

# Class 8: Breast Cancer Mini Project

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## Lab 8: Unsupervised Learning Analysis of Human Breast Cancer Cells

Before we get stuck into project work we will have a quick look at applying PCA to some example RNAseq data.

Read the data (detailed in lab7):

```
url2 <- "https://tinyurl.com/expression-CSV"
rna.data <- read.csv(url2, row.names=1)
head(rna.data)
```

	wt1	wt2	wt3	wt4	wt5	ko1	ko2	ko3	ko4	ko5
gene1	439	458	408	429	420	90	88	86	90	93
gene2	219	200	204	210	187	427	423	434	433	426
gene3	1006	989	1030	1017	973	252	237	238	226	210
gene4	783	792	829	856	760	849	856	835	885	894
gene5	181	249	204	244	225	277	305	272	270	279
gene6	460	502	491	491	493	612	594	577	618	638

Q. how many genes are in this dataset?

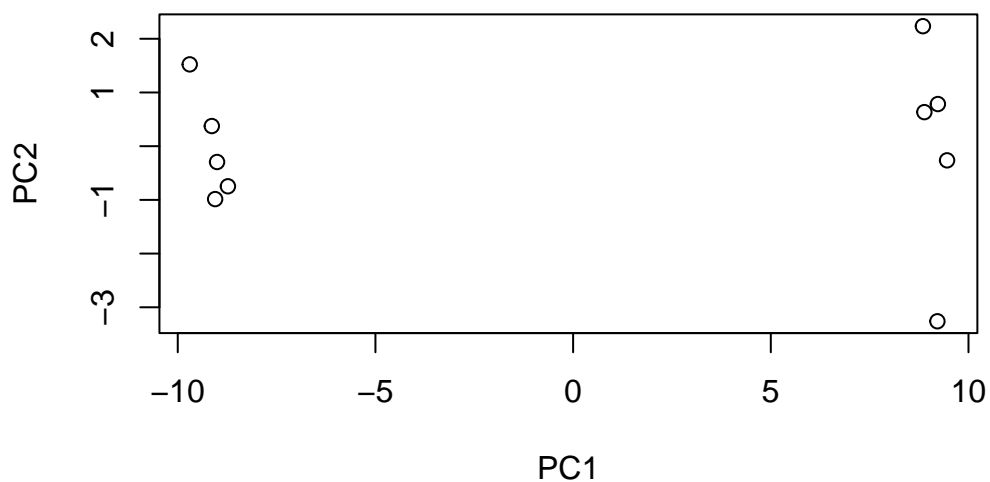
```
nrow(rna.data)
```

```
[1] 100
```

## Run PCA

```
## Again we have to take the transpose of our data
pca <- prcomp(t(rna.data), scale=TRUE)

## Simple un polished plot of pc1 and pc2
plot(pca$x[,1], pca$x[,2], xlab="PC1", ylab="PC2")
```



```
summary(pca)
```

Importance of components:

	PC1	PC2	PC3	PC4	PC5	PC6	PC7
Standard deviation	9.6237	1.5198	1.05787	1.05203	0.88062	0.82545	0.80111
Proportion of Variance	0.9262	0.0231	0.01119	0.01107	0.00775	0.00681	0.00642
Cumulative Proportion	0.9262	0.9493	0.96045	0.97152	0.97928	0.98609	0.99251

	PC8	PC9	PC10
Standard deviation	0.62065	0.60342	3.345e-15
Proportion of Variance	0.00385	0.00364	0.000e+00
Cumulative Proportion	0.99636	1.00000	1.000e+00

```
pca$x
```

	PC1	PC2	PC3	PC4	PC5	PC6
wt1	-9.697374	1.5233313	-0.2753567	0.7322391	-0.6749398	1.1823860
wt2	-9.138950	0.3748504	1.0867958	-1.9461655	0.7571209	-0.4369228
wt3	-9.054263	-0.9855163	0.4152966	1.4166028	0.5835918	0.6937236
wt4	-8.731483	-0.7468371	0.5875748	0.2268129	-1.5404775	-1.2723618
wt5	-9.006312	-0.2945307	-1.8498101	-0.4303812	0.8666124	-0.2496025
ko1	8.846999	2.2345475	-0.1462750	-1.1544333	-0.6947862	0.7128021
ko2	9.213885	-3.2607503	0.2287292	-0.7658122	-0.4922849	0.9170241
ko3	9.458412	-0.2636283	-1.5778183	0.2433549	0.3654124	-0.5837724
ko4	8.883412	0.6339701	1.5205064	0.7760158	1.2158376	-0.1446094
ko5	9.225673	0.7845635	0.0103574	0.9017667	-0.3860869	-0.8186668

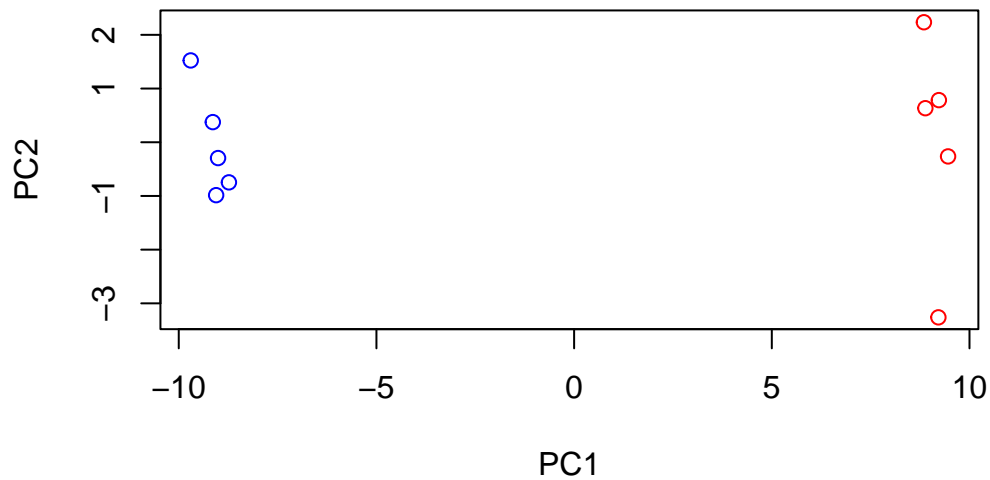
  

	PC7	PC8	PC9	PC10
wt1	-0.24446614	1.03519396	0.07010231	3.388516e-15
wt2	-0.03275370	0.26622249	0.72780448	2.996563e-15
wt3	-0.03578383	-1.05851494	0.52979799	3.329630e-15
wt4	-0.52795595	-0.20995085	-0.50325679	3.317526e-15
wt5	0.83227047	-0.05891489	-0.81258430	2.712504e-15
ko1	-0.07864392	-0.94652648	-0.24613776	2.768138e-15
ko2	0.30945771	0.33231138	-0.08786782	3.317091e-15
ko3	-1.43723425	0.14495188	0.56617746	3.299214e-15
ko4	-0.35073859	0.30381920	-0.87353886	3.000948e-15
ko5	1.56584821	0.19140827	0.62950330	2.785473e-15

```
# We have 5 wt and 5 ko samples
mycols <- c(rep("blue", 5), rep("red", 5))
mycols
```

```
[1] "blue" "blue" "blue" "blue" "blue" "red" "red" "red" "red" "red"
```

```
## Simple un polished plot of pc1 and pc2
plot(pca$x[,1], pca$x[,2], xlab="PC1", ylab="PC2", col=mycols)
```



I could examine which genes contribute most to this first PC

```
head(sort(abs(pca$rotation[,1]), decreasing = T))
```

gene100	gene66	gene45	gene68	gene98	gene60
0.1038708	0.1038455	0.1038402	0.1038395	0.1038372	0.1038055

## Analysis of Breast Cancer FNA data.

The data itself comes from the Wisconsin Breast Cancer Diagnostic Data Set.

Values in this data set describes characteristics of the cell nuclei present in digitized images of a fine needle aspiration (FNA) of a breast mass.

First we will read the data:

```
wisc.df <- read.csv("WisconsinCancer.csv", row.names=1)
head(wisc.df)
```

	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean
842302	M	17.99	10.38	122.80	1001.0

842517	M	20.57	17.77	132.90	1326.0	
84300903	M	19.69	21.25	130.00	1203.0	
84348301	M	11.42	20.38	77.58	386.1	
84358402	M	20.29	14.34	135.10	1297.0	
843786	M	12.45	15.70	82.57	477.1	
smoothness_mean compactness_mean concavity_mean concave.points_mean						
842302		0.11840	0.27760	0.3001	0.14710	
842517		0.08474	0.07864	0.0869	0.07017	
84300903		0.10960	0.15990	0.1974	0.12790	
84348301		0.14250	0.28390	0.2414	0.10520	
84358402		0.10030	0.13280	0.1980	0.10430	
843786		0.12780	0.17000	0.1578	0.08089	
symmetry_mean fractal_dimension_mean radius_se texture_se perimeter_se						
842302		0.2419	0.07871	1.0950	0.9053	8.589
842517		0.1812	0.05667	0.5435	0.7339	3.398
84300903		0.2069	0.05999	0.7456	0.7869	4.585
84348301		0.2597	0.09744	0.4956	1.1560	3.445
84358402		0.1809	0.05883	0.7572	0.7813	5.438
843786		0.2087	0.07613	0.3345	0.8902	2.217
area_se smoothness_se compactness_se concavity_se concave.points_se						
842302	153.40	0.006399	0.04904	0.05373		0.01587
842517	74.08	0.005225	0.01308	0.01860		0.01340
84300903	94.03	0.006150	0.04006	0.03832		0.02058
84348301	27.23	0.009110	0.07458	0.05661		0.01867
84358402	94.44	0.011490	0.02461	0.05688		0.01885
843786	27.19	0.007510	0.03345	0.03672		0.01137
symmetry_se fractal_dimension_se radius_worst texture_worst						
842302		0.03003	0.006193	25.38		17.33
842517		0.01389	0.003532	24.99		23.41
84300903		0.02250	0.004571	23.57		25.53
84348301		0.05963	0.009208	14.91		26.50
84358402		0.01756	0.005115	22.54		16.67
843786		0.02165	0.005082	15.47		23.75
perimeter_worst area_worst smoothness_worst compactness_worst						
842302		184.60	2019.0	0.1622		0.6656
842517		158.80	1956.0	0.1238		0.1866
84300903		152.50	1709.0	0.1444		0.4245
84348301		98.87	567.7	0.2098		0.8663
84358402		152.20	1575.0	0.1374		0.2050
843786		103.40	741.6	0.1791		0.5249
concavity_worst concave.points_worst symmetry_worst						
842302		0.7119	0.2654	0.4601		
842517		0.2416	0.1860	0.2750		

84300903	0.4504	0.2430	0.3613
84348301	0.6869	0.2575	0.6638
84358402	0.4000	0.1625	0.2364
843786	0.5355	0.1741	0.3985
fractal_dimension_worst			
842302	0.11890		
842517	0.08902		
84300903	0.08758		
84348301	0.17300		
84358402	0.07678		
843786	0.12440		

Note that the first column here `wisc.df$diagnostics` is a pathologist provided expert diagnosis.

```
diagnosis <- as.factor(wisc.df$diagnosis)
```

Now I want to make sure I remove that column from my data set for analysis.

```
wisc.data <- wisc.df[,-1]
head(wisc.data)
```

	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	
842302	17.99	10.38	122.80	1001.0	0.11840	
842517	20.57	17.77	132.90	1326.0	0.08474	
84300903	19.69	21.25	130.00	1203.0	0.10960	
84348301	11.42	20.38	77.58	386.1	0.14250	
84358402	20.29	14.34	135.10	1297.0	0.10030	
843786	12.45	15.70	82.57	477.1	0.12780	
	compactness_mean	concavity_mean	concave.points_mean	symmetry_mean		
842302	0.27760	0.3001		0.14710	0.2419	
842517	0.07864	0.0869		0.07017	0.1812	
84300903	0.15990	0.1974		0.12790	0.2069	
84348301	0.28390	0.2414		0.10520	0.2597	
84358402	0.13280	0.1980		0.10430	0.1809	
843786	0.17000	0.1578		0.08089	0.2087	
	fractal_dimension_mean	radius_se	texture_se	perimeter_se	area_se	
842302		0.07871	1.0950	0.9053	8.589	153.40
842517		0.05667	0.5435	0.7339	3.398	74.08
84300903		0.05999	0.7456	0.7869	4.585	94.03
84348301		0.09744	0.4956	1.1560	3.445	27.23
84358402		0.05883	0.7572	0.7813	5.438	94.44
843786		0.07613	0.3345	0.8902	2.217	27.19

	smoothness_se	compactness_se	concavity_se	concave.points_se
842302	0.006399	0.04904	0.05373	0.01587
842517	0.005225	0.01308	0.01860	0.01340
84300903	0.006150	0.04006	0.03832	0.02058
84348301	0.009110	0.07458	0.05661	0.01867
84358402	0.011490	0.02461	0.05688	0.01885
843786	0.007510	0.03345	0.03672	0.01137

	symmetry_se	fractal_dimension_se	radius_worst	texture_worst
842302	0.03003	0.006193	25.38	17.33
842517	0.01389	0.003532	24.99	23.41
84300903	0.02250	0.004571	23.57	25.53
84348301	0.05963	0.009208	14.91	26.50
84358402	0.01756	0.005115	22.54	16.67
843786	0.02165	0.005082	15.47	23.75

	perimeter_worst	area_worst	smoothness_worst	compactness_worst
842302	184.60	2019.0	0.1622	0.6656
842517	158.80	1956.0	0.1238	0.1866
84300903	152.50	1709.0	0.1444	0.4245
84348301	98.87	567.7	0.2098	0.8663
84358402	152.20	1575.0	0.1374	0.2050
843786	103.40	741.6	0.1791	0.5249

	concavity_worst	concave.points_worst	symmetry_worst
842302	0.7119	0.2654	0.4601
842517	0.2416	0.1860	0.2750
84300903	0.4504	0.2430	0.3613
84348301	0.6869	0.2575	0.6638
84358402	0.4000	0.1625	0.2364
843786	0.5355	0.1741	0.3985

	fractal_dimension_worst
842302	0.11890
842517	0.08902
84300903	0.08758
84348301	0.17300
84358402	0.07678
843786	0.12440

Q1. How many patients are in this dataset? **Answer:** 569

```
nrow(wisc.data)
```

```
[1] 569
```

Q1. How many observations are in this dataset? **Answer:** 30

```
ncol(wisc.data)
```

```
[1] 30
```

Q2. How many of the observations have a malignant diagnosis? **Answer:** 212

```
table(wisc.df$diagnosis)
```

```
  B    M  
357 212
```

Q3. How many variables/features in the data are suffixed with `_mean`? **Answer:** 10

```
length(grep("_mean", colnames(wisc.data)))
```

```
[1] 10
```

## Principal Component of Analysis

Here we will use `prcomp()` on the `wisc.data` object - the one without the diagnosis column.

First, we have to decide whether to use the `scale=TRUE` argument when we run `prcomp()`.

We can look at the means and sd of each column. If they are similar then we are all good to go. If not we should use `scale=TRUE`.

```
colMeans(wisc.data)
```

radius_mean	texture_mean	perimeter_mean
1.412729e+01	1.928965e+01	9.196903e+01
area_mean	smoothness_mean	compactness_mean
6.548891e+02	9.636028e-02	1.043410e-01
concavity_mean	concave.points_mean	symmetry_mean
8.879932e-02	4.891915e-02	1.811619e-01
fractal_dimension_mean	radius_se	texture_se
6.279761e-02	4.051721e-01	1.216853e+00
perimeter_se	area_se	smoothness_se
2.866059e+00	4.033708e+01	7.040979e-03



compactness_se	concavity_se	concave.points_se
2.547814e-02	3.189372e-02	1.179614e-02
symmetry_se	fractal_dimension_se	radius_worst
2.054230e-02	3.794904e-03	1.626919e+01
texture_worst	perimeter_worst	area_worst
2.567722e+01	1.072612e+02	8.805831e+02
smoothness_worst	compactness_worst	concavity_worst
1.323686e-01	2.542650e-01	2.721885e-01
concave.points_worst	symmetry_worst	fractal_dimension_worst
1.146062e-01	2.900756e-01	8.394582e-02

```
apply(wisc.data,2,sd)
```

radius_mean	texture_mean	perimeter_mean
3.524049e+00	4.301036e+00	2.429898e+01
area_mean	smoothness_mean	compactness_mean
3.519141e+02	1.406413e-02	5.281276e-02
concavity_mean	concave.points_mean	symmetry_mean
7.971981e-02	3.880284e-02	2.741428e-02
fractal_dimension_mean	radius_se	texture_se
7.060363e-03	2.773127e-01	5.516484e-01
perimeter_se	area_se	smoothness_se
2.021855e+00	4.549101e+01	3.002518e-03
compactness_se	concavity_se	concave.points_se
1.790818e-02	3.018606e-02	6.170285e-03
symmetry_se	fractal_dimension_se	radius_worst
8.266372e-03	2.646071e-03	4.833242e+00
texture_worst	perimeter_worst	area_worst
6.146258e+00	3.360254e+01	5.693570e+02
smoothness_worst	compactness_worst	concavity_worst
2.283243e-02	1.573365e-01	2.086243e-01
concave.points_worst	symmetry_worst	fractal_dimension_worst
6.573234e-02	6.186747e-02	1.806127e-02

These are very different so we should scale=TRUE.

```
wisc.pr <- prcomp(wisc.data, scale=TRUE)
summary(wisc.pr)
```

Importance of components:

	PC1	PC2	PC3	PC4	PC5	PC6	PC7
Standard deviation	3.6444	2.3857	1.67867	1.40735	1.28403	1.09880	0.82172
Proportion of Variance	0.4427	0.1897	0.09393	0.06602	0.05496	0.04025	0.02251
Cumulative Proportion	0.4427	0.6324	0.72636	0.79239	0.84734	0.88759	0.91010
	PC8	PC9	PC10	PC11	PC12	PC13	PC14
Standard deviation	0.69037	0.6457	0.59219	0.5421	0.51104	0.49128	0.39624
Proportion of Variance	0.01589	0.0139	0.01169	0.0098	0.00871	0.00805	0.00523
Cumulative Proportion	0.92598	0.9399	0.95157	0.9614	0.97007	0.97812	0.98335
	PC15	PC16	PC17	PC18	PC19	PC20	PC21
Standard deviation	0.30681	0.28260	0.24372	0.22939	0.22244	0.17652	0.1731
Proportion of Variance	0.00314	0.00266	0.00198	0.00175	0.00165	0.00104	0.0010
Cumulative Proportion	0.98649	0.98915	0.99113	0.99288	0.99453	0.99557	0.9966
	PC22	PC23	PC24	PC25	PC26	PC27	PC28
Standard deviation	0.16565	0.15602	0.1344	0.12442	0.09043	0.08307	0.03987
Proportion of Variance	0.00091	0.00081	0.0006	0.00052	0.00027	0.00023	0.00005
Cumulative Proportion	0.99749	0.99830	0.9989	0.99942	0.99969	0.99992	0.99997
	PC29	PC30					
Standard deviation	0.02736	0.01153					
Proportion of Variance	0.00002	0.00000					
Cumulative Proportion	1.00000	1.00000					

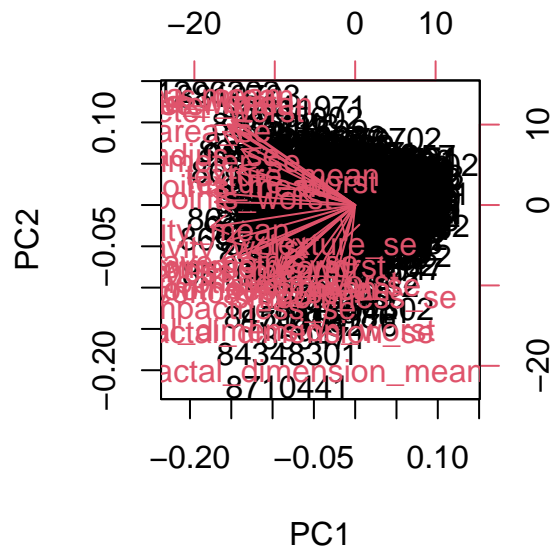
Q4. From your results, what proportion of the original variance is captured by the first principal components (PC1)? **Answer:** 44.27%

Q5. How many principal components (PCs) are required to describe at least 70% of the original variance in the data? **Answer:** 3 PCs capture 72.6% of the original variance.

Q6. How many principal components (PCs) are required to describe at least 90% of the original variance in the data? **Answer:** 7 PCs capture 91.0% of the original variance.

## Plotting the PCA results

```
biplot(wisc.pr)
```



Q7. What stands out to you about this plot? Is it easy or difficult to understand? Why? **Answer:** Difficult. The point labels completely overlap each other making this plot difficult to read.

