

Data Quality: Lecture 6

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Task 01

A data set *learning* is given. The dataset *learning* shows the relationship between learning effort in self-study [hours per week] and success on the final exam [index 0 to 10] in a master's program.

Run a “Cluster Based” outlier detection applying k-means clustering after Barai & Dey (2017). Calculate solutions with two different numbers of clusters. $x = 3$ and $x = 4$ in `kmeans(datas, centers = x, nstart = 10)`

How can the solutions be interpreted?

Load & Explore

```
library(readxl)
library(MVA)
library(cluster)

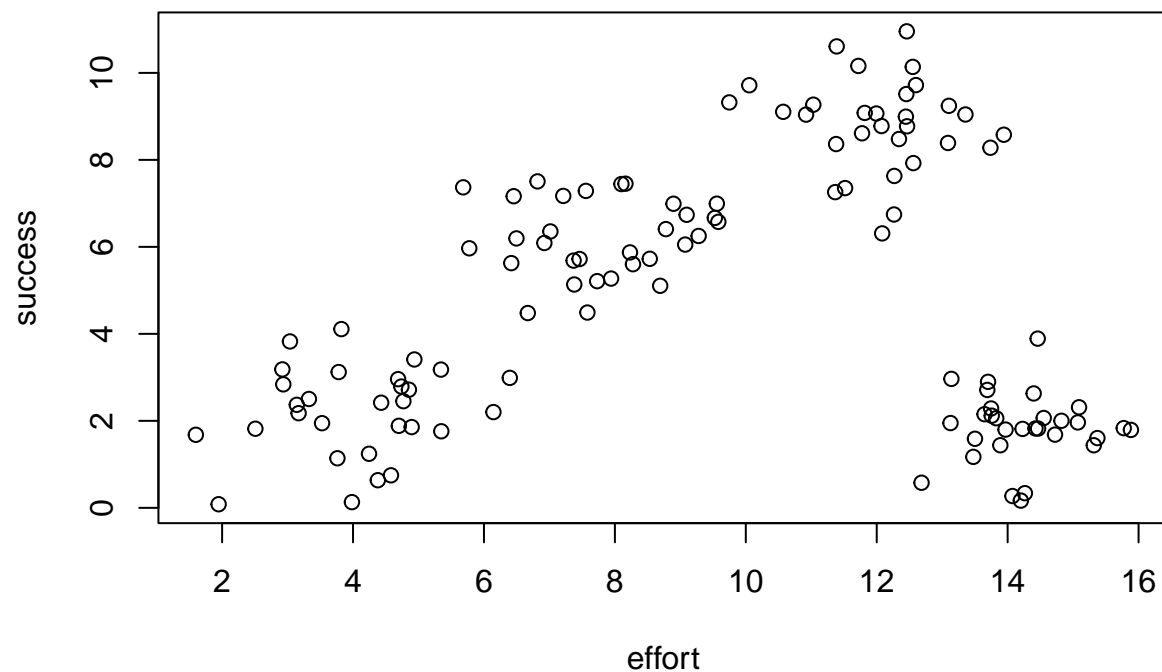
data <- read_excel("data/learning.xlsx")
any(is.na(data))
```

```
## [1] FALSE
```

```
summary(data)
```

```
##      effort      success
## Min.   : 1.599   Min.    : 0.08273
## 1st Qu.: 6.332   1st Qu.: 1.99214
## Median : 9.664   Median : 4.48437
## Mean   : 9.571   Mean    : 4.80295
## 3rd Qu.:13.194   3rd Qu.: 7.35565
## Max.   :15.884   Max.    :10.95476
```

```
plot(data)
```

