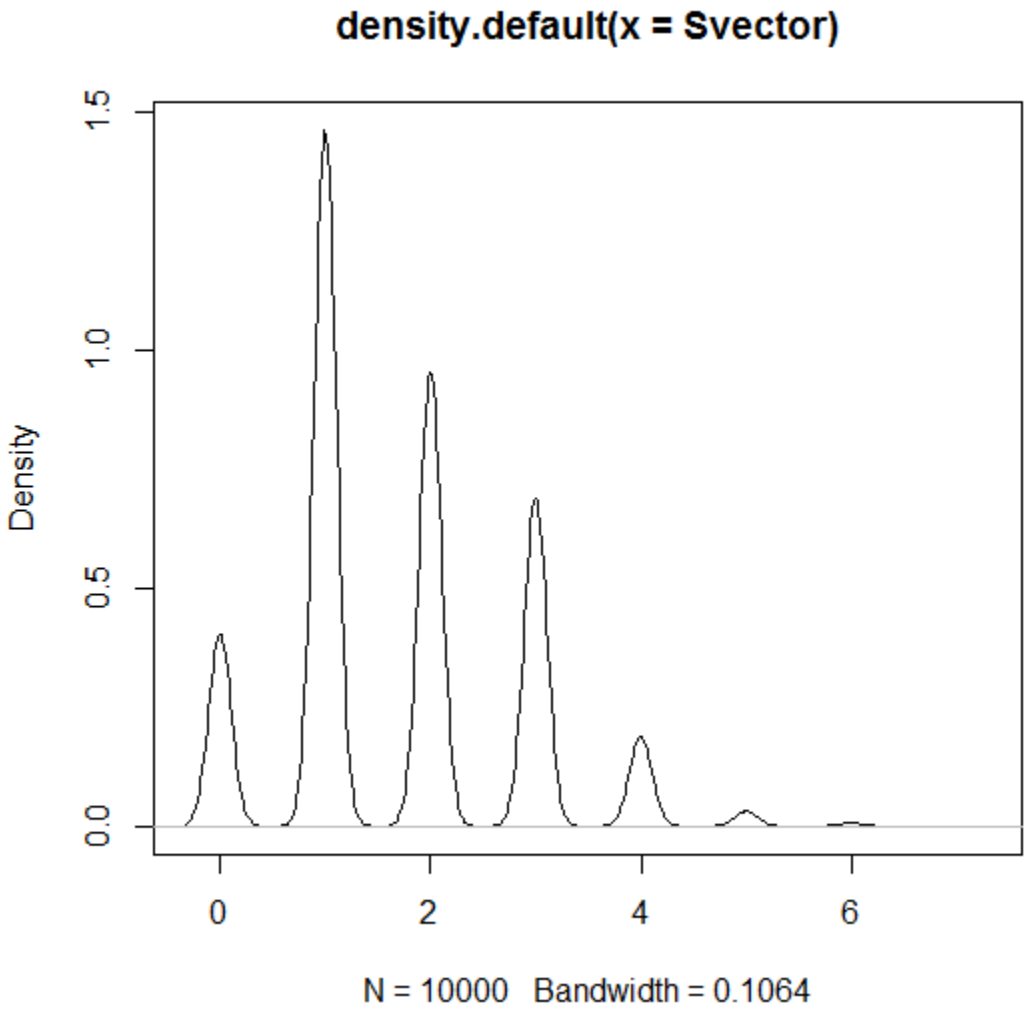


From initial look at the table and histogram, the median score looks to be in the range of lower 50s. The data was recoded into four groups to analyze it better. There are 109 girls and 91 boys in the sample. On the 20-39 range, more boys seem to score lower than girls. Boys also seem to have more high scores (greater than 70).

Part 2: Is there a significant difference in the median score between these two groups? Use a permutation test to find out. Remember to set seed so that the grader can reproduce your result.

- H_0: There is no significant difference between median score of boys and girls.
- H_A: There is a significant difference between median score of boys and girls.
- S = Difference in median math scores between female and male





s = |median(female) -median(male)|
s = 53 -52 = 1

P value obtained- P(S >= 1) = 0.8876

Table

0	1	2	3	4	5	6	7
1080	3911	2553	1851	504	83	17	1

Over repeating the experiment 10000 times the p-value obtained was 0.8876, which is very high. So, our H_0 is true i.e There is no significant difference in median scores between boys and girls.

Part 3: Is there a significant difference between male and female in the proportion of those who math score is 65 or more? Use a test of your choice.