We have to make our own plot.

```
attributes(wisc.pr)
```

```
$names
[1] "sdev"      "rotation" "center"    "scale"     "x"
```

```
$class
[1] "prcomp"
```

```
wisc.pr$x
```

	PC1	PC2	PC3	PC4	PC5
842302	-9.18475521	-1.946870030	-1.122178766	3.630536408	1.1940594778
842517	-2.38570263	3.764859063	-0.528827374	1.117280773	-0.6212283647
84300903	-5.72885549	1.074228589	-0.551262540	0.911280840	0.1769302185
84348301	-7.11669126	-10.266555635	-3.229947535	0.152412923	2.9582754313

84358402	-3.93184247	1.946358977	1.388544953	2.938054169	-0.5462667446
843786	-2.37815462	-3.946456430	-2.932296681	0.940209586	1.0551135428
844359	-2.23691506	2.687666414	-1.638471247	0.149208600	-0.0403240371
84458202	-2.14141428	-2.338186649	-0.871180715	-0.126931171	1.4261817833
844981	-3.17213315	-3.388831138	-3.117243065	-0.600768440	1.5209521144
84501001	-6.34616284	-7.720380945	-4.338098744	-3.372234369	-1.7087596141
845636	0.80970132	2.656937673	-0.488400053	-1.671096176	-0.2755690974
84610002	-2.64876984	-0.066509405	-1.525113359	0.051216497	-0.3316592904
846226	-8.17783882	-2.698602007	5.725193241	-1.111278747	-1.0425531111
846381	-0.34182514	0.967428026	1.715661982	-0.594479872	-0.4675990720
84667401	-4.33856172	-4.856809832	-2.813639832	-1.453278303	-1.2889287269
84799002	-4.07207318	-2.974443983	-3.122526655	-2.455909915	0.4079831402
848406	-0.22985277	1.563382114	-0.801813642	-0.650010973	0.4942761390
84862001	-4.41412695	-1.417423150	-2.268323145	-0.186108659	1.4226094459
849014	-4.94435304	4.110716528	-0.314472408	-0.088128974	0.0566653163
8510426	1.23597583	0.188049490	-0.592761930	1.594942716	0.4417655273
8510653	1.57677384	-0.572304625	-1.799863016	1.124286473	0.3949222435
8510824	3.55420904	-1.661487969	0.450790799	2.071941593	0.4903150736
8511133	-4.72904972	-3.302058265	-1.465247427	2.039355666	0.0261970715
851509	-4.20482441	5.123858059	-0.751740573	-0.861951843	0.4705538779
852552	-4.94528075	1.542395143	-1.711687827	0.046718059	1.7377012054
852631	-7.09232236	-2.016835734	-0.028984132	2.585675482	2.0375470912
852763	-3.50717666	-2.169715994	-3.891122637	-1.294620549	0.0681580703
852781	-3.06136021	1.874902631	2.579478032	0.128371462	0.1165625639
852973	-4.00374127	-0.536769860	-2.759197831	-1.896718595	0.5252107652
853201	-1.71380176	1.522365502	0.146058578	1.909706071	-0.5356519265
853401	-6.05411853	0.756511800	-0.348932376	-1.063281958	0.7454493340
853612	-2.89968469	-4.001774373	-2.998823809	-0.325030387	0.8546038749
85382601	-4.55077848	-0.337239419	-0.753637681	-0.699714306	1.5471839770
854002	-4.98621538	1.131593223	-2.575118337	-1.216191663	-0.6693259394
854039	-2.98271631	-0.757756497	-3.490690279	0.054212589	-0.1669530505
854253	-2.76393718	0.354044421	-1.895295337	-0.533786198	0.8832432812
854268	-1.29505925	-0.912393466	-1.574383382	-1.042249570	-0.4143571251
854941	3.74601730	1.412230504	1.730784885	-0.564945456	-0.0802687991
855133	0.99719148	3.348346731	4.301788720	-0.560716245	0.4639645611
855138	-0.76459136	-0.885464837	-2.702540362	-0.274538185	-0.8097169787
855167	2.14906252	1.922300194	-1.179446370	-1.112219391	-0.4480774771
855563	0.09324934	-2.258764532	-1.903051997	-1.441039161	1.7038647386
855625	-9.08001023	-2.016898441	2.139343894	-1.068304028	-0.7972299505
856106	-0.98958304	-0.984064148	-2.308702241	-0.276582144	0.6399478981
85638502	0.29328849	0.136978564	-3.299029123	-1.008898141	0.0224910920
857010	-5.37620991	0.134758404	-1.677366657	1.506369463	-0.1518645822
85713702	4.57790860	-1.482915508	0.042037623	0.295968708	0.7132249498

85715	-1.69851237	-2.350203862	-3.075383081	-0.065962912	1.0555376469
857155	2.13456708	-0.095745364	-1.491099878	1.120077655	0.0679774156
857156	1.56610099	1.207370855	-0.368834570	-1.474331566	-0.1725985690
857343	3.53979091	1.281368110	1.017315805	-0.607621596	0.2194428358
857373	3.15503795	1.687473796	-0.495857416	0.193841543	-1.4386516886
857374	3.44745515	0.497780720	-0.152383875	0.574980496	0.0522688899
857392	-3.29964761	1.129943574	0.825666100	0.981853085	1.1942122234
857438	0.67402621	2.114549137	-1.394992302	-1.042221635	-0.2416042153
85759902	2.85564577	-0.152588874	0.428557855	0.482635650	1.5092086632
857637	-4.64465207	2.308301508	-0.728168145	0.639379104	1.1573061797
857793	-2.17494916	-0.971261438	-1.942179421	-0.736670095	0.3954358798
857810	3.71818738	1.786070097	1.278807604	0.115464169	0.5258196576
858477	4.13232693	-2.401679261	-1.241865694	2.046545722	1.1646276518
858970	2.38373822	-2.755233814	1.213018303	1.792911568	3.3352233901
858981	2.57661610	-3.135912650	1.399049169	-0.763194998	2.7816479152
858986	-4.75492832	-3.009032875	-0.166094576	-0.605295233	-1.1406976712
859196	2.31209785	-3.265116721	2.793766025	0.565229094	0.3814984103
85922302	-1.69012080	-1.539322116	-1.798262954	-1.389367072	1.2116088977
859283	-1.81071217	-0.722104815	-1.464960560	-1.197676214	1.4267861675
859464	2.78347559	-2.308617372	0.472309720	-1.605747397	1.6114402596
859465	3.51555502	0.657730736	0.590855071	-0.010793189	-0.0205709988
859471	-4.32619605	-9.194435552	1.491650337	0.319666023	-4.7240139158
859487	3.25841241	0.937013647	0.204949679	1.089113223	0.4599452518
859575	-2.70221851	4.433240985	0.307075192	0.488263229	-0.3721675732
859711	0.30758513	-7.381317396	3.815728542	2.131680166	-2.7083196796
859717	-5.49886689	-0.937500513	-2.208188675	-1.522456429	-0.9240784393
859983	0.36139121	-0.119633821	-2.039161544	1.057953093	-0.7564437850
8610175	2.62766457	0.696696349	-0.583428281	0.337884296	-0.4671344130
8610404	-1.42691206	1.965372092	1.110961327	0.752248984	0.5394071070
8610629	0.83378424	-1.963876860	0.789737653	3.434609101	2.3524809639
8610637	-6.22541880	-0.919260690	0.089748341	2.536926544	-0.0620812262
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8610908	2.01980045	0.254675746	-0.647302452	0.059199217	0.0547996477
861103	1.63694460	-1.714440587	0.433824539	-1.526622964	1.7678261507
8611161	-1.16643527	-2.512305286	-1.904043397	0.637750373	-0.2359734956
8611555	-10.75977535	2.255997858	0.038801648	-0.389043228	-1.1862447821
8611792	-5.03038488	-0.773728357	2.679979922	-1.665039071	0.3113456414
8612080	2.17255269	-0.496441169	-0.948257444	0.207037052	0.8845677371
8612399	-3.28534463	1.666770480	0.146802675	0.437108401	1.3673667927
86135501	-0.60707378	-0.162071919	1.635935419	-1.113531850	0.5403198078
86135502	-3.58041324	2.204721916	-1.703037100	-0.800589442	-0.3650009185
861597	0.93333687	-0.926885919	-0.040128345	-1.352209082	-0.0648850467
861598	-1.25849730	-1.014684255	-0.080521995	2.049531496	-0.1373994614

861648	1.58686770	1.618232954	0.309726682	-1.091038889	-0.0537268234
861799	-0.25227559	0.530884425	0.588809736	-0.110441165	-0.4283042881
861853	2.84492835	2.891103732	0.527524677	0.598290300	-1.4344348070
862009	1.96322268	0.964308498	-0.081136715	-0.093998029	0.5495403920
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86208	-4.39236314	2.121640892	0.579000549	-0.776729960	0.3035669597
86211	2.58980407	-0.213446120	1.034701089	0.661423462	0.5402889624
862261	3.90090576	-1.189020421	1.550616806	-0.934952821	0.7074978792
862485	2.81575365	-0.367560567	-1.350247556	1.736886645	-0.2840715251
862548	-0.61573908	-0.638349988	-0.199743121	-1.096533937	-0.1185853914
862717	0.43247968	1.390820523	-0.082646762	-1.933578565	0.0344302397
862722	4.55102442	-3.525683788	-0.215074716	1.090925794	2.7559240651
862965	3.44515217	1.423370040	-0.088646005	-1.709223842	0.1065229834
862980	2.11410008	-1.847747782	-0.556184595	-0.463948150	0.4744968363
862989	2.68898618	-1.418813334	0.968298772	-0.002857011	1.2554137475
863030	-3.21109134	-4.043198634	-2.712997305	1.327457319	0.2214783192
863031	0.74861266	-1.796058175	-0.567866143	-0.560006237	0.9322757208
863270	3.15622889	1.034838878	-1.489373670	-0.592646911	-0.5136339075
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864033	2.49063954	-2.596401708	1.668257671	0.632929090	1.1557305724
86408	0.10325957	-2.278139015	2.107708229	-0.351536677	-0.6219347413
86409	-3.58813694	-3.922881433	2.045207163	-0.231562584	-5.4604591892
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864496	2.50791098	-3.248461200	-1.686140767	1.188915291	0.4551865326
864685	2.04423086	-0.304616836	-0.533369397	-0.489411120	0.0678524055
864726	2.09522559	-3.663872062	3.629007335	1.538433194	-2.2345636748
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866203	-1.91744627	3.534971966	1.253821297	0.335703696	-0.5885511025
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866674	-4.63960895	1.480714297	-1.169651383	-1.217534223	-0.1779160105
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8670	-1.43081046	1.048681220	-1.260901861	0.532720319	0.6261456617
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868202	1.97510247	0.419018755	-0.380240597	-1.737931013	0.3083668329
868223	2.59850310	0.481911436	1.870726668	-0.437633248	-0.0160686443
868682	3.25514318	0.417953651	-0.691197447	0.659273518	-0.1214593563
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869691	-2.39788795	-4.833735642	-1.027253164	0.342615376	2.3897699977
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87106	3.74011364	-0.250281306	-0.097297641	1.930448497	1.0426741051
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8711216	0.75094226	3.067949187	1.447907672	-0.952587697	-0.8911446262
871122	3.65143365	0.674055644	-0.906188637	1.509832817	-0.2935538042
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8712289	-5.48932277	4.162167037	-0.600732185	0.149568094	-0.6250164993
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8712729	-1.21256768	2.037246395	0.979834026	0.238756035	-0.0856932721
8712766	-5.06520424	1.783582969	1.172615291	-0.693122956	-0.6480853131
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87164	-2.81688978	-1.263990953	-2.151251366	2.706077979	0.0400092558
871641	3.48092345	-1.618268077	2.673117328	1.252511728	0.5984548400
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872608	-1.16986842	-7.008319996	4.268106508	-0.332347396	-2.9068870248
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873357	4.97132782	3.383227983	0.439451738	-1.576183104	-1.0328868993
873586	4.06045289	1.245070643	0.573972801	1.703893823	-0.6153230400
873592	-9.50430706	5.598558052	-0.636679193	0.224024081	0.4061861282
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875093	1.71622508	0.542688019	3.295475582	-0.087253972	-0.0840995519
875099	5.56084294	0.477427493	4.123834207	-2.350422636	1.0515357688
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8810987	-1.31690973	-2.152585453	-1.785061911	-0.010160725	-0.1670054272
8811523	0.38841453	-2.274796314	0.626780574	-0.429349217	-0.1192752256
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8812816	2.37141521	0.732757814	-1.524685925	1.851700285	-1.1820779548
8812818	0.96634003	-0.438052741	-1.446423567	1.988611655	0.0938834761
8812844	2.97318270	-1.809381711	-0.223238842	0.391290904	1.5280262811
8812877	-1.80166175	-0.166314618	-2.626288708	-0.643175553	0.5214235661
8813129	2.47618073	1.417329346	-0.316254972	0.328213945	-0.6614306092
88143502	0.82531310	1.249148354	0.267725157	2.308595141	1.0139214702
88147101	3.89127342	-0.538097276	-0.880783727	1.037886765	0.8083176466
88147102	0.38923560	0.613875324	-1.351679911	1.174159176	-1.7883197584
88147202	1.45604019	0.201549415	-1.097912687	-2.004011649	-1.4772623926
881861	-2.75314552	-3.462726769	-2.471875866	-1.007392449	-0.1549996143
881972	-3.25439115	0.125090426	-2.893551435	0.748931137	0.3525453547
88199202	4.01560693	1.353056834	-0.360155815	-2.633480577	-0.7345986421
88203002	3.67318128	1.290493562	0.424237023	-4.597664394	0.7402578603
88206102	-3.31340866	3.935689268	-0.205273062	-2.116361469	-0.9691280654
882488	4.03305870	-1.161524089	0.189581014	0.939690169	0.5651016963
88249602	2.33218128	1.347793816	0.232482459	-1.211847619	-0.0515295475
88299702	-8.39645911	4.150252991	0.046927784	-0.551357625	0.2878270868
883263	-2.64524110	3.947699392	1.370675284	0.207636553	-1.4038189712
883270	0.68116951	1.134992457	1.232581929	-3.861102774	-1.4270964368
88330202	-3.34735048	2.152675899	-1.107968825	-4.345184373	-0.0623295495
88350402	2.22576208	1.213931555	-0.192244621	1.469984705	-0.0196978073
883539	4.47364832	1.739598699	-0.887426246	0.763980319	-0.6046080177
883852	-1.32145867	-4.785266054	-0.661952674	-1.020298051	-2.1481343740
88411702	1.84846341	1.582735509	1.262806090	-0.801397452	-0.7107861777
884180	-3.79222888	1.025330459	0.897845626	-0.759791922	0.7571812276
884437	2.27931254	-2.075859442	2.428512195	-1.185017124	2.8564899050
884448	3.22593164	1.171043084	0.264431658	-1.002062865	-0.8936812738
884626	-1.02499890	-2.359186109	-1.615464155	1.144955805	-4.1408350383
88466802	2.58028546	-0.728572047	-0.547660903	-2.330028998	1.8336515859
884689	2.48369783	-0.460191483	-0.598393817	0.997839640	0.4299455562
884948	-7.13756174	2.073018195	1.087430513	0.715703759	-0.8191801992
88518501	3.02981522	0.648897838	0.310409540	0.579772365	0.7322406058
885429	-7.07878207	-0.527758800	-1.278861780	0.650990489	-1.8521950854
8860702	-1.31294375	1.773865017	-1.671161321	0.694009370	-0.1127114795
886226	-3.70838653	2.805008998	-1.754649703	0.903310417	0.0709235923
886452	-0.46007427	-0.393819769	-1.003815294	1.074442849	0.4271589571
88649001	-6.38703001	1.821491443	0.479427881	-1.694969593	-0.5561879657
886776	-5.25092469	-3.891107226	-0.833120389	1.680122512	0.7836374535
887181	-8.72618338	-3.276993966	2.901146761	-0.276944482	1.0609133753
88725602	-3.68807276	-1.064709236	-3.512498419	-4.769000799	0.8017786584
887549	-3.37528098	3.368264175	-1.765224543	-2.076130195	0.5972560049
888264	0.83947101	3.497008034	0.182323228	-1.241480335	0.1084218681

888570	-3.28148526	0.989802279	2.552140777	-0.122718992	-0.3505294554
889403	1.90709089	3.119201237	-1.062121558	-1.061133233	-0.9564549675
889719	-1.61336234	2.472397898	-1.989384336	-0.378757895	0.4428590571
88995002	-6.61390681	5.997998811	0.988507976	-2.884219766	1.6938934564
8910251	1.46338831	-1.685149061	1.168877382	0.325375950	0.4644646263
8910499	2.01038350	1.102516460	1.336847795	-1.614259260	-0.6911126965
8910506	2.28233204	-0.009485293	-0.450043551	0.295519714	0.8031608330
8910720	0.73909276	-3.149749158	1.468565664	-0.314616789	-0.9468561582
8910721	4.50260070	3.166486414	-0.187896260	0.390816184	-1.3839888843
8910748	3.15597737	-0.409941090	-1.107842420	1.969885542	0.0585356134
8910988	-7.66940121	3.072602737	1.480656591	0.551916238	-0.8854262609
8910996	3.63593673	-1.588189625	0.715650110	0.669795890	1.5759444757
8911163	-0.33704893	3.141609173	-0.115619749	-1.813699425	-0.0352621513
8911164	1.27546111	-0.848306563	3.067369195	1.165472001	2.6757698121
8911230	4.34219338	0.321694999	0.388133185	1.106173921	1.5020111044
8911670	-0.01741547	3.456302110	0.306650981	0.475151814	-0.4003842967
8911800	3.48935577	2.631766723	-0.072124181	-0.307707020	-0.5245541387
8911834	1.86490793	0.901271186	-0.870402828	1.027910020	0.2316732520
8912049	-4.95590744	1.339944038	-1.455772409	-1.466907423	0.6119216765
8912055	2.46855062	0.137904923	1.793307382	1.546266616	0.6967490495
89122	-3.78173258	1.900235409	-1.742708503	0.391939754	0.3389814297
8912280	-2.63493731	-0.576647607	-1.992946242	0.272309546	-1.1957159307
8912284	1.37147827	-0.005800358	1.547927203	0.583925361	-3.0022368265
8912521	4.13524399	1.375298123	0.877276691	-0.059803630	0.5970712749
8912909	0.68633639	-1.693519506	1.025310679	-0.874708540	-2.1727638053
8913	4.30833870	1.976746804	-0.251085558	1.573526614	-1.9816674884
8913049	-0.40295486	-3.720160654	4.582436940	0.215721385	-0.8070907499
89143601	3.00096526	-0.353848878	1.232930128	-0.716826045	1.3114083326
89143602	-3.13125303	-4.269702670	5.861122345	0.596058607	-4.1973346842
8915	0.41746954	0.807865734	-1.092330348	-0.089650892	-0.2568431865
891670	1.41897459	-1.392752638	-0.836251021	1.104473313	0.3640802623
891703	2.86806475	0.268408338	-0.468574962	-0.245287741	0.5574288140
891716	3.36288672	0.806890637	-0.806369895	1.662223414	-0.0505417655
891923	3.31208587	1.440908382	-0.583119519	1.783361666	0.0192555651
891936	4.76551701	0.542484530	0.893082182	1.729539559	-1.0008319932
892189	2.38378528	0.823391074	1.982219343	0.055206875	0.5052838506
892214	2.78464581	2.530807159	-0.883257225	-0.259446372	-1.6463839898
892399	3.39085817	-0.753301131	1.770235939	-0.276430081	1.0849483019
892438	-6.58444233	1.483557076	0.361022239	1.187401386	0.1208047145
892604	1.45405111	-0.591422478	1.145332613	0.078947827	-1.0867825344
89263202	-7.17661843	-0.055097580	2.011148288	0.082703332	0.6651964595
892657	3.57568917	-0.890799182	0.261257526	-0.253872371	0.5990662990
89296	3.05434514	0.179055836	0.621226832	0.261168580	-0.8959467593

893061	3.07173303	0.305789373	1.258146621	-2.206685025	0.6058786167
89344	3.85015201	1.523386003	-1.143503482	0.814334011	-0.4926180820
89346	5.38551771	-0.555766489	0.559577694	0.471440565	0.3994468273
893526	4.65358767	3.062692587	-0.075942289	1.507190163	-1.2716964644
893548	4.02400169	2.540671520	0.352906609	1.513056174	-0.6669118526
893783	3.34487880	0.068502773	-0.269955756	-0.627084568	1.1246979202
89382601	3.29694105	3.135950089	0.148761476	0.741837997	-0.3941040424
89382602	2.13452598	0.004388987	-0.055090483	1.786540911	-1.2993021931
893988	4.03446724	0.240486452	-1.326959165	2.438086999	-0.2771454326
894047	3.76210430	-4.394333943	3.946735131	-0.306998155	4.7854456445
894089	4.86695697	2.337158334	-0.168146877	0.694278950	-0.8202171408
894090	4.74307511	1.796820963	0.169570993	1.550246788	-0.5346670358
894326	-1.89365006	2.390134936	-1.675017462	0.711402276	-0.3830648490
894329	-1.57154834	-6.503377021	2.165253786	0.030049446	-1.0524851013
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894604	1.29372783	-3.467757378	1.108552569	0.766005357	-0.2103251163
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896864	0.52723271	-1.264758769	-0.919631937	0.429094010	-0.5602900988
897132	3.21067592	-1.102473082	1.610564041	-0.486005834	3.4562087554
897137	4.38256677	0.760434627	-0.400245248	0.586341023	0.3762481427
897374	3.80666840	0.909118626	0.442778081	-0.949587668	0.3513268837
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89813	-0.29505357	-0.226735533	-1.088458865	0.946589841	-0.7284538257
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89827	2.07535283	-1.804931340	-1.166053416	1.141225718	0.4132078419
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89869	1.20553704	1.315886497	-0.929922572	1.703291193	-0.7180879050