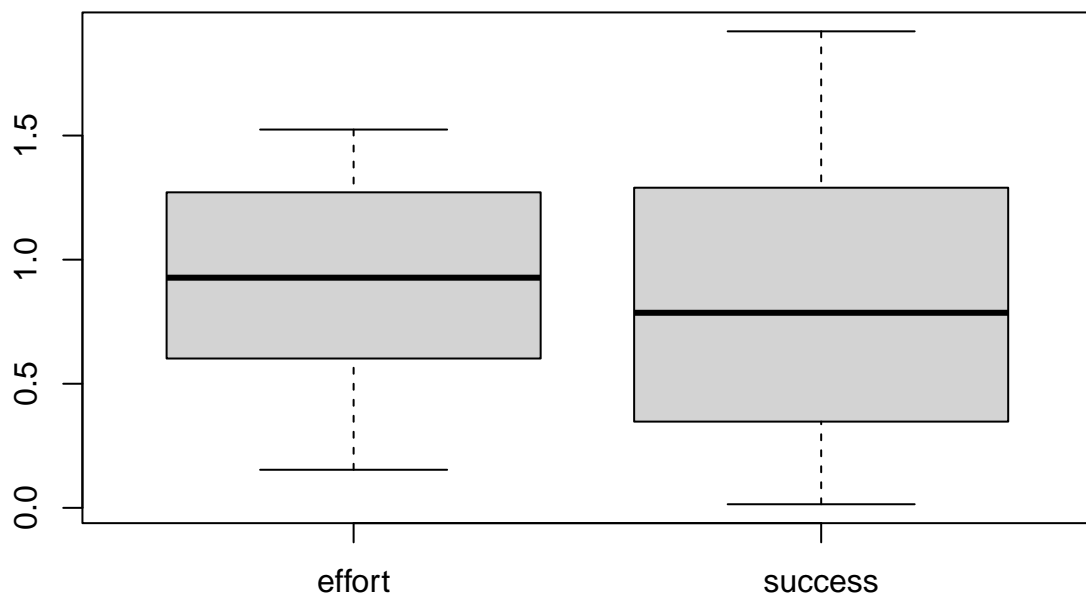


Preparation

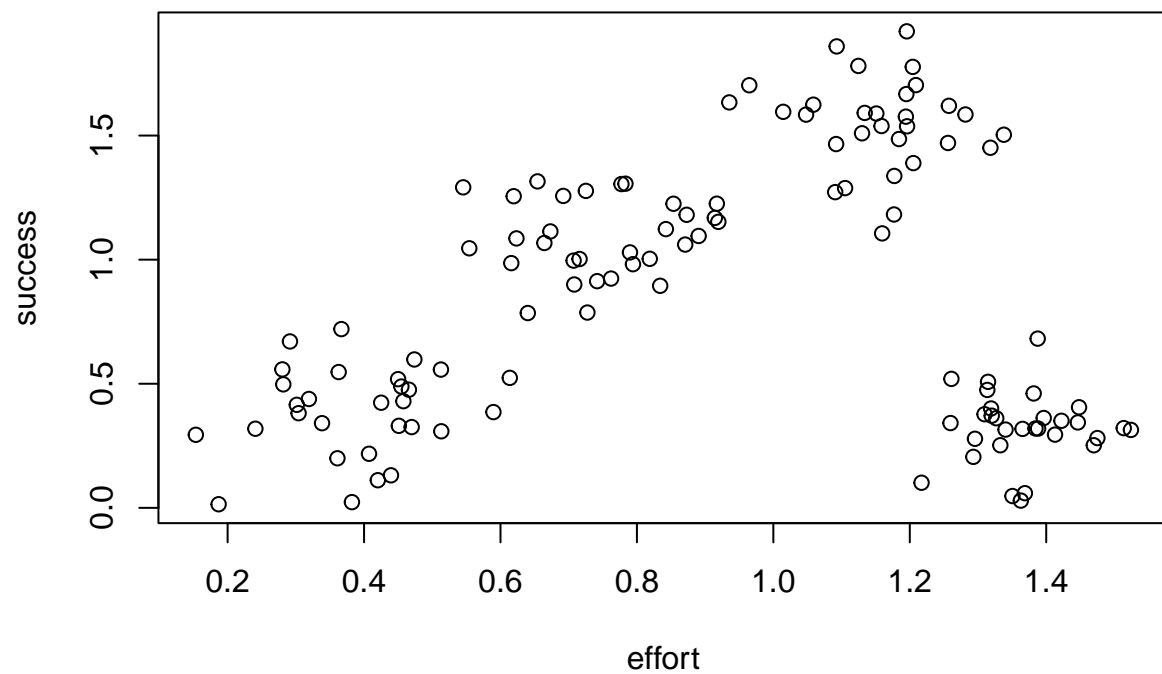
```
data.scaled <- scale(data, center = FALSE, scale = TRUE)
dists <- dist(data.scaled)
summary(data.scaled)
```

```
##      effort      success
##  Min.   :0.1534  Min.    :0.0145
##  1st Qu.:0.6076  1st Qu.:0.3491
##  Median :0.9274  Median :0.7859
##  Mean   :0.9184  Mean    :0.8418
##  3rd Qu.:1.2662  3rd Qu.:1.2891
##  Max.   :1.5242  Max.    :1.9199
```

```
boxplot(data.scaled)
```

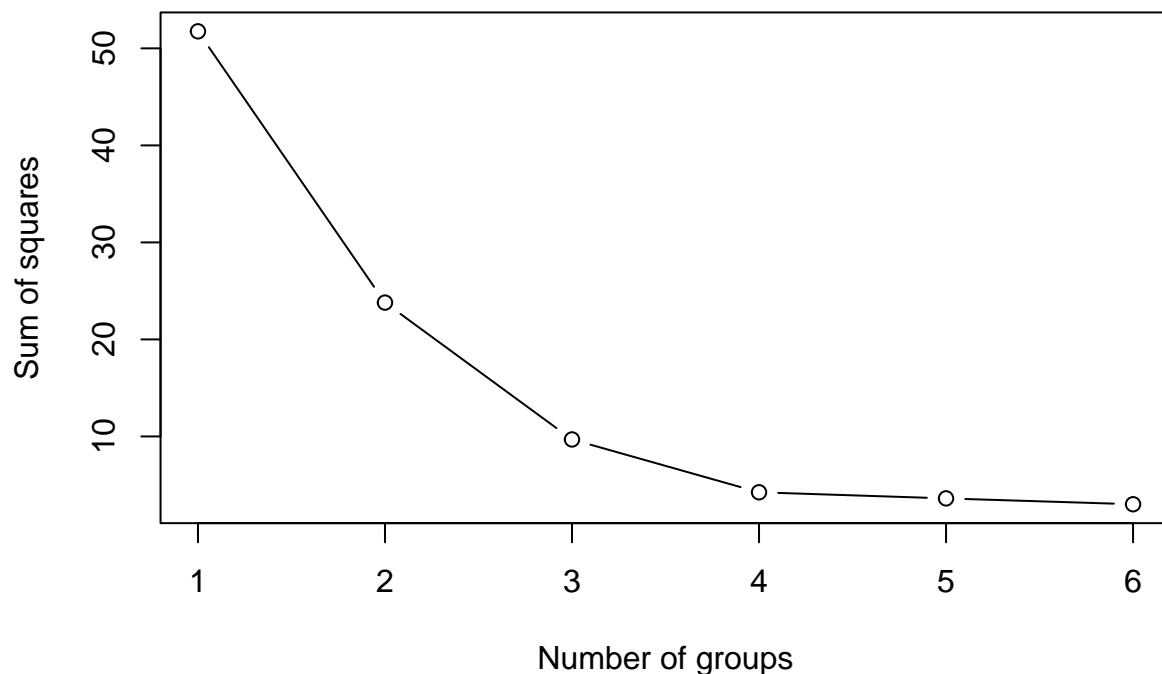


```
plot(data.scaled)
```



Clustering

```
reps <- rep(0, 6)
for (i in 1:6) reps[i] <- sum(kmeans(data.scaled, centers = i, nstart = 20)$withinss)
par(mfrow = c(1,1))
plot(1:6, reps, type = "b", xlab = "Number of groups", ylab = "Sum of squares")
```



Scree plot

```
km.4 <- kmeans(data.scaled, centers = 4, nstart = 10)
km.4.groups <- km.4$cluster
km.4.groups
```

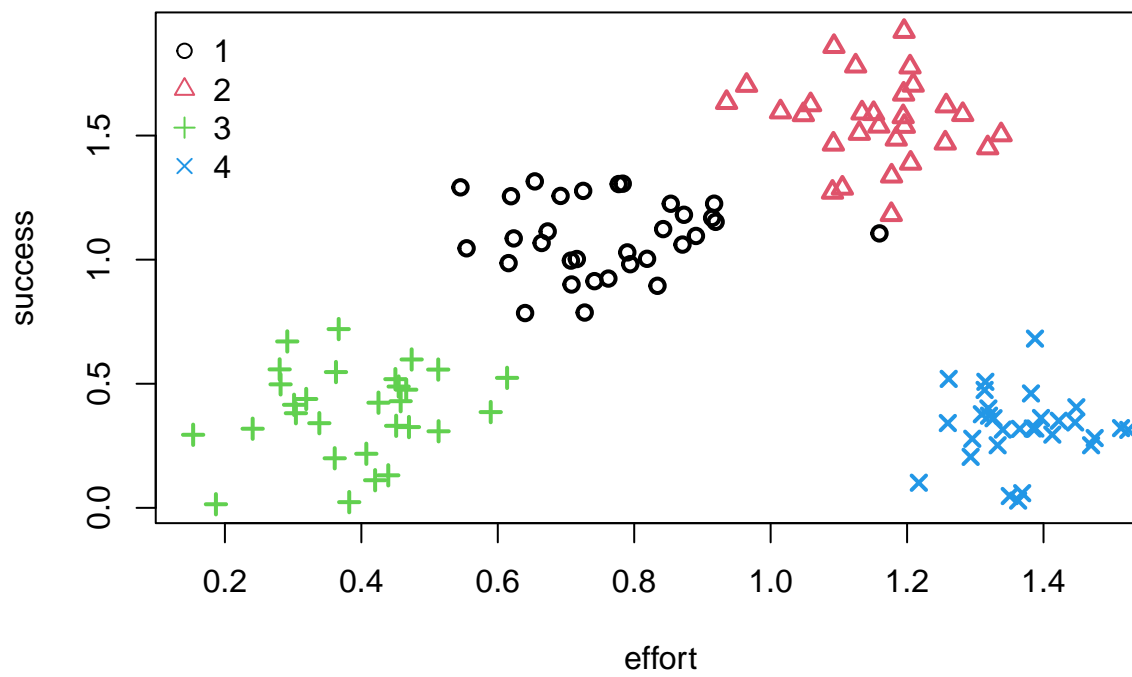
4 Clusters

```
##      [1] 3 3 3 3 3 3 3 3 3 3 3 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 1 1 1 1 1 1 1
##     [38] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2
##     [75] 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
##    [112] 4 4 4 4 4 4 4 4 4 4
```

```
cluster.size.4 <- cbind(sum(km.4.groups == 1), sum(km.4.groups == 2),
                        sum(km.4.groups == 3), sum(km.4.groups == 4))
cluster.size.4
```

```
##      [,1] [,2] [,3] [,4]
## [1,]   32   29   29   30
```

```
plot(data.scaled, pch = km.4.groups, col=km.4.groups, lwd=2)
legend("topleft", legend = 1:4, pch = 1:4, col=1:4, bty="n")
```



