

ProblemSet4.R

DavidAarhus

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```
rm(list = ls()) #removing all variables

#Question a
movies <- read.csv("/Users/DavidAarhus/Documents/310 R/Datasets/movie_metadata.csv") #loads dataset

#Question b
# removing missing values of budget and gross
movies <- movies[!is.na(movies$budget),]
movies <- movies[!is.na(movies$gross),]
#removes movies with ridiculous budgets
movies <- movies[movies$budget<4e+8,]
#puts gross, budget, and profit columns in terms of 'millions'
movies$grossM <- movies$gross/1e+6
movies$budgetM <- movies$budget/1e+6
movies$profitM <- movies$grossM-movies$budgetM
movies$cast_total_facebook_likes000s <- movies$cast_total_facebook_likes / 1000
#creates training and test datasets
set.seed(310)
train_indx <- sample(1:nrow(movies), 0.8 * nrow(movies), replace=FALSE)
movies_train <- movies[train_indx, ]
movies_test <- movies[-train_indx, ]

#Question c
nrow(movies_train) # gives number of rows

## [1] 3103

nrow(movies_test) # gives number of rows

## [1] 776

#Question d
nums <- sapply(movies, is.numeric) # names of numeric variables
cormat <- cor(movies[,nums], use="complete.obs") #removes missing values from correlation matrix
print(cormat[, "profitM"]) #prints the correlation coefficient between profitM and all the numeric variab

##          num_critic_for_reviews          duration
##          0.24353361          0.09423033
##    director_facebook_likes    actor_3_facebook_likes
##          0.10485194          0.17831580
##    actor_1_facebook_likes          gross
##          0.05850519          0.78438560
##          num_voted_users    cast_total_facebook_likes
##          0.50043953          0.11507040
```

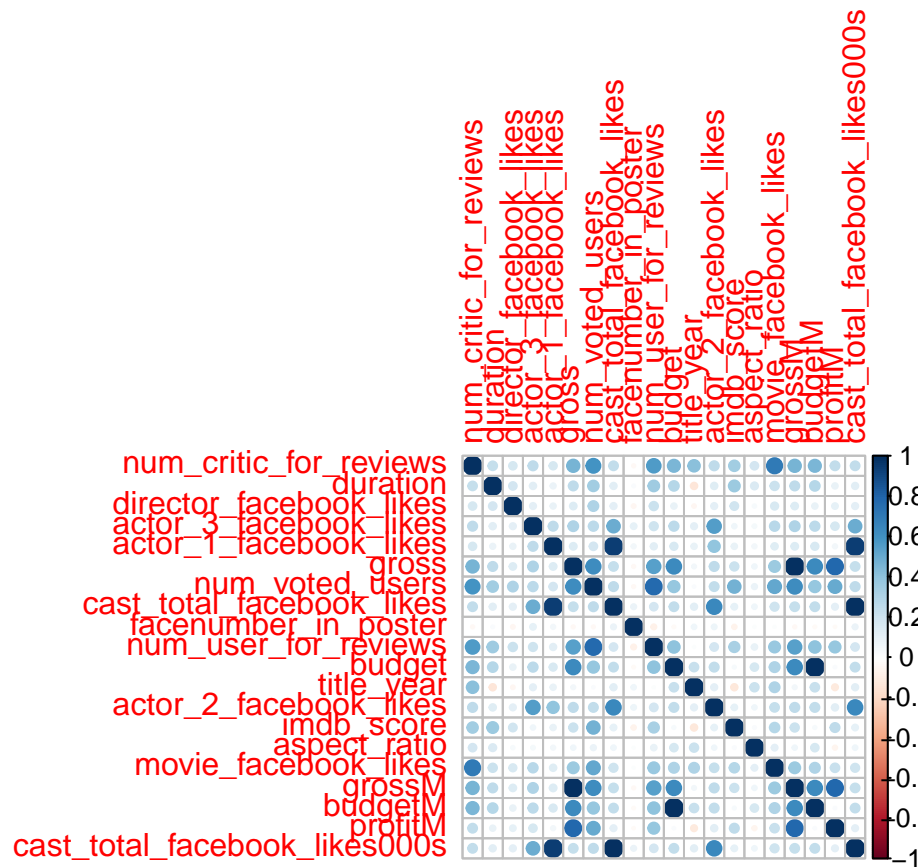
```
##          facnumber_in_poster          num_user_for_reviews
##          -0.02128043              0.38106102
##          budget                  title_year
##          0.02352410              -0.11615920
##          actor_2_facebook_likes      imdb_score
##          0.12969431              0.25215121
##          aspect_ratio              movie_facebook_likes
##          -0.05979073              0.22941383
##          grossM                    budgetM
##          0.78438560              0.02352410
##          profitM cast_total_facebook_likes000s
##          1.00000000              0.11507040
```

#Question e

```
library("corrplot")
```

```
## corrplot 0.84 loaded
```

```
corrplot(cormat) #prints of correlation plot
```



#Question f

#create model

```
mod1 <- lm(profitM ~ imdb_score + cast_total_facebook_likes000s, movies_train)
```

#summary of mod1

```
summary(mod1)
```

```
##
```

```
## Call:
```

```
## lm(formula = profitM ~ imdb_score + cast_total_facebook_likes000s,
##     data = movies_train)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -385.81  -26.09   -9.71   14.42  492.49
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -74.93608     5.85351  -12.802 < 2e-16 ***
## imdb_score      13.25704     0.89893   14.748 < 2e-16 ***
## cast_total_facebook_likes000s  0.25329     0.04925    5.143 2.87e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 53.14 on 3100 degrees of freedom
## Multiple R-squared:  0.07812,    Adjusted R-squared:  0.07752
## F-statistic: 131.3 on 2 and 3100 DF,  p-value: < 2.2e-16
```

#Question g

*# cast_total_facebook_likes000s show that it is positively correlated with ProfitM.
This means that for every 0.2532 units of cast_total_facebook_likes000s ProfitM increases 1 unit*

#Question h

*# imdb_score p-value < 2e-16
cast_total_facebook_likes000s p-value < 2e-16
p-value represents how significant each variable is to profitM
in this case both p-values are very low, therefore they are both significant*

#Question i

*# imdb_score has a high coefficient as well as a low p-value, this means that this variable is significant
and has a large affect on profitM
the imdb_score and cast_total_facebook_likes000s variables are statistically significant
at a 95% level because their p-value is < 0.05.*

#Question j

*# our R² was 0.07812, this implies our model is not accurate nor a good fit to the data
our Adjusted R² was 0.07752*

#Question k

*# F-statistic: 131.3 on 2 and 3100 DF
This represents the probability of all the coefficients being zero at the same time.*

#Question l

`mod1$residuals`