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899667	-6.17684877	-5.103514894	0.520682438	0.939912167	0.6059916654
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901028	3.19111003	1.847526445	0.099310968	-0.022762481	-0.1788449118
9010333	2.99060189	-1.629958015	2.554470244	1.344703963	-0.0407045185
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9010598	2.39655663	0.250524355	-0.326850211	-0.277129058	0.3545026443
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904969	3.64405137	1.240273815	1.385405524	1.612540488	0.1728393129
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905190	1.34966974	-0.369249002	2.484489568	-1.139714833	-1.9041890533
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905502	2.92861019	0.494421191	-1.016176763	-1.684940447	0.5652328718
905520	2.92380175	-0.377000536	-0.886014238	-0.115243469	0.9848137147
905539	3.99267514	-0.959012260	0.204224433	-1.508902626	-1.7077458028
905557	-0.15500167	0.437623166	-0.461040030	-1.453254393	-0.8550878945
905680	0.93326963	2.104094210	1.431657320	-2.891717258	1.2742945854
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905978	2.62003325	-2.499901968	2.432858840	-1.876362157	3.1480466996
90602302	-5.99833869	0.090949196	1.709697317	0.946542059	1.1740030698
906024	2.91930912	0.009204582	-0.900511128	1.789753754	-0.5764724361
906290	3.33900683	0.022205192	0.502858739	-1.141258134	1.5633857813
906539	2.01314368	-0.777767778	0.125468395	-0.659155792	0.0219104429
906564	-1.98671401	-2.314011967	1.235217081	1.768220225	-0.1438692164
906616	1.66813615	-0.861560770	-1.009417991	1.322731355	0.2813203167
906878	0.37085180	-0.113512779	-0.997485893	-0.155233295	-1.4746581730
907145	1.84733447	-2.538995601	2.003584668	0.483946194	3.5055609223
907367	4.69890766	0.431922385	0.005300424	-1.369403704	0.0850247711
907409	1.28205907	-2.548666752	-0.083786622	0.770833997	-0.5564209652
90745	2.31221232	-0.401678043	0.274381769	-1.668994639	0.5362392557
90769601	4.65498928	0.781611021	0.191953023	0.493247906	-0.5356508029
90769602	3.94000659	2.028231657	0.691127602	0.512954900	-0.3398155529
907914	-4.94550694	-3.003421435	-1.752529645	-0.671769430	-2.8622552978
907915	0.91499842	-2.476833776	0.362287911	0.261736218	-0.1383500423
908194	-4.54511193	0.815283142	-0.518299038	0.915534201	0.0714231738
908445	-4.43843746	0.991566424	1.441051113	-0.574529073	0.3572756344

908469	2.19305464	1.803766114	-0.434726892	0.953104432	-0.5533135626
908489	-0.66385679	-0.436476802	-2.678425146	-0.728585540	0.0277629459
908916	2.23890605	0.454189872	-0.465118333	0.188558748	0.8275650396
909220	2.12331215	1.193746541	0.489940891	0.854644353	0.1058427332
909231	2.61301823	1.830449830	0.763657618	-0.822442197	0.3005228170
909410	3.20814515	2.233177743	-0.166078298	1.129064342	-1.2590809462
909411	0.30648073	-2.183077955	0.039251705	-0.486027975	-2.0876130896
909445	-2.47018342	1.498506224	0.590933256	-2.265358224	-1.4046042766
90944601	3.45168126	2.134583340	0.196989342	1.532828161	-0.9420463979
909777	3.89709781	-0.730133530	2.134193239	-0.780486142	0.8318195830
9110127	-0.98086448	2.208486712	-1.698424795	0.970118413	-1.1822180725
9110720	1.25614629	-1.066752885	0.259247160	-1.240660490	0.3928701037
9110732	-3.24256054	1.776795240	-1.791577273	-2.482874793	-0.5498682865
9110944	1.55585043	1.037014643	-1.300101127	0.621126067	0.3790198963
911150	1.24815985	1.587442008	-0.326126484	-0.924508658	-1.5340001134
911157302	-4.32784530	4.045772565	-0.192336290	-0.290357973	-0.6103038017
9111596	1.07650412	-1.802032564	1.779475879	-1.627520204	-3.7384644652
9111805	-2.50954497	2.526584455	0.797500590	-0.822950476	0.4288865709
9111843	2.21514321	-0.029865010	0.635900610	-3.373732618	-0.4795727546
911201	1.17279871	0.474422064	-0.481147553	2.142074589	0.2430866392
911202	2.83380799	1.017230750	-1.485323075	0.456004436	-0.1146041549
9112085	1.85545330	1.570011674	0.825756166	-3.926794310	0.2206325260
9112366	1.32744636	-0.776412499	1.255653387	-3.782215661	1.2439684480
9112367	2.80030738	1.664836753	-0.193847761	-2.231144249	0.2050662449
9112594	3.17177797	2.073908798	0.074834422	-1.868185223	0.2091427763
9112712	4.08348433	0.484283961	0.630808963	-3.399741429	0.0182086861
911296201	-3.47243837	1.671413723	0.856073545	-1.155750941	1.3813559853
911296202	-16.30488665	7.769016888	6.229933870	2.326026514	1.7079531344
9113156	2.55786437	2.491852880	0.170162861	-2.107901855	-0.9783779753
911320501	2.96627878	0.068786611	-0.777727248	-0.046625788	-0.2280062503
911320502	2.75500634	1.792341696	-0.757147909	0.024097077	-1.2827836689
9113239	-1.36913518	-2.108156394	-0.852969723	-0.723132156	-3.8210171185
9113455	0.41729731	-0.116417262	-0.535671262	-0.363878888	-1.5121265752
9113514	3.83502421	-0.898388162	0.699948069	-0.219746414	1.3359873635
9113538	-5.92575082	-1.227216861	1.720074272	-0.473165926	-2.8810043579
911366	-0.64491119	-3.422999542	0.607750202	0.234280083	1.2086350824
9113778	2.68148698	-1.442286469	0.339105123	-0.244601788	0.7919949893
9113816	2.03986918	0.902461858	2.840741857	-2.883294431	1.0158156443
911384	1.39806620	1.770668244	-1.478260847	1.306959009	-1.8037276563
9113846	3.53330636	1.245758018	3.382434941	-4.661948944	1.8740788308
911391	1.98877953	-1.897792693	-2.029212586	0.911103793	-1.2304717877
911408	1.99642872	0.206189711	-1.639882150	1.038296903	-0.9034160493
911654	0.52020039	0.972512103	-0.323850426	-0.543521127	-1.4281800593

911673	3.16958159	2.087215768	-0.977945244	0.386756799	-1.4182276802
911685	2.20077374	-1.284908734	-0.886619084	0.700486694	-0.1796630638
911916	-3.82107090	-2.303209735	0.027521977	0.669669644	-1.2886313605
912193	2.98286009	0.672747298	-0.589970772	-0.593827781	-0.4615631694
91227	2.47887396	2.361880555	-0.432234246	-0.383132558	-1.0372087673
912519	1.27099312	-0.509385643	-2.237023334	1.670906156	0.1175030515
912558	2.23319191	1.297562775	-0.900644424	0.433712494	-0.1827652155
912600	0.05613371	0.227183495	-2.253532782	2.708217480	-0.8010805172
913063	-2.31535334	-4.385275755	1.776847691	0.968563355	-2.6430509823
913102	2.28232306	2.464672105	-0.820466562	-0.040767325	-1.0918206156
913505	-4.75043499	1.488114177	-1.252648906	-0.052540766	0.0965398306
913512	1.72479328	-0.997300316	-0.080167877	1.063711106	1.4343549437
913535	0.74112965	2.449879331	-1.995953713	-0.457537180	-0.2610613824
91376701	2.89176621	0.977084588	-0.804935982	-1.719266485	0.0289580691
91376702	1.65306732	4.551659142	0.751661685	1.646873743	-1.4018393993
914062	-3.10079133	1.235066483	1.286223339	0.608113830	1.1212732858
914101	4.06069761	0.560461075	2.174771231	1.374658804	-0.1992898120
914102	2.79087498	1.076940539	0.843799658	-1.109231547	-0.0048653882
914333	1.47362330	1.589695437	0.319710133	-0.798129881	-0.1579186103
914366	0.22919297	-1.514570755	-2.214334625	0.555081328	-0.2509810467
914580	2.55101378	0.763228924	-1.607988258	0.059875184	-0.5054003068
914769	-3.71243855	1.057755506	0.521494703	1.395773631	-0.3682903454
91485	-5.09036286	2.017432706	-0.708746074	-0.082722167	-0.3834794788
914862	0.60008810	0.837717560	-0.686437977	1.154318132	-0.9815689274
91504	-2.78794673	-3.382584454	-0.752414277	-1.332009710	1.5841377430
91505	1.40753273	-1.504446838	-0.353584900	1.120754558	1.8100776146
915143	-7.25279714	5.490904302	1.909245947	1.894050092	-0.3960294570
915186	-1.29772469	-7.723057325	-0.688309017	2.890184346	2.0135831354
915276	-1.07574673	-8.287483337	0.433810751	1.952471847	1.3946448821
91544001	1.24866183	-1.594281055	-1.355282076	0.126156474	-0.0233994859
91544002	1.25582341	-4.113567176	-0.412366931	1.053246923	1.1385251781
915452	1.16550969	1.664229389	-0.737229323	1.760617958	-0.7377031703
915460	-4.09054331	-2.800463137	-0.506987325	-1.975580106	-0.1327084112
91550	1.88597978	-1.670721680	0.119692299	1.217144238	-2.5658122684
915664	2.76500279	2.159148972	-0.021077623	1.608860107	-0.7157489170
915691	-2.22503669	-1.939927827	-2.283594176	-0.339561903	0.5363853531
915940	1.13058210	1.409761524	-0.564556376	1.993206904	-0.5280229629
91594602	0.73312738	1.941988438	-0.274994234	-0.337526159	-0.6604100570
916221	2.33161916	-0.789451973	-0.349735677	0.440471990	1.4212995780
916799	-2.69485257	1.942001189	-0.959719996	0.459104689	0.5839845732
916838	-3.37604410	2.331377578	-1.200875536	0.553126259	-0.5274167311
917062	0.19969487	-1.075413752	-0.672557052	0.627893020	0.8395117260
917080	1.17499204	-1.010481061	-0.711142576	1.065131254	1.4206509043

917092	1.29150016	-4.959860548	0.345622908	2.238565182	3.8371535988
91762702	-8.62316838	3.456410638	-0.178899380	1.176129200	0.0228851505
91789	4.42556234	0.785345015	-0.473002900	-0.696004578	-0.1037131678
917896	0.61929383	-0.635789842	-0.488421490	-0.015141135	0.1063131129
917897	3.24945659	-1.284794677	-0.218284421	0.307537632	0.0993416275
91805	3.34997942	-2.670950443	-1.777523046	1.388364375	0.3541295063
91813701	0.85904712	-0.096763381	-2.811570840	0.184161855	0.6295214724
91813702	3.15384692	0.870776432	-2.193784489	1.448593014	-0.4310565911
918192	-0.34622347	-1.539870352	2.843951628	1.908132516	0.5713316529
918465	2.45924278	-0.600319751	-1.170435277	2.209110148	0.6913036191
91858	1.52875558	-0.404861554	0.603933344	-0.346866279	0.7853562456
91903901	1.77202587	-0.803503014	-2.026135257	-0.686728928	0.6155504122
91903902	2.67808519	1.483403662	-1.740162222	1.022590841	-0.2972072410
91930402	-4.02489378	2.938844225	1.658026507	0.224969353	0.5131432277
919537	2.13447312	-1.517245623	0.178807901	-0.500336469	-0.6824469628
919555	-5.16086993	2.380108987	-0.421906048	0.882650977	0.2092240560
91979701	-0.53546080	-0.380380451	-0.442745212	-1.877719723	-0.2266699710
919812	-0.34282174	-3.531373815	0.069607554	-1.549307121	1.9552004887
921092	4.19339024	-2.365311059	1.325978010	-2.037710987	1.7603677988
921362	1.14182718	-5.594535868	1.299893249	-2.186325923	-0.7649016389
921385	1.66401100	-2.387517361	1.500928782	0.875181074	-0.4841195986
921386	-1.01082308	-1.091429307	-0.632142163	-1.756972472	-1.0459061568
921644	1.29978604	1.819814057	0.372979316	-1.846544182	-0.1994515741
922296	2.37134219	1.680097929	0.384190094	-3.014076570	0.0382130321
922297	1.66440651	0.213774641	-0.147942249	-0.196878516	-0.5559910407
922576	1.92598353	1.136739705	0.477781900	-1.156482818	0.2021640255
922577	4.23349159	-0.184110499	-0.326131445	0.587786142	0.7040073381
922840	2.67551655	-2.313756961	-0.053800867	0.340150357	-0.4502519824
923169	3.83312511	-0.495813665	0.922428047	-0.551386509	-0.0799652223
923465	2.54919727	-0.228129228	1.412934778	-1.969057256	1.4550448383
923748	4.69079604	0.766803238	1.542607509	-0.778334167	0.7842069600
923780	2.02325691	-1.260133116	0.504482203	-1.134529125	0.1141621816
924084	2.89340232	1.450359601	0.779859803	-2.967836815	0.3568359788
924342	3.49912218	-1.799249342	2.764024589	-0.865545694	0.6248149194
924632	2.15201013	0.829339088	0.564300199	-3.009108230	-0.5653278607
924934	2.05327740	-1.615038205	1.837342797	-3.110797801	-0.2108571316
924964	3.87388097	-1.083301553	1.858308794	-0.433358360	1.6859553304
925236	4.06028949	-0.122061034	3.235925374	-3.466133119	2.2399371646
925277	0.09858059	0.213372093	0.388587548	-1.011820230	-2.9864399976
925291	1.08841850	-1.291711328	1.428122289	-3.369171941	-0.9465087393
925292	0.48134743	0.177863190	1.031200235	-2.008512908	-0.3268156112
925311	4.86602793	2.129232607	3.411187296	-5.129474909	0.4884909563
925622	-5.91241029	-3.479575000	-3.259923297	-3.914141413	-1.7148732547



926125	-8.73365338	0.573350185	0.896301447	0.384811315	-0.6784463175
926424	-6.43365455	3.573672989	2.457324373	1.176279049	0.0747585153
926682	-3.79004753	3.580897052	2.086640366	-2.503824654	0.5102735378
926954	-1.25507494	1.900624364	0.562235817	-2.087390339	-1.8084001296
927241	-10.36567336	-1.670540206	-1.875379194	-2.353959892	0.0337122683
92751	5.47042990	0.670047220	1.489132801	-2.297135901	0.1845409324
	PC6	PC7	PC8	PC9	PC10
842302	1.410183639	2.1574715203	0.398056982	-0.156980233	-0.8766305374
842517	0.028631162	0.0133463502	-0.240776600	-0.711278966	1.1060217613
84300903	0.540976145	-0.6675790845	-0.097288135	0.024044486	0.4538760367
84348301	3.050737497	1.4286536346	-1.058633755	-1.404204115	-1.1159933184
84358402	-1.225416405	-0.9353895017	-0.635816609	-0.263573547	0.3773724202
843786	-0.450642134	0.4900139551	0.165298432	-0.133355760	-0.5299649041
844359	-0.128835073	-0.3013023315	-0.083624609	-0.079954220	0.2189506984
84458202	-1.255934103	0.9732434974	0.652763899	0.247965464	0.9997064885
844981	0.559052820	-0.2149145974	0.686736938	0.511473855	0.0291618051
84501001	-0.723272337	2.5176245802	-0.364827879	-0.716766009	-1.1646060593
845636	0.127219899	0.6244628561	-0.165603833	-0.301115608	0.3759046163
84610002	0.764194227	0.6655068738	-0.619000411	-0.400588340	-0.3307781202
846226	2.592290301	0.9406696600	3.318863750	-0.747130974	0.3955980681
846381	1.006774257	-1.7974995418	-1.105684467	0.267389882	0.4391951701
84667401	-0.349408795	0.7422274132	0.280679206	-0.674510305	-0.1155553104
84799002	0.495342130	0.9142524133	-0.302257713	0.456538430	0.4467643551
848406	-0.761520960	-0.0867706702	-0.029483040	0.502783775	-0.4992331367
84862001	-0.751827782	0.4415962916	0.413405991	0.018656683	0.3563165037
849014	-1.136688687	-0.2510619539	-0.741499503	0.410086322	-0.5708248435
8510426	-0.048594023	-1.2006310194	-0.403270875	0.404944121	0.0059203674
8510653	0.430462491	0.3381860916	0.861201670	-0.187036602	0.3606065559
8510824	-0.769391365	-0.1908707908	0.244247147	0.546415425	0.0076299444
8511133	3.020386239	-1.0062943167	-0.104544724	0.168363304	-0.2454047607
851509	-0.595316618	-0.0747626295	-0.180094245	-0.363806008	0.6909368005
852552	-0.812165001	0.7996017629	-0.419539913	0.810965561	0.0214595144
852631	1.183160422	0.6013244034	1.306262282	1.100042783	2.2842657360
852763	0.786665153	0.2896641020	0.495541562	0.113090873	0.2951812417
852781	-0.906797174	-0.6452669891	-0.340174492	-0.043873679	-0.3961957456
852973	0.192679233	0.1609885641	-0.378501497	0.356974453	-0.5691360315
853201	0.036227947	0.1838685926	0.218709799	-0.381333094	-0.0364970759
853401	0.241867529	0.4615706215	0.291813749	0.284492214	0.1182178679
853612	1.233593969	1.9763494638	-0.202453666	0.564148659	-0.2297663753
85382601	-0.190839648	-0.8888020606	0.243842164	0.442519010	0.1433737325
854002	0.267243832	1.0317090641	-1.141727259	-0.566293378	0.2446991603
854039	1.000905829	0.7700944229	-0.210139235	-0.585132155	-0.0747302216
854253	2.009267717	-0.7199616429	-1.411392236	0.196789071	-0.7431027433

854268	0.568095150	-0.1425954318	-0.488198042	0.390894097	-0.3824484486
854941	0.290013739	-0.8043318792	1.707341340	-0.891664549	-1.0876247249
855133	-1.493142577	1.2791292757	1.498249655	2.100532774	0.0114924931
855138	-1.036438899	-0.1775681622	-0.198083551	0.431153558	-0.4385877226
855167	0.928295680	0.0418357439	0.048599880	0.666574547	0.3902914311
855563	-2.120772389	-0.4965417472	0.484027443	0.912512891	-0.4303234931
855625	4.307303747	0.4337837927	-1.387017258	-0.352517752	-0.9339783433
856106	0.242568260	0.6132339088	0.067809257	0.282512565	0.1518262957
85638502	0.110049368	0.2333988676	-0.174872997	0.544441256	-0.2067359385
857010	0.423532149	-0.7874816331	-0.790091300	0.111457042	-1.0551322678
85713702	0.575420451	0.2230057137	-0.867569780	0.328258562	-0.1456716219
85715	-0.281861620	-0.1604792421	-0.018943396	0.591809797	-0.1053337966
857155	-0.692882067	0.1971605392	0.040044188	0.419441177	-0.6168907916
857156	0.544804546	-0.6838772921	0.555862941	0.605703404	0.1987895162
857343	0.266013819	0.4536379429	-0.123851495	0.259381187	-0.4343429520
857373	-0.256313209	0.4449438979	0.057879905	-0.492076521	-0.2410267010
857374	0.629337135	0.0607736151	-0.510873270	0.413623505	0.8230489282
857392	0.707227400	0.6479398411	1.537761700	-0.614290601	0.0886086788
857438	-0.656077776	-0.2152637743	-0.207515896	0.505338373	0.1085018162
85759902	1.277739611	-0.3925629141	-0.745416793	0.301153902	0.0751610030
857637	-0.178434830	-0.1853434904	-0.309233059	0.012534355	-0.1128753503
857793	0.461927636	0.5362098378	0.951178388	0.073379908	0.1941817154
857810	0.705119501	0.4873781448	-0.297723909	-0.127261763	0.7362638224
858477	-0.900267281	0.4064726785	-1.225062124	0.345609537	-0.4642608787
858970	2.538550035	0.7457813449	0.909941133	0.262199059	1.3178790775
858981	-0.815018482	-0.3959097935	-0.230734976	0.102956869	-0.9272860914
858986	-1.218994501	0.8193030850	-0.330742314	0.528189577	-0.4855301241
859196	2.955682829	0.2103798445	0.627427082	-0.232120660	0.0413657355
85922302	-1.242117920	-0.0057834579	-0.385706296	0.801372546	-0.1817471124
859283	-0.727422417	-0.5309593004	0.474393258	0.003939003	0.1728882560
859464	-1.188527693	0.1693780934	-0.029824460	-0.111145907	-0.2713131090
859465	-0.405353080	-0.5265287503	-1.082071976	0.427426065	-0.3912329742
859471	2.213816387	-2.5787909992	-1.298010892	3.780791875	-2.7357511959
859487	-0.433947228	-0.8493285940	-0.334869937	-0.004978691	-0.3104418547
859575	-0.291543973	0.2832433298	-0.086188560	0.326867199	0.0333168740
859711	-1.638316786	2.4262266414	-1.317108728	-1.883468421	3.1898325590
859717	-0.539586813	1.5624901202	-0.593662500	-0.672507942	0.0611282077
859983	-0.919638446	0.6971724884	0.393036492	-0.357905538	-0.1474184494
8610175	0.034838302	0.1200189004	0.459971988	0.314694924	-0.0155400843
8610404	-0.994688029	-0.9081210535	-1.100360740	1.244777578	0.0926553152
8610629	-0.612562561	-0.7756714142	0.246838044	-0.772831741	1.5166900630
8610637	0.682870529	1.3985754634	-0.719241167	-0.096664805	0.5085691762
8610862	4.876508199	-1.1544779461	-0.483077495	-1.170391748	-1.3237161139