Plot / Silhouette plot

```
plot(silhouette(km.4.groups, dists))
```

4 clusters C_j

$j: n_j \mid \text{ave}_{i \in C_j} s_i$

1: 32 | 0.56

2: 29 | 0.60

3: 29 | 0.66

4: 30 | 0.79

0.0 0.2 0.4 0.6 0.8 1.0

Silhouette width s_i

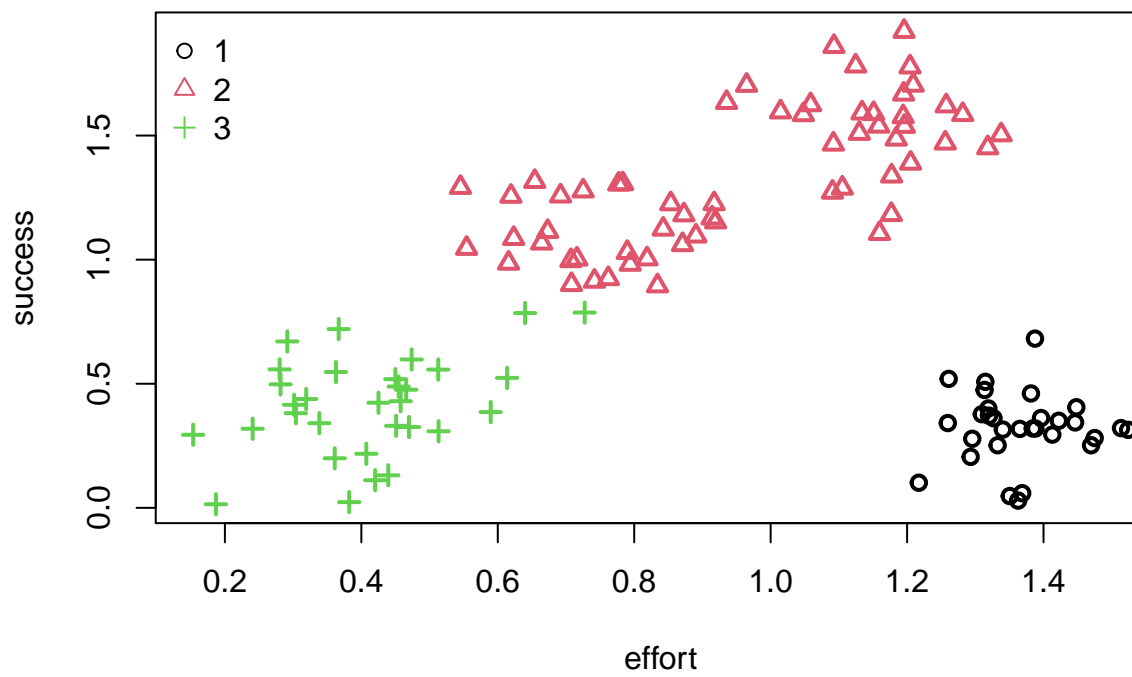
Average silhouette width : 0.66

3 Clusters

```
cluster.size.3 <- cbind(sum(km.3.groups == 1), sum(km.3.groups == 2),  
                        sum(km.3.groups == 3))
```

```
cluster.size.3
```

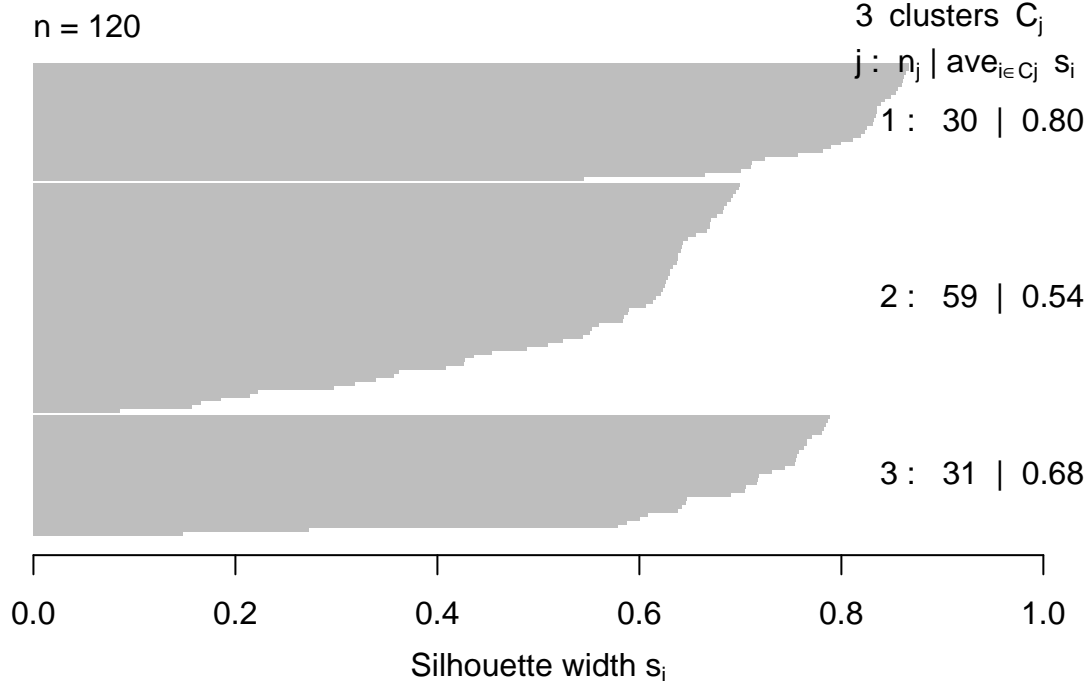
```
plot(data.scaled, pch = km.3.groups, col=km.3.groups, lwd=2)
legend("topleft", legend = 1:3, pch = 1:3, col=1:3, bty="n")
```



Plot / Silhouette plot

```
plot(silhouette(km.3.groups, dists))
```


Silhouette plot of (x = km.3.groups, dist = dists)



Average silhouette width : 0.64

```
dc <- dist(data.scaled, method = "euclidean")
dc
```

