Output Results

Exercise 1:
Number of students: 340823
Number of schools: 640
Number of programs: 33
Number of choices: 3086
Missing test score: 179887
Apply to the same school: 120071
Apply to less than 6 choices: 20988

Exercise 2:

choice_1	50112Home Economics	50112	Home Economics	Kumasi Metro	-1.59718716	6.682060	293	325.1623	499	
2	choice_1	70102General Arts	70102	General Arts	Ho Municipal	0.52614224	6.717607	300	357.8523	440
3	choice_1	50702Business	50702	Business	Kwabre (Mamponteng)	-1.54142010	6.806778	242	283.9383	600
4	choice_1	90501Visual Arts	90501	Visual Arts	Kassena/Nankani (Navrongo)	-1.21744096	10.909423	243	299.0790	405
5	choice_1	51802Home Economics	51802	Home Economics	Sekyere East (Effiduase)	-0.84423596	7.210829	282	312.3000	520

6	choice_1	10102General Arts	10102	General Arts	Accra Metropolitan	-0.19711526	5.607396	343	394.1492	248
7	choice_1	80301General Arts	80301	General Arts	East Gonja (Salaga)	-0.53393960	8.729157	224	267.4633	300
8	choice_1	40301General Arts	40301	General Arts	Nzema East (Axim)	-2.31180215	5.141226	237	278.7280	500
9	choice_1	21303Business	21303	Business	East Akim (Kibi)	-0.45434421	6.178558	312	343.2532	462
10	choice_1	80101General Arts	80101	General Arts	Tamale	-0.78434825	9.383351	237	326.1164	550
11	choice_1	100201General Science	100201	General Science	Lawra	-2.80094123	10.546398	288	335.9600	200
12	choice_1	30603Business	30603	Business	Awutu/Efutu/Senya (Winneba)	-0.50863892	5.544896	238	267.8074	270
13	choice_1	80101Business	80101	Business	Tamale	-0.78434825	9.383351	237	326.1164	550

14	choice_1	90301Technical	90301	Technical	Builsa (Sandema)	-1.33749449	10.55707 3	211	260.0045	220
15	choice_1	40903General Arts	40903	General Arts	Wassa West (Tarkwa)	-1.98885322	5.276049	271	295.4975	400
16	choice_1	80102General Arts	80102	General Arts	Tamale	-0.78434825	9.383351	262	310.7913	599
17	choice_1	10401General Arts	10401	General Arts	Dangme West (Dodowa)	0.51238650	5.786251	287	334.9248	359
18	choice_1	60301Agriculture	60301	Agriculture	Berekum	-2.63174391	7.503565	266	318.9624	399
19	choice_1	100102General Arts	100102	General Arts	Wa Municipal	-2.28503036	10.03062 2	250	296.4956	450
20	choice_1	50501Home Economics	50501	Home Economics	Sekyere West (Mampong)	-1.18007684	7.199565	211	267.7506	441

Exercise 3:

1	1	South Dayi (Kpeve)	0.207630 74	6.375762	WESLEY GIRLS HIGH SCHOOL, CAPE COAST	30107	Cape Coast Municipal	-1.306593 89	5.153656	134.096471
2	2	Sawla-Tuna-Kalba	-2.361167 19	9.407022	WESLEY GIRLS HIGH SCHOOL, CAPE COAST	30107	Cape Coast Municipal	-1.306593 89	5.153656	302.887571
3	3	Adaklu Anigbe (Kpetoe)	0.488698 30	6.383957	HOLY CHILD SENIOR HIGH SCHOOL, CAPE COAST	30103	Cape Coast Municipal	-1.306593 89	5.153656	149.911415
4	4	talensi-Nabdam (Tongo)	-0.749606 25	10.67834 6	WESLEY GIRLS HIGH SCHOOL, CAPE COAST	30107	Cape Coast Municipal	-1.306593 89	5.153656	384.024735
5	5	Tain	-2.286830 90	7.948905	HOLY CHILD SENIOR HIGH SCHOOL, CAPE COAST	30103	Cape Coast Municipal	-1.306593 89	5.153656	204.682638
6	6	Amansie Central (Jacobu)	-1.739857 67	6.242801	HOLY CHILD SENIOR HIGH SCHOOL, CAPE COAST	30103	Cape Coast Municipal	-1.306593 89	5.153656	81.015011