8610908	-0.072350138	0.0536554932	0.355866547	0.048832592	-0.1077491295
8611103	-1.501869476	0.1435614258	0.486258862	-0.122378079	-0.0390292436
8611161	0.138012244	-0.3263920580	0.151919734	-0.226864771	-0.5036154424
8611555	-2.186236690	0.0355707110	0.547079286	-1.647859246	0.3961746350
8611792	-1.421297891	-0.0432176692	2.012767522	-2.966728252	0.0222412116
8612080	0.882263930	-0.2550878307	0.229994161	0.423649141	0.1477716874
8612399	0.967176566	-0.1536701262	0.192125163	-0.083450911	0.4426520533
86135501	0.567360307	-1.6613223577	0.349250281	0.571523884	-0.1210561314
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861597	0.223702425	0.0769126070	0.148776905	0.262252261	0.4555666494
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861648	0.325518164	0.2995505173	0.128752056	-0.246304891	0.5210683990
861799	-0.199459121	-1.7255946363	-0.786058401	0.116745956	0.1441268207
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862028	-1.066707998	-1.0421552988	-0.283564277	0.637899776	-0.2969722678
86208	1.783555798	0.0004244298	-0.292506839	-0.580370555	0.4991648297
86211	-0.096852967	-0.0225249946	1.596299697	0.179428829	0.4099629648
862261	-2.351934315	1.1157841763	0.148452301	-0.906614963	-0.3165086702
862485	-0.430903499	0.4844971328	-0.290694588	0.057293175	-0.3825068496
862548	-0.853188272	-0.5060704070	0.634423963	-0.237141676	0.1392901935
862717	-0.595802895	0.0029648840	0.062601958	0.797723981	-0.2095356865
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862965	0.342937555	-0.2377974400	0.513345470	0.454774516	0.1528759939
862980	-0.991047162	-0.5084776263	-0.051816347	0.885904532	0.1673165990
862989	0.940750946	0.1577998775	0.592437419	0.477922672	0.6483605373
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863031	-1.608771501	-0.4979118440	0.452844869	0.527102050	-0.4592233167
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86355	1.020860934	-0.0954075198	0.767942841	0.627017416	-1.0979068211
864018	-1.439608866	0.2115695617	-1.388075349	0.448512027	-0.6290141193
864033	-1.095444306	0.2037178296	-1.218964989	-0.570481422	-0.7426654271
86408	-1.458702835	-1.0401187280	0.120431563	-0.227163027	0.3361622567
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864496	-1.706440486	0.5119879213	-0.337466388	0.678858808	-0.4910440978
864685	-1.337752701	0.4595072608	-0.488509104	0.354100824	0.4414446401
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86517	-0.579613971	-0.2505498519	0.361729650	-0.241886354	0.1402872611

865423	-0.946220851	-1.2957391097	-0.792061520	-1.694971898	-0.0776531867
865432	0.180693692	-0.5030415897	1.294717404	-0.091526472	-0.3633815227
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87281702	-0.268706635	-0.9944966018	0.217537500	-0.231151234	-0.4710279564
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873586	-1.507807056	0.3330008518	0.077576227	-0.396246129	0.2634730538
873592	-0.835878816	-0.7140340991	0.801923303	-2.159841626	0.0290996051
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873843	-1.003522807	-0.2666554566	-0.089381943	-0.084952464	-1.1914664073
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874158	-0.793026617	0.4370590422	-1.900279550	-0.315356103	-0.1041326653
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874373	-0.634963902	-0.5973256464	-0.160681786	0.540712933	-0.5131869412
874662	0.695238561	-0.9098868735	0.019838578	-0.533804197	-0.9625494330
874839	0.692017491	-0.1875842559	-0.316611583	0.063671760	-0.2430371800
874858	3.668891109	0.4667888874	-1.321343281	-1.944665503	-0.9460823770
875093	1.004175357	0.9998306814	0.995368772	0.232326073	-0.1188888078
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88147202	-0.085304557	0.6038288041	-0.582829665	0.337061968	-0.3472837941
881861	-0.700792123	0.2700147671	0.072412480	0.495533123	0.0191778760
881972	-0.804236090	-1.3941815505	0.685226377	0.294524200	0.3136095403
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906878	0.475543714	-0.0888980901	0.594727093	0.241075301	0.1971506440
907145	0.534064618	0.6990198575	-0.021404230	0.814478925	1.3128052104
907367	-0.329783732	0.9938632467	0.373519271	0.178584068	0.3765056070
907409	0.269764170	0.5109650849	0.068952658	0.529911757	-0.2080990691
90745	0.507927890	-0.1387719046	0.215789438	1.148416888	0.3339800541
90769601	0.225843093	0.2262523820	0.059322537	-0.221416174	-0.1343794131
90769602	-0.065040152	0.0501820538	-0.579122858	-0.197427671	-0.2002923800
907914	-0.306811042	-0.6492623125	0.204735773	0.498195417	-0.3822299065
907915	-0.990364525	-0.0511584766	0.093881253	-0.626421919	0.1094714105
908194	-0.930064293	-2.2544646797	-0.466263010	-0.779551562	-0.4944820815
908445	-0.029941068	-0.3229932215	0.184135669	-0.211715686	-0.1099176849
908469	-0.168463334	-0.2352388721	-0.258165645	-0.232065607	0.1692935309
908489	-1.081099413	-0.0010498906	0.127505394	-0.009932973	-0.4806494971
908916	0.952481157	0.6728863814	-0.317435674	0.138036068	0.5451107699
909220	0.195170967	-0.0034491992	-0.433572768	-0.140699333	0.1874799788
909231	0.089858744	0.1462143751	0.377690612	-0.542497574	-0.2190587029
909410	-0.103500301	-0.2351662467	0.290218440	0.059239661	0.5054990744
909411	-1.103172853	-0.1347436553	-0.336778691	0.554968936	-1.1858618222
909445	-0.964009904	-0.8135868399	-0.909974880	-0.011726962	-0.7359070393
90944601	-0.936292265	0.6826624088	-0.219293278	-0.308724084	0.2824428958
909777	0.897031883	-0.8902959516	1.094199056	0.255568406	1.5382410183
9110127	0.143526659	-0.4567092765	0.067773791	-0.449875463	0.0829893004
9110720	-0.699155425	-0.4977435511	0.227881449	0.450993502	0.6764541937
9110732	-0.598086185	-0.4691884880	-0.028367892	0.235193368	-0.1530934151
9110944	1.534348384	-0.2905432068	-0.389028021	-0.115317167	0.3463440740
911150	0.012054627	-0.1010876325	0.373277438	-0.072018973	-0.8150752476
911157302	-1.422336801	-0.6695517414	0.494477666	-0.504225601	-0.3499116171
9111596	0.342133611	0.9291469178	-0.519441949	-0.838453134	-0.3223334058
9111805	-1.829924638	-2.4021852235	-0.892011579	-0.152064160	0.0759597638
9111843	-0.484220288	0.0429605111	-0.189466889	0.115269170	0.4091777819
911201	-0.482435963	-0.5070647518	0.404778479	-0.553293100	-0.1734093525
911202	0.972979646	-0.1503289773	-0.049308997	0.506948394	0.1720798859
9112085	-1.198785425	0.3364916499	0.494756697	-0.147821627	0.1016758719
9112366	-0.225426032	-0.7491044280	-0.224370438	0.477457642	-0.5361690702
9112367	-0.571668797	-0.3612489115	0.006881983	0.436844123	0.3019340195
9112594	-0.482141691	-0.1794272022	-0.043697576	0.510127264	0.6733694070
9112712	-0.309548924	0.2304236421	0.114637527	0.665361229	0.3199077091
911296201	-0.999041862	1.1146528459	-1.117284997	0.689040819	0.5537425764
911296202	-1.123832614	4.9581336925	-0.886731866	3.591598013	-0.5871910850
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9113239	0.223223930	1.4700860059	-0.804221019	-0.005541270	-0.4061653296

9113455	-0.555212156	-0.2170958245	-0.809387767	0.563504122	-0.5881572108
9113514	0.076677038	0.6404792504	-1.356209300	-0.068321249	-0.3122139454
9113538	-1.099270464	2.0225405128	0.483563669	-0.679068588	0.6046420108
911366	-2.425717007	-0.9408861129	-0.133959458	0.374829645	0.0300465387
9113778	0.924815954	0.4955679709	0.271493006	1.207045823	0.9402146855
9113816	0.104368624	0.3193046533	1.032390830	0.608291184	0.3973472073
911384	0.614923390	0.2799737367	0.064837589	0.000246286	0.1024202377
9113846	0.889614864	0.9246961441	1.085823439	-1.206656818	-0.4839705795
911391	-0.419258899	1.2867603886	0.403282990	0.138807336	0.2209332151
911408	0.367305570	-0.3444775333	-0.345062063	0.425223320	-0.3655267250
911654	-0.049155752	0.2225068454	0.195224752	0.027736360	-0.4073010683
911673	1.337188809	0.5365858519	-0.041952920	-0.041897079	0.7863400612
911685	-0.024030956	0.2726963978	0.651189204	0.259076986	-0.5098708464
911916	0.808383394	-1.5668970121	-0.294290441	-0.135446630	0.2353454104
912193	-0.544923618	0.6168567753	0.360787470	-0.185386117	-0.6053952951
91227	-0.020448924	0.5596010017	0.238972704	0.281984868	0.2297284929
912519	-0.015465239	0.0341998123	0.556776251	-0.410366430	-0.0001525405
912558	-0.163288967	-0.2363141916	1.110535207	0.404965671	0.0866869538
912600	-0.959725312	-1.0374933742	0.281339803	-0.273903950	-0.2516387236
913063	1.555748208	-0.0074068986	0.103548840	0.620787469	0.0066500562
913102	-0.100925216	-0.2480033888	0.236855524	-0.190191595	-0.7367867541
913505	-0.355060598	-0.6249667494	0.532054753	-0.572942001	-0.7416972638
913512	-0.865293960	-0.3426305869	0.107911866	0.387462633	-0.0895571414
913535	3.200742182	0.1681848622	-1.037468192	-0.233454240	0.5205880964
91376701	0.211717707	0.6719224926	-0.478277765	0.094544374	-0.0149590726
91376702	-0.552916738	0.1223216364	0.339129401	-0.965159125	-0.6851658328
914062	0.929231997	-0.1972060738	-0.161505829	0.030338925	0.5659987102
914101	0.564240369	0.2686459455	-0.516024743	-1.234008136	0.0270632156
914102	0.565106052	0.4685793512	-0.573882748	-0.356776050	0.2895432749
914333	-0.437681039	-1.0429086282	0.759487730	-0.479171345	-0.6395383847
914366	-0.602030766	0.4096827364	-0.141544270	-0.126704802	-0.5507565750
914580	0.213609008	0.0982391416	-0.007360691	0.100535897	-0.5819463924
914769	-1.103639415	0.6339022355	0.059087104	-0.286816236	0.3931897963
91485	-1.446663003	-0.5729903088	0.649548750	-0.535576844	0.2509909032
914862	-0.852480433	0.7049106403	1.345754994	-0.488514486	0.4163000633
91504	-0.507970681	0.2069805672	-0.080099530	-0.051659333	0.9747986067
91505	-0.241932508	-1.0452388229	-0.209946317	-0.039368061	-0.1874087571
915143	0.066333057	1.1529703725	-0.991695109	0.167376682	-0.5695827223
915186	-2.200919526	1.0250951989	2.028889513	-0.236610613	1.1453491173
915276	-3.508790828	0.6042606963	-1.278500206	-1.872556795	1.0201289746
91544001	-0.484723076	-0.1359505647	0.665044251	0.777877875	0.9392975863
91544002	-1.947329468	0.4881934312	-0.255064594	-0.906528375	1.2755281468
915452	-0.833977551	-1.4088879023	-0.297979389	-0.073731957	0.6470988652

915460	-1.602111794	-1.0533691956	0.356568603	-0.428904878	-0.7303104811
91550	0.253668588	0.5472551225	-0.542053825	-0.617650801	-0.0916288468
915664	0.032979942	-0.8752970956	-0.295663965	-0.033414237	0.3412769300
915691	-0.136700223	0.3929176231	0.614735076	0.714787485	0.1215931340
915940	0.072494321	-0.1758143289	0.255077079	0.311421297	-0.2139098582
91594602	-0.773624515	-0.1454686759	0.499925801	0.270529716	-0.4082811925
916221	0.046608047	-1.0005231004	-0.306962199	0.655600375	-0.0907347030
916799	-0.491293222	-0.5167539200	0.050028508	-0.131357405	0.2258787420
916838	-1.017677377	-0.0261084918	0.443355468	-0.658166813	0.5299438963
917062	-1.286369931	0.7480548590	1.375305788	-0.257540461	-0.2080778673
917080	-0.265206232	0.1942744924	0.462310866	0.357702019	0.7940768989
917092	-0.548135411	-0.8140726857	-0.987108671	-0.070507407	-0.0537361968
91762702	-0.006685146	0.9611743974	0.397621795	-1.256638663	0.8486917334
91789	0.097095633	0.7218828231	0.508127340	0.060557805	0.3878654534
917896	-0.600188263	0.1391868086	0.295156517	-0.243768633	0.0023377369
917897	-1.401965911	0.9527774834	-0.299971512	-0.503892654	-0.7846233548
91805	-1.210209018	0.8160391133	-0.373064638	0.292981675	-0.3609872357
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91813702	0.325770470	-0.0944504391	0.149150397	0.318904984	-0.2288534014
918192	-1.686010994	-1.7109061685	2.408540813	0.332918111	-0.1176166151
918465	-0.851940525	-0.0288485824	-0.205098471	0.032406632	-0.3895059803
91858	-1.101161685	0.0869517853	1.295452125	0.161515938	-0.9103205148
91903901	-0.289073515	0.4730366470	-0.069618747	0.543463275	0.0572082633
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91930402	1.934520374	-0.7275859760	0.757319150	-0.175980334	0.2702433954
919537	-1.550311718	-0.7176961616	0.139629661	0.188290346	-0.3701820155
919555	0.578720770	-0.5430102167	0.951930849	-0.247809950	0.5286878926
91979701	-0.523378449	-1.1495594767	1.091132033	0.323915796	-0.1038818740
919812	-2.337461193	-0.4830815304	0.501982823	-0.069804388	1.2788258192
921092	0.042391707	2.1668488112	-1.479915189	-0.322804378	1.1801175946
921362	-1.158207647	0.1913668076	-1.796559226	0.876067543	0.9484780485
921385	-1.188472456	-0.6771595730	0.146514414	-0.291391323	0.1026424111
921386	0.425520296	0.3979358310	-0.835301076	-0.383809102	0.6190792834
921644	0.765081147	-0.4663049042	0.398228821	0.364670551	0.7941292239
922296	0.068753051	-0.4148574879	0.507946096	0.278027691	0.2875814970
922297	-0.930763180	0.5238585798	0.300437607	-0.356308724	0.4182343622
922576	0.114797260	-0.1161527345	-0.013618636	0.058006015	0.1323174915
922577	-0.145962831	0.2596286888	0.149437375	0.564356936	0.5746698535
922840	-0.677751360	0.0640445882	-0.970113001	-0.454875027	0.0952997770
923169	-0.112569772	0.4740694793	-0.169694808	0.410188208	-0.2194120652
923465	0.854769667	1.0210226174	-0.160349809	0.446749349	0.3987268089
923748	0.850625097	0.7520064103	-1.069484886	-0.588800008	0.0688498920
923780	1.783207929	0.3901520318	0.873654798	0.310967487	0.3653727356

924084	-0.582689902	-0.6178681677	-0.938396865	0.362221796	0.4485215927
924342	0.411907169	-0.3073955477	-0.357594218	-0.143055766	-0.4514830478
924632	-0.549918834	-0.4839795902	-0.892397382	0.435103530	0.2439245685
924934	-1.640362885	-1.0878956916	-0.349885533	0.514611257	-0.0049422107
924964	-0.814176294	-0.4706597676	-0.071321985	-0.701263764	-0.0705817127
925236	0.174755382	1.0763071056	-0.129380621	-0.426655069	-0.2770426795
925277	0.012441261	-0.2900018002	0.312069081	-0.067804247	-0.3254840515
925291	-1.724352624	-0.3536636324	1.163315907	-0.207312716	-1.3904847631
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925311	-1.109815814	0.4879418774	1.288150901	-1.389256180	-1.7451271378
925622	1.012707855	0.2712037562	-0.091882489	0.372148526	-0.6298691742
926125	-0.300488375	0.0947410215	0.733436507	0.830362739	0.4502424273
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926682	-0.246493221	-0.7156966020	1.112380784	-0.105114917	-0.1085369986
926954	-0.533977345	-0.1925887705	-0.341586475	0.393570521	0.5204194692
927241	0.567437190	0.2228855560	0.279992246	-0.541558028	-0.0892176149
92751	1.616415088	1.6974579729	-1.045433644	0.373772231	-0.0476836145
	PC11	PC12	PC13	PC14	PC15
842302	-0.262724285	-0.8582592992	0.103296775	-0.6901967966	0.601264078
842517	-0.812404827	0.1577837523	-0.942699807	-0.6529008436	-0.008966977
84300903	0.605071514	0.1242777100	-0.410265611	0.0166650952	-0.482994760
84348301	1.150501182	1.0104267377	-0.932450704	-0.4869883986	0.168699395
84358402	-0.650787016	-0.1104182769	0.387606915	-0.5387065429	-0.310046684
843786	-0.109669824	0.0813699015	-0.026251351	0.0031339435	-0.178447576
844359	-0.393343607	0.2419761651	-0.351941936	-0.2216015267	0.060855369
84458202	0.196313828	-0.2777917914	-0.460630835	-0.0961356710	0.187478261
844981	0.560021577	0.0788169039	0.493001875	0.1120530076	-0.034237132
84501001	-0.548555069	-1.0841629631	-0.375475245	-0.0006033716	-1.206141020
845636	-0.294276512	0.6099198621	-0.692298563	-0.1301140961	0.091099184
84610002	0.150099383	-0.8725334105	-0.978852628	0.4132851288	-0.076575493
846226	1.119190867	0.0520074379	-1.983208918	-0.2667913889	0.492408131
846381	0.853628961	0.0628135272	0.194455743	-0.1212264306	-0.151174299
84667401	0.637371253	-0.5439530565	0.152152510	0.0208341513	-0.504094726
84799002	-0.089892055	-0.0929155801	0.272937688	0.4193736451	-0.531937246
848406	-0.283115330	0.3228336349	-0.873313571	-0.2068809463	0.026977460
84862001	-0.077022788	0.1450773283	-0.056826726	-0.5557727446	0.357788221
849014	-0.382631859	0.0680073259	-0.762829689	-0.1781151366	0.186075363
8510426	-0.087947737	-0.3232036086	-0.240304220	-0.1497219434	-0.277740235
8510653	0.252743308	0.1820993618	0.534747411	0.5364927035	0.630306593
8510824	0.295829357	-0.1193713638	-0.105109885	-0.5505241800	0.208888166
8511133	0.747761739	-0.7897394650	0.018967583	-0.3939657391	0.178368816
851509	-0.845138812	0.1995874763	-0.760017755	0.1495561475	0.585041105
852552	-0.600095326	0.2321645154	-0.719018102	0.0560160318	0.622570169