Hierarchical cluster analysis

##	1	2	3	4	5	6
## 2	0.238418601					
## 3	0.169587844	0.218150335				
## 4	0.410365817	0.611284076	0.408331610			
## 5	0.399048295	0.593652338	0.387629295	0.027606096		
## 6	0.333039453	0.315530308	0.163808883	0.455515780	0.429534851	
## 7	0.185388502	0.263490110	0.045361307	0.367582688	0.345987447	0.155364889
## 8	0.306637961	0.504021221	0.303699765	0.107334145	0.092570511	0.368947783
## 9	0.216730524	0.162569955	0.082790889	0.489468227	0.468025532	0.158297333
## 10	0.069935120	0.285691711	0.153276127	0.342495918	0.330193249	0.306536777
## 11	0.173180716	0.090339269	0.219544121	0.573804204	0.559356818	0.354073197
## 12	0.459394256	0.280802851	0.327270234	0.708586463	0.683928742	0.262545772
## 13	0.173292148	0.247628505	0.030188007	0.379015614	0.358005801	0.162743616
## 14	0.183361226	0.420763030	0.289249154	0.274401096	0.273455072	0.425523902
## 15	0.161419744	0.302276969	0.098078874	0.312390987	0.292943092	0.213412401
## 16	0.237887258	0.398703055	0.188011280	0.221397234	0.199814642	0.252498625
## 17	0.084721583	0.312001316	0.180948933	0.326276621	0.315894830	0.330565597
## 18	0.240260788	0.476345694	0.371706597	0.323553037	0.329392617	0.514196675
## 19	0.255039471	0.408054838	0.194165502	0.219773646	0.196694743	0.244975852
## 20	0.485108303	0.697421041	0.500154806	0.096125577	0.122296532	0.551599754

## 21	0.188629758	0.304358331	0.089120922	0.320659853	0.299257187	0.182088129
## 22	0.095097882	0.173185065	0.091675319	0.439572413	0.423055148	0.251930798
## 23	0.492247536	0.728305817	0.568552099	0.252644581	0.278233168	0.664401482
## 24	0.308173686	0.520504607	0.330950453	0.106473424	0.104335346	0.410819765
## 25	0.118361571	0.344663773	0.200250868	0.293962151	0.284572691	0.340749712
## 26	0.238637457	0.218842608	0.073707145	0.455338353	0.432329104	0.106327279
## 27	0.298961897	0.437005706	0.219381916	0.218036702	0.192151805	0.237480053
## 28	0.166426623	0.380181358	0.209542976	0.243941237	0.233108078	0.330268492
## 29	0.327668764	0.401863344	0.192721164	0.322631805	0.295752585	0.139929375
## 30	0.060359491	0.183967338	0.174155960	0.468016300	0.455572770	0.335128532
## 31	0.914009105	0.701437229	0.788697072	1.154498756	1.128380426	0.699010405
## 32	0.903560246	0.684287585	0.785808771	1.161362935	1.135695604	0.706392670
## 33	0.735471112	0.523850786	0.613438112	0.989517859	0.964043637	0.535310465
## 34	0.966376471	0.747158127	0.847451051	1.220043775	1.194182573	0.764659506
## 35	0.642308135	0.444660230	0.511568486	0.881505631	0.855874236	0.426751659
## 36	0.829838797	0.591905070	0.756240787	1.161463608	1.138797033	0.731878444
## 37	0.680201468	0.446511607	0.593060412	0.995330377	0.972163957	0.562051451
## 38	0.620165378	0.421757843	0.490968972	0.864123088	0.838674662	0.410185886
## 39	0.840204960	0.623394820	0.720886098	1.096448425	1.070836229	0.641660154
## 40	0.951520357	0.718798518	0.855216657	1.248772911	1.224327962	0.800608121
## 41	0.586346955	0.385736197	0.460569694	0.839542157	0.814447564	0.387905188
## 42	0.896939365	0.662255167	0.806993614	1.205070955	1.181153511	0.761644977
## 43	0.655606795	0.438245134	0.542598675	0.930343953	0.905683205	0.481739991
## 44	0.815079749	0.608267212	0.686421688	1.050986941	1.024908788	0.595479358
## 45	0.925610766	0.701466395	0.813912936	1.195329737	1.169974041	0.741489917
## 46	0.737912049	0.533429258	0.609281756	0.977143694	0.951285539	0.521771368
## 47	0.853409004	0.644288522	0.725974565	1.090832216	1.064728398	0.635336527
## 48	0.686218390	0.457020962	0.589015517	0.986533967	0.962716374	0.545805846
## 49	0.531492209	0.366739182	0.386078321	0.742228685	0.716322509	0.286795476
## 50	0.705069482	0.501031955	0.577097433	0.947344744	0.921632055	0.492298808
## 51	0.863061775	0.627428744	0.776934850	1.177303416	1.153712873	0.737264759
## 52	0.591898167	0.364261289	0.496094344	0.896380858	0.873009713	0.462371385
## 53	0.729959534	0.498607397	0.635578113	1.033754644	1.009972661	0.592917921
## 54	0.836471349	0.598383463	0.778690731	1.186686751	1.165128651	0.770695810
## 55	0.898730807	0.660940358	0.822631796	1.226632550	1.203651855	0.792729622
## 56	0.680438602	0.498840394	0.537707160	0.886048397	0.859606518	0.431588788
## 57	0.947137472	0.714161698	0.851541246	1.245624515	1.221234086	0.797901824
## 58	0.921878248	0.707309525	0.798471256	1.166605650	1.140577227	0.711090505
## 59	0.612309048	0.375692047	0.537491083	0.944078580	0.921924001	0.525465004
## 60	0.666061402	0.448990079	0.552289930	0.939031984	0.914285580	0.489648845
## 61	1.535238148	1.303361878	1.431125687	1.811880296	1.786207941	1.356833269
## 62	1.310762285	1.075917876	1.216189659	1.607148068	1.582295370	1.155624559
## 63	1.141785742	0.931670501	1.010967944	1.361901299	1.335143305	0.909056165
## 64	1.584969554	1.350685208	1.486842452	1.872857139	1.847523671	1.418866471
## 65	1.386592528	1.160684781	1.272251560	1.643085176	1.616936293	1.187606039
## 66	1.690716783	1.458146659	1.587434008	1.967842232	1.942109620	1.512659739
## 67	1.126915541	0.932443586	0.984201791	1.311092188	1.283836442	0.866369795
## 68	1.408354707	1.199634579	1.274093651	1.612782235	1.585642365	1.164560052
## 69	1.262581082	1.040052377	1.144323109	1.511901955	1.485657728	1.056542125
## 70	1.283607850	1.072448162	1.152451437	1.499579773	1.472664312	1.048180377
## 71	1.521170281	1.294528536	1.407116453	1.776748227	1.750504145	1.321373113
## 72	1.458515552	1.247492243	1.326011699	1.667308783	1.640208773	1.218285374
## 73	1.385316212	1.150142651	1.291259375	1.682019797	1.657124783	1.230198241
## 74	1.413000762	1.190598021	1.293395184	1.656906340	1.630447378	1.202100108