```
##      10      2176      691      886      2170
## 12.58345025 35.16373577 -9.07499002 -39.16256604 -35.20407242
##      3669      1457      2207      2256      3061
## 118.39802603 -12.78421633 -19.65660934 -21.44114497 -35.18290071
##      2403      3346      2127      2042      801
## 22.07059783 60.06835064 -31.99796794 1.57227789 -72.92082054
##      1370      571      1342      3439      946
## 25.73470768 -43.04629846 -9.78022124 -13.88103203 57.47492725
##      676      919      2313      1236      2642
```

##	-20.88918141	-31.97677655	-39.88169890	12.88006369	-9.82732277
##	4142	145	4736	3558	2079
##	87.10181456	-107.33286051	-22.09229095	32.26653421	31.70960773
##	826	900	105	3598	2648
##	-12.52341984	-5.29317432	-96.17916196	-13.03841847	4.18327554
##	275	505	3111	3563	672
##	2.54968318	-49.10093442	16.24961650	3.29788442	-34.09627355
##	550	3056	4407	2358	4784
##	-52.36211662	-24.40438175	-17.42525111	78.25877954	-22.42495480
##	268	3127	4492	343	2197
##	-86.56000159	17.33288136	-20.24898668	12.43760399	26.33928594
##	4697	1386	4897	2402	4344
##	-27.06427318	3.98244687	-19.93153619	45.32487083	-21.46589123
##	2308	1097	1371	3917	4055
##	-9.83127472	-29.15965351	-2.92001276	-20.97422306	-14.32594559
##	2822	701	3799	2080	3781
##	28.98309427	-70.87414738	-12.29583054	-4.51309989	-19.41600479
##	4092	1518	1693	69	907
##	-3.82432646	-46.06464537	-11.51853092	11.44419603	-81.81218467
##	47	188	712	2701	1797
##	-13.71630589	159.33207925	62.74396322	-43.65709869	97.61010708
##	1880	1647	700	3146	1716
##	49.02010306	-1.93213668	39.88400039	-1.31545670	-31.43102070
##	2231	3095	850	2862	2130
##	0.14627210	62.28509072	44.32062254	23.47556768	-21.09083783
##	1110	918	318	4748	1253
##	-4.51019623	-41.92229954	-69.96566265	-42.21672942	-7.04795646
##	2599	4721	1717	416	837
##	-27.85561319	-21.07236984	-37.55272535	-55.58154236	228.98859375
##	1891	3531	697	1261	934
##	44.87914717	-20.14852121	-59.95343589	-11.64768075	52.28833410
##	1935	4828	2927	2632	3737
##	34.88408311	-13.41996071	24.64017336	29.47936728	24.28725134
##	2357	1986	1211	172	775
##	130.48120021	-23.45987093	46.24301087	15.09396408	-29.38838924
##	439	2195	1679	352	2826
##	78.54429049	-7.72575751	-11.19623761	-13.07094088	-33.33515960
##	3099	2166	461	3667	1214
##	47.37818902	73.82249218	6.98425503	-18.15185649	0.65898290
##	251	1392	1431	271	684
##	116.89999641	-37.43957864	24.99985249	173.45259373	-71.04825104
##	1295	3196	2262	2626	185
##	-18.22292476	-6.72147021	-6.98103790	5.72372619	56.34707356
##	3443	1496	4155	3070	1969
##	-7.51883292	-5.38428984	-9.14853211	41.75220801	14.51400704
##	485	2276	3279	1333	3457
##	-33.64951002	-32.19766252	6.00663673	81.14514321	-34.42112324
##	2664	1154	2334	1321	114
##	2.16445721	-30.49699672	-10.44850361	-23.19435455	-124.91440770
##	4190	2834	1962	465	2860
##	-1.95491054	13.24103806	1.97883138	6.30330837	-18.90652135
##	1567	2867	2634	1487	2360
##	-18.88376864	-34.05268894	19.17816129	-43.82246773	27.36751287
##	725	1656	2557	821	1658

##	19.37622674	-23.44894817	5.46310646	-31.55614053	-6.66754721
##	1884	2033	3107	1067	1946
##	48.41715868	-8.06694491	8.68028073	-3.21751565	-29.43459580
##	2538	3863	956	2859	600
##	-14.08661233	-56.89171713	17.99695232	-16.81108111	9.61053035
##	1408	62	3421	3868	3936
##	99.31167716	-89.74222314	-18.49177611	66.64865457	-22.09395885
##	2930	2568	3470	935	799
##	31.54446560	-27.44334795	7.07435625	-63.54478697	-59.09234698
##	4208	3899	1226	3275	3850
##	-5.92307375	44.12166688	8.51542347	-27.56995661	-37.87989937
##	1534	546	820	2707	1922
##	-21.65538981	-49.07892279	-13.60495349	-23.79790264	9.88172090
##	3954	1994	3759	1182	1279
##	-10.07092945	-52.85134288	-14.18645975	216.61294014	-41.78326273
##	4435	1851	4689	4948	1553
##	-15.56524137	15.99281501	-27.97054879	-12.68383754	-5.85614674
##	1177	176	1926	631	3018
##	-46.59361885	-90.15550380	-12.41718918	37.38197451	-20.92705923
##	500	4047	1030	2685	882
##	-68.11359138	111.90414382	-15.96676720	13.84729344	-59.55344851
##	1872	731	150	3971	3060
##	86.03696701	10.14106342	11.62637565	160.43498770	-40.39951859
##	3005	2835	1842	1713	3503
##	-36.77195582	113.54490682	20.27179246	-25.29518307	-10.12795471
##	3090	2721	3059	1805	1795
##	77.10466808	-34.36271070	-47.96489287	37.00646209	-14.77391821
##	1131	1163	698	2145	1011
##	-24.45383930	-12.98411679	260.79878425	-27.26375150	-46.73474860
##	696	3378	1528	2625	3441
##	142.13136247	-0.26839818	-42.67265220	39.23242622	-14.82893363
##	644	1318	1802	1438	2966
##	-36.86197847	-31.74116615	-45.95282902	-11.88826146	-12.48080662
##	440	3435	4500	2040	2246
##	295.50890998	72.73095157	-33.43807119	-12.61050361	-5.42063688
##	3308	4076	1303	117	529
##	-14.98127451	2.51696772	-36.30277620	62.57018719	31.78824170
##	355	1175	44	2668	4680
##	-40.18424742	-48.43979975	175.05301410	-19.34098812	-9.37841111
##	2214	4744	2021	302	3486
##	8.19293591	3.76994377	-72.55756637	-18.78119662	1.64200026
##	2693	1475	3078	2571	1838
##	-16.97053811	-7.69632393	-5.52903792	-2.99723470	60.24285653
##	1997	2331	1783	2935	1407
##	8.32518072	-58.41521593	-180.37478739	18.81089988	61.26239150
##	2516	1542	5028	3123	1925
##	25.83470304	61.21015758	-23.82921373	7.77037699	0.90992486
##	282	609	1014	1046	319
##	-67.47601911	-23.95200569	-40.42211647	-7.48495543	-72.55756637
##	2182	1937	3385	964	1109
##	16.81682534	28.04330769	-9.22147525	-7.04147127	-9.42055324
##	2980	131	887	2311	446
##	-5.74573462	-2.06067046	-10.27239797	-26.54960996	53.76478341
##	908	4465	3521	2573	567

##	-5.52603882	-12.80584170	-26.47756942	15.60347356	-42.89423746
##	2799	4931	541	430	1158
##	35.22037254	-6.14098431	-42.91381438	54.21432613	36.36178058
##	3221	3778	2929	1191	2355
##	-72.64711070	-14.86166832	36.61889110	145.56874393	-36.50462891
##	836	277	722	4231	4726
##	-20.98063621	2.87812151	45.14529445	-5.64818710	32.84463986
##	1740	1258	1676	624	1906
##	-45.11052598	-18.23640948	-9.19107454	-64.60646352	5.18759035
##	2512	4831	3096	3733	97
##	44.95413646	-17.89114267	44.08659248	-13.99219814	-24.05876604
##	2004	2881	3045	1257	1554
##	-39.42783258	-20.14878587	4.29479071	-10.21695987	-14.97526828
##	1394	944	1663	1063	1924
##	-52.62110429	24.61482897	-3.09264688	-17.93912114	9.98248376
##	1146	577	1607	2976	2275
##	-3.65229972	-61.83315904	-67.46764615	-17.26014520	-21.36320995
##	1060	1671	1597	2550	3925
##	-29.34232839	-25.40694791	59.35427183	-8.89807887	-22.86972366
##	227	1588	645	382	705
##	-9.03666440	103.19390521	14.11703332	-14.02245226	-6.94833083
##	1118	962	2189	808	591
##	-20.90177288	3.10423658	6.81349917	-61.18333888	-36.05836981
##	4302	2611	4248	1882	1149
##	-14.99684970	-38.24131042	-2.06052382	45.74461727	-16.61526635
##	1241	2393	2727	783	2997
##	-15.23828528	84.87310887	-36.36170814	-7.20208637	-19.11199409
##	2179	867	2125	180	2514
##	4.80167463	-4.82621490	-26.42183046	1.72483661	-5.33172850
##	1001	2876	2852	4833	3106
##	-29.93005404	8.70381042	28.52997357	-13.96417700	21.03611831
##	4864	477	2084	795	1615
##	1.80834383	-31.69175033	112.21768406	348.62044098	14.73709638
##	1910	1452	340	2099	1640
##	23.51077727	6.17089773	238.33797099	-5.50397883	11.52699414
##	3701	231	2675	3463	3855
##	34.25149730	-65.59488676	-5.09189939	33.03199166	-40.53420469
##	2872	1830	3785	2741	2299
##	-13.37717598	-42.77004144	-21.43493012	-307.18945989	-21.22049114
##	4386	729	2523	1026	3777
##	-25.44554763	15.84263142	20.27674008	-34.26305131	11.97800513
##	1282	693	3880	1357	1988
##	-29.64582592	-29.85245237	-122.41145099	-47.58608879	-32.01639693
##	2994	4459	720	2194	2794
##	-29.73688299	-38.24768936	32.22072542	0.51726983	5.33902386
##	3197	1643	654	4891	851
##	-31.46172076	-25.19907569	87.57510515	-24.60593385	8.92741590
##	2365	3732	589	5022	170
##	21.81527204	17.66309402	1.11942520	-12.65242818	-69.27503010
##	3402	2294	4743	2267	1093
##	