Table:

	Greater than 65 score
Female	13
Male	10

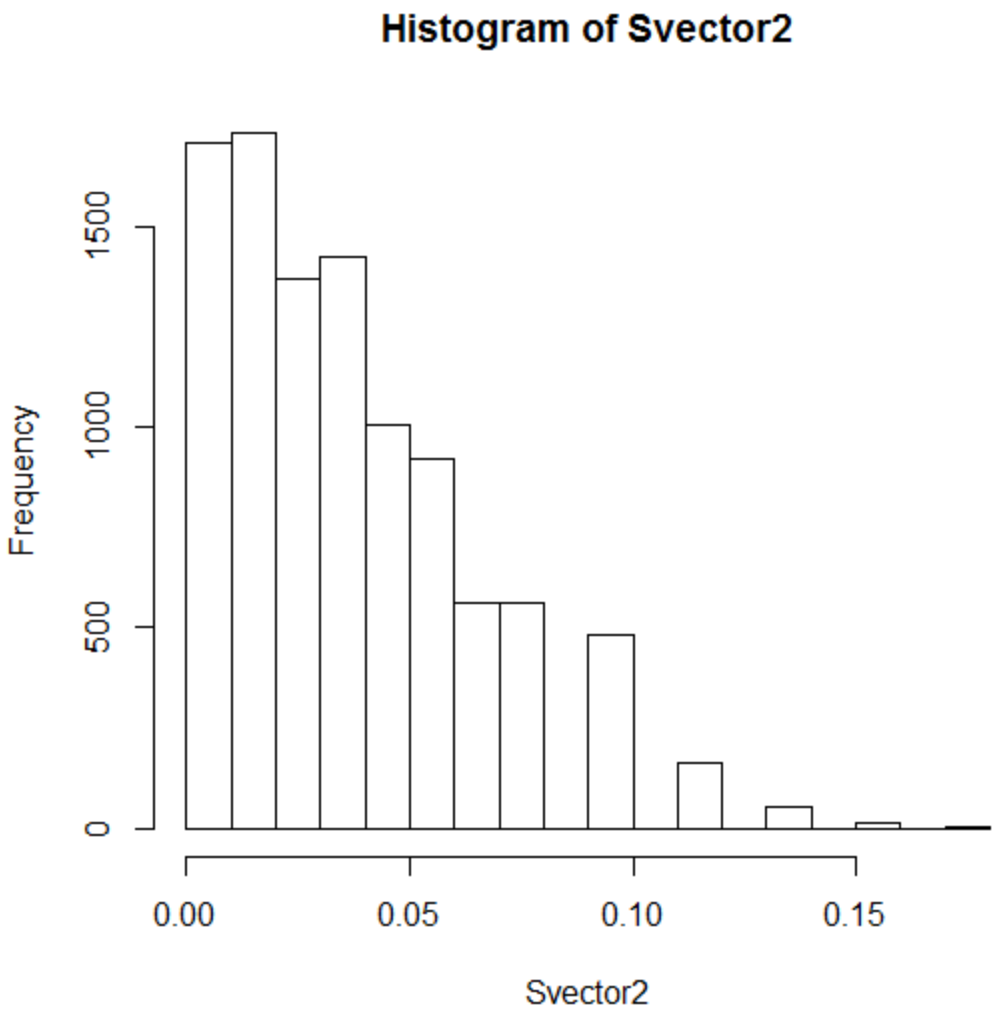
- H_0: There is no significant difference between male and female in the proportion of those who math score is 65 or more
- H_A: There is no significant difference between male and female in the proportion of those who math score is 65 or more
- S = Difference in proportion of girls and boys who scored 65 or more