## 75	1.395298099	1.170276391	1.279533913	1.648459772	1.622223586	1.193078932
## 76	1.361042238	1.138563009	1.241913366	1.606821581	1.580432985	1.151786194
## 77	1.320223481	1.088995930	1.216142620	1.598947109	1.573472845	1.144494077
## 78	1.338442207	1.119973556	1.214468768	1.572648061	1.546028213	1.118642733
## 79	1.068042372	0.881536967	0.921121013	1.239233103	1.211879179	0.798042486
## 80	1.320297817	1.097707325	1.201635717	1.567781395	1.541456155	1.112579915
## 81	1.329856094	1.100349620	1.222179793	1.601289272	1.575584698	1.146179623
## 82	1.577213457	1.348176196	1.467003408	1.840761714	1.814694113	1.385246610
## 83	1.477300207	1.258818087	1.352390911	1.706955180	1.680180303	1.253974092
## 84	1.487161010	1.265872650	1.365611289	1.725292444	1.698675707	1.271208101
## 85	1.368826928	1.138539076	1.262391051	1.642352866	1.616684325	1.187324672
## 86	1.227718094	1.018626104	1.095145271	1.440869387	1.413940093	0.989718760
## 87	1.119955024	0.910173555	0.989066293	1.340425288	1.313689626	0.887411079
## 88	1.384697672	1.164198925	1.262827545	1.623464633	1.596911655	1.169075440
## 89	1.484073185	1.258082818	1.369203991	1.738205816	1.711945039	1.282859392
## 90	1.376763772	1.163250587	1.247180469	1.595372266	1.568452950	1.143904315
## 91	1.121125701	1.021421575	0.951706290	1.123038069	1.096418294	0.789858383
## 92	1.159762215	1.191728799	1.016334774	0.932515156	0.914874708	0.877330874
## 93	1.170147783	1.126281151	1.004627228	1.069120337	1.045242941	0.842856131
## 94	1.100604646	1.047437320	0.933491710	1.023009109	0.998211284	0.770545781
## 95	1.037399356	1.028585090	0.879145896	0.891163286	0.868668585	0.724767239
## 96	1.046139705	1.015170379	0.882577296	0.936735764	0.912832406	0.722729455
## 97	1.174776603	1.143186919	1.011580582	1.052222422	1.029159739	0.851845066
## 98	1.149251535	1.129205688	0.988579791	1.009561422	0.987137582	0.831319295
## 99	1.053974022	1.024922875	0.890844397	0.940305053	0.916577031	0.731397556
## 100	1.042102212	1.004678300	0.877273889	0.944306587	0.919996552	0.716249220
## 101	1.120672544	1.097078886	0.959036472	0.990000070	0.967118599	0.800895297
## 102	1.212874446	1.192052833	1.052255780	1.068432344	1.046387530	0.894895173
## 103	1.172232646	1.200453640	1.027329497	0.949987360	0.932057829	0.886620914
## 104	1.034989211	1.003251741	0.871222767	0.928315447	0.904284113	0.711202103
## 105	1.016105190	1.051896153	0.873486214	0.797085318	0.778317844	0.736786046
## 106	1.098446336	1.076458334	0.937093712	0.967467899	0.944534394	0.779288954
## 107	1.178270487	1.212270844	1.035787030	0.946169725	0.928925790	0.897664775
## 108	1.122930550	1.090112605	0.959297676	1.007792267	0.984310930	0.799242277
## 109	1.074346579	1.054463022	0.913391538	0.942532869	0.919560087	0.756054316
## 110	1.150113818	1.118323668	0.986789733	1.030364872	1.007129851	0.826975690
## 111	1.033175308	0.971466672	0.864907315	0.978485432	0.952909443	0.701293063
## 112	1.213206144	1.198174514	1.054061544	1.058960377	1.037365544	0.898149375
## 113	1.116869096	1.093442043	0.955256157	0.986321749	0.963424358	0.797146893
## 114	0.979632509	0.916441806	0.811100738	0.934713169	0.908788284	0.647385107
## 115	0.990430075	0.969859965	0.828894721	0.870532232	0.846828279	0.671231111
## 116	1.032267504	0.978093142	0.864833892	0.964639901	0.939399496	0.701701032
## 117	1.052897272	1.059836872	0.899535282	0.878026333	0.856922859	0.750396263
## 118	1.079370139	1.073367196	0.922133595	0.923346559	0.901432376	0.768650349
## 119	1.256075986	1.226637276	1.093605338	1.122482250	1.100068500	0.934411365
## 120	1.244595639	1.214301348	1.081903503	1.113434049	1.090890756	0.922523549
##	7	8	9	10	11	12
## 2						
## 3						
## 4						
## 5						
## 6						
## 7						
## 8	0.264731210					

```

## 9 0.122042961 0.385744595
## 10 0.151316202 0.237643197 0.221969340
## 11 0.261142646 0.467207817 0.196289281 0.233565047
## 12 0.354650652 0.612974239 0.250305220 0.472161065 0.366945321
## 13 0.016842389 0.275004124 0.110740472 0.144523337 0.244302013 0.349395190
## 14 0.274553247 0.194820050 0.363552041 0.143156469 0.355275896 0.613787817
## 15 0.066303690 0.206569012 0.180839181 0.107009599 0.280708307 0.420360865
## 16 0.146251430 0.120874505 0.268252910 0.170449500 0.375530060 0.492127808
## 17 0.175276543 0.223942412 0.251144900 0.029363806 0.255481969 0.501394208
## 18 0.361341112 0.265152136 0.441263436 0.219686641 0.400614995 0.690979889
## 19 0.150697287 0.124393489 0.272452382 0.188393730 0.388441034 0.490039937
## 20 0.460690030 0.196464867 0.582076288 0.420314180 0.653804817 0.804363826
## 21 0.046988045 0.217812365 0.168833837 0.138765403 0.292526017 0.399252773
## 22 0.125105727 0.332245941 0.122013066 0.116994456 0.142521793 0.365272255
## 23 0.539265226 0.299912050 0.650058142 0.444198117 0.664222254 0.893820264
## 24 0.295481177 0.049728182 0.413727809 0.242410331 0.475800642 0.648290504
## 25 0.187401939 0.193356272 0.275081196 0.059173876 0.289397837 0.525136936
## 26 0.093701902 0.355286608 0.056315563 0.226983172 0.248620959 0.260956449
## 27 0.174138618 0.139416500 0.292004972 0.233602864 0.424517766 0.493011371
## 28 0.185523677 0.141203210 0.290196656 0.099313527 0.332677054 0.536591358
## 29 0.153258045 0.247950413 0.241596630 0.275585048 0.412264174 0.402242420
## 30 0.202760679 0.363002470 0.197584428 0.125531651 0.113111222 0.425424258
## 31 0.814302025 1.065564447 0.711343479 0.932572644 0.791520657 0.461513578
## 32 0.813901181 1.069604006 0.706513866 0.926040587 0.773673590 0.459282747
## 33 0.641085558 0.896996198 0.534767062 0.755241190 0.614104645 0.286539958
## 34 0.874934881 1.129339017 0.768527091 0.988416485 0.836479481 0.520524414
## 35 0.536942173 0.790097001 0.435207250 0.657019575 0.534560325 0.184903582
## 36 0.794501710 1.059154273 0.673654228 0.870413799 0.670739291 0.471096644
## 37 0.629670601 0.894316184 0.510270513 0.715060100 0.531604316 0.301214584
## 38 0.517123702 0.771752378 0.413977845 0.635628051 0.511663474 0.163833360
## 39 0.748787281 1.004481837 0.641819475 0.861717753 0.713174568 0.394197525
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## 42 0.842050789 1.105957348 0.724346398 0.931712021 0.745806553 0.499527307
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## 44 0.711322933 0.961968062 0.609892909 0.831553185 0.698602077 0.359654238