852631	0.196585356	-0.8095860291	-0.394727262	-0.9305675819	-0.282237083
852763	0.441362589	-0.9739851395	-0.516422067	-0.7074323955	-0.383724915
852781	-0.412668030	-0.3158058348	-0.298472337	-0.2950812415	-0.235804579
852973	0.370382886	-0.1246372082	0.129900549	0.1958202715	0.175956263
853201	0.246904961	-0.0031839923	-0.222279620	0.1283529520	0.091747519
853401	-0.496378073	-0.1044630774	0.885636344	0.0692396351	-0.376293016
853612	-0.756864461	-0.2657615457	-0.522186276	-0.3000453967	0.072356014
85382601	-0.585836567	0.2547032178	1.119529771	0.2184706425	-0.403789163
854002	0.077919478	-0.1992975316	0.307173136	0.2036374012	0.068495324
854039	-0.326307877	-0.4066154950	-0.351748055	-0.0564880712	-0.224784255
854253	-0.328257659	0.2292843967	-0.619894462	0.2143138994	-0.067766013
854268	-0.217741168	-0.0195015091	0.032551005	0.1704452228	-0.479641248
854941	-0.032328754	0.4115801153	-0.245663247	-0.3627028769	-0.150524126
855133	1.047288688	-0.6130946673	-0.290379074	0.1249868104	-0.401912364
855138	0.591014507	-0.0004681369	-0.235544182	-0.4578511130	-0.668135575
855167	0.145009410	-0.0423201249	0.029903294	0.0054147710	0.005022251
855563	-0.115306889	0.3312318699	0.019742154	0.2321540822	-0.128765770
855625	1.277954488	-0.8309410010	-0.922742372	0.9892697016	0.220725927
856106	0.160272727	0.1311301054	-0.144226466	-0.1816995714	0.160135565
85638502	0.240085901	0.1091591008	-0.164573360	-0.0950096841	-0.193897144
857010	0.003089503	-0.1206287088	-0.149769253	0.3143049855	-0.268535008
85713702	0.090090936	-0.0249037139	0.378695789	-0.2394451655	0.277696370
85715	-0.289430944	-0.0732252281	-0.561084977	-0.2625113637	-0.646184357
857155	-0.324354020	0.0931121402	0.393569102	0.5995102295	-0.169047859
857156	0.237322628	-0.0116411885	-0.208908133	-0.1508619753	-0.058578846
857343	0.639460669	0.6058597387	0.224644982	-0.0446479438	-0.040260858
857373	0.079686662	0.0240053741	-0.377273811	-0.4453178247	0.108861412
857374	0.025165467	0.1593213356	0.246020193	-0.5093448931	-0.077987883
857392	-0.274018692	0.6533266173	0.601165133	0.6072878098	-0.501815152
857438	0.058487255	0.2677384961	-0.399395210	-0.0450747265	-0.036176457
85759902	0.197754405	0.5401834853	0.058602197	-0.1399689340	-0.349863814
857637	-0.605550553	-0.1156566994	-1.096994917	0.1275301954	0.597982425
857793	0.381160012	0.2814152874	-0.376294366	-0.0229779469	-0.331463457
857810	-0.228334046	-0.1991733623	0.421272292	0.2167665417	-0.342304785
858477	-0.621205924	0.3367435600	-0.148838932	-0.4425445128	0.511520357
858970	-0.369405174	0.4379929489	0.090549052	0.3353742675	-0.536697760
858981	0.341145747	0.3759209730	0.161076437	1.1878815701	0.321697375
858986	0.717323304	-1.1859167706	0.589385595	0.3030289831	0.129915286
859196	-0.511053316	-1.0091261525	-0.229682636	-0.7934928857	0.139211976
85922302	0.223067407	0.0582255955	-0.512702935	0.1419434406	-0.178536288
859283	0.510796559	0.5421158683	0.129143047	0.1548683357	-0.008334256
859464	-0.231340120	0.1520401549	-0.494456567	-0.0986237426	0.137340458
859465	0.171674515	0.0917544994	0.214040320	-0.4676657086	-0.320276347

859471	-2.301916714	1.9478812125	1.103679434	0.2450717685	1.060326663
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859575	0.428848750	0.2049555851	-0.371823339	-0.1793614799	0.291771882
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859717	0.018812465	-0.7441487192	-0.132429495	0.9380256690	-0.369608299
859983	0.379838236	-0.1163449791	-0.053581681	-0.1557475752	-0.059940319
8610175	-0.007559389	-0.2732435321	0.012174976	0.2578796832	-0.032393640
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8610862	1.209082105	1.2860572446	1.339239602	-0.5384927467	0.904755029
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8611555	0.253381955	-0.5690714729	0.753989687	-0.5460281371	0.432021867
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86208	-0.644167720	-0.1613821271	-0.079839276	0.2971928632	-0.073910222
86211	0.585191831	0.4438091073	-0.230398088	-0.1827187582	-0.061170624
862261	-0.329894644	0.3323522602	-0.138254531	-0.1072538655	-0.178613587
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907409	-0.098066039	-0.3714077431	-0.107936858	0.2148874460	0.261733251
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90769601	0.075191001	0.3949339823	0.270875034	-0.5475871587	-0.029071084
90769602	0.409537036	-0.1470984446	0.495252130	-0.0700425469	-0.013660800
907914	1.011034162	-1.2466625351	1.094800727	-0.4903384327	-0.520238112
907915	-0.196847173	0.0977631101	0.333884393	0.2403149333	0.387682009
908194	-0.153839783	0.8933575853	0.113104196	-0.2952590052	-0.339417894
908445	-0.370490599	-0.2814114776	-0.357324961	0.3051133657	0.193852862
908469	0.201968069	0.1436794229	0.069879671	0.3147938889	0.064438374
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909231	-0.078430690	0.0188002577	-0.269916821	0.1368716751	0.048366741
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909411	0.263217116	-0.8953011390	-0.477419438	-0.1808677660	0.148161949
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90944601	0.408904198	0.1995708358	0.486910166	0.2734708114	0.121766965
909777	-1.438452742	-1.7938747444	0.161070023	-0.3039571250	-0.345216401
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9110732	0.024414131	0.4975854996	0.549558951	-0.2011023381	-0.299910155
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9111596	0.282046443	-0.1482442235	-0.260896037	-0.1300141283	-0.054651126
9111805	-0.377946437	0.2722833864	0.821258211	0.0367052224	-0.085581752
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9112366	-0.204478448	-0.0879105786	0.581589377	0.2314154786	0.309254048
9112367	-0.035684549	0.4289464068	0.269673560	0.2916575984	-0.090558303
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9112712	0.389759897	0.1576981922	0.482690501	-0.2214880341	-0.105395304
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9113239	0.010409429	-0.6880358416	-0.253546790	0.7249879119	-0.468468560
9113455	0.439378419	-0.3404106882	0.495375677	0.0627561683	-0.088792334
9113514	-0.364180390	-0.1631137476	0.125574467	-0.4001931920	0.166251942
9113538	0.535093911	-0.0377950008	-0.464832463	-0.3503553816	-0.290794655
911366	-0.031264444	-0.6301533197	-0.151333198	-0.2751542086	0.303176650
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9113816	0.143857161	-0.3980403216	-0.213639067	0.0122987635	-0.489240636
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9113846	-0.924547217	-0.1650804727	0.331463040	-0.1098471364	-0.147999119
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911408	-0.080959244	-0.0289294939	0.300967232	0.1986298009	-0.100281123
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911673	-0.234743745	-0.6218627235	0.326319542	-0.1666228749	-0.095218142
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84501001	-1.1318257248	0.7584688292	-2.387387e-01	-0.1275685149	0.1779240553
845636	-0.0138706093	0.2849159741	-6.134944e-02	0.1720437193	0.0937289351
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846381	-0.1992780260	0.0096995090	9.339247e-02	0.1010674465	0.1967267792

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84862001	0.2215767406	-0.0781818510	5.021716e-02	0.3243354151	0.1355909907
849014	-0.1393548032	-0.6855739616	-2.705080e-01	-0.4576544799	-0.0261720852
8510426	0.1209221166	-0.1193080949	1.076572e-01	-0.0023196540	0.0627784940
8510653	-0.1439936507	0.2273189096	-9.075712e-02	0.1205914711	0.1354815837
8510824	-0.2156163397	0.0416265799	-4.312105e-02	-0.2850057948	-0.0664739762
8511133	0.0779077052	0.0516753915	-1.351681e-01	-0.2505840594	0.2833238390
851509	-0.1695420732	-0.5795650326	-1.524509e-01	-0.4622425441	0.2441235537
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854039	-0.2649508034	0.5116666688	-5.148992e-01	-0.0449359045	0.1396499273
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85713702	0.4341320342	0.0058211607	8.968932e-02	-0.2077530623	0.0078418173
85715	-0.0343499856	0.1432864234	1.566433e-01	-0.2386347890	-0.2403366743
857155	0.0675974293	-0.1890272279	8.181192e-03	0.2854018034	0.0309365297
857156	0.1742017650	0.0643542582	5.355821e-02	-0.2002754121	0.2156803986
857343	-0.0583889171	-0.0825241914	-1.534190e-01	0.0859253386	-0.0634891959
857373	0.0267599697	0.2211230693	1.393874e-01	0.0785551072	0.0905176134
857374	-0.1451536668	-0.0455372106	7.295476e-02	-0.0932288239	-0.0218792424
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858986	0.1448061468	-0.4050970648	6.565549e-02	0.2559123023	-0.4289500187
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85922302	0.2644121106	-0.3189750634	1.006240e-01	0.0343908745	-0.1639586428
859283	0.4712897357	0.1030461736	5.156184e-02	-0.0435454461	0.0120385599
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905190	0.1863543693	-0.0982790875	-5.729795e-02	-0.0388984179	0.0557874647
90524101	-0.0429222796	0.0165584409	7.914470e-02	-0.0618518508	-0.1390506688
905501	0.4412085793	0.0674448838	1.243995e-01	-0.1425535019	0.0599460017
905502	0.7728127083	0.1611878014	3.280364e-01	-0.0244310856	0.2654863902
905520	0.2427710985	0.3338411480	-1.592733e-01	-0.1344298159	0.1286209794
905539	0.1236608229	0.1734031309	-3.726524e-02	-0.2076969781	-0.1782328735
905557	-0.3249598417	0.2628099431	-6.843972e-02	-0.0705852651	0.2497885990
905680	-0.2351073479	-0.0582276787	4.709226e-02	0.1036232039	-0.1451630506
905686	0.0513147073	-0.0161882978	2.105953e-01	-0.1507661340	-0.2487480873
905978	-0.1822978116	-0.1146730419	-8.631163e-02	0.0731007670	0.0435188064
90602302	-0.1451851214	-0.4061454862	-4.109776e-01	-0.1762098642	0.0725047518
906024	0.0100219071	0.1827189984	2.228853e-01	0.1121369401	-0.0861705150
906290	0.0020694751	0.1932744745	-2.120432e-01	-0.0005163735	0.0389376292
906539	-0.1461766809	-0.0148695752	7.423495e-02	0.1983024808	0.0625604783
906564	-0.1057334449	-0.0604261221	2.658781e-02	0.4153361325	-0.0751121436
906616	0.1554229198	-0.0999754480	6.865526e-02	-0.1337791973	0.0936140768
906878	-0.0346413992	-0.0449609493	8.376150e-03	-0.2283698549	0.1980684171
907145	-0.3398433202	-0.2718880642	-1.825878e-01	0.1952621463	-0.1548608524
907367	0.0895074097	0.0906375771	1.146371e-01	-0.1802758003	-0.0941855952
907409	-0.1623492871	-0.0017792522	-3.176198e-02	-0.1001717831	-0.1299250945
90745	0.0701954194	-0.1566916921	1.764543e-01	-0.0737384502	-0.0849579054
90769601	0.0404244404	0.0805511489	-3.926308e-02	-0.2515004628	-0.0201208648
90769602	0.1045915501	-0.1339975004	-6.398436e-02	0.0535673844	-0.0600015243
907914	-0.1708901952	-0.3445541895	4.313214e-02	-0.0486632645	0.1531607343
907915	-0.3267691024	0.0269214414	2.118412e-01	0.3072162496	0.2085041689
908194	0.1152322177	0.0549709970	3.427705e-01	0.0817876010	-0.1281378126
908445	-0.1471326612	0.1225225413	1.313822e-01	-0.1887657795	0.0454628684
908469	0.0038408798	0.0494909974	4.846952e-02	0.1344431797	-0.0828256608
908489	0.1773816760	0.0958090019	2.717694e-02	-0.1489215864	-0.0456675800
908916	0.0419126079	0.2165302680	-1.293663e-01	0.2518107451	-0.1155450183
909220	0.0039545080	0.0535841548	-3.371880e-02	0.2077974873	-0.0218736455
909231	0.0262134858	0.0871973587	-9.077136e-02	0.1271623834	0.1635763831
909410	-0.0369945971	0.0529532825	1.226743e-01	-0.0342691180	0.1016459372
909411	0.2160259204	-0.0279905658	4.124786e-02	-0.1160930580	0.0119980095
909445	0.0022431459	-0.2330894726	3.244261e-01	0.0448851797	0.0522115326
90944601	-0.2380473886	-0.0410117693	-2.537247e-01	0.2621017351	0.1244182572
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9110127	-0.2245382968	-0.0264798838	1.065067e-01	0.1605994330	0.1937812128
9110720	-0.2081535579	0.1556903449	6.260450e-02	-0.4011694116	-0.0212653698
9110732	-0.1667274124	-0.1458701973	-2.519375e-01	-0.1048584546	0.0856938908
9110944	-0.1274540640	0.2478273656	-6.660839e-02	0.2447654819	0.1614361449
9111150	-0.0980157044	0.0419551380	-1.973387e-01	0.0187669106	0.1367394187
911157302	0.1182697949	-0.1897041359	7.319364e-02	-0.2763388130	-0.0360886538
9111596	0.3023811300	0.0077199329	1.345593e-01	-0.2184060575	0.0381999906
9111805	-0.2075103911	0.0499271046	1.364878e-01	0.1454063699	-0.1392078703
9111843	0.0636753200	0.0645610230	1.325198e-01	-0.1593267650	-0.0230293717
911201	0.0446388629	0.0111269523	-1.019937e-01	-0.0247202803	-0.0173480886
911202	0.2128912238	0.1028098920	1.646636e-02	-0.1007777172	-0.1362036316
9112085	0.0904844228	0.2839185263	-1.366948e-01	-0.0472354259	0.1345243127
9112366	-0.0808518879	-0.0740424954	6.554379e-02	0.1098374324	-0.0412836773
9112367	0.0933317815	0.0140758789	2.189715e-01	0.0844439571	0.0446639419
9112594	0.1713723380	-0.0767897798	1.796050e-01	0.0785053885	0.0201118723
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911320501	0.4093659972	0.1500933696	5.328932e-02	0.0508637577	-0.0908707847
911320502	0.4173330623	-0.3048383097	3.903673e-01	-0.0113977017	0.0141957264
9113239	-0.5974218658	-0.1471347025	-1.849631e-01	0.0873280813	-0.3477157152
9113455	0.0291153507	-0.2534408859	4.252163e-02	0.1488658763	0.0808908761
9113514	0.3421853326	-0.0986465839	5.041461e-02	0.2709480873	-0.0442397637
9113538	0.1763564924	-0.0372038848	-2.845932e-02	-0.0736369742	-0.1005821487
911366	0.0172054420	-0.0308367920	4.471065e-02	0.2432901471	0.1623773566
9113778	0.0453408189	0.0054958394	-5.969832e-03	-0.0895727295	-0.1057466710
9113816	-0.0375389091	-0.0185752968	-3.814678e-01	0.2193251118	-0.1105674525
911384	-0.3061000700	-0.0456225836	-1.504954e-01	0.0183164709	0.0824946722
9113846	-0.3118583243	-0.1663433967	-6.947857e-02	0.1596341500	-0.1369845189
911391	-0.5691688283	-0.1311857188	8.801939e-02	-0.1537656514	-0.0164150330
911408	0.0117212288	-0.0724106602	5.570345e-02	0.0750153505	-0.0219888150
911654	-0.0680199510	-0.0159018154	-6.871319e-02	-0.0502469230	0.1534418424
911673	-0.1709974620	-0.0123870580	1.253255e-01	0.0402899453	0.0872854803
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911916	0.0066630909	-0.0333292719	9.492904e-02	0.1037114236	0.1504849896
912193	0.0730122133	0.1229340999	-1.878168e-02	0.0273209128	0.1648002007
91227	-0.0625536671	-0.0670321490	-1.133739e-01	-0.0066267371	0.0204274114
912519	0.0807803538	0.3695553903	-9.558657e-03	-0.1087302625	-0.0145514514
912558	-0.1108431089	0.0993002176	-8.432065e-03	-0.0759792888	0.0589537649
912600	-0.1179671609	-0.2487553324	3.755785e-01	0.2183619219	0.0804185129
913063	-0.2231144879	-0.0609497955	9.549203e-02	0.1245838741	-0.2692460854
913102	0.1344296202	0.0451822383	-1.368277e-01	0.0478395415	0.1626515967

913505	0.3504701936	-0.0342112188	-1.722325e-01	-0.1952482257	-0.1726036657
913512	-0.0886881633	-0.0843837467	-4.710080e-02	0.0779530510	0.1300871141
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91376701	0.2775019763	0.2758897054	-9.571030e-03	0.1151118680	-0.0749493374
91376702	-0.0621296592	0.0166135409	-1.918704e-02	0.2927827630	0.0650347032
914062	-0.1897339023	-0.0714451555	3.853807e-02	0.1814519333	0.0840049422
914101	-0.1719195076	-0.1391153592	-1.557396e-01	0.0534505330	0.3398210898
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914333	0.0821806078	0.1322074081	7.798112e-02	-0.0934486716	0.1347701593
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914580	0.3028308700	0.1781680304	-9.454086e-04	-0.0391171702	0.0452046506
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91485	-0.1178393087	-0.0117894072	1.272862e-01	0.0101121466	0.0908039604
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915143	-0.3891070161	-0.0692886438	-4.328159e-01	-0.0792224197	-0.1311026627
915186	-0.4989273290	0.0614426403	1.472576e-02	-0.0052089236	0.1871894308
915276	0.1061688558	0.1450975453	1.952681e-01	0.1988225061	0.3483613390
91544001	-0.5869003919	-0.0713984513	1.147645e-01	-0.0515120701	0.0833758506
91544002	-0.4477928280	0.2116429077	1.901902e-01	-0.1937817362	-0.0831327797
915452	-0.4326986916	-0.0421231224	4.042337e-01	-0.0714777001	-0.0411972178
915460	0.0811069349	0.1173216262	2.709368e-01	-0.0068353403	0.1695494454
91550	-0.0251036033	0.1275815587	7.160374e-03	-0.3158463077	0.0718202346
915664	-0.1656525129	-0.0253422903	1.276502e-01	0.0321720287	0.0174672338
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915940	0.0337297517	-0.1151432061	-2.808120e-01	0.1177171098	0.0119567274
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916221	0.0036030549	-0.0917038623	1.850439e-01	-0.1336185270	-0.0104974251
916799	0.1917801920	0.0156821488	-6.479661e-02	0.0497413311	-0.1812578717
916838	-0.5242638655	-0.1324175078	4.164366e-02	0.1739884378	-0.2905878805
917062	-0.0403973202	0.0983046405	-1.417744e-01	0.1817929811	0.2574283017
917080	-0.2654299713	0.0557073790	-4.489172e-02	0.2980716460	0.1251235465
917092	-0.5662658617	0.0688884138	-4.355084e-02	-0.0827461636	0.0817261030
91762702	-0.1930575838	0.1638605084	1.696156e-01	0.0564170440	-0.0405222312
91789	0.0367359627	0.2271729812	9.887981e-02	-0.0959645408	-0.0860998270
917896	-0.1157537076	0.1773029044	2.921844e-01	0.0806429725	-0.0289322155
917897	0.3472701757	0.1286726709	4.361274e-03	-0.0003997164	-0.0658280590
91805	0.0997620180	0.1237155150	3.308483e-01	-0.1543674922	-0.2362715510
91813701	0.1779140177	0.2259259121	1.293641e-01	0.2521963074	0.0172741437
91813702	0.4493965033	0.2358398169	2.839421e-02	-0.1211408420	0.0401779785
918192	-0.4918703631	0.3934087720	-2.733424e-01	0.0808508482	-0.3937157839
918465	-0.1573548181	-0.0332560589	4.103334e-02	0.1527013574	-0.0954426500