-10.93952777	-26.52467326	-10.98651982	-25.05026126	33.57018672
##	889	2702	649	1645	4979
##	-26.56129181	-9.05288537	95.64727939	-9.31354620	0.15896817
##	1269	1754	228	1539	1288

##	1.76240187	5.23830879	-27.50218962	-27.31025854	1.80788944
##	2618	337	782	2463	1443
##	36.63882938	87.10181456	-51.05589800	-3.06785061	6.30495000
##	3526	3104	984	3229	1198
##	33.43117959	95.00558089	-33.70612125	-19.91088929	27.10123968
##	2804	2341	3979	965	4900
##	-50.24238273	-11.89091909	-20.00433971	28.07857087	-20.35010727
##	1247	1649	1664	4019	3155
##	-17.57789847	-16.85121227	-10.14462476	-21.34005263	6.45412760
##	1188	484	328	2071	1860
##	36.28698562	-28.03267869	-125.69477891	-21.10128270	-27.42092110
##	1798	2586	192	1611	4284
##	-4.42962258	13.53059883	4.07052961	31.73683115	-11.30755239
##	414	1555	2895	4713	52
##	46.31638881	-9.61578324	-23.76064104	-13.72643446	-125.89519734
##	4591	1632	2549	3166	1052
##	-26.55145371	27.03214890	13.54309975	-0.70731390	-48.09484644
##	4576	3946	4796	3847	2946
##	-21.62584085	-22.86357155	-34.64434757	-35.68061015	-11.18125871
##	3293	4061	149	3121	235
##	-13.31613828	19.49180087	54.21017920	-6.74284358	-52.38931386
##	1300	2991	142	2518	4029
##	-5.68594321	-29.77208521	-41.97414253	-11.33865917	-34.66780225
##	1742	4158	1829	2409	520
##	-8.45203530	-13.67885560	-33.49303684	45.81899720	232.08248817
##	2046	768	1470	1285	1761
##	-22.65250113	163.68246012	1.57300410	-28.15559218	26.95931425
##	284	391	441	938	2199
##	45.27036494	0.51726983	159.13236957	49.17466271	5.66643337
##	784	1695	2892	32	3588
##	-36.95586623	-29.46876358	24.27402017	140.54763910	-88.75480742
##	809	443	1760	4939	812
##	-37.63406800	54.02913789	7.07572553	-18.00829256	-86.79281240
##	4394	1905	3024	1375	745
##	-20.81253484	29.16712031	116.13537187	-46.15205198	-12.02695898
##	855	217	3500	401	1185
##	6.33777103	-28.80431776	-9.71240783	66.63701263	61.77778330
##	2291	466	4160	1272	3472
##	-20.35455346	16.66039220	-2.13160268	-1.37259901	30.54777628
##	376	33	4334	3705	2165
##	-15.42492229	180.77092350	-3.03467393	18.76803899	63.35399252
##	1129	1023	1501	2263	1345
##	-48.52366611	-30.26502892	-47.98330310	149.28854094	-43.47940643
##	769	4566	3338	2297	847
##	11.03265709	21.25443540	-15.85134589	-22.90971640	25.04143912
##	1696	1563	4588	922	2808
##	-8.33847499	-56.87454651	-22.72577671	-40.03362750	12.22864802
##	3114	314	1652	2918	1087
##	13.57435686	-29.40980081	-25.79770269	220.36125852	-2.25503363
##	1868	2606	3044	1807	4985
##	164.44027962	83.24058921	25.95691157	17.30348843	-2.43706821
##	1745	4314	5026	3320	1284
##	-44.51006320	-4.47764307	-5.95389001	10.83788023	-14.11243391
##	2114	939	2432	2908	1081

##	3.48771107	42.33038088	-15.01543065	-40.49579079	32.20504783
##	342	2490	1627	316	1655
##	-80.13157113	53.23617556	11.40466124	-127.89210628	46.39849905
##	2519	3754	471	3704	3119
##	25.13009810	34.49023404	-13.28030622	27.33159176	25.16815625
##	3587	1208	4490	487	652
##	19.03378670	46.48090809	-4.23547410	-42.26384967	90.19281226
##	4524	2898	2856	4467	1157
##	-23.17831873	-18.61056635	14.20233542	-37.18009084	43.47047262
##	4756	80	1964	1790	357
##	-10.45486380	150.83759828	-25.85310543	-20.24048224	39.54500792
##	536	3003	3072	623	3001
##	70.17689196	-18.13062190	42.63630222	-55.58715818	-21.92277886
##	1454	4916	3607	3985	2184
##	-19.43938626	-27.34253113	-0.94980338	21.25443540	25.60690376
##	187	605	225	516	341
##	256.32680334	-18.46668727	8.25163716	41.39597029	200.23977989
##	1575	4712	3186	1833	1202
##	-28.57818586	0.09873737	8.31939852	0.07036546	23.49097463
##	2801	862	3369	1077	3485
##	-0.80295758	-10.86592839	-10.26205642	54.15140826	17.91856723
##	3360	2150	173	1681	2923
##	123.51536300	-42.71835529	-18.49428230	-9.49401446	53.79409980
##	1108	4485	2172	4353	2505
##	-13.41387975	2.66462095	38.35858881	-10.65761384	4.06244266
##	3610	1773	147	4552	4265
##	-13.87792459	-9.69664531	-51.50350055	4.00737085	-16.59648485
##	2022	3522	1677	1168	3141
##	70.81460853	-17.14280479	-0.84195052	-4.89225607	27.04465618
##	2704	787	2982	857	3595
##	-43.42172560	-48.22963730	-15.78963815	-4.23217606	0.19738140
##	1324	2052	4497	4782	559
##	-60.64732835	227.23046956	-42.15505167	-28.62230582	-65.68215638
##	3288	370	1340	455	3367
##	-16.00336462	-5.20347623	82.20544844	44.15979142	7.31773753
##	3548	1966	1212	3857	387
##	-25.15041127	-4.47764307	3.44337225	-32.26758481	-40.46000429
##	972	747	492	2640	1531
##	-26.63223248	-24.46147202	-54.63359260	-23.81476628	1.05147092
##	4054	3153	678	4978	3433
##	-1.87493950	38.74965615	-40.27692887	-10.37595098	-20.73892303
##	1692	1331	2400	3404	3832
##	-26.23450365	5.07869611	28.02697680	-22.87023488	-13.45981167
##	2540	4934	1232	2430	239
##	35.26760034	-23.18574337	-7.39011299	-28.52344480	138.65875794
##	3476	1256	2174	601	4406
##	28.55696027	-5.12477083	40.38607406	0.63639129	-12.78440084
##	1715	861	4516	3878	2395
##	-67.38424736	-12.97041359	-7.16568447	-170.58007943	88.53772538
##	2842	3592	3927	2137	4170
##	34.11696785	1.82015479	-3.82902643	5.91755682	27.40125051
##	86	2669	2812	281	4109
##	-150.59628847	8.65161403	-19.55208308	-115.56299801	8.41799728
##	1395	3980	1240	4479	2149

##	-29.11347702	-20.39302514	6.01920160	1.15447946	-23.33480965
##	2690	1869	1294	579	879
##	-23.56201193	113.59346605	-53.61881294	-59.91521189	-36.60830734
##	2497	2542	3043	2123	2874
##	-0.16749133	50.88332084	4.07090932	-31.32266899	-12.07918308
##	2788	816	1822	3981	3334
##	10.54162493	10.72039928	-25.00861411	-17.34478371	3.88463368
##	3445	2914	4107	3573	3150
##	-8.33093999	13.28823849	-9.63161182	-30.61112062	-19.59459624
##	1507	796	688	3471	4312
##	-49.58228576	-36.40226207	-47.24168352	88.96295481	-22.57140882
##	4045	1581	4489	1215	322
##	-18.44894224	13.18586656	-19.16661964	17.98984683	-72.59011854
##	4927	1161	4104	2607	3088
##	-16.97717509	8.02280207	-13.47292566	73.80263302	-18.16778688
##	23	4861	1815	3699	3010
##	-109.48804599	-22.15759102	-42.69528815	31.38311488	-39.04626333
##	4292	2171	657	3721	4840
##	-16.84591966	33.89800949	29.55619659	-8.78626524	1.57267348
##	1113	65	869	4173	1181
##	-25.78070785	94.83875393	-41.37817967	-7.62848449	-13.17879083
##	108	3757	437	1971	4313
##	153.58304581	19.03806542	142.31439543	-12.33228013	-14.55803283
##	1686	3577	154	1140	3782
##	-17.74241853	-27.92993541	-84.40590613	23.62407728	-23.68429769
##	3769	2106	1739	2323	2491
##	-34.69979024	-115.56274472	-9.11623706	-48.67427793	34.46092702
##	2950	1517	2070	1465	2838
##	0.62645317	-36.58836213	-33.02468164	-12.15298597	-10.19893127
##	1684	2851	3798	3384	459
##	1.23800917	56.41725075	52.55573927	-24.21939294	8.98409714
##	452	2273	3554	2116	1004
##	24.96040347	-11.99845751	-36.60658613	10.84308801	-35.54887497
##	3144	3152	2746	1940	417
##	-7.94289607	6.36602636	-15.95755845	-22.88333570	-27.85085893
##	1446	3132	2018	2870	152
##	-5.94436644	23.12758065	-38.76204047	-20.54356339	42.42000256
##	885	4354	2865	2641	2714
##	-47.90694259	-26.52808570	-17.62994006	13.95303058	-2.04384599
##	3928	512	4567	1002	4857
##	-13.00439127	30.34408753	-26.83181445	-29.93824762	-9.67330295
##	177	4174	1890	40	4183
##	-32.16530171	-32.00025677	57.87553459	-18.28423145	27.54558082
##	1338	3484	788	1831	15
##	-29.22709669	-11.67256494	-51.99892460	-30.32685465	-148.53476508
##	3401	2055	632	3766	1522
##	-25.00990756	15.56895028	229.18983557	-12.76168708	-28.38458253
##	518	890	1225	3266	2372
##	-68.79734978	-68.07790275	2.19681427	17.92452748	23.50681523
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##	-41.36471112	-2.12369803	-8.87028023	-66.67973188	3.06659004
##	2270	2090	1320	564	274
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##	-9.16214371	-5.18357580	75.16137278	-22.95669459	6.95135392