## 45 0.843674852 1.101872426 0.733475939 0.951096149 0.789871975 0.489421956
## 46 0.634665364 0.886850356 0.532535103 0.754167962 0.623746238 0.282340216
## 47 0.751115424 1.001911226 0.649140569 0.870663742 0.734570091 0.399012915
## 48 0.623563406 0.887339940 0.506534779 0.717128284 0.544451883 0.283275330
## 49 0.406364193 0.652966830 0.316401935 0.536711570 0.451300400 0.087389122
## 50 0.602952376 0.856242129 0.500032683 0.721570583 0.591325246 0.249968147
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## 52 0.531645389 0.796020531 0.413421452 0.622729826 0.452617850 0.202603809
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## 55 0.860252789 1.124983682 0.739919220 0.938693020 0.740001643 0.530664226
## 56 0.557656124 0.800210028 0.466910685 0.687950864 0.587225737 0.222987044
## 57 0.885223289 1.148045550 0.769229785 0.979791972 0.798914509 0.537539665
## 58 0.824687651 1.077043452 0.720595739 0.941484402 0.797231627 0.471201133
## 59 0.576596132 0.840901074 0.455158743 0.651185190 0.458245543 0.274622873
## 60 0.582913883 0.843210581 0.471638952 0.689577074 0.538980768 0.230480427
## 61 1.461528730 1.719554876 1.350061794 1.565239147 1.388074804 1.107374576
## 62 1.249225980 1.511068274 1.134020025 1.344608495 1.158634456 0.898636575

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## 63	1.033817723	1.277939051	0.935722690	1.157612107	1.021795120	0.685451327
## 64	1.518661563	1.778760142	1.405100250	1.617654493	1.433658597	1.165803612
## 65	1.300068611	1.553796332	1.192791586	1.411598729	1.248092963	0.945583429
## 66	1.617863134	1.875769593	1.506326801	1.721234504	1.542323851	1.263686663
## 67	1.002026773	1.233630428	0.914124948	1.135072079	1.022605896	0.667727446
## 68	1.295027994	1.533064160	1.200375063	1.422335423	1.289760524	0.950525924
## 69	1.171191163	1.423400967	1.065601607	1.285463632	1.128466680	0.817187074
## 70	1.174839068	1.417123011	1.077470509	1.299385339	1.162452584	0.827227838
## 71	1.434809696	1.688028457	1.327686363	1.546455091	1.381603176	1.080382114
## 72	1.347561692	1.586970301	1.251656671	1.473619177	1.337451543	1.001547583
## 73	1.324289976	1.586071271	1.209081427	1.419482203	1.232462723	0.973557067
## 74	1.319559052	1.569920240	1.215112472	1.435353786	1.278935787	0.966134753
## 75	1.306913385	1.559779427	1.200371905	1.419603507	1.257946394	0.952616862
## 76	1.268317897	1.519318080	1.163477570	1.383590403	1.226916893	0.914678858
## 77	1.246885541	1.505706759	1.134956584	1.349984353	1.174260375	0.893070256
## 78	1.239331438	1.487118694	1.137263786	1.358380661	1.209119522	0.887390739
## 79	0.936986242	1.163772225	0.853428864	1.073068958	0.971174548	0.610612107
## 80	1.228262293	1.479826534	1.123057519	1.343042452	1.186063919	0.874440691
## 81	1.251966266	1.509279736	1.141508577	1.357988568	1.186453398	0.897539116
## 82	1.495720733	1.750789555	1.386891515	1.604421100	1.434296082	1.141071817
## 83	1.376697653	1.622778311	1.275556247	1.496848337	1.347889812	1.025509268
## 84	1.391031108	1.639596885	1.287865250	1.508552423	1.354413644	1.038375709
## 85	1.292438832	1.550113288	1.181560414	1.397582203	1.224242148	0.938126294
## 86	1.117106889	1.358645817	1.020628403	1.242588716	1.108779191	0.770514545
## 87	1.011948472	1.256270856	0.913820358	1.135712284	1.000324884	0.663551287
## 88	1.288308328	1.537295956	1.185091599	1.405822879	1.252958043	0.935589963
## 89	1.396710090	1.649633953	1.289915772	1.508917318	1.345396488	1.042360231
## 90	1.269981344	1.512851036	1.171732593	1.393556122	1.253016559	0.921430447
## 91	0.944436164	1.084488963	0.917586871	1.095690908	1.096144687	0.754515804
## 92	0.983060057	0.958490809	1.035128855	1.102989181	1.228708012	1.023937655
## 93	0.984912557	1.057564146	0.993211204	1.129451986	1.186733602	0.892832582
## 94	0.915983053	1.004185486	0.918120080	1.062690146	1.110166221	0.809264940
## 95	0.853064584	0.890343888	0.881758679	0.989486545	1.078042556	0.828501080
## 96	0.860753646	0.925643218	0.876137541	1.003212144	1.071319202	0.795958555
## 97	0.989411809	1.046694299	1.005116767	1.131123478	1.200146667	0.918909226
## 98	0.964271695	1.008565536	0.986727030	1.103104531	1.182646833	0.915011926
## 99	0.868606204	0.930522043	0.885205726	1.010535224	1.080553210	0.806947243
## 100	0.856772700	0.929972841	0.868175408	1.000748505	1.062675612	0.780460229
## 101	0.935491901	0.986023416	0.955720767	1.075507059	1.151441876	0.880985755
## 102	1.027920902	1.069627036	1.050151955	1.166542035	1.246003577	0.975174155
## 103	0.994622471	0.974485851	1.044640627	1.116087773	1.238742323	1.028534260
## 104	0.849600713	0.916282967	0.864444531	0.992330277	1.059562470	0.783884925
## 105	0.839779662	0.818293792	0.894091380	0.959342733	1.086842246	0.894787229
## 106	0.913312796	0.963249238	0.934400808	1.053059626	1.130233798	0.862514943
## 107	1.002183537	0.973959502	1.055340682	1.121055243	1.248648233	1.045710588
## 108	0.937544593	0.999480054	0.952251142	1.079892010	1.147193423	0.866539969
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## 114	0.796440865	0.905483831	0.791117001	0.945327877	0.981260464	0.675255125
## 115	0.805240607	0.861356425	0.826638337	0.945521166	1.022603260	0.761882710
## 116	0.847885626	0.942130311	0.848812057	0.995150263	1.040752920	0.741467519

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## 117 0.870555242 0.885968813 0.908535136 1.001528081 1.104455698 0.873169805
## 118 0.895408915 0.926081348 0.925901676 1.030562353 1.122189961 0.873849500
## 119 1.070787520 1.121065266 1.088114114 1.211473720 1.283300747 1.001741340
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##          13          14          15          16          17          18
## 2
## 3
## 4
## 5
## 6
## 7
## 8
## 9
## 10
## 11
## 12
## 13
## 14 0.273262181
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## 19 0.164034608 0.229208822 0.107922811 0.019463089 0.190834442 0.317896300
## 20 0.471351553 0.327948732 0.402947223 0.315147192 0.400423115 0.354953342
## 21 0.059051592 0.243686787 0.033089513 0.099445182 0.156936313 0.333003352
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## 29 0.169719456 0.355357536 0.168818523 0.149262829 0.289755891 0.445732286
## 30 0.187645426 0.242329031 0.197514096 0.284348309 0.144283382 0.292474052
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## 34 0.869919068 1.131270576 0.940813777 1.009117315 1.017780291 1.204332417