91858	0.2357778568	0.1714303720	-1.682333e-01	-0.0480760651	-0.0048463579
91903901	0.0664241146	-0.0049832053	2.166153e-01	0.1474758498	0.0376285657
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919555	0.2236113177	-0.0556410397	-1.201821e-02	-0.1633614569	-0.0988305409
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919812	-0.1845235859	0.2560471166	2.157609e-01	0.0185852693	0.1565496905
921092	0.2246393773	-0.0759854108	-2.144004e-01	0.1077679119	-0.0754591770
921362	0.1157153017	-0.0946085126	5.607015e-01	-0.1632070601	-0.4108193773
921385	-0.0562823823	0.1692280446	-1.213046e-02	-0.0535534599	0.1078587734
921386	-0.1524138427	-0.0391271728	1.677550e-01	0.1610284957	-0.1314182663
921644	-0.2181697442	0.0270419575	7.676963e-02	-0.0335181090	0.1858465398
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922297	-0.4367745068	0.0792966644	1.675768e-01	0.2307348371	-0.0359430593
922576	-0.0494701048	0.0013069407	4.558326e-02	-0.0629478688	-0.1050644118
922577	0.0091468550	0.0290324891	1.488410e-02	0.0181300769	0.0288337616
922840	0.2476202326	-0.1276536694	4.694131e-01	-0.2003872236	-0.0195139777
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923748	-0.0103802678	-0.3204581803	-9.803317e-02	0.0202986827	0.0295470955
923780	-0.0057459625	-0.0405914791	6.431842e-02	-0.3217160263	-0.1685804913
924084	-0.0573291350	0.0452087235	1.212636e-01	-0.0765829801	-0.0502932900
924342	-0.4351182523	-0.1917622682	-1.571844e-01	-0.2947566845	0.1635577852
924632	0.0048691691	-0.0303433227	8.876475e-02	0.0041081275	-0.1145334139
924934	0.0206805941	0.1334742843	1.145619e-01	-0.1800354098	0.1188747634
924964	-0.2612530693	-0.0405031771	-1.773446e-01	-0.2615734828	-0.0134633024
925236	0.1100555556	-0.2497956869	-4.510752e-01	0.2787558115	-0.0588049466
925277	-0.1194566710	0.1244195792	1.484120e-02	0.0607378108	0.0576588492
925291	0.2761350539	0.2273597903	-6.871634e-02	-0.0276269369	0.1478646421
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925622	-0.8029651181	0.1220605895	-4.950476e-01	-0.1819617089	0.3143066179
926125	0.0098729574	-0.0800009784	6.354433e-02	0.5562492156	-0.1554353516
926424	0.1475121301	0.3479599809	-1.950425e-01	-0.2460983953	-0.4040909029
926682	-0.1380625998	0.2932365347	-1.089496e-01	-0.1823602477	-0.2297445474
926954	-0.2324439379	-0.0655571760	2.108950e-02	-0.0419829133	-0.0813483422
927241	-0.0609931700	-0.1683659911	-3.066037e-01	0.3102957595	0.1730640918
92751	0.9204776932	-0.3045424620	-1.808133e-01	0.1889373346	0.1631105493
	PC21	PC22	PC23	PC24	PC25
842302	0.0964300446	-0.0687893946	8.444429e-02	0.1751022126	0.1508872943
842517	-0.0772594939	0.0944953050	-2.175267e-01	-0.0112801927	0.1703603547
84300903	0.3107932463	0.0602560125	-7.422581e-02	-0.1026714190	-0.1710076559



84348301	0.4338116608	0.2030870644	-1.239955e-01	-0.1532947800	-0.0774275740
84358402	-0.1164424689	0.0176343316	1.393310e-01	0.0053271101	-0.0030593705
843786	-0.0024001785	0.1010804263	3.344819e-02	-0.0028377493	-0.1222827647
844359	-0.0497039122	-0.0909661524	-1.428548e-01	0.0801136391	0.2774169346
84458202	0.0446160665	0.1312420402	-2.402675e-01	-0.0962489988	0.1953110200
844981	0.0956161490	-0.1961497958	-5.867294e-02	0.0884762672	-0.1302274924
84501001	-0.2564517862	0.7160864577	1.671813e-01	-0.2158422553	-0.1346590354
845636	-0.1931514370	0.1797289643	1.239130e-04	-0.0661301394	0.1793508578
84610002	0.0256613371	0.1785045463	-2.105003e-01	0.1707930257	-0.2775786245
846226	-0.0212336227	-0.2717732995	8.302672e-01	0.5694022242	0.2050807032
846381	0.0536465611	0.2250613132	1.057031e-01	-0.0118578557	0.0109923447
84667401	0.1057076291	0.0548565083	5.742781e-03	0.1230654885	-0.1363435633
84799002	-0.0751373662	0.0433461466	1.334490e-01	0.1175438173	-0.2497804016
848406	-0.2344824832	-0.0800755365	-1.157460e-01	-0.0257880551	0.1982873357
84862001	-0.1000151185	0.2316735867	-1.000205e-01	-0.1851440561	0.2205773586
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877500	0.1998626546	-0.2994766894	1.318315e-01	-0.0695652574	0.1164275044
877501	-0.1038052557	0.2178052406	-1.049581e-01	0.0526821849	-0.0508188155
877989	0.1279552568	-0.0945051018	-2.438231e-01	0.1472610027	0.0929555605
878796	-0.0027228859	-0.1913806191	3.426568e-01	0.1284350338	0.0829815306
87880	-0.1000833614	-0.0083708106	3.090184e-02	0.0011103715	-0.3573301089
87930	0.0837245389	0.0683833173	7.602116e-02	-0.0867975599	0.0794350264
879523	0.3708654703	0.1067653793	1.684507e-01	0.0644184257	0.0823558647
879804	0.0235208407	-0.0396041087	5.086282e-02	0.1508615288	0.0377821851
879830	-0.0661588882	-0.0406963146	5.900265e-02	0.0324913417	0.0535513031
8810158	0.2540257054	-0.0214357526	1.438473e-02	-0.0144980797	-0.1542563649
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901836	0.0319615134	-0.0968231219	2.486895e-03	0.0071948356	-0.1162327543
90250	0.0134316255	-0.1698369175	1.703009e-01	0.0950466642	-0.0147075625
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902975	-0.1919506336	0.0146756846	-9.445196e-03	-0.0015569820	0.0681560852
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903011	-0.1081337224	-0.0851867667	-7.159536e-04	0.0621432089	0.0011260706
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903483	-0.0342672160	-0.3138320113	-2.166716e-01	0.0511732722	-0.0163250052
903507	-0.1410053670	0.0209689852	-1.014002e-03	0.0368520285	0.1853021199
903516	0.1814668966	0.0199690432	4.537036e-02	-0.0069415733	-0.3393143357
903554	0.0970833511	0.0376140702	9.688994e-02	-0.0522451115	0.0363768619
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904357	-0.1373826082	0.1529384093	-5.524373e-02	-0.0052282533	0.0217460915
90439701	0.0701893451	0.0904031221	5.966770e-01	-0.1366247545	0.2058619450
904647	-0.1958065408	0.1903036506	4.447664e-02	0.0001518732	-0.0192018375
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905189	-0.1076709172	-0.2238560686	-8.967892e-02	-0.0694107063	0.0580830537
905190	0.1891398220	0.1067109845	2.301607e-02	-0.3244498446	0.0501422127
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907367	-0.1158352298	0.1689739828	2.628463e-02	0.0015121747	-0.0385982618
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925277	0.0974032157	-0.0506046046	4.281686e-03	0.0074148594	0.1833745030
925291	0.0104818333	-0.0097405680	3.344908e-02	-0.0084439272	0.0371458564
925292	0.0720893347	0.0359652007	4.155828e-02	0.0841586957	0.0655886608
925311	0.6438555162	-0.1160958384	-1.348357e-01	0.0778267477	0.2155456879

925622	-0.3366411323	-0.5256708725	4.037840e-01	-0.2315981974	-0.0744296594
926125	-0.2819119524	-0.0637883885	3.027516e-01	0.3971743169	0.1344740836
926424	0.0068818177	0.0669407679	8.851262e-02	-0.1078034921	-0.2193267810
926682	-0.0097931016	-0.0195459671	-5.535634e-02	-0.0860588433	-0.0011958031
926954	-0.0365600992	-0.0632967943	-2.001358e-01	0.0447797442	-0.0024266219
927241	0.1405238587	0.0424409640	1.686715e-01	0.1957966922	-0.3774982893
92751	0.2744382324	0.2430237050	3.788121e-02	0.0750448656	0.0174926193
	PC26	PC27	PC28	PC29	PC30
842302	-0.2013263051	-2.523629e-01	-3.388464e-02	4.560759e-02	4.712774e-02
842517	-0.0410926274	1.811108e-01	3.259550e-02	-5.682424e-03	1.866234e-03
84300903	0.0047312486	4.952586e-02	4.698448e-02	3.143131e-03	-7.498749e-04
84348301	-0.2749828222	1.833008e-01	4.244698e-02	-6.923387e-02	1.991989e-02
84358402	0.0392197801	3.213957e-02	-3.475564e-02	5.033481e-03	-2.119512e-02
843786	-0.0302723330	-8.438081e-02	7.296587e-04	-1.970400e-02	-3.456433e-03
844359	-0.0267249755	2.074464e-02	-4.673321e-02	-1.296846e-02	-5.468279e-03
84458202	-0.0594137473	6.662113e-02	2.615274e-02	-2.859407e-03	-1.696347e-03
844981	-0.0549994685	3.829073e-02	3.712728e-02	1.169858e-02	-5.276735e-03
84501001	0.3108206873	-2.849340e-03	1.356126e-01	3.775496e-02	-3.823914e-03
845636	-0.0011132902	-1.675329e-02	-1.787033e-02	-8.472303e-04	8.589286e-03
84610002	-0.0988438257	-5.025511e-02	1.672603e-02	-8.893782e-03	-2.264877e-02
846226	0.1544995990	-1.601695e-01	2.189479e-01	-4.168578e-02	-3.128057e-02
846381	0.0185216253	-6.094451e-03	-2.104929e-02	1.333681e-02	-5.901062e-03
84667401	-0.1817110172	1.686671e-01	-1.248878e-02	5.471581e-02	2.767104e-03
84799002	-0.0132177128	-1.545333e-01	-8.311679e-02	3.490813e-02	-4.127870e-03
848406	-0.0741980103	1.496604e-02	1.660988e-03	-2.340097e-02	-1.378581e-02
84862001	0.0998664510	-7.732604e-02	6.074890e-02	-9.698796e-03	-1.266565e-02
849014	0.0289918326	-5.273101e-02	-1.596623e-03	4.840404e-02	5.987472e-03
8510426	0.0314450550	-5.423713e-02	9.789698e-03	7.673122e-03	1.840938e-03
8510653	0.0355362005	-9.840364e-02	-1.503860e-02	-1.881974e-02	-1.131431e-02
8510824	-0.0038246508	4.633703e-02	-1.209599e-02	-6.511882e-03	-8.590024e-03
8511133	-0.1164538409	-2.216492e-02	1.015524e-03	-1.634073e-02	1.872530e-02
851509	0.0916050281	1.468242e-01	6.867301e-02	1.786932e-02	1.386952e-02
852552	-0.0874379704	-1.431175e-01	3.447092e-03	-2.255543e-02	-3.999663e-03
852631	-0.0677237649	-4.147013e-02	-2.951161e-02	-1.657229e-02	-3.178130e-03
852763	-0.0357830509	6.090625e-02	-2.388746e-02	5.642173e-03	-1.339863e-02
852781	-0.0483807591	7.474866e-02	-1.755439e-02	2.208178e-02	-8.553100e-03
852973	-0.0463898691	-2.400501e-01	-1.852092e-01	-1.492340e-02	9.578804e-04
853201	0.0860853392	-1.294573e-01	1.125290e-02	3.714214e-02	2.014350e-03
853401	0.1964367931	-2.131927e-01	-9.860072e-02	2.126908e-02	1.608133e-02
853612	0.0582729648	-2.306134e-01	-1.768593e-01	-7.475334e-02	-1.128161e-03
85382601	-0.1339382974	-1.253022e-01	1.125350e-01	-4.434909e-03	1.886774e-03
854002	-0.0291953182	4.075234e-02	1.254330e-02	1.420997e-02	-1.165588e-02
854039	0.0209466264	-2.240063e-02	4.957060e-02	5.795811e-03	-3.132503e-02

854253	0.0848362899	1.615390e-01	-1.339550e-02	3.934955e-02	3.490852e-03
854268	-0.0342079425	-6.060832e-02	-1.122619e-01	6.738025e-02	1.370542e-02
854941	-0.0875148451	-1.650241e-01	-3.219827e-02	-1.617018e-02	5.144779e-04
855133	0.1758886282	1.604604e-01	5.386968e-02	1.842240e-01	1.989133e-02
855138	-0.1021726527	1.289034e-01	-7.427828e-02	2.945002e-02	2.146481e-03
855167	-0.0714635560	7.019861e-02	1.158537e-02	-2.247350e-02	-1.566702e-02
855563	0.1507064526	-3.820128e-03	-4.882003e-02	2.547541e-03	2.308071e-03
855625	-0.0097682136	-2.479041e-02	-7.096251e-02	-1.155836e-02	1.589353e-02
856106	0.0612412639	-1.019745e-01	-1.370845e-03	-7.961068e-02	-1.397809e-02
85638502	-0.0171718343	-4.877762e-02	1.425226e-02	-7.139958e-02	-1.085998e-02
857010	0.1332320422	1.573983e-02	5.422979e-02	-6.387622e-03	-7.213235e-03
85713702	0.1425991752	5.474195e-02	-1.825670e-02	-2.922901e-02	-2.649774e-03
85715	0.0028553147	1.498919e-02	1.783116e-02	3.335616e-02	-1.785149e-03
857155	0.1324480590	-2.199369e-03	3.816358e-03	-1.275649e-02	-8.411835e-04
857156	0.0241950429	3.299221e-02	-8.502787e-03	-1.188563e-02	-2.865884e-03
857343	-0.0209776680	6.139058e-02	-9.541691e-03	1.959516e-02	4.711585e-04
857373	-0.0739111736	3.792347e-02	-1.418360e-02	2.929794e-02	7.270380e-03
857374	-0.0893671777	-1.803353e-02	4.758468e-03	-2.715377e-04	1.642671e-03
857392	-0.0606178187	-2.190753e-02	-4.764801e-02	3.402123e-02	1.303268e-02
857438	-0.1075797759	1.268873e-01	2.923216e-03	1.113450e-02	-4.343678e-03
85759902	-0.0058355492	2.774052e-02	1.416855e-02	2.401521e-03	-1.940349e-03
857637	-0.0722065369	-8.119004e-02	7.271206e-02	1.327148e-02	4.135286e-03
857793	-0.1343191246	2.950093e-02	5.444365e-02	4.011741e-03	1.659040e-02
857810	-0.0691174690	8.049384e-04	2.627152e-02	4.565142e-03	6.788361e-03
858477	0.0400160356	-1.686265e-02	-1.071847e-02	1.590382e-02	-6.883016e-03
858970	0.0568714092	7.112930e-02	8.806180e-03	1.288489e-02	6.812673e-03
858981	0.0788845808	2.201995e-01	-2.946023e-02	-1.562093e-02	5.269029e-03
858986	-0.0098332379	-1.134152e-03	9.638361e-02	2.795349e-03	-1.901582e-02
859196	0.0335429502	5.289948e-02	-8.110426e-02	-1.615960e-02	-1.141707e-02
85922302	-0.0290360085	-1.228215e-01	9.356070e-03	-8.243027e-02	-4.849783e-03
859283	0.0465312637	-1.922755e-01	1.659535e-02	6.820462e-03	3.908128e-03
859464	0.0604134233	9.187789e-02	-1.975320e-02	9.282008e-03	5.559412e-03
859465	0.0761632336	-9.449785e-03	3.607516e-02	1.644550e-02	3.225830e-03
859471	0.2804283970	-2.445271e-02	6.842730e-03	7.394054e-03	-1.258908e-02
859487	0.0091579194	-5.251089e-02	1.240814e-02	1.391723e-02	6.642330e-03
859575	-0.0668453796	-1.379328e-02	-4.034711e-02	-4.567540e-02	-1.497659e-05
859711	0.0533337084	1.533702e-01	2.941771e-02	-5.665631e-03	-1.872210e-03
859717	-0.0797672858	1.517182e-02	8.814363e-02	-3.560637e-02	-2.146240e-02
859983	-0.0717088123	-3.146387e-02	-4.010897e-02	-4.737433e-02	-9.918869e-03
8610175	-0.0169312595	5.540068e-02	3.076006e-02	-2.228666e-02	-2.118429e-02
8610404	-0.0026046375	-9.489266e-02	2.564001e-02	-5.653385e-04	-5.060816e-04
8610629	0.0207984498	-1.733530e-01	5.676664e-02	3.943605e-02	2.590542e-04
8610637	0.0028980342	-1.148445e-01	-4.691931e-03	5.128264e-02	2.095843e-02

8610862	-0.0292208810	-4.654883e-02	5.126402e-02	3.512806e-02	-7.332746e-02
8610908	0.0603063922	7.898511e-02	1.797480e-02	7.861041e-03	-4.882806e-03
8611103	-0.0093357855	-4.725720e-02	-2.313927e-02	-4.685092e-03	-5.544045e-03
8611161	0.1263341389	-1.278413e-01	7.181074e-02	-8.010741e-02	8.607098e-03
8611555	0.1532547175	2.065368e-01	-6.524724e-02	-2.149175e-02	6.506712e-03
8611792	0.0648110159	-2.543076e-01	1.221035e-01	1.212184e-04	-1.076054e-02
8612080	0.0007406985	4.610443e-02	-3.731944e-04	-1.674579e-02	-8.527853e-03
8612399	-0.0331782104	-7.289186e-02	-4.793390e-02	-1.125719e-02	-1.093361e-02
86135501	-0.0897923772	3.869966e-02	1.113252e-02	-1.599296e-02	9.423312e-03
86135502	0.0997869683	-2.630915e-02	5.753144e-02	-1.604379e-01	3.833652e-02
861597	0.0314408018	-5.616749e-03	-1.563489e-02	1.027323e-02	6.715216e-03
861598	0.0664403562	-1.205373e-02	2.007444e-02	2.728987e-02	7.404621e-03
861648	-0.0003730261	-1.122276e-02	2.580197e-03	9.258593e-03	-8.194443e-03
861799	0.0128416323	-2.061422e-01	-2.391746e-03	2.073897e-02	-1.300581e-03
861853	-0.0569819083	2.149318e-02	2.606583e-03	-6.390703e-02	-1.160386e-02
862009	-0.0083745308	2.504138e-02	2.196984e-02	-1.134910e-02	-1.335217e-03
862028	-0.0497851056	-4.559731e-02	4.608258e-02	-1.812182e-02	-1.283830e-02
86208	0.1201800560	4.208440e-02	3.674203e-03	-2.057035e-02	5.126475e-03
86211	-0.0506141608	-5.027953e-02	-2.802634e-02	3.203650e-03	-4.353658e-04
862261	-0.0312503688	7.193844e-02	-9.341616e-03	2.552925e-03	-1.402809e-02
862485	0.0844032885	-1.349955e-01	9.281856e-03	4.750116e-03	-3.466455e-03
862548	-0.0257304933	-5.673535e-02	9.393122e-04	1.313570e-02	-7.638205e-03
862717	-0.0025631120	1.356357e-03	1.644737e-02	-3.823881e-02	-9.833806e-03
862722	0.1064206394	1.519109e-01	-4.087998e-02	-4.398503e-02	-1.438949e-03
862965	-0.0140467040	3.459111e-02	2.954355e-04	1.254899e-02	-2.957340e-04
862980	0.1847666902	5.359975e-02	-8.938925e-03	-3.344707e-03	3.673153e-03
862989	0.0211923117	5.879791e-02	-1.571216e-02	-1.570264e-02	-8.774836e-03
863030	-0.0232042053	4.932440e-02	1.155743e-02	-1.955738e-02	2.994340e-03
863031	0.0047096088	1.265146e-01	1.027214e-02	1.037018e-02	2.799425e-03
863270	0.0606735954	-1.540510e-02	2.302233e-02	2.966592e-02	2.369330e-03
86355	-0.3282574905	7.597204e-02	-4.208036e-02	5.752181e-03	1.961708e-02
864018	0.0296359776	-1.096758e-01	1.567934e-03	1.856333e-02	2.232873e-03
864033	-0.0464114027	6.782503e-02	-1.148012e-02	3.717658e-03	7.837625e-04
86408	-0.0523768243	-1.293519e-01	2.375350e-03	5.226188e-03	1.553986e-02
86409	-0.1891288061	1.521924e-01	7.250653e-02	-8.085429e-03	-5.721149e-04
864292	-0.0317323231	-1.046274e-02	-3.791760e-02	-4.603995e-03	-8.643990e-03
864496	0.0075563673	9.480868e-02	-5.016599e-02	2.620338e-02	-8.430096e-03
864685	-0.0503911791	1.785086e-02	2.192546e-02	1.495819e-04	-3.887868e-03
864726	0.0777033458	1.294349e-01	7.314377e-02	-2.121766e-02	-3.512427e-03
864729	-0.1234132759	-1.703396e-02	1.368415e-03	-4.179289e-03	6.831538e-03
864877	-0.0224658175	-1.080530e-01	9.287116e-02	1.743955e-03	-2.880034e-02
865128	0.1309244119	1.540883e-02	4.173716e-02	-6.394356e-03	3.945424e-02
865137	0.0508063449	-6.447124e-02	7.984368e-03	8.721731e-03	-1.275857e-02