##	3147	4001	2619	4125	169
##	-14.31185176	-15.86867153	43.83697588	-6.17896505	-17.53748547
##	2111	2706	762	1317	1293
##	-9.63436501	-18.97522231	-35.31484608	-23.50329678	-21.37104198
##	2993	2480	496	2601	2247
##	-33.62275176	18.67546202	20.34492005	198.04276942	-8.59799167
##	4084	442	3000	1784	233
##	37.05042790	64.23419114	-30.60536861	-6.81482032	-82.23099980
##	3171	1744	1705	1546	1625
##	-50.95052350	-52.36779508	-5.27799997	120.54705929	28.56962751
##	2098	1886	4073	2147	3675
##	13.78023387	15.62744431	-12.36846909	-32.28312630	-32.60412396
##	4558	250	2424	311	111
##	104.20192968	-46.27437796	3.85470313	-71.32899065	-59.39317046
##	2356	4100	1944	667	2901
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##	4731	2012	4271	2783	2921
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##	2853	1825	1428	2427	3159
##	50.19176653	37.65515827	11.16181288	4.37099428	18.76803899
##	1277	3011	2295	3552	2983
##	1.61734460	23.92791813	-38.58833610	-16.04424272	-12.82967844
##	1381	2159	1536	206	4512
##	-6.13142449	69.31309460	-37.51628399	120.73799832	-7.31582296
##	2198	1289	2697	3084	3532
##	19.27423692	-31.48571640	33.67238305	-20.85929747	-10.34131625
##	179	325	1171	2569	1218
##	-102.91341525	-22.07649184	-54.74831888	28.02697680	-0.89154941
##	3062	4090	16	717	3182
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##	2566	2987	17	3204	3151
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##	1440	1427	3389	3613	371
##	-13.12806181	2.93432776	-9.95176991	-3.11195987	-14.69935506
##	4506	203	1811	304	3212
##	-21.71205131	164.72495807	-8.64099948	-122.40866475	-15.92710490
##	347	3679	1714	2839	2066
##	-31.82050807	-12.90818920	-29.30552651	71.77535099	-13.91938954
##	4675	498	3581	388	110
##	85.94350915	-62.43812209	-25.21627363	-55.66264710	-87.67466597
##	3051	878	3315	3755	3446
##	7.13636562	-51.01381203	-34.76807328	-3.93385217	29.43466773
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##	1122	2665	2274	2206	4647
##	-41.69922525	-24.21813447	-16.81739846	0.74889377	-11.86212225
##	1996	1488	2712	1432	1619
##	-17.38352898	-26.76367413	-8.94158749	4.30378863	20.03375729
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##	-36.82467576	27.74747114	23.12460673	1.82268626	-34.09713136
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##	4805	2883	2312	415	3550

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##	2637	1467	2988	1923	1992
##	8.18717745	-12.89432303	-29.35190682	18.50056897	0.68860823
##	3490	122	36	1765	3739
##	-7.53405157	15.26480194	42.88329621	14.30910475	10.68049664
##	4794	2889	4009	4980	4682
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##	1723	4004	4829	4787	3978
##	-56.28992067	-26.48698316	-7.84701490	-25.53416341	-19.34744865
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##	61.90941719	-21.05254392	-41.53927258	5.35318364	20.18939740
##	4502	93	332	1687	503
##	-7.15348091	-61.48100008	-17.70868329	-4.78450298	-53.15631434
##	2532	572	1616	3488	1957
##	26.75929556	59.50960421	3.83237631	30.08934277	-8.96212536
##	2049	967	2209	4214	482
##	17.75212264	-3.27565352	34.14388301	5.31998334	-27.08171387
##	3727	2122	2837	1425	4639
##	5.92131116	-3.90724491	-52.23721433	7.35197787	-27.89170367
##	4157	1927	2827	1573	3895
##	20.57390381	-1.31484765	-21.72977503	-23.53596613	-1.20366643
##	2121	4462	3873	2260	1358
##	1.78172818	-32.30612675	-7.22849211	-30.24850249	14.86659446
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##	3743	2830	4696	4570	2868
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##	-90.66384446	81.72394259	-13.88670045	51.54587872	-16.75541684
##	2054	1268	4816	2088	219
##	47.74418938	-10.64322974	-20.93122373	44.75980041	131.37471149
##	4304	3683	3451	3113	2589
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##	2633	744	2086	1020	728
##	12.68235953	23.02778114	57.53693438	-47.36146250	49.12864917
##	2162	4472	628	2604	2790
##	81.90831585	29.63572141	-45.37330861	128.31029675	-20.22714656
##	2836	997	2415	759	1841
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##	-54.41496027	-9.14801948	-39.15907979	-36.83258021	-21.56882539
##	1242	765	3619	545	1897
##	-7.62565042	-34.95483456	-23.45428955	-1.84490255	23.73945001
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##	1032	3586	2603	293	1718
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##	310	4960	1757	1952	2949
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##	48	1902	3519	4008	1035
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##	153.04285262	-33.06021315	-55.61215185	-17.06424110	-98.72209199
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##	3571	841	4720	1560	4207
##	-26.02906496	54.10007023	-27.83099158	-4.84587823	-14.36743128
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##	-36.05117156	69.10377536	-39.28039926	-58.37587678	-17.24927133
##	4064	2332	3324	3064	2419
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##	33.16351966	-63.08999687	-19.42886674	-2.00436023	-20.82098127
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##	3591	1911	2911	1771	3929
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##	5.84288041	-31.13381112	-15.33915621	-29.83433314	-52.23746763
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##	317	2383	3316	3501	2609
##	-49.93260723	-17.50956534	-15.73488418	-27.40337737	91.78539870
##	73	2498	3945	2577	3719
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##	2017	2064	422	4972	2627
##	-15.43533798	-16.95233632	-43.29912221	4.18327554	24.38743706
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##	-62.28735328	-36.52113705	-10.66922076	-25.32918589	-1.10280974
##	535	427	704	4191	1736
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##	639	4464	4501	4111	4345
##	4.90514827	-24.14009555	-5.66845745	-23.94958298	-10.99352391
##	5016	451	2378	880	3029
##	-17.98566917	27.73154819	-22.93298860	-44.61656600	93.94749467
##	89	2531	1700	3606	4025
##	-109.09494412	8.32810662	-38.22292939	-12.69861961	40.75412967
##	2730	353	1690	1864	3497
##	-8.71470485	135.01497616	-20.58516502	0.36115364	-15.95637123
##	539	1089	1650	499	3632
##	40.06078974	24.09861006	4.09982482	-70.93893840	-22.48221342
##	3512	692	3838	746	3698
##	-20.41356047	-75.00522908	-24.63699993	21.69830728	69.41758418
##	3771	1900	1418	3245	1092
##	-17.47741061	39.34527016	20.93010295	-24.02784902	10.36356502
##	1098	2719	1963	4817	2917
##	12.33397380	3.58557427	0.29716676	-28.69896710	164.82012819
##	1210	312	1275	1429	2931
##	10.63900390	-105.13938271	-4.45693858	18.79052611	-3.30871046
##	3277	94	2841	875	3053

##	-24.19340016	13.43571158	31.49767013	-26.68167827	6.54126255
##	1133	329	288	3143	3612
##	-50.46036808	-62.82590650	78.67954216	-7.07107048	-15.65054008
##	3919	4541	2469	552	3628
##	-16.40798179	45.17674970	-19.06342364	-54.56652237	-26.40822300
##	4684	2510	1246	3341	3345
##	-13.32461153	-25.77900538	-10.08099482	28.90006057	-41.26266029
##	3014	3168	3713	1781	30
##	-19.46553200	-0.17977406	35.55685216	-9.90669990	482.17170089
##	2904	2546	2501	921	2146
##	2.48552827	-2.61982670	3.71908071	-49.45877332	-12.22097376
##	2336	4499	3226	2327	1441
##	-32.03765249	-42.22683789	-17.80307590	-23.80456178	4.91957390
##	158	1727	3975	2732	4123
##	3.89503889	-49.64385328	-13.81714973	-26.64927609	15.34653844
##	1748	372	4118	761	1101
##	144.81296974	8.63539681	1.50298401	-17.06586476	1.34969284
##	1519	3218	4430	2878	912
##	-16.61426635	-10.30078056	-10.22378998	-25.65458671	69.11809058
##	2433	674	2670	1194	409
##	5.94745244	-11.83856933	-2.23278119	94.88318060	-42.72580075
##	128	3409	3193	1706	2907
##	2.02334575	-32.97574962	-25.33395665	-16.95562914	-31.97777260
##	220	456	1116	2392	2083
##	46.62497866	6.05741759	-31.48969074	121.44564465	133.11353249
##	2649	566	3251	5035	197
##	9.97814798	-20.56262334	-26.54618427	-8.52020659	-93.24201209
##	3187	749	2763	3991	473
##	-32.50339767	21.26961610	94.99124568	4.97766920	33.00978545
##	1985	1213	856	3185	1426