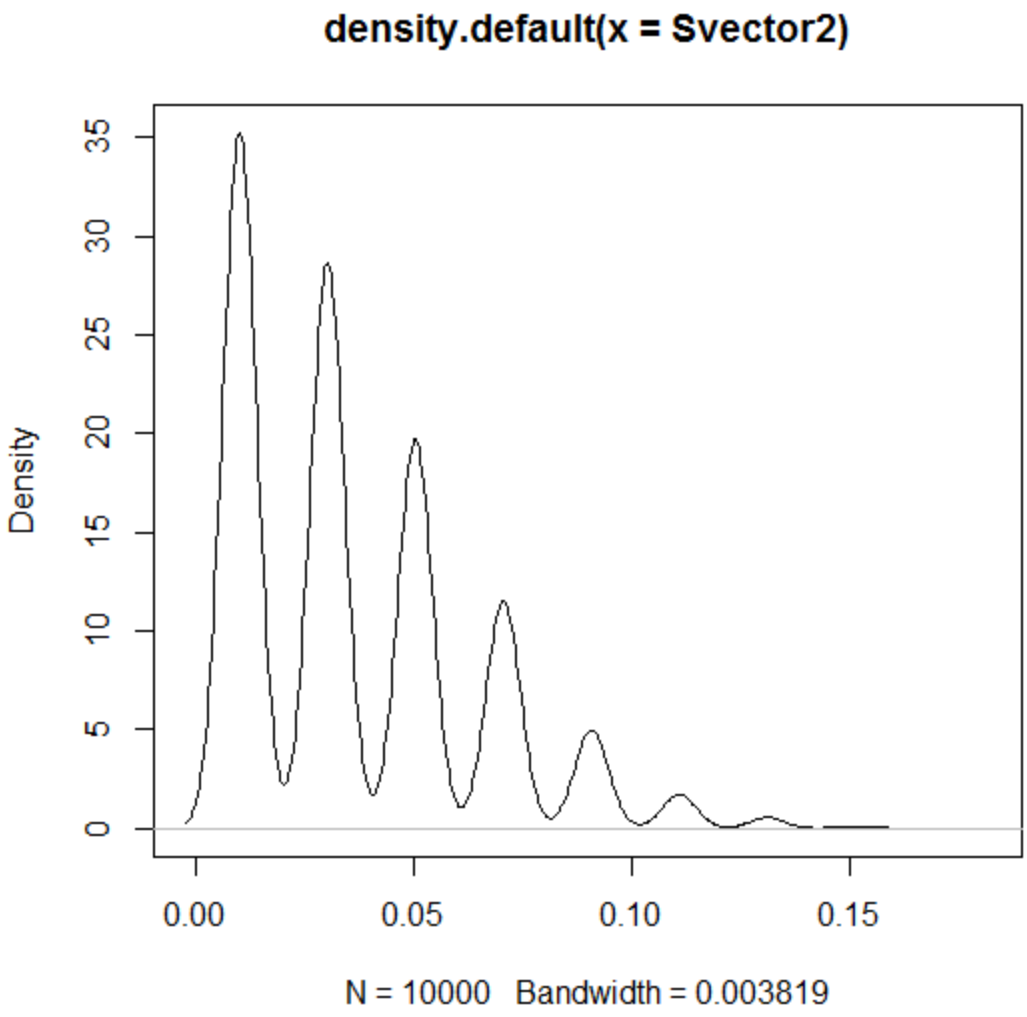
  |S| = |(female)-(male)|

  |S| = |(13 /109)-(10/91)|

  = 0.0094

- Type of test used: permutation


Histogram of Svector2
Frequency
0
500
1000
1500
0.00
0.05
0.10
0.15
Svector2



P-value

P (S >= 0.0094) = 0.8294

S calculated = 0.0094

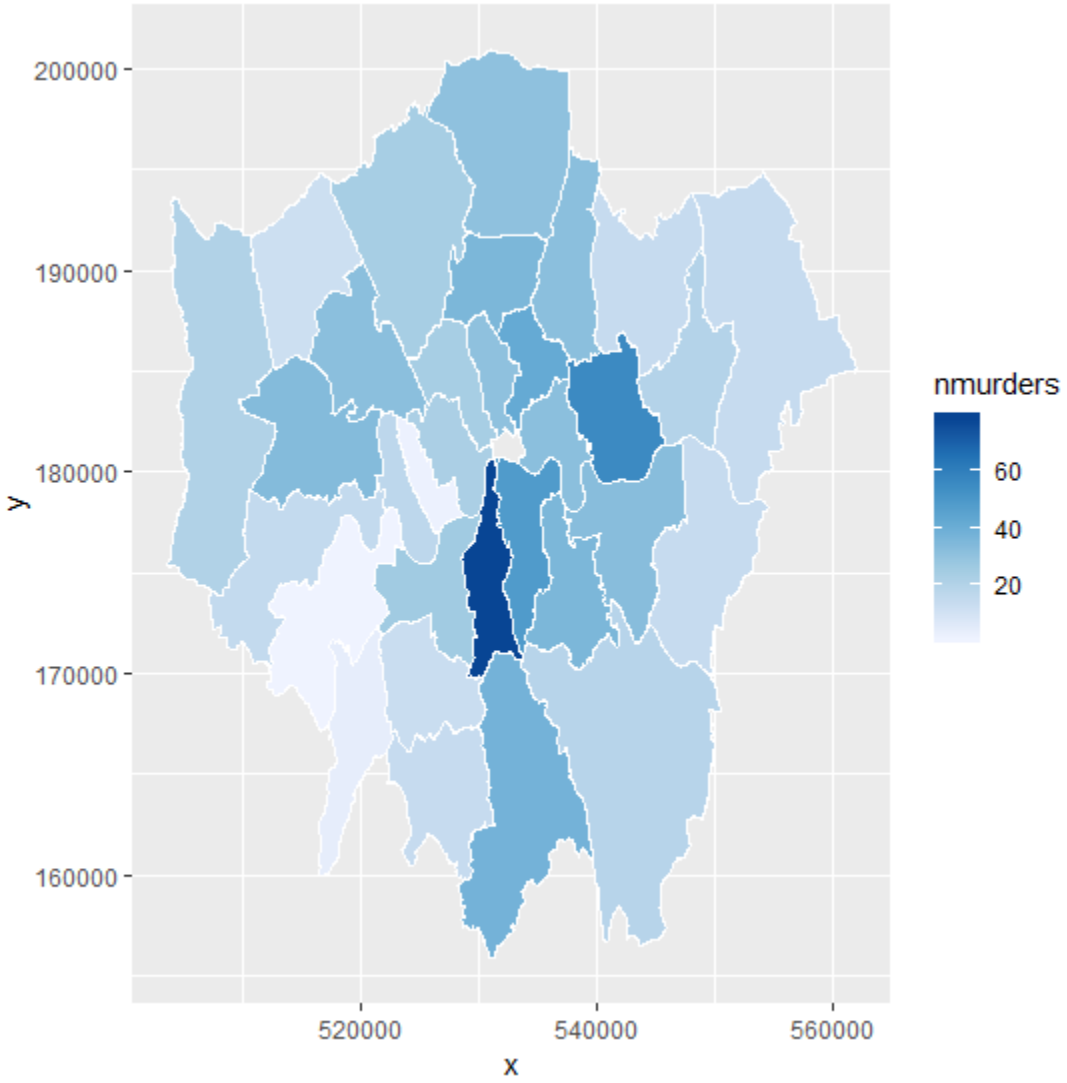
The p value and graph suggest that our H_0 is correct and H_a is false i.e there is no significant difference in the proportion of those who math score is 65 or more

Part 4: Does your analysis disprove or support the claim that top math students tend to be male"?

My analysis shows that top math students can be both male or female.

Question2

Part 1: Produce a map to visualize the murders by borough



Part 2. Produce a table that counts the number of murders by borough.

Borough Name	Number of Murders
Barking & Dagenham	20
Barnet	24
Bexley	14
Brent	32
Bromley	19
Camden	24
Croydon	38

Ealing	34
Enfield	31
Greenwich	33
Hackney	42
Hammersmith & Fulham	17
Haringey	36
Harrow	12
Havering	14
Hillingdon	21
Hounslow	15
Islington	31
Kensington & Chelsea	2
Kingston	4
Lambeth	79
Lewisham	36
Merton	13
Newham	56
Redbridge	14
Richmond	1
Southwark	49
Sutton	14
Tower Hamlets	32
Waltham Forest	32
Wandsworth	26
Westminster	23