86517	-0.1525315195	-6.004771e-02	3.475692e-02	9.488712e-03	2.183874e-02
865423	-0.2229870539	-2.472825e-02	-1.010000e-01	4.103202e-02	-2.125541e-04
865432	0.0418498033	-2.909973e-02	-1.592235e-02	1.748397e-02	5.563332e-03
865468	-0.0202921763	-5.942333e-02	5.064636e-02	3.555551e-03	-1.133817e-03
86561	-0.1121602734	-1.161802e-02	-1.407714e-02	-1.884080e-02	3.161868e-03
866083	-0.0257506726	-1.393456e-01	-5.830674e-02	-5.148794e-02	-8.016295e-03
866203	0.0876668247	2.343153e-02	5.135429e-03	-2.716794e-02	-3.988293e-04
866458	0.1187115289	-9.014834e-02	-9.844412e-03	-2.289141e-02	2.376357e-02
866674	-0.1706089520	7.382328e-02	1.538592e-02	5.700609e-03	3.355304e-02
866714	-0.0432871492	-2.692320e-03	-2.110486e-02	1.944582e-02	-9.803105e-04
8670	0.0011718217	-1.596438e-02	4.600205e-02	-3.640996e-02	-7.315411e-03
86730502	-0.0528996064	4.515608e-02	-1.839276e-02	-7.431547e-03	-5.422633e-03
867387	-0.0282699050	-1.184145e-02	-2.195837e-02	-1.263740e-02	-4.758611e-03
867739	0.1191672859	-3.904577e-02	1.757057e-02	1.638597e-02	-1.846504e-03
868202	-0.0227364289	-4.455291e-02	6.116922e-03	1.501203e-02	-7.453719e-03
868223	0.0238785713	7.539973e-02	-1.181029e-03	-1.745342e-02	-3.718782e-03
868682	0.0453529768	3.918415e-02	-9.718923e-03	-6.407847e-04	-8.921861e-04
868826	-0.0046654928	1.410890e-01	-3.285330e-02	4.483727e-02	2.993330e-02
868871	0.1495819096	1.751436e-02	-4.783602e-02	-2.357881e-02	-2.338267e-04
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869104	0.0199857883	-9.378889e-02	5.731649e-03	-5.278943e-03	-5.891067e-03
869218	0.0049677942	5.801943e-02	-2.392725e-02	-1.320679e-02	-4.310563e-03
869224	0.0043929369	-3.683012e-02	-2.305639e-02	1.838762e-02	-1.360631e-03
869254	0.0495119056	4.722858e-02	-1.055344e-02	-1.275491e-02	2.378069e-03
869476	-0.0263294206	-6.201771e-02	2.591795e-02	1.040242e-02	-1.781949e-02
869691	-0.0862135434	1.222878e-01	-8.321784e-03	2.277179e-03	-1.119635e-02
86973701	-0.0493239513	-3.627953e-03	2.379318e-02	-1.808326e-03	9.272048e-04
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871001501	-0.0734031813	-3.077032e-03	1.873760e-02	4.537366e-03	-8.726467e-03
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8710441	-0.1390340354	-2.638579e-02	-3.366712e-02	1.779878e-02	-1.574621e-03
87106	-0.0365289819	-1.101000e-02	3.811133e-03	1.088321e-02	-7.351056e-03
8711002	-0.1315499734	2.241155e-02	-1.438139e-02	2.428473e-02	1.113668e-04
8711003	-0.0066142429	-3.117548e-02	2.147334e-02	5.902105e-03	-2.092831e-03
8711202	0.0059292226	-7.990834e-02	1.053452e-01	1.097157e-02	-1.879966e-03
8711216	-0.0208420277	1.045552e-01	-1.873284e-02	2.041273e-02	1.338303e-02
871122	-0.0347925369	5.128014e-02	1.544007e-03	1.585498e-02	-3.662968e-03
871149	0.0320333494	9.611557e-02	1.100796e-02	9.278600e-03	3.250644e-03
8711561	0.1625166960	1.062510e-02	3.867946e-02	9.830449e-03	1.758741e-02
8711803	0.1833278621	-6.514273e-02	-4.949089e-02	-3.143983e-04	-1.024462e-02
871201	0.0466382547	4.488584e-02	9.110442e-02	1.485736e-03	-1.312096e-02
8712064	-0.0778884859	-1.494685e-02	1.326543e-02	4.271208e-03	-3.692513e-03

8712289	0.1648438853	3.025702e-01	-2.340033e-02	-8.324051e-03	1.848549e-03
8712291	-0.0187672166	2.205116e-02	1.467823e-02	-6.467033e-03	1.148680e-02
87127	-0.0022116006	-3.659396e-02	1.749325e-02	1.437802e-02	-3.555458e-03
8712729	0.0111851727	-5.483086e-02	9.163004e-03	-1.515471e-02	-1.308248e-02
8712766	-0.1128389699	4.360550e-02	-2.252514e-03	-4.939426e-03	7.403680e-03
8712853	0.0047133540	-4.722385e-02	9.407798e-03	3.756833e-03	5.469545e-03
87139402	0.0058479819	-5.422273e-02	1.519286e-02	-1.626943e-02	-1.424677e-03
87163	-0.0621792689	-4.679305e-02	-2.794307e-02	-8.322050e-02	-9.724531e-04
87164	-0.0204716584	-2.174815e-01	8.286055e-03	-1.945686e-02	-1.449219e-03
871641	-0.1283484525	-2.105483e-01	-1.812564e-02	-3.558919e-02	-1.771539e-04
871642	-0.0652630427	2.760698e-02	1.000593e-02	4.358827e-03	-7.483755e-03
872113	0.0316665578	7.087026e-02	5.732845e-03	6.943427e-03	-4.316588e-03
872608	-0.0130124597	9.505262e-03	2.489507e-02	-3.715104e-02	-1.768256e-03
87281702	0.0149367843	-3.373768e-02	-2.874672e-02	4.494640e-02	6.648435e-03
873357	-0.0565577633	-3.716741e-02	1.515057e-02	-5.631381e-03	7.259187e-03
873586	-0.1181480118	-4.202926e-02	-2.804052e-03	2.235523e-02	-3.575397e-03
873592	0.5075073909	3.875397e-01	-3.649879e-02	-4.817298e-02	-1.234021e-02
873593	0.1715237713	1.077659e-02	1.370693e-01	1.607476e-02	-4.130650e-03
873701	-0.0408188409	-1.855354e-02	5.026622e-02	-2.081737e-02	-6.144694e-03
873843	-0.0032329462	4.783222e-02	-5.100500e-02	-6.710928e-03	-1.311918e-02
873885	0.0566462354	-4.700916e-02	5.079073e-02	-1.107745e-03	-3.410878e-03
874158	0.0326076649	7.283462e-02	7.799828e-03	4.257019e-03	-6.436029e-03
874217	0.0970624158	4.300686e-02	2.557256e-02	3.511308e-03	4.228434e-03
874373	0.0030832009	2.037473e-02	-1.368604e-02	8.753567e-03	1.345992e-03
874662	0.0059062159	-1.096237e-02	-8.635239e-03	1.119167e-02	-4.636712e-03
874839	0.0290239084	2.453131e-02	1.775126e-02	-1.022940e-02	8.378152e-03
874858	0.0639676895	-4.746824e-02	4.534134e-02	1.788060e-02	3.942582e-02
875093	0.0691856368	-1.014548e-02	9.965295e-03	4.872696e-02	-1.213839e-03
875099	-0.1193609214	-5.010956e-02	-4.591822e-02	-1.193226e-02	-3.963558e-03
875263	-0.0723515248	1.223090e-02	7.793775e-03	-2.935833e-02	-1.693386e-02
87556202	0.0957203640	-1.086967e-01	-1.582959e-03	1.441066e-02	1.349096e-02
875878	-0.0043906404	-2.636426e-02	9.351632e-03	2.336560e-02	1.097957e-03
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877159	-0.0125777667	-5.077927e-02	-6.943705e-03	2.010879e-03	7.766158e-03
877486	-0.0457090424	4.732110e-04	-1.101138e-01	5.298756e-03	-1.730179e-02
877500	-0.0387661993	2.856540e-02	8.960081e-02	-4.193797e-03	-1.195863e-02
877501	0.0406861821	-4.063331e-02	1.658042e-02	-2.740055e-02	-6.035120e-03
877989	0.0628321938	1.662944e-03	-5.740479e-02	-9.416140e-03	6.126064e-04
878796	0.0356893819	3.128748e-01	-1.007465e-01	-8.529045e-04	-3.819438e-02
87880	-0.0522821695	-1.586622e-01	2.118169e-02	-2.050653e-02	1.151177e-03
87930	-0.0093959004	3.989723e-02	9.128397e-03	-3.727004e-02	-1.006706e-02
879523	-0.0442994933	-1.772295e-02	-1.493651e-03	1.711604e-02	-1.574921e-02
879804	0.1136387746	1.087258e-01	1.246010e-02	1.874143e-02	1.204608e-03

879830	0.0194917676	-6.808987e-02	-4.364781e-03	-1.874407e-02	1.185807e-02
8810158	0.0266412052	-1.522403e-01	-4.513389e-02	3.041498e-02	-1.748377e-02
8810436	-0.0665932751	-3.875520e-02	-1.000271e-03	-1.976138e-02	2.741061e-04
881046502	0.0899645237	7.156408e-02	2.004215e-02	-1.900426e-02	4.412764e-02
8810528	-0.0129848991	3.220875e-02	6.694608e-03	-1.558529e-03	2.875884e-03
8810703	-0.0059839516	-1.940912e-02	1.123293e-01	-1.540261e-01	6.534187e-03
881094802	-0.1752161446	-8.473609e-02	-3.450049e-03	-2.207832e-02	-2.188679e-02
8810955	-0.0569743952	-6.261779e-02	-4.860221e-03	-5.786062e-03	1.020700e-02
8810987	0.1237499184	-8.195971e-02	1.529261e-02	6.937451e-03	2.619794e-03
8811523	0.1225618939	2.156147e-03	5.564389e-03	-3.560424e-03	-9.562893e-03
8811779	0.0207754683	5.065478e-02	-1.366777e-02	-2.066266e-02	-6.442102e-03
8811842	0.0647228635	-4.574542e-02	-1.722227e-02	-3.308224e-02	7.010155e-03
88119002	-0.0251689372	-3.974507e-02	1.042405e-01	1.826330e-02	-1.796512e-02
8812816	-0.0960222584	-4.425287e-02	-1.275666e-02	-1.388723e-02	-5.890132e-04
8812818	0.0376677232	-6.505149e-02	-8.533465e-03	4.279110e-03	6.539797e-03
8812844	0.0535466030	3.276009e-02	-2.756607e-02	-1.454529e-03	7.416389e-04
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8813129	-0.0307382236	-6.048268e-03	-2.004751e-02	7.491103e-03	4.944308e-03
88143502	0.0038497261	-3.295088e-02	1.592811e-02	-7.082278e-03	-2.641670e-03
88147101	0.0417846570	1.014432e-01	-1.676444e-02	-2.230372e-02	-1.486683e-03
88147102	0.0227429302	-3.082262e-02	-3.311199e-02	1.177004e-02	1.492911e-02
88147202	0.0421147176	4.962457e-02	2.486351e-02	2.865424e-02	-1.872174e-02
881861	-0.0425668315	4.688174e-02	-4.618497e-02	-6.874296e-03	2.119647e-02
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88199202	0.0056845921	-4.220301e-02	-1.412551e-02	5.629644e-03	5.025942e-03
88203002	-0.0181151448	2.843831e-02	-1.654791e-03	1.080407e-03	4.042317e-03
88206102	0.0042149614	1.146302e-01	-2.067239e-02	-6.311137e-03	6.009812e-03
882488	0.0118534104	-4.761135e-04	-1.400283e-02	1.197801e-02	-4.726901e-03
88249602	-0.0850496766	5.335101e-02	-4.697283e-03	6.637333e-03	4.165397e-03
88299702	0.2409967021	2.607101e-02	4.560323e-02	8.437318e-02	1.316171e-02
883263	0.0681708739	5.063556e-02	-5.389681e-02	-6.290592e-02	1.779366e-02
883270	-0.0523829446	-4.076603e-02	-6.505627e-03	-2.591461e-03	7.136696e-03
88330202	-0.2620795734	7.106819e-02	7.135497e-02	-1.065164e-01	3.469120e-03
88350402	0.0139953617	-1.884256e-02	2.886332e-02	1.645641e-02	1.335793e-03
883539	-0.0375142186	-2.700686e-02	1.148629e-02	2.074699e-02	1.639722e-03
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884448	-0.0014005785	-4.654162e-02	1.083157e-02	3.151084e-02	-1.264109e-03
884626	0.1601457813	-6.855604e-02	-3.446241e-02	8.982938e-03	8.781242e-03
88466802	0.0713281560	3.797545e-02	-2.621500e-02	-8.606330e-03	-1.208039e-03
884689	0.0647306238	5.543553e-02	1.748686e-02	9.221382e-03	-1.937773e-03

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88649001	0.1694749187	-1.452418e-01	-4.223670e-02	1.760845e-02	-4.754179e-02
886776	-0.1987411786	1.534773e-01	-1.717000e-02	2.091682e-02	2.190131e-02
887181	-0.0491380386	9.414766e-02	2.762488e-02	4.803323e-02	-4.682385e-03
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887549	0.0002781657	5.127961e-02	-5.011346e-02	7.952146e-03	1.184872e-02
888264	-0.0440770570	4.210933e-03	-1.786385e-02	-1.460748e-02	1.581327e-02
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8910506	-0.0139591621	2.428365e-02	1.976969e-02	2.633992e-02	-4.107245e-03
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8910748	0.0375752134	3.203805e-02	8.858806e-03	-2.961281e-03	-1.207918e-03
8910988	0.1490111178	1.779051e-02	-4.740955e-02	1.222139e-02	-3.728448e-02
8910996	0.0327419876	8.148477e-03	8.654636e-03	-1.952291e-03	-6.147097e-03
8911163	0.0087349948	-2.586902e-02	-1.982127e-02	-2.952873e-02	1.231110e-02
8911164	0.1985841490	-1.657353e-01	2.135428e-03	4.348128e-02	-6.801149e-04
8911230	-0.0883232465	1.507252e-03	1.628523e-02	-1.568217e-03	-8.397414e-03
8911670	0.0367848322	6.676286e-02	1.394801e-02	-9.331447e-03	1.667624e-02
8911800	-0.0790263545	-1.488143e-02	-3.854222e-03	-2.903717e-02	3.250515e-03
8911834	-0.0439433966	-7.992376e-04	-5.775437e-03	1.333417e-03	5.149795e-03
8912049	0.0240789261	-2.159175e-02	-3.065026e-02	3.221432e-02	2.504987e-02
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89122	-0.0989052165	1.476582e-01	6.469516e-02	-6.425264e-02	-3.674088e-03
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89143602	0.1095218903	-4.354009e-02	-1.189663e-01	1.684308e-02	-1.505344e-02
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891936	-0.0033749247	-2.609997e-02	-1.145724e-02	-2.605510e-02	-1.049788e-03
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892214	-0.1158169986	2.418180e-03	5.330283e-03	-7.836024e-04	-2.693467e-03
892399	-0.0273016481	-5.583721e-02	1.780719e-02	-1.012395e-02	4.592012e-03
892438	-0.0282443641	8.385431e-02	7.402991e-03	7.987707e-03	-4.376741e-03
892604	0.0261265002	-1.263315e-02	8.707451e-03	8.122662e-03	1.265416e-02
89263202	0.0373782196	-2.276784e-01	3.191511e-02	5.069162e-02	-1.893042e-02
892657	-0.0062233253	2.515242e-02	-6.055567e-03	6.048636e-03	-3.441770e-03
89296	-0.0216028124	7.907603e-02	1.869958e-02	5.518316e-03	2.679961e-04
893061	-0.0237083184	-3.415762e-03	-5.446159e-03	1.323583e-02	-4.273406e-03
89344	-0.1224970335	5.435459e-02	1.468262e-03	7.994120e-03	1.133243e-03
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894047	-0.0640172940	-2.207106e-02	2.742342e-02	1.096522e-02	-3.349680e-03
894089	-0.0750516303	1.104417e-02	5.262369e-03	-4.431895e-04	1.289335e-03
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894326	0.1036850662	-4.122734e-02	3.720628e-02	-1.037487e-02	3.310589e-03
894329	-0.0961353683	2.559677e-01	2.025943e-02	-4.386663e-02	3.848493e-02
894335	-0.0383937277	-1.053789e-01	-7.689872e-03	-5.177114e-03	4.696287e-03
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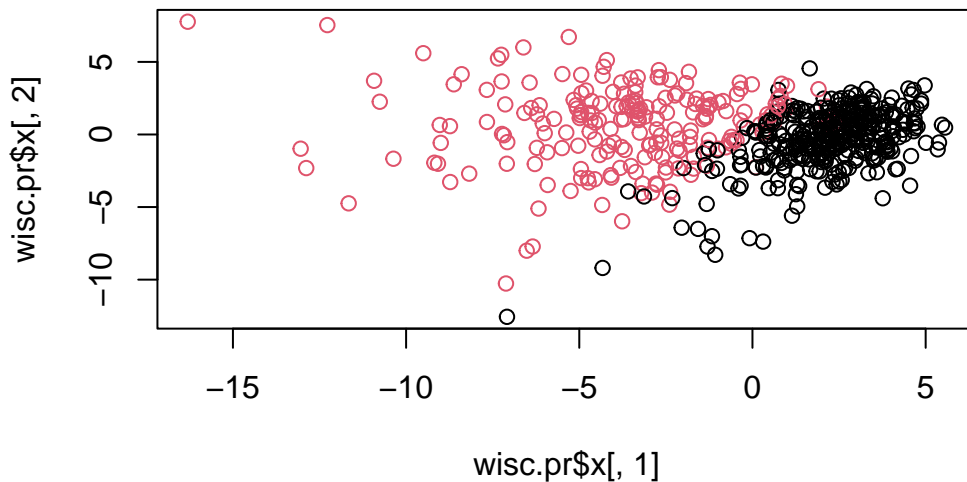


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912558	-0.0154989113	8.817212e-03	9.226792e-03	1.934553e-03	1.020699e-02
912600	-0.0136577142	-6.945356e-02	7.542745e-03	-1.162578e-02	1.376873e-02
913063	-0.0107779990	3.093484e-03	1.413849e-01	-6.100949e-03	1.202071e-03
913102	0.0095431487	-7.376165e-03	2.000637e-02	-2.068873e-02	-5.432457e-03
913505	0.0040869238	1.517483e-02	1.015079e-01	-1.262707e-02	3.374017e-03
913512	0.0355692398	9.085520e-02	-4.393050e-03	4.668312e-03	-6.227434e-03
913535	0.0086380352	1.069920e-02	-3.724756e-02	-2.337908e-02	9.673922e-03
91376701	-0.0523983166	-2.155044e-02	-3.015589e-02	4.206849e-03	-4.615799e-03
91376702	0.0364243509	2.194271e-02	6.585056e-03	-5.260954e-03	1.175358e-02
914062	-0.0249186250	-9.840999e-02	-1.409311e-02	-4.124637e-03	-2.145734e-03
914101	-0.0546115161	-1.086523e-01	2.580461e-02	6.505626e-03	3.807495e-03
914102	-0.0900970424	-7.973081e-02	-1.382759e-02	2.391790e-02	2.493993e-03
914333	-0.0040977809	-6.976257e-02	-1.359450e-02	-7.869232e-03	4.008083e-03
914366	0.0965211814	-5.682683e-02	6.498587e-03	1.456788e-02	2.151391e-03
914580	-0.0422754385	2.085169e-02	-1.607462e-03	3.798926e-03	-1.110263e-02
914769	-0.0967977019	-1.485310e-01	1.576602e-02	3.329348e-03	-9.341349e-03
91485	-0.0641045051	1.841422e-01	-7.024287e-02	1.970595e-02	-1.498247e-02
914862	0.0854465362	-1.747535e-01	-3.607397e-02	1.867275e-03	-3.821167e-03
91504	-0.0963197757	9.104160e-02	-2.312398e-02	3.386630e-02	-1.529871e-02
91505	-0.0121822447	-1.090114e-02	8.724908e-03	4.694641e-03	-1.074887e-03
915143	-0.1180678238	2.658401e-01	-7.894180e-02	-2.561913e-02	7.697159e-03
915186	0.1148367203	2.121193e-01	-3.514142e-02	-5.061458e-02	3.668640e-02
915276	0.2752439895	-3.019773e-01	9.673065e-03	-1.996698e-02	4.151417e-02
91544001	-0.0485533966	5.416690e-02	-1.649414e-02	-1.490646e-02	-2.155321e-03
91544002	-0.0036376007	-1.802591e-01	-1.011343e-02	2.070820e-02	6.669538e-03