##	31.24712286	6.87764397	6.64331454	-0.93993632	-0.33170579
##	486	2271	671	4956	1932
##	-60.08356106	-22.60440300	-15.64019345	-4.04344876	-19.73355137
##	4874	514	2555	3889	276
##	-8.85408991	-55.95225673	2.03858475	3.98794596	-108.08248595
##	4	84	306	2455	209
##	133.34042267	9.08829696	-50.95052350	-42.47097387	75.92101217
##	1898	2177	1824	1378	881
##	37.60929868	54.99151663	-35.35686167	15.14312827	-47.17328823
##	238	568	4789	1393	525
##	170.90036509	19.47416918	-21.82233918	-13.60998175	101.14911253
##	2178	4535	472	3295	3625
##	-4.15414132	29.51186161	0.47672957	22.10663274	-31.69127996
##	4901	1377	3317	2290	4067
##	-27.19605661	1.64491371	-24.02237401	-23.19691204	-9.83381588
##	1812	3655	2211	109	1950
##	4.62586124	-32.82225102	31.85791879	-136.25570934	-14.63357937
##	515	2539	1128	90	3776
##	18.07876802	-28.38996409	-40.12086046	26.94265604	-28.80839986
##	1606	399	4924	3780	1956
##	56.64451063	68.99338914	-4.45151626	-37.39193033	-3.14979114
##	547	1846	4892	458	2958
##	-43.33304920	12.39477890	-17.30526331	-7.35105873	9.38376295
##	1160	507	303	616	621

##	102.79581679	-56.36197109	-38.42983985	-33.94553221	-16.54435125
##	2943	681	911	2081	4453
##	10.35149959	-45.94583678	-59.19542823	-37.95304405	-13.98840336
##	2756	267	2772	871	358
##	19.93495860	-30.86566736	31.24712286	-0.31353903	6.69627628
##	1845	920	876	2128	797
##	20.34832830	-40.63832664	-26.02143596	1.35283140	-32.56849332
##	4434	350	278	1281	2112
##	-3.48646455	137.83581750	-20.44297367	-15.75471732	-25.15154555
##	778	1255	3926	83	323
##	-39.47948545	-20.59060636	-27.82632396	39.61400642	-84.99861087
##	779	993	1826	1768	2884
##	-34.69796527	-11.98146406	-2.63695071	14.98612148	-40.54152873
##	4673	1329	4604	4656	694
##	-14.83021206	1.20956648	-18.21349038	-0.41322440	-31.48154095
##	2450	719	1051	901	4797
##	-56.23974717	-1.49308475	-16.09142567	-62.03058541	-18.09420164
##	4159	1453	1468	3363	3381
##	51.69509743	-21.95164251	-25.04956635	11.67834034	-5.21502057
##	612	4285	805	2975	4486
##	-53.05847419	-30.35115644	-42.43844038	-115.09130156	25.50301536
##	2280	565	2306	3570	3040
##	-14.26272901	-53.34018442	-12.75607190	-24.10762585	9.58814189
##	2132	4036	1512	777	4793
##	-9.20414527	-19.05357568	52.75018390	-29.99509326	-20.38399846
##	2059	2093	1305	2537	1584
##	-33.46770813	38.19652428	-34.63562492	-20.20485687	11.73646117
##	2322	5024	562	3220	2338
##	-33.78130457	-7.58778450	-31.03642453	-1.20704867	-30.00715632
##	2082	254	4377	4738	1808
##	176.98288698	-20.78615684	-14.87100376	-10.72283366	-3.24449710
##	2639	3988	660	1274	2359
##	-0.19867772	1.68454907	34.99632226	-30.28440219	20.32878855
##	272	3242	2047	349	2302
##	-88.75480742	12.04236700	-15.73194840	-90.66384446	24.64591216
##	1398	555	1374	2237	127
##	209.38072513	-1.65644417	-52.96631239	-31.50390295	110.84260498
##	1186	3604	1028	4281	1617
##	67.25101809	-3.10622044	-48.71915019	4.51210205	36.78297084
##	2314	2528	4152	2026	2504
##	29.36528234	-15.29693323	-14.00015096	60.06835064	5.74394984
##	830	3944	4436	3478	2196
##	-16.27805939	-31.25143808	-38.44374101	-6.25168907	10.72828957
##	3289	2401	3543	264	326
##	49.56036955	-19.93058895	-30.77226296	-60.07216344	91.37874518
##	1605	1844	3082	2438	1818
##	30.67435802	1.46452296	-15.33615554	-18.00712252	-17.83991110
##	252	1336	2223	1373	832
##	35.01528788	-29.19752297	-18.84191145	1.79595328	8.62144912
##	3300	2025	3474	1311	467
##	-16.42891752	14.92297673	10.59939817	-41.46402546	-1.93934301
##	1788	2435	2366	960	3462
##	-16.90066641	-32.40683053	58.90858627	-2.04874460	59.60725863
##	4091	2560	2677	195	2762

##	17.53028152	19.49059359	3.25333490	-81.77499222	-38.35844060
##	1850	426	2043	734	4519
##	1.03795044	-25.90517089	-36.74157782	6.85382494	-3.31708921
##	4172	2915	991	374	793
##	-28.25967820	-44.57396531	-30.24409562	-42.14695263	-50.46025351
##	4585	2673	1155	3148	1126
##	-35.50330644	-10.40203639	70.87527073	-3.97935178	-60.98006015
##	2981	406	2945	3783	3640
##	-15.93664809	16.75922964	-16.42437483	-21.04210921	-13.41382463
##	3911	757	742	517	3375
##	24.87970340	-18.50802337	-10.16788184	-115.98677564	-18.15028863
##	1712	4026	1609	1984	4060
##	-11.43200012	-23.11859471	67.67950310	-24.94208403	29.27801568
##	2588	815	951	2451	124
##	-25.04377000	265.36036201	19.29107619	-31.13143513	5.85147027
##	2368	2051	3513	711	1631
##	2.49933940	132.05409500	-8.41557296	184.26764311	-13.15189270
##	3708	2005	2489	2056	813
##	15.30187658	-43.39152119	43.17939369	-5.18365787	267.95847539
##	1270	985	1707	2087	334
##	-28.65088269	-12.35068043	-9.92897788	4.56981174	12.10598648
##	730	893	3118	1854	351
##	20.76355840	9.86567052	-20.92705923	11.55443050	-87.21799448
##	2227	1776	3590	403	3290
##	-11.93047339	19.61659520	6.85457200	34.71627884	19.89511561
##	509	53	5036	2737	296
##	78.22127666	-110.93236393	-14.54081669	-25.45333174	-5.57862796
##	945	3092	873	1747	2421
##	91.62592348	62.08501390	-25.93695985	-43.17578143	3.93088521
##	1636	1049	2379	2984	1466
##	1.28679772	-29.50732243	-29.93340776	39.65245195	-23.63698232
##	1164	864	3746	218	4578
##	-15.45644306	7.89758579	0.39636812	7.48639261	-14.83762416
##	650	2109	186	630	313
##	-35.45975610	-4.02807257	25.57423430	-32.30721905	-43.27549311
##	1651	4547	683	253	982
##	10.51998348	0.65726839	-51.05051254	3.34807647	-10.64449518
##	4729	2023	129	1541	1003
##	13.08883909	-30.86598693	-38.95457314	112.86257967	-16.99274467
##	1209	1800	2805	1929	104
##	13.59815550	-13.10391777	-25.40772954	19.78859223	88.49130796
##	1421	2307	3556	363	1053
##	-10.65761384	-22.72635338	-15.03023981	4.99242367	-38.39227027
##	2279	756	4491	2057	595
##	-25.42291937	-15.81135254	-16.49396424	-7.05617787	13.17510900
##	4403	2579	569	4269	2069
##	-2.62305579	-26.65656844	-2.58145348	-12.66581972	-4.78773593
##	6	4779	257	2758	4974
##	-203.67613131	-8.60809551	5.68251481	8.06786060	-21.85781008
##	4150	2764	2793	3140	3172
##	-13.39215018	125.69304115	-14.48016133	-23.02785642	2.63836031
##	4867	3589	4898	548	3744
##	-6.50732516	11.37613219	-32.00821661	-31.03599252	-20.43502390
##	395	3115	582	1545	4577

##	134.45891717	10.08872751	141.65532783	47.13099433	-18.82712559
##	727	1298	824	748	1804
##	-33.44579050	-29.46067850	-23.20430314	21.47076541	20.26341398
##	2044	4209	1620	3468	1239
##	-2.64689778	-18.55226231	8.11785357	84.76777487	1.01697838
##	2154	581	3372	2370	1614
##	141.03423247	76.27500358	11.85783929	-41.83926880	14.10136516
##	1916	708	4711	849	1156
##	-0.28975478	45.21866468	-0.05583066	16.49098942	53.79863430
##	3020	750	3016	2659	1411
##	32.65219880	2.77427730	-36.99864431	7.85965926	97.35042941
##	1894	242	1430	393	4204
##	22.74104748	19.36112812	-17.07533547	-73.89532390	-3.43481061
##	135	2679	2913	2249	339
##	-48.02448972	0.63334867	-25.96418712	-28.74480095	251.63838038
##	860	4600	2584	398	4451
##	-3.83020753	-6.58228357	-28.75073709	68.77525602	-15.07264952
##	2183	1648	21	462	1385
##	66.03235774	-6.91868222	-21.70150708	7.12362679	12.04941626
##	4838	840	4256	2807	88
##	-26.10053940	67.26297317	-16.46541846	-23.76586271	62.29075906
##	55	1883	364	2216	1938
##	120.96451049	36.16855643	-5.39486889	6.82687074	-48.43113992
##	4198	1637	4398	4083	3035
##	-17.38001690	-0.25125255	-62.70305799	-24.76311736	17.41246709
##	4854	1775	2863	3080	2416
##	-12.93745290	9.06405425	-9.87953391	9.43386563	-6.77815523
##	1600	764	1639	968	3549
##	71.39074144	-36.61734710	-12.73938240	-11.78787843	-16.82239995
##	4039	1291	4749	2509	2708
##	-12.41295630	-35.78112165	-36.80043147	-5.17654491	-7.66766815
##	4988	1180	1459	450	3038
##	-8.89930827	-30.20559158	-22.51183640	47.06996915	6.44402086
##	4202	1090	2222	1987	637
##	-15.21122918	5.00819806	26.41017445	-19.52572351	-90.36005019
##	3609	3419	1221	2019	3489
##	14.31041295	-13.30424565	29.34518638	58.95966873	-7.88817761
##	1399	1577	1953	617	118
##	-54.54387986	35.60186096	-32.08730032	-19.07250086	82.55952434
##	476	1667	1865	2301	1219
##	-6.65856276	-11.81039694	-29.47841999	-25.97185524	39.22015198
##	2683	2210	2888	640	2388
##	-10.87145660	-3.63361860	-35.16310029	-73.44335656	-2.29881363
##	2141	2329	4929	301	833
##	-17.89918289	18.83815416	16.28923246	53.00268627	-40.66005656
##	2283	1390	829	2724	412
##	-33.51143163	-23.81476628	-36.54756354	-41.04961916	4.58891199
##	1654	3749	2676	524	1901
##	-13.30467467	18.29813055	-4.42920600	144.42570189	7.11560387
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##	-82.15322635	-26.93627224	15.40932145	-16.11282387	27.73924938