Part 3: Is the count itself meaningful? What other statistics are we missing to compute the murder rate? Go online to find them and compute the murder rate by borough.

The count itself would not be meaningful. It would be useful if we had population by bourough, so we could calculate the murder rate.

From Greater London Authority's website population average from 2011

Borough Name	Number of Murders	Population	Murder Rate per 100k people
Barking & Dagenham	20	187,029	10.69
Barnet	24	357,538	6.71
Bexley	14	232,774	6.01
Brent	32	312,245	10.25
Bromley	19	310,554	6.12
Camden	24	220,087	10.90
Croydon	38	364,815	10.42
Ealing	34	339,314	10.02
Enfield	31	313,935	9.87

Greenwich	33	255,483	12.92
Hackney	42	247,182	16.99
Hammersmith & Fulham	17	182,445	9.32
Haringey	36	255,540	14.09
Harrow	12	240,499	4.99
Havering	14	237,927	5.88
Hillingdon	21	275,499	7.62
Hounslow	15	254,927	5.88
Islington	31	206,285	15.03
Kensington & Chelsea	2	158,251	1.26
Kingston	4	160,436	2.49
Lambeth	79	304,481	25.95
Lewisham	36	276,938	13.00
Merton	13	200,543	6.48
Newham	56	310,460	18.04
Redbridge	14	281,395	4.98
Richmond	1	187,527	0.53
Southwark	49	288,717	16.97
Sutton	14	191,123	7.33
Tower Hamlets	32	256,012	12.50
Waltham Forest	32	259,742	12.32
Wandsworth	26	307,710	8.45
Westminster	23	219,582	10.47