7	7	Garu Tempane	-0.17186244	10.822017	ST. PETER'S SENIOR HIGH SCH, NKWATIA-KWAHU	21003	Kwahu South (Mpraeso)	-0.63552868	6.619226	292.417252
8	8	Pru	-0.99218947	8.007647	PRESBY BOYS SENIOR HIGH. SCHOOL, LEGON	10111	Ga West (Amasaman)	-0.39751053	5.664688	167.107839
9	9	Bunkpurugu Yunyoo (Bunkpurugu)	-0.08416700	10.522129	MFANTSIPIM SENIOR HIGH SCHOOL, CAPE COAST	30104	Cape Coast Municipal	-1.30659389	5.153656	380.540341
10	10	Adansi North (Fomena)	-1.56873786	6.073349	WESLEY GIRLS HIGH SCHOOL, CAPE COAST	30107	Cape Coast Municipal	-1.30659389	5.153656	66.122956
11	11	Atiwa (Kwabeng)	-0.67517191	6.326782	ABURI GIRLS SENIOR HIGH. SCH., ABURI	20301	Akwapim South (Nsawam)	-0.26824936	5.826003	44.526311
12	12	Atwima Mponua (Nyinahin)	-2.17718053	6.549507	ST. PETER'S SENIOR HIGH SCH, NKWATIA-KWAHU	21003	Kwahu South (Mpraeso)	-0.63552868	6.619226	106.052990

13	13	Adansi East (New Edubiase)	-1.396528 60	6.105482	OPOKU WARE SENIOR HIGH. SCHOOL, SANTASI	50110	Kumasi Metro	-1.597187 16	6.682060	42.203469
14	14	Adansi West (Obuasi)	-1.659274 22	5.986412	ACHIMOTA SENIOR HIGH SCHOOL, ACHIMOTA-ACCRA	10110	Accra Metropolitan	-0.197115 26	5.607396	103.949462
15	15	Afigya Sekyere (Agona)	-1.548614 26	7.001996	HOLY CHILD SENIOR HIGH SCHOOL, CAPE COAST	30103	Cape Coast Municipal	-1.306593 89	5.153656	128.928600
16	16	Ahafo Ano North (Tepa)	-2.207579 61	6.900830	ARCHBISHOP PORTER SENIOR HIGH SCHOOL, SEKONDI	40103	Shama/Ahanta/East (Sekondi/Takoradi)	-1.623654 72	5.081101	132.106895
17	17	Ahafo Ano South (Mankranso)	-1.989172 22	6.928771	ST. ROSE'S SENIOR HIGH SCH, AKWATIA	21103	Kwaebibirem (Kade)	-0.799037 28	6.133319	98.519871
18	18	Amansie East (Bekwai)	-1.370728 85	6.383361	ABURI GIRLS SENIOR HIGH. SCH., ABURI	20301	Akwapim South (Nsawam)	-0.268249 36	5.826003	85.030567

19	19	Amansie West (Manso-Nkwanta)	-1.893369 91	6.436945	ST. LOUIS SENIOR HIGH. SCHOOL, ODOUM	50102	Kumasi Metro	-1.597187 16	6.682060	26.494148
20	20	Asante Akim North (Konongo)	-1.017963 05	6.834004	WESLEY GIRLS HIGH SCHOOL, CAPE COAST	30107	Cape Coast Municipal	-1.306593 89	5.153656	117.911328

Exercise 4:

```
> mean(dat_long$cutoff)
[1] 235.8754
> sd(dat_long$cutoff)
[1] 44.28297
> mean(dat_long$cutoff)
[1] 235.8754
> sd(dat_long$cutoff)
[1] 44.28297
> mean(dat_long$quality)
[1] 281.6939
> sd(dat_long$quality)
[1] 41.89298
> mean(data4$distance)
[1] 149.849
> sd(data4$distance)
[1] 101.3256
```