##	4201	1993	558	2407	4941
##	-28.46077292	-10.11791088	-43.86610322	15.19704631	-19.33305270
##	2254	4356	2831	346	4288

##	-20.98722398	-23.04681850	-40.49359981	54.60050342	-19.89334435
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##	-10.05688911	-8.03455829	-72.34687173	10.93921448	-13.03351735
##	4232	3788	2922	549	651
##	5.69456257	-25.31216644	65.67854972	-55.39146246	101.41740890
##	4852	3063	4724	4562	161
##	-10.29957211	-16.20286767	21.42195852	-19.25754842	66.63343610
##	3923	454	2444	2819	4862
##	-19.71233927	38.32179158	-3.89704218	-40.49959088	-10.36741863
##	434	2325	2454	3916	2651
##	-28.02850161	-34.63362518	13.52662920	0.29716676	31.67729907
##	1551	4734	4902	3461	213
##	-31.30854420	-24.31900050	-12.12185807	-26.62562358	31.66438859
##	2840	2321	1359	914	3358
##	41.62686480	-13.90713034	-44.37313024	62.62223566	-9.95432902
##	2526	457	3740	1931	3128
##	-32.07118181	20.81195799	19.79273621	-35.73615722	3.02565053
##	2094	2565	76	1481	675
##	11.17063839	-20.81996589	-110.80972284	5.55298860	-26.37501434
##	2890	3555	1918	1448	475
##	-25.04558993	80.52349391	20.50059714	21.60416580	4.99457086
##	1309	359	4241	1904	4099
##	-16.84896460	88.39185415	-41.04325602	-24.84117662	0.49977923
##	1552	521	1352	2328	924
##	21.63044687	-14.68618642	56.74358956	-36.47435462	27.89964952
##	4068	166	3203	463	528
##	16.67833966	-50.28065423	-29.32108952	-19.36081809	39.15712872
##	1701	468	3406	4176	2535
##	1.52582451	17.60220146	-27.48047116	-23.13704419	5.27503287
##	1635	2205	3940	1369	143
##	10.97127717	-18.04001102	-15.50514799	43.74348513	-91.41616793
##	658	766	502	718	3156
##	79.91461482	-25.20228976	-71.53632203	27.66950405	-14.02347743
##	937	3583	929	2717	3390
##	56.92809707	88.87192129	-10.63546616	-23.68759492	26.91110878
##	1967	1954	1	3137	2411
##	-53.00330077	-23.43388078	492.48687833	4.44765643	11.38359827
##	1382	3789	287	4350	2992
##	94.63823131	-14.08025309	-16.42437483	-3.61038637	-31.63153893
##	3105	3164	3764	3170	1722
##	5.42693331	-16.52883970	-17.70453586	10.35956381	-10.35038708
##	2616	1598	2091	344	3225
##	53.25541168	69.21871498	26.33631037	-99.25452019	-25.80632504
##	983	3787	1659	4906	3703
##	-22.06817264	11.57866960	-5.02938293	-21.71259391	61.14538487
##	1365	194	1117	587	687
##	-34.91979339	-33.98956633	-50.82182714	82.56824625	-57.44949774
##	2439	872	2245	1743	4538
##	-1.58392763	-34.90869607	-9.94131444	32.74039752	-7.23321524
##	1413	2103	1050	3192	578
##	24.44778060	16.29519621	-16.43894277	-24.11815855	-27.84742445
##	4450	4145	2447	400	2077
##	155.72434506	-28.46712011	-13.72570930	71.73323592	-14.54355269
##	2153	3142	1072	2458	2499

##	183.35666856	10.36349739	-32.42702128	-28.46558565	20.80208183
##	3866	3412	706	575	3821
##	-11.68948029	-17.82312694	-33.22371559	-30.55608603	-25.95068809
##	1313	590	979	2500	2848
##	-20.92896765	19.49236472	-9.28918003	-19.63142843	10.72643781
##	1439	1119	3483	183	2580
##	41.75220801	-30.09903928	0.04073011	-67.59368910	-31.08371596
##	211	3025	4121	902	4671
##	75.15002968	406.11981386	-25.86269967	14.32826796	6.51921729
##	1599	664	3825	3454	4759
##	60.53099925	29.34518638	-17.69900141	-19.97844942	12.88485922
##	4106	3202	4503	3407	3440
##	-37.45758130	-12.61053842	-24.34123912	-23.08741217	9.70061520
##	526	256	1047	4418	2937
##	-74.68215328	49.34606309	-65.71048800	-14.89137998	28.32069751
##	1669	2495	1025	5010	3653
##	-21.71259391	27.34327313	-45.91321751	-13.90486314	-23.71527587
##	5038	4087	2971	2422	506
##	-10.08817082	-15.65404636	-39.10872556	5.39196252	-31.33039596
##	1837	3387	2534	916	2674
##	-17.16514598	-10.75270064	-3.05800258	46.27318499	11.20661006
##	1595	4057	3730	2590	3282
##	61.04194301	30.77521040	2.92395822	-9.45353025	36.44195882
##	1979	4279	3663	4105	740
##	-52.64080985	4.53765861	14.59796501	-8.92678246	-1.97979136
##	1514	4742	4404	1477	633
##	-18.78513320	-11.98879433	-4.80152708	6.40696989	-20.46795261
##	67	45	2716	501	2386
##	289.29785208	-94.19787600	-10.44625024	-64.27531192	10.05188118
##	3052	4792	4790	27	2939
##	-8.11218118	26.60294092	-51.00357122	420.07443642	-8.82092770
##	2038	896	2543	2126	653
##	-5.36983520	-17.43445521	8.94098450	-37.62423094	-35.38104768
##	1193	2191	3578	4255	1043
##	37.59961755	6.71806255	-35.66245472	-19.16801930	-2.93300423
##	2326	237	1056	3874	2533
##	-3.09091940	230.28953418	7.60651747	-10.12387009	-34.18995034
##	420	489	1088	1106	2377
##	-73.43408749	-46.55098878	31.86021876	-17.50041357	-23.83706667
##	2823	223	583	290	527
##	-21.43084638	-1.25892563	265.66563925	-37.19504277	53.71395484
##	1921	3524	3960	436	373
##	-0.28044502	-13.98811492	1.94223372	-52.21574569	-17.51402461
##	2974	2156	2861	3734	4800
##	-25.57829116	7.83355693	9.59100812	-15.81838685	-19.94257580
##	3032	2786	3673	1813	2461
##	16.60663530	14.58466181	-2.29727106	-39.67424132	-38.28849284
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##	-15.29285541	21.08804792	-7.89064149	-62.28753540	-19.42045484
##	3467	3700	3511	2880	2445
##	74.67011087	46.25917601	-36.40169653	-119.38705917	-8.06860247
##	570	1778	2644	724	1791
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##	666	1216	1076	4727	4351

##	0.28280974	4.83080057	63.10323236	29.35485853	-3.09264688
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##	-36.05836981	-26.06811607	38.87919406	-45.83927553	3.06659004
##	2879	327	4595	4643	1262
##	3.61427605	-58.88333773	-11.67919994	-19.16058414	-1.48336984
##	3281	1673	1909	1672	2305
##	9.64317513	-18.94508440	-8.10543411	36.54003092	12.19619855
##	1752	4287	1478	1537	1379
##	1.14180751	-35.78014465	-28.72437069	236.74513001	149.28879423
##	2414	1144	3582	1949	2770
##	11.08322883	56.90989200	153.54674507	41.37960876	36.68653790
##	3566	3584	3081	1009	7
##	-27.99624645	88.21989553	393.94290478	-82.10433181	59.60725863
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##	-21.63238752	-11.38056141	-3.46682701	-10.13658587	-30.80617834
##	3758	3331	2909	4028	3376
##	1.26850225	-10.33862149	-28.88500701	-12.22200685	0.14012402
##	3567	2527	4568	2095	2700
##	-28.19768781	-33.12426261	-17.89976161	0.94827172	2.02346827
##	1248	2496	866	3618	4013
##	11.98028798	38.26261108	-3.31896267	11.01183996	8.98757965
##	603	741	2108	31	1079
##	-38.95091005	10.75695593	-11.66219913	75.37497016	50.62927457
##	4523	3706	1203	4268	504
##	-7.13911516	13.46481109	42.56723507	-29.14266570	-75.64783520
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##	4.72321336	-10.57152880	4.93863326	39.32385684	-39.41907096
##	2225	61	3887	1235	1504
##	2.50393844	-36.38565296	4.25775397	-3.91202292	-37.24573540
##	1603	163	3638	2142	2320
##	32.46294604	-3.71895195	-20.31810781	-8.74781857	-43.08149303
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##	-40.44553051	-64.37536075	-9.40457518	-16.84227063	0.64321920
##	2405	3453	1657	4229	2944
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##	3287	196	3886	1007	1951
##	12.81749443	82.45923844	94.09500925	-29.25804809	-1.20919263
##	9	737	1847	2866	1915
##	161.19679226	5.74607014	-9.73882113	18.73725427	10.51554179
##	661	3291	3205	3370	1975
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##	4197	1889	751	3235	1873