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## 36 0.784299488 1.010380053 0.854282126 0.940212288 0.898526047 1.068177115
## 37 0.620306483 0.857035380 0.691067000 0.774551295 0.743800945 0.920344264
## 38 0.512549012 0.777523584 0.583153081 0.651313887 0.664908104 0.853986355
## 39 0.743555970 1.004552646 0.814557694 0.884024039 0.891081458 1.077832177
## 40 0.880948107 1.126555296 0.952372838 1.030608170 1.012899747 1.191775512
## 41 0.483011577 0.745775183 0.554006537 0.624740912 0.632782139 0.821222712
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## 49 0.404121031 0.675323879 0.472622319 0.533587550 0.565437913 0.756391216
## 50 0.598554986 0.863584707 0.669047795 0.736052063 0.750867938 0.939695643

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## 51	0.803884955	1.040913977	0.874848843	0.957092653	0.927858016	1.102897166
## 52	0.522784586	0.765478860	0.593872949	0.675931909	0.651764261	0.832041107
## 53	0.661973746	0.904845825	0.733201985	0.813983678	0.791229784	0.970219353
## 54	0.807729911	1.019146252	0.876005475	0.965446844	0.909520384	1.071274185
## 55	0.850400695	1.078980439	0.920709844	1.005605243	0.966908217	1.137257030
## 56	0.555687738	0.826941250	0.623845998	0.681958832	0.716775815	0.907630805
## 57	0.877361357	1.122400317	0.948768733	1.027290377	1.008775851	1.187384196
## 58	0.820212991	1.083970110	0.890771675	0.957145469	0.970831539	1.158580721
## 59	0.565898209	0.791738723	0.635420910	0.722682524	0.679449603	0.851683831
## 60	0.576405163	0.832669715	0.647832664	0.722337544	0.718921706	0.904404971
## 61	1.455270818	1.708292219	1.526667638	1.598915489	1.594430551	1.775463658
## 62	1.241715066	1.487063742	1.313176367	1.390205095	1.373538990	1.550855221
## 63	1.030821072	1.299013334	1.100119781	1.159925239	1.186842908	1.376213389
## 64	1.511747641	1.760373561	1.583233840	1.657927685	1.646688829	1.825162098
## 65	1.294966766	1.554675408	1.365920094	1.433809401	1.440945242	1.625848068
## 66	1.611602690	1.864251241	1.683001505	1.755156042	1.750405258	1.930970352
## 67	1.001079243	1.273394843	1.067809969	1.118862178	1.163826624	1.354758423
## 68	1.292865257	1.562935226	1.361222234	1.416799867	1.451460886	1.641471698
## 69	1.166494016	1.428349908	1.237209407	1.303669340	1.314827087	1.501030192
## 70	1.172058007	1.440680100	1.241128682	1.299660328	1.328604650	1.518046294
## 71	1.429774531	1.689540908	1.500694210	1.568164778	1.575799305	1.760539227
## 72	1.345150426	1.614594835	1.413803415	1.470367177	1.502798355	1.692504763
## 73	1.316787425	1.561879371	1.388249050	1.465204739	1.448392300	1.625348929
## 74	1.315185860	1.578140093	1.385686692	1.450613338	1.464717122	1.651269989
## 75	1.302005980	1.562623660	1.372851444	1.439956715	1.448959078	1.634324782
## 76	1.263834564	1.526414127	1.334411336	1.399860365	1.412954155	1.599381136
## 77	1.240453999	1.493041362	1.311884036	1.384964559	1.379177839	1.560417730
## 78	1.235511673	1.500753343	1.305581531	1.368355873	1.387721080	1.575511525
## 79	0.936800574	1.209818342	1.002353150	1.050266136	1.101545730	1.292572080
## 80	1.223677582	1.485900265	1.294321656	1.360240695	1.372406213	1.558707725
## 81	1.245974088	1.501132790	1.317297886	1.388710878	1.387252302	1.569849368
## 82	1.490232468	1.747576419	1.561375221	1.630596273	1.633723003	1.817072727
## 83	1.373130209	1.639093798	1.442981137	1.504474281	1.526178386	1.714193715
## 84	1.386987301	1.651168636	1.457241823	1.520711158	1.537909748	1.725011074
## 85	1.286331022	1.540705132	1.357688458	1.429502615	1.426823199	1.608918041
## 86	1.114494760	1.383621463	1.183380579	1.241332552	1.271771603	1.461476977
## 87	1.008934252	1.277108017	1.078251040	1.138192792	1.164941944	1.354325569
## 88	1.284228087	1.548414500	1.354509941	1.418280055	1.435178706	1.622391963
## 89	1.391754775	1.651974326	1.462629295	1.529819894	1.538267542	1.723298987
## 90	1.267039540	1.535114662	1.336280471	1.395296304	1.422810399	1.611932219
## 91	0.952587022	1.202908578	0.996406281	1.000209676	1.118367202	1.293488989
## 92	0.998576669	1.142521108	0.998899992	0.942969438	1.111675955	1.222291052
## 93	0.996935871	1.210531121	1.023159133	0.999895719	1.146773299	1.299444494
## 94	0.927344317	1.149750906	0.957213267	0.939684124	1.081192443	1.239441344
## 95	0.866829883	1.055681770	0.882508663	0.846176979	1.003570622	1.142278641
## 96	0.873356827	1.080717558	0.896518494	0.870056759	1.019670540	1.169240274
## 97	1.002135571	1.205925155	1.024300043	0.995411034	1.147147708	1.293879984
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## 99	0.881327761	1.086866099	0.903762755	0.876235481	1.026757037	1.175202507
## 100	0.868997930	1.081578896	0.894355611	0.870962982	1.017896851	1.170572895
## 101	0.948588645	1.147381360	0.968546686	0.937104828	1.090871219	1.234899808
## 102	1.041246904	1.234935724	1.059533570	1.025209338	1.181272448	1.321690301
## 103	1.010016933	1.157594899	1.011607465	0.957043412	1.125199375	1.237904136
## 104	0.862144460	1.070516188	0.885684450	0.859849065	1.008918405	1.159151159

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## 105 0.855375149 1.000505385 0.855222407 0.799797605 0.968165135 1.081206017
## 106 0.926470582 1.124630850 0.946087436 0.914373997 1.068337359 1.212125648
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## 108 0.950142751 1.156456517 0.973162443 0.945832657 1.096233862 1.244750778
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## 112 1.042266301 1.230878909 1.058604837 1.021741690 1.179676379 1.317011256
## 113 0.944793341 1.143567348 0.964729069 0.933288134 1.087050887 1.231091303
## 114 0.806907494 1.039899433 0.841369827 0.831764951 0.965282621 1.130266370
## 115 0.818342289 1.019280998 0.838594305 0.808760433 0.961128741 1.107298263
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## 117 0.885064080 1.058587827 0.895061508 0.851399519 1.013723631 1.143222618
## 118 0.909349568 1.094086704 0.923658699 0.885188431 1.044140867 1.180072147
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##      19      20      21      22      23      24
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## 20 0.314833880
## 21 0.105064665 0.413704045
## 22 0.246172721 0.524471437 0.150886729
## 23 0.420376794 0.195578141 0.495751275 0.560898911
## 24 0.166212631 0.178051595 0.249486900 0.347337920 0.254247174
## 25 0.174928537 0.366772834 0.161052102 0.175866801 0.385091078 0.190279035
## 26 0.235677436 0.549853777 0.138765910 0.150244604 0.632952868 0.388248349
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## 28 0.132308274 0.321129791 0.148567113 0.207419161 0.360067348 0.143136974