Exercise 5:

```
set.seed(1)
X<-data.frame(matrix(ncol = 6, nrow = 10000))
colnames(X)<-c("x1","x2","x3","e","yhat","ydum")
X$x1 = runif(10000,1,3)
X$x2 = rgamma(10000,3,2)
X$x3 = rbinom(10000,1,0.3)
X$e = rnorm(10000,2,1)
X$yhat = 0.5 + 1.2*X$x1 - 0.9*X$x2 +0.1*X$x3 + X$e
X$yhat>mean(X$yhat)
```

X$ydum = as.numeric(X$yhat>mean(X$yhat))
X$ydum

Exercise 6:

Calculate the correlation between Y and X_1. How different is it from 1.2?

The correlation is 0.4840753, which is quite different from 1.2, but the coefficient is 1.19650, which is quite close to 1.2.

The outcome of the regression of Y on X where X = (1, X_1, X_2, X_3) and the coefficients on this regression:

```
Coefficients: (1 not defined because of singularities)

            Estimate Std. Error t value Pr(>|t|)

(Intercept)  2.49188    0.04071  61.210  < 2e-16 ***

A1_Xx0            NA         NA      NA       NA

A1_Xx1       1.19650    0.01729  69.198  < 2e-16 ***

A1_Xx2      -0.89122    0.01149 -77.577  < 2e-16 ***

A1_Xx3       0.12510    0.02196   5.696 1.26e-08 ***

---

Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1


Residual standard error: 1.006 on 9996 degrees of freedom

Multiple R-squared:  0.523, Adjusted R-squared:  0.5228

F-statistic:  3653 on 3 and 9996 DF,  p-value: < 2.2e-16
```

the standard errors:

sqrt.diag.A1_beta_covar..

x0 0.04071021

x1 0.01729093

x2 0.01148825

x3 0.02196299

Exercise 7:

- Write and optimize the probit, logit, and the linear probability model:

Probit:

	glm : est	glm :se	own : est	own :se
(Intercept)	-1.1018029	0.05747094	-1.1018046	0.05736692
A1_X[, 2:4]x1	1.2152073	0.02794769	1.2152090	0.02800771
A1_X[, 2:4]x2	-0.9194758	0.02194937	-0.9194769	0.02199494
A1_X[, 2:4]x3	0.1721539	0.03202531	0.1721540	0.03200663

Logit:

	glm : est	glm :se	own : est	own :se
(Intercept)	-1.8496186	0.09744222	-1.8494140	0.09743945
A1_X[, 2:4]x1	2.0528867	0.05015516	2.0526546	0.05015192
A1_X[, 2:4]x2	-1.5626940	0.03970133	-1.5625276	0.03969868
A1_X[, 2:4]x3	0.2900667	0.05467398	0.2899749	0.05467215

Linear Model:

	A1_lp_betas	SE
x0	0.14293129	0.016511557

x1 0.34963841 0.007012985

x2 -0.23006264 0.004659492

x3 0.04674943 0.008907915

	lm : est	lm :se	own : est	own :se
(Intercept)	0.14293129	0.016511557	0.14293129	0.016511557
A1_X[, 2:4]x1	0.34963841	0.007012985	0.34963841	0.007012985
A1_X[, 2:4]x2	-0.23006264	0.004659492	-0.23006264	0.004659492
A1_X[, 2:4]x3	0.04674943	0.008907915	0.04674943	0.008907915

- Interpret and compare the estimated coefficients. How significant are they?

Bsically all three variables are significant for all models.

Exercise 8:

• Compute the marginal effect of X on Y according to the probit and logit models.

Probit: 4853.412329

Logit: 4861.955193

• Compute the standard error of the marginal effects.

Probit:

	X1	X2	X3	X4
Stand dev	0.04294753	0.05929212	0.1140750	0.009657713
Mean	-0.29214910	0.34128385	-0.2712761	0.047240071

Logit:

	X1	X2	X3	X4
Stand dev	0.01512585	0.005297875	0.004565588	0.009213092
Mean	-0.29575609	0.329217938	-0.251447415	0.046721049