915452	-0.0647665350	4.842798e-03	1.594580e-02	9.613952e-03	-3.100001e-04
915460	-0.1754187549	1.359165e-01	4.067320e-02	5.041105e-02	2.144200e-04
91550	-0.0556837067	6.632740e-02	-6.746846e-03	1.531456e-02	-1.218153e-02
915664	-0.0984427406	1.808916e-02	1.255164e-02	9.930751e-03	9.221713e-03
915691	0.0036057142	-8.355934e-02	-3.592810e-02	2.235170e-02	3.151072e-03
915940	-0.0112187011	2.530924e-02	4.763963e-03	-1.126705e-02	7.608210e-04
91594602	-0.0091762716	-7.293476e-02	2.792662e-02	-3.556928e-03	-1.164186e-03
916221	0.0038142602	3.300541e-02	8.325671e-03	-4.509973e-03	-1.285385e-03
916799	0.0189855035	-9.752934e-02	-6.505096e-03	-2.312757e-03	-1.589520e-02
916838	0.0550042618	-1.724436e-01	-9.894992e-02	-7.051032e-02	7.208234e-03
917062	0.1580673727	-6.410352e-02	-8.250866e-03	-1.932592e-02	1.086353e-02
917080	0.0544002611	1.580256e-02	-1.613705e-03	8.423291e-04	9.014139e-04
917092	0.0074556575	9.663785e-02	-2.665164e-02	-3.072198e-02	-5.603826e-03
91762702	0.2131860543	1.741659e-01	-1.264691e-01	1.220225e-02	-8.726745e-03
91789	-0.0681589606	-9.361363e-03	-8.419239e-03	1.344440e-02	2.051314e-03
917896	-0.1061345671	4.966193e-03	-6.582652e-03	4.193781e-02	7.898565e-03
917897	0.0664531179	-2.655619e-02	-2.136312e-02	-9.637608e-03	2.497448e-03
91805	0.0886147194	1.155966e-01	-5.229288e-02	1.076846e-02	1.449954e-03
91813701	0.0330021360	8.336065e-02	-5.061548e-03	3.298927e-02	5.387830e-04
91813702	0.0181336410	4.282084e-02	3.040698e-02	1.508284e-02	-7.330015e-03
918192	-0.0934720894	-5.020254e-02	4.171083e-02	-7.809330e-03	-9.193665e-05
918465	0.0288790490	-5.652693e-02	-1.947227e-03	1.611639e-03	-4.255828e-03
91858	0.0424242869	9.025177e-03	-1.623234e-02	6.269355e-03	-8.871060e-04
91903901	0.0931826121	-3.654002e-02	4.324270e-03	4.165806e-03	-1.106227e-03
91903902	-0.0830740552	1.658681e-02	1.150422e-02	-1.563064e-02	-6.663151e-03
91930402	0.1480707171	8.699232e-03	-5.961362e-02	-1.044751e-02	-6.141284e-03
919537	0.0728753384	1.259825e-02	-9.518713e-03	9.373100e-03	-3.095154e-03
919555	0.1536070303	-3.265112e-02	2.996697e-02	8.171708e-03	-3.458037e-02
91979701	-0.0487762627	5.821042e-02	1.015633e-02	2.035367e-02	9.738559e-03
919812	0.0329233687	-1.804282e-02	-2.169062e-02	-2.378939e-02	8.893677e-03
921092	0.1468627182	7.253893e-02	-8.746899e-03	-1.161071e-02	9.286171e-03
921362	0.1812441331	7.132198e-03	1.665571e-03	-5.739799e-02	3.679201e-02
921385	-0.0295036155	-8.523727e-03	-8.796157e-03	-2.463757e-03	9.112497e-05
921386	-0.0987152511	2.575798e-03	-1.994940e-02	8.161193e-03	-1.262046e-02
921644	-0.0565374950	1.610918e-02	-1.295072e-02	-2.390649e-02	4.092165e-03
922296	0.0568923371	-7.840121e-02	-1.162042e-02	3.505356e-03	-6.121733e-03
922297	-0.0542291424	-8.247547e-02	-8.960736e-03	1.302883e-02	4.772981e-03
922576	-0.0678745818	-1.961314e-02	-6.487119e-03	-4.750888e-03	-3.114620e-03
922577	0.0125381679	4.498783e-02	5.470187e-03	-7.783998e-03	-4.507372e-03
922840	0.0313546289	-4.161718e-02	-2.705643e-03	9.706143e-03	3.657914e-03
923169	0.1006525985	5.511332e-02	-8.274135e-04	-2.590615e-02	8.789459e-04
923465	-0.0007909619	3.418774e-02	6.937288e-05	-2.145122e-02	-4.134624e-03
923748	-0.0163685109	-1.107701e-02	2.770954e-02	1.795767e-02	8.260042e-03

923780	-0.0014215153	5.637368e-02	-3.381745e-03	3.849594e-03	-1.779362e-03
924084	-0.1022492547	-9.323360e-03	5.913651e-04	1.263059e-02	-7.162542e-03
924342	0.0044220903	4.297202e-03	-9.650436e-03	-1.615592e-02	-1.435061e-03
924632	0.0024994349	-7.130661e-02	4.473723e-02	1.560585e-02	1.385123e-03
924934	0.0938320141	3.896512e-02	-1.164274e-02	-1.431460e-03	6.878081e-03
924964	0.0152530115	-3.226473e-03	2.268760e-03	-1.799952e-02	-4.947889e-05
925236	0.1510723322	1.702667e-01	3.413466e-02	3.102528e-02	8.728220e-03
925277	0.0407493494	3.978350e-02	-1.130892e-02	4.068695e-03	-6.920526e-03
925291	0.0599659983	-3.787753e-02	2.037519e-02	-3.413149e-04	1.269775e-02
925292	0.0968312180	-1.392626e-02	2.900866e-02	1.731854e-03	4.328273e-03
925311	0.0041827618	2.209661e-02	7.486086e-03	-3.107530e-04	5.831723e-03
925622	0.2037854413	-1.474368e-01	-1.245986e-01	9.015380e-03	-7.118296e-03
926125	-0.0729289516	1.450989e-01	-3.945551e-02	7.014761e-02	7.638391e-03
926424	-0.1227922446	1.590577e-01	9.843968e-03	7.112909e-03	1.413613e-03
926682	0.0658312978	-6.845211e-02	-2.355466e-02	-2.746212e-02	1.041027e-02
926954	0.0070890278	-2.367063e-02	-2.575490e-03	6.700316e-03	-3.767102e-03
927241	-0.1980178555	-2.738532e-02	-6.802653e-02	-8.408929e-02	2.376191e-02
92751	0.3468098821	1.272691e-01	-9.507513e-03	-6.085956e-02	1.945846e-02

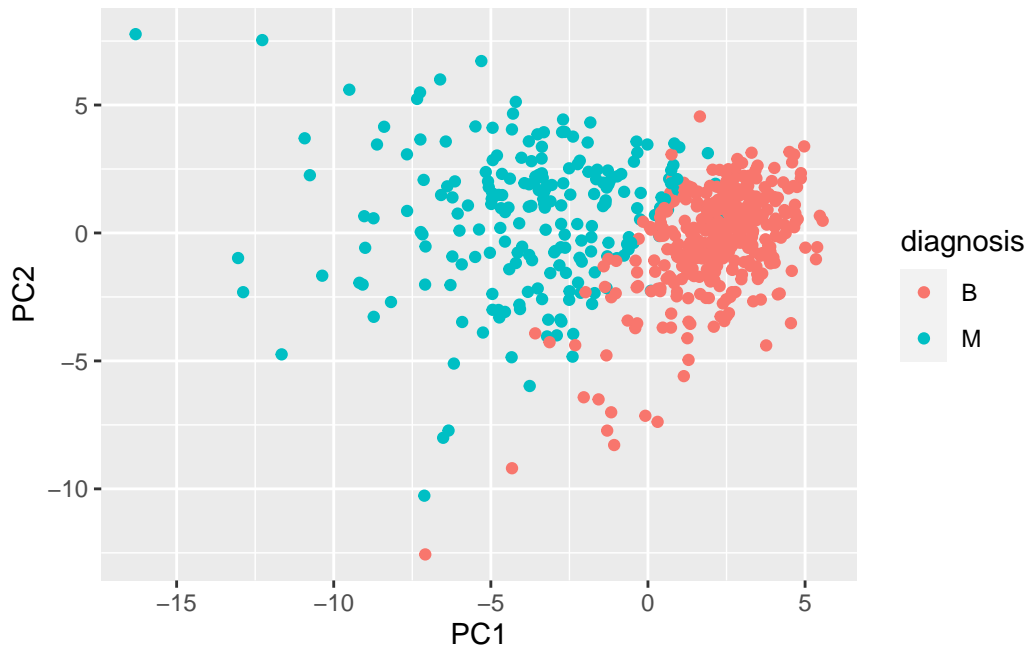
```
plot(wisc.pr$x[,1], wisc.pr$x[,2], col=diagnosis)
```



```
library(ggplot2)

pc <- as.data.frame(wisc.pr$x)

ggplot(pc) +
  aes(PC1, PC2, col=diagnosis) +
  geom_point()
```



Q8. Generate a similar plot for principal components 1 and 3. What do you notice about these plots? **Answer:** Points are less overcrowded. Plot is larger. It is easier to read.

### Communicating PCA results

Q9. For the first principal component, what is the component of the loading vector (i.e. `wisc.pr$rotation[,1]`) for the feature `concave.points_mean`?

```
wisc.pr$rotation["concave.points_mean",1]
```

```
[1] -0.2608538
```

Q10. What is the minimum number of principal components required to explain 80% of the variance of the data? **Answer:** 5

```
tbl <- summary(wisc.pr)
which(tbl$importance[3,] > 0.8)[1]
```

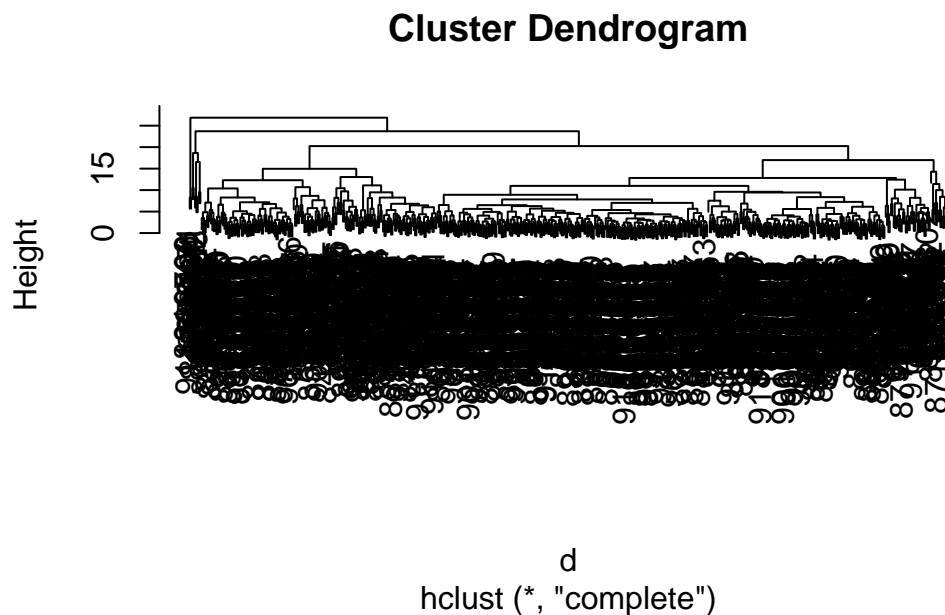
PC5

5

## Hierarchical clustering

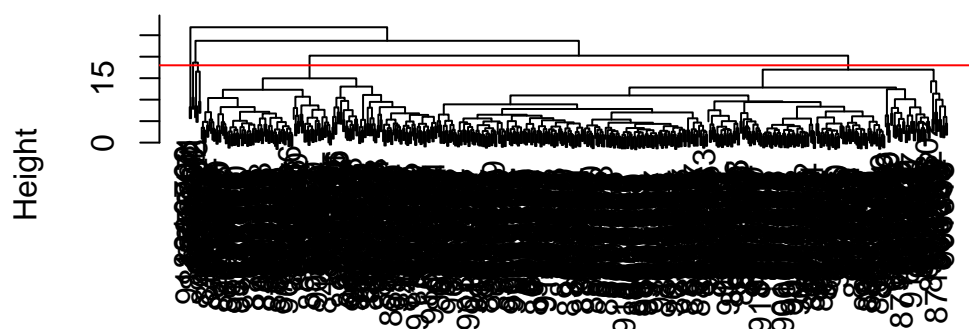
The main function for Hierarchical clustering is called `hclust()` it takes a distance matrix as input.

```
d <- dist(scale(wisc.data))
wisc.hclust <- hclust(d)
plot(wisc.hclust)
```



```
plot(wisc.hclust)
abline(h=18, col="red")
```

## Cluster Dendrogram



d  
hclust (\*, "complete")

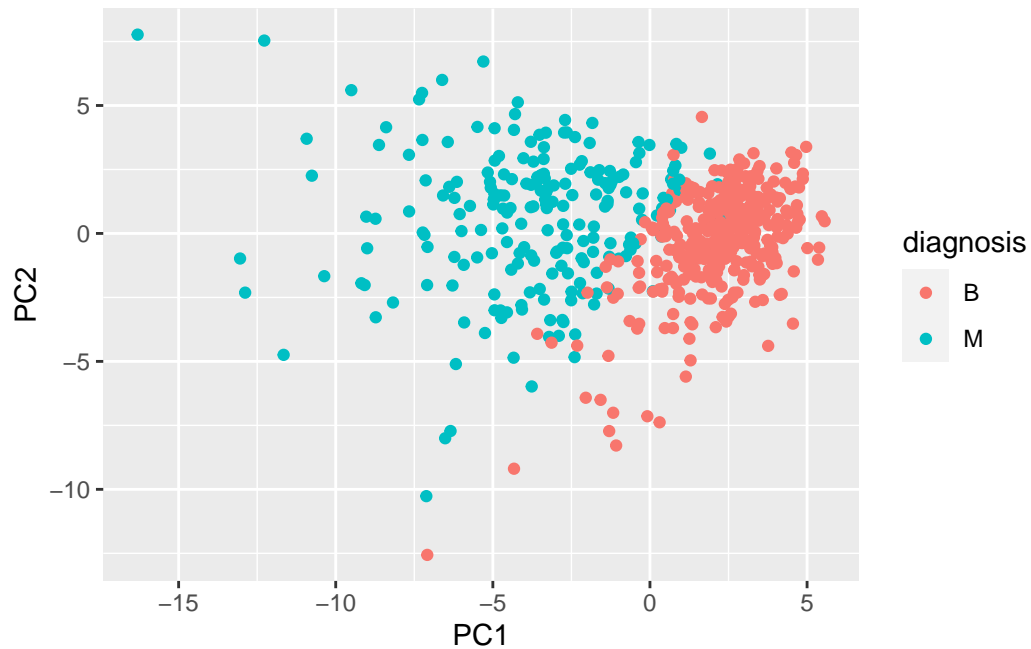
```
grps <- cutree(wisc.hclust, h=18)  
table(grps)
```

grps

1	2	3	4	5
177	5	383	2	2

Come back here later to see how our cluster grps correspond to M or B groups.

```
library(ggplot2)  
  
pc <- as.data.frame(wisc.pr$x)  
  
ggplot(pc) +  
  aes(PC1, PC2, col=diagnosis) +  
  geom_point()
```

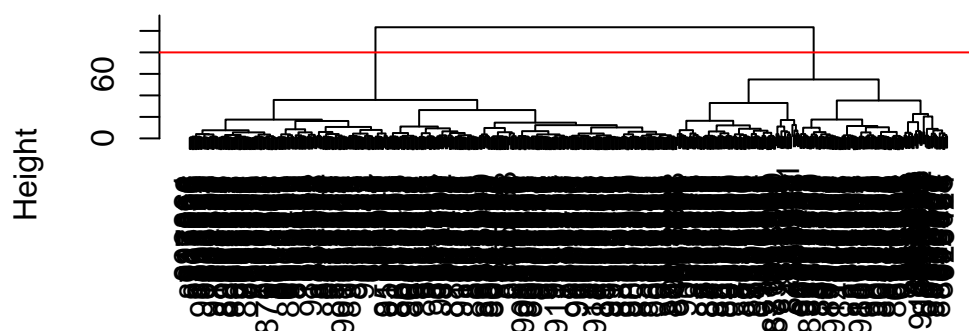


Here we will perform clustering on our PCA results rather than the original data.

In other words we will cluster using `wisc.pr$x` - our new better variables or PCs. We can choose as many or as few PCs to use as we like. It is your call!

```
d.pc <- dist(wisc.pr$x[, 1:3])  
  
wisc.pr.hclust <- hclust( d.pc, method="ward.D2")  
plot(wisc.pr.hclust)  
abline(h=80, col="red")
```

## Cluster Dendrogram



d.pc  
hclust (\*, "ward.D2")

```
grps <- cutree(wisc.pr.hclust, h=80)
table(grps)
```

```
grps
  1   2
203 366
```

We can use `table()` function to make a cross-table as well as just a count table.

```
table(diagnosis)
```

```
diagnosis
  B   M
357 212
```

```
table(grps, diagnosis)
```

```
diagnosis
grps   B   M
```



```
1 24 179
2 333 33
```

Write a note here about how to read this cross-table result: The results indicate that our cluster 1 mostly captures cancer (M) and our cluster 2 mostly captures healthy (B) samples/individuals.

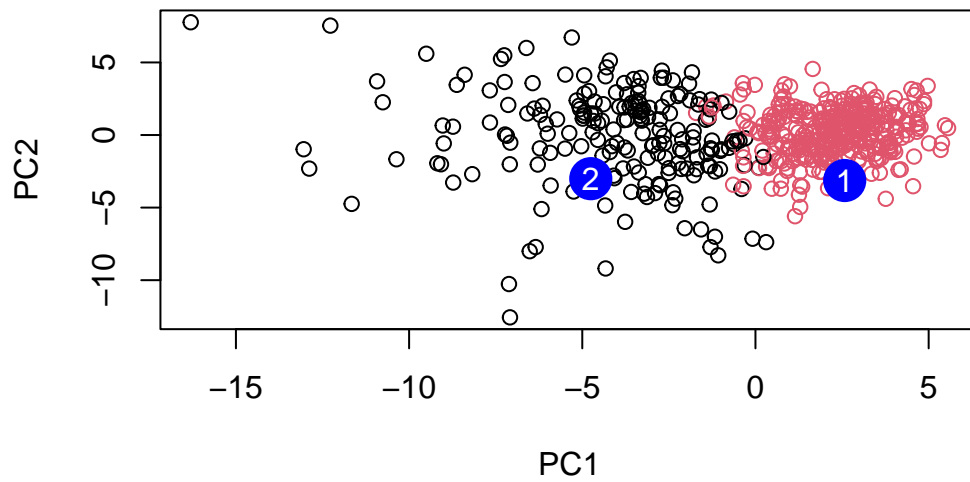
## 7. Prediction

```
url <- "https://tinyurl.com/new-samples-CSV"
new <- read.csv(url)
npc <- predict(wisc.pr, newdata=new)
npc
```

	PC1	PC2	PC3	PC4	PC5	PC6	PC7
[1,]	2.576616	-3.135913	1.3990492	-0.7631950	2.781648	-0.8150185	-0.3959098
[2,]	-4.754928	-3.009033	-0.1660946	-0.6052952	-1.140698	-1.2189945	0.8193031
	PC8	PC9	PC10	PC11	PC12	PC13	PC14
[1,]	-0.2307350	0.1029569	-0.9272861	0.3411457	0.375921	0.1610764	1.187882
[2,]	-0.3307423	0.5281896	-0.4855301	0.7173233	-1.185917	0.5893856	0.303029
	PC15	PC16	PC17	PC18	PC19	PC20	
[1,]	0.3216974	-0.1743616	-0.07875393	-0.11207028	-0.08802955	-0.2495216	
[2,]	0.1299153	0.1448061	-0.40509706	0.06565549	0.25591230	-0.4289500	
	PC21	PC22	PC23	PC24	PC25	PC26	
[1,]	0.1228233	0.09358453	0.08347651	0.1223396	0.02124121	0.078884581	
[2,]	-0.1224776	0.01732146	0.06316631	-0.2338618	-0.20755948	-0.009833238	
	PC27	PC28	PC29	PC30			
[1,]	0.220199544	-0.02946023	-0.015620933	0.005269029			
[2,]	-0.001134152	0.09638361	0.002795349	-0.019015820			

And plot this up

```
plot(wisc.pr$x[,1:2], col=grps)
points(npc[,1], npc[,2], col="blue", pch=16, cex=3)
text(npc[,1], npc[,2], c(1,2), col="white")
```



Q17. Which of your analysis procedures resulted in a clustering model with the best specificity? How about sensitivity? For sensitivity the k-means clustering. For specificity the plot3d.

Q18. Which of these new patients should we prioritize for follow up based on your results? The cluster that is malignant, cluster 1.