##	-28.17463019	24.13433260	-22.45835759	17.87938884	-13.93459316
##	2947	3685	973	3774	3395
##	9.94735567	-11.42961615	-28.88934718	-22.67479581	3.18439441
##	4261	1115	4249	1853	1322
##	14.07643745	-47.61380955	5.79306195	-27.44543030	-40.78849177
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##	-11.42443621	109.04074900	-21.14333971	16.33079507	10.04178215
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##	-45.08779071	-49.63255480	63.58274129	-0.46051060	-43.28743087
##	785	259	418	913	4421
##	-34.35982729	-59.54427489	-50.43230652	31.85585379	-30.07899594
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##	-24.40914370	38.70293407	-23.81612947	-20.78325023	10.43215775
##	2621	3891	285	126	4196
##	22.31781124	17.90493802	-0.30685436	224.26516261	-18.86479550
##	1136	1624	2513	1397	3621
##	-45.62125015	26.02889715	-7.83195346	4.78709124	5.40416515
##	1276	807	1017	1456	4239
##	-7.12861614	-34.20487565	-385.81415811	0.54713563	-11.38759642
##	4662	1319	4011	998	483
##	-20.90117536	-35.98331883	-18.37592022	-32.12634391	-41.39344119
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##	1875	2208	599	1549	2572
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##	210	786	71	3768	3238
##	18.36589081	-37.17983755	-129.79453558	-10.92880355	6.92402465
##	428	390	2635	286	3750
##	77.65507682	-46.27437796	12.07338113	129.76907610	-13.12272252
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##	4319	580	3830	1674	2315
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##	3982	2241	2563	2063	106
##	10.21314931	-6.98810122	16.81682534	-15.86086161	-122.06642731
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##	-27.64403123	-31.14586451	60.14903186	-9.75760781	-19.40774258
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##	-2.63337723	-19.47427511	44.43005292	-7.30518047	-17.75729756
##	411	802	2654	1989	202
##	11.28642034	-36.03625129	-17.11129851	-11.14181763	-15.18471704
##	4841	333	42	1074	2316
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##	-4.44088932	-16.19102650	-25.25749542	-9.98336836	5.59154451
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##	2160	1908	2897	2666	1124
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##	2134	28	3933	620	3272
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##	404	369	5043	425	4447

##	23.35028544	-55.03420518	-12.51755498	-56.21100258	-1.97979136
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##	41	70	4259	1265	1955
##	-19.63168173	138.56132666	15.17377564	4.35072679	15.84536878
##	3133	1958	3479	1000	3941
##	5.29829589	-5.85906474	-7.02638986	-43.10182084	-7.03301822
##	874	1463	4420	1130	3361
##	-35.53178682	-22.46856531	-12.71644451	-56.53808789	50.65157216
##	3912	1184	3199	2193	3403
##	-13.60099290	-41.58155415	-20.12997353	63.09514039	-19.22516135
##	13	2287	3396	1492	3858
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##	2678	1037	2622	2412	153
##	-24.17363918	-27.87773327	74.16059635	-1.16620683	40.73235166
##	1785	2188	3534	662	1585
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##	-9.92274220	41.84441911	-35.60279608	-67.62116013	-42.09406412
##	3999	1080	1493	2906	4602
##	-0.23467818	36.91858233	-25.49838790	-37.91724407	-7.05077813
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##	1396	2789	1720	1065	1583
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##	53.85754327	-33.32283335	-5.51370337	348.62044098	62.63613161
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##	1749	618	2858	888	63
##	102.55032487	-39.95146460	-14.28242675	-31.54788087	-137.26604772
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##	3751	619	283	3410	936
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##	26.87013039	1.18985824	-30.35532840	50.05047538	31.24752007
##	4185	1021	294	3285	3347
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##	100.64775490	27.37168506	40.96356710	2.33782751	106.37636722
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##	2942	3514	3745	931	1934
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##	1423	713	3527	1335	1682
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##	4741	3600	4932	3493	35
##	-22.40887246	5.76585718	-20.62070454	-0.15391304	3.64818237
##	2008	408	1376	3672	3217
##	-44.23068067	-5.20283153	4.89553843	2.94344808	17.30127073
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##	-14.48463761	-32.81111283	-17.31855486	-17.52743362	-7.21499361
##	3464	3176	4463	1084	4131
##	104.20192968	-40.83944137	-24.77189026	23.35992853	-6.76406081
##	348	2720	1533	2503	1662
##	-23.90309390	-34.88056216	-11.08787710	15.72875773	-4.62807820
##	1562	2310	819	1403	1738
##	-13.67555489	-38.19074834	0.84659812	95.47916924	-4.24138035
##	868	4124	3907	112	1579
##	-13.63001386	-17.10713532	-9.93151505	51.23994295	-2.19236437
##	2694	1479	4357	3222	2680
##	-6.54146626	-31.86116102	39.39075607	-14.79187565	11.16481272
##	2440	291	3615	1764	4205
##	-14.23836497	-3.49677272	-0.64650509	-1.36968223	-21.64225151
##	14	1474	1668	1372	3313
##	163.91107954	-23.09004462	-17.84932988	-3.66646825	-15.32744326
##	292	424	2548	4280	1688
##	9.62087938	-22.27091200	-6.03148506	10.26536963	-15.09823592
##	1852	123	1346	1709	2570
##	-13.60691651	10.27548702	-4.97155599	-50.50336140	-23.05235627
##	1251	940	1310	791	413
##	13.32980991	117.50632482	5.99417705	-43.23780208	-9.49429834
##	1419	3191	2340	2431	1325

##	14.28986120	-5.97665630	-144.50619274	-20.71231631	-30.06465170
##	1855	2846	2286	703	320
##	-8.02979984	-7.94013547	-29.58229491	-1.25629783	-21.52144860
##	1592	1903	534	2718	2446
##	-34.82784051	-128.72369917	41.59475659	-30.89636857	-29.66440201
##	3135	1462	208	2425	449
##	8.32102696	-2.43680323	177.60341882	5.81681985	73.67736221
##	2696	4596	2009	2493	2264
##	-17.35855146	-16.03115167	-26.30570382	15.79096107	-4.57791474
##	2104	904	2817	4540	4387
##	-16.64085133	-21.58988098	-28.89591345	-4.46964666	-17.83068133
##	4587	2735	2250	910	2547
##	-27.94775567	-41.12234413	-29.14840880	-36.04456057	34.85456454
##	2472	2092	1568	928	3041
##	-28.12298794	-8.34492017	-46.84761179	177.78781624	11.27778208
##	4429	702	4098	2650	3411
##	-13.60294609	10.58172584	-23.50433139	34.46394426	-19.65915798
##	3599	596	4999	848	2643
##	-1.84489300	-28.45132957	-30.85226684	45.05383836	24.51071268
##	680	933	2809	3356	1314
##	-26.09918157	70.12098260	-12.26802202	52.68462036	-37.46878509
##	2748	51	297	1520	1306
##	-18.57543248	10.43190445	14.67638379	-32.00025677	-42.09406412
##	429	1613	969	4565	57
##	-40.93363183	26.72919639	-14.79245740	-15.54244771	30.49982898
##	4677	2217	2798	3800	3437
##	-12.54645135	-5.09651860	17.44328432	25.75076902	10.84467506
##	3265	2067	4834	1341	175
##	-38.86354611	34.98287212	-18.64848410	33.99761627	159.33207925
##	1976	2143	510	3596	1758
##	-30.91370681	9.90986308	338.39923348	-9.95865247	-36.82302866
##	240	4156	3261	3779	3827
##	-7.35214124	-13.11469450	40.74698628	-21.18910142	-17.52558925
##	68	3233	2952	1069	870
##	82.21476503	-17.14417250	-9.04775067	-27.53550734	-32.10173697
##	4644	2973	679	4504	361
##	-11.26341376	0.94069231	-23.84367088	-22.25023638	31.42235507
##	4295	3854	3572	295	3729
##	10.89441173	8.09260548	-28.49045800	0.20897943	18.50159322
##	828	1355	1449	1849	3693
##	-31.97458743	-43.95784377	-40.50173808	9.20228303	-31.26420150
##	2541	3263	625	2875	4586
##	88.57895141	16.52374051	-62.60174111	-14.46157076	-34.28895500
##	2926	1782	1735	59	2561
##	47.22989287	-0.37527578	139.86859389	6.63027381	-17.84007549
##	622	3643	1983	241	839
##	-28.96200517	2.96664155	-11.64629573	338.75496867	87.21032704
##	2684	4034	2050	448	743
##	-18.69242076	-38.34110396	-11.26731715	62.73768985	-0.37506207
##	397	191	3796	2284	3077
##	112.47566667	-7.44494091	-9.97074140	9.42326342	-12.67100849
##	4905	4692	1697	5034	230
##	-24.54721138	-20.12572436	-15.34243318	-17.53865888	-38.99079662
##	377	1626	532	3997	184