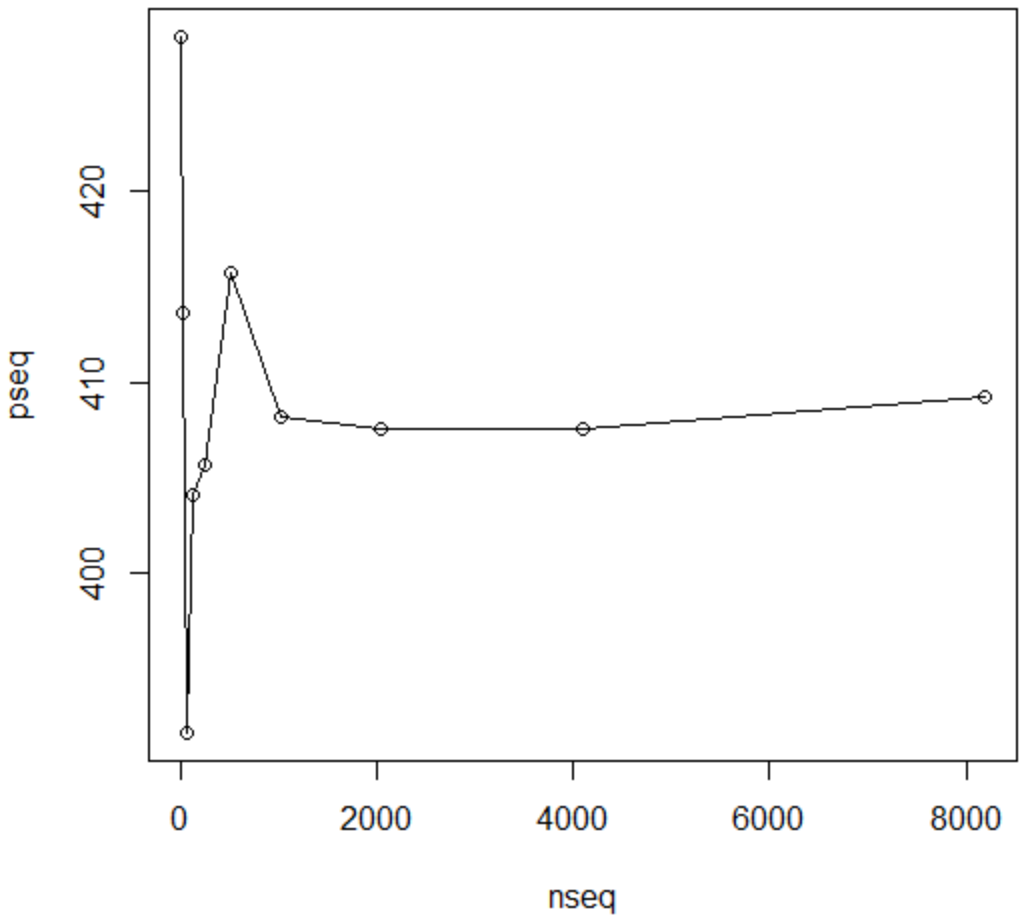
Question 3

Part 1: Is there a significant difference in the rate of murders between boroughs? Answer this question by performing a permutation test.

- H_0: There is no difference between murder rates between boroughs. Let p1…p32 be the true murder rates of 32 boroughs respectively.
- H_A: There is a significant difference in murder rates between boroughs
- S = Difference in murder rates between London and a borough

$$S = \left|\mathrm{p1} - \left(\mathrm{p1} * \frac{\text{Population of Borough}}{Population\ of\ London}\right)\right| + \left|\mathrm{p2} - \left(\mathrm{p2} * \frac{\text{Population of Borough}}{Population\ of\ London}\right)\right| + \cdots + \left|\mathrm{p32} - \left(\mathrm{p32} * \frac{\text{Population of Borough}}{Population\ of\ London}\right)\right|$$

S = 315.3778



Computed p value P(S >= 315.3778) = 0.04078424

The computed p values is very small, so we can conclude that our hypothesis is false. That is, there is a significant difference in murder rates between boroughs. Some boroughs are safer than others.