```
## -23.01647422 35.55530334 29.51323542 6.14229746 80.29166847
## 3498 3506 262 4815 2978
## -22.40853734 46.32400372 -13.56907047 -12.23133823 -22.01799841
## 2962 4681 3329 1387 3429
## 8.81340226 1.03273201 -7.22226972 -7.41130326 -23.92305162
## 2027 721 3648 1315 222
## 27.47866607 13.05200670 -27.50206507 -47.10928712 32.02961026
## 636 629 4402 554 4367
## -4.25284493 -42.74355067 7.07572553 -49.83861480 -21.62991716
## 1199 1249 1350 1107 383
## 43.96274667 -21.85548928 0.91894672 -9.84784208 -113.00226155
## 3335 638 1112 189 2767
## 19.66456794 -40.96020641 -33.71422327 23.92791813 95.34695349
## 2663 584 2282 3075 1205
## 33.17522867 102.29574741 -9.77938247 -24.60484799 32.88808550
## 2426 3894 1162 4651 3741
## -58.87990660 -8.14963344 -9.64827890 -27.13463474 -15.61224180
## 3278 1556 3884 3902 3918
## 29.51191642 -52.55627018 -13.99938750 -6.60834671 24.91080379
## 1343 1982 3943 157 2034
## 50.26253328 -36.35643741 -13.10819122 -68.66888868 -19.95369182
## 4998 1132 4584 215 1420
## -24.45452623 -47.49749522 -7.28303692 29.55619659 22.66529232
## 1148 2502 1772 260 4059
## -13.52787909 7.14523902 5.62860410 -26.56657942 59.85538183
## 957 2289 4425 1634 2924
## -13.66034920 -16.61443081 -9.11493382 9.99296415 36.56762933
## 1330 2985 4414 4856 685
## -48.09153758 0.41481157 36.51185686 -17.00048376 -43.71843871
## 1789 1590 4592 2524 3973
## -27.93253819 70.42296098 -16.11865053 -3.05800258 -19.72843934
## 338 1033 593 1042 148
## -35.50355974 -41.44540252 28.36795899 -39.80692230 -66.83138052
## 726 4707 4603 3616 1548
## 26.70824281 -26.28655422 0.84977838 -23.46416198 13.02326235
## 753 2844 1513 3885 1143
## -25.31269273 4.14510504 -21.83407968 37.79773506 -5.28402747
## 1436 2833 3181 716 980
## 9.37857888 76.38161941 -10.08779937 73.18812010 -32.46064157
## 447 1543 3892 2824 1264
## -51.05819845 52.73725779 -87.63433814 4.41685909 -33.06449351
## 362 2255 3903 74 2155
## -6.93770679 -12.04544215 -13.04339835 -33.30925266 81.35300316
## 1094 1190 3494
## 15.69618816 68.45010366 75.37497016
```

```
length(mod1$residuals)
```

```
## [1] 3103
```

```
nrow(movies_train)
```

```
## [1] 3103
```

```
#Question m
# did not attempt
```