## 29 0.134242100 0.417960030 0.139125345 0.278341852 0.547862437 0.294827828
## 30 0.299966660 0.544538854 0.218832775 0.083240636 0.551351005 0.367110820
## 31 0.941215485 1.250550061 0.857468363 0.822217616 1.353206004 1.104144251
## 32 0.945617497 1.257487027 0.858185748 0.813492958 1.353103009 1.106564302
## 33 0.773134213 1.085619568 0.685314846 0.644029157 1.180323594 0.933733094
## 34 1.005180583 1.316161406 0.918922026 0.876133752 1.414199726 1.166858790
## 35 0.665975121 0.977628540 0.580316502 0.548962327 1.075980299 0.827725360
## 36 0.942104081 1.255170005 0.841479895 0.753480339 1.314250093 1.086946633
## 37 0.775625207 1.089696395 0.676520380 0.598295056 1.156690549 0.923945789
## 38 0.647812313 0.960221778 0.560876712 0.527018343 1.056339741 0.808833272

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## 39	0.880523903	1.192568801	0.793033504	0.749628875	1.288010083	1.041399620
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## 41	0.621993516	0.935531866	0.532718283	0.493695115	1.027465750	0.781493335
## 42	0.985404697	1.300192329	0.888604938	0.815033683	1.372599614	1.137265737
## 43	0.711632286	1.026096126	0.619031981	0.566000945	1.111127503	0.868493312
## 44	0.837614721	1.147052585	0.754244942	0.722452836	1.249995757	1.000639853
## 45	0.978317045	1.291400328	0.888617014	0.837154559	1.382224399	1.137706566
## 46	0.762596014	1.073260646	0.677902864	0.645146989	1.173617504	0.924940109
## 47	0.877555945	1.186888724	0.794113318	0.761083968	1.289864263	1.040579215
## 48	0.766831507	1.081593436	0.670056636	0.601138081	1.155865902	0.918896254
## 49	0.528588533	0.838336306	0.447620535	0.436438963	0.942813504	0.692154048
## 50	0.732089830	1.043470316	0.646445904	0.612354878	1.142067944	0.893919273
## 51	0.957533702	1.272098857	0.859597826	0.782338941	1.341067898	1.107651913
## 52	0.676615599	0.991005125	0.578359431	0.506676195	1.062050645	0.826572870
## 53	0.814034586	1.128770514	0.717015949	0.645966133	1.201892177	0.965708426
## 54	0.968914513	1.278820291	0.866055441	0.766323275	1.326222406	1.107057367
## 55	1.007028660	1.320719515	0.907190669	0.821718145	1.382301706	1.153530033
## 56	0.675912894	0.981897419	0.598262420	0.585653137	1.092584216	0.840732516
## 57	1.026382494	1.341155987	0.931440135	0.863520323	1.418819829	1.180703520
## 58	0.952743108	1.262688352	0.868133535	0.830514825	1.363792958	1.115269233
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## 60	0.720491095	1.034836659	0.628323345	0.576309926	1.120777272	0.877751410
## 61	1.595780203	1.908003713	1.506559421	1.449826363	1.999657879	1.755652328
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## 64	1.655508786	1.968913747	1.564207394	1.501514832	2.055158205	1.813650402
## 65	1.429509965	1.739126177	1.344044504	1.298050553	1.839331019	1.591773528
## 66	1.751948011	2.063967748	1.662883305	1.605688577	2.155972836	1.911954975
## 67	1.110731916	1.405267201	1.040743696	1.032386113	1.530752053	1.276903642
## 68	1.409485838	1.707369949	1.335430207	1.315199183	1.828477728	1.575355565
## 69	1.299048714	1.607894554	1.214770123	1.172882046	1.710378519	1.461884756
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## 75	1.435444567	1.744457395	1.350688607	1.306376504	1.846165605	1.598081799
## 76	1.394930333	1.702716958	1.311646112	1.271208114	1.807361352	1.558255030
## 77	1.382153402	1.695043417	1.292081441	1.234602230	1.784694174	1.541331720
## 78	1.362761757	1.668311457	1.281906054	1.247401724	1.777549089	1.527031461
## 79	1.041537514	1.332944631	0.974525789	0.973119239	1.461882202	1.207743071
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## 95	0.827131985	0.948365226	0.851516320	0.970754948	1.139694558	0.937907206
## 96	0.851566373	1.000498846	0.864447833	0.973329507	1.188137571	0.974377612
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## 101	0.918285693	1.048632820	0.936921719	1.050226710	1.239344951	1.034049720
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## 107	0.940855674	0.980599865	0.989831090	1.126170930	1.176066331	1.016255503
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## 109	0.870660273	1.001765298	0.890137667	1.004711622	1.192132695	0.986217923
## 110	0.952883934	1.090558582	0.967913428	1.077572429	1.280464461	1.072067605
## 111	0.864418248	1.051024196	0.860644202	0.952765172	1.231071509	1.002290548
## 112	1.002636645	1.111413385	1.027567070	1.145578512	1.304748249	1.110022594
## 113	0.914470091	1.045042349	0.933106084	1.046451813	1.235707132	1.030288953
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## 115	0.790078062	0.933551169	0.806881331	0.920143340	1.121640768	0.909868219
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## 26	0.272841122					

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## 27 0.221486678 0.248643124
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## 81	1.414487466	1.158349704	1.383433666	1.431502145	1.283195336	1.281829740
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## 83	1.550587666	1.283598614	1.489890784	1.561002201	1.384438130	1.434419249
## 84	1.562933259	1.297655658	1.507797124	1.574688385	1.403087327	1.443090122
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## 86	1.294718149	1.024806889	1.224456098	1.302284814	1.118237595	1.188295927
## 87	1.188288055	0.919268732	1.123286344	1.196824827	1.017974419	1.080134073
## 88	1.460162738	1.194913200	1.405844367	1.471916434	1.301435963	1.340909196
## 89	1.564416752	1.303038537	1.520225488	1.578728140	1.417212183	1.437860761
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## 91	1.124354633	0.883639392	0.950669316	1.103024475	0.850984207	1.114156925
## 92	1.098419783	0.980617524	0.877029642	1.053820905	0.832676124	1.185715351
## 93	1.144322650	0.947675580	0.939897612	1.111550397	0.858681561	1.177804111
## 94	1.080501517	0.874228051	0.881674164	1.050049436	0.795506772	1.105624584
## 95	0.996874545	0.831064258	0.782949490	0.959220487	0.714070467	1.053128155
## 96	1.016120046	0.828521517	0.809347327	0.982162602	0.730604285	1.056468377
## 97	1.142894822	0.957626272	0.933803032	1.107920269	0.857693197	1.185514653
## 98	1.112197173	0.937566191	0.899780037	1.075459759	0.828225116	1.162735750
## 99	1.022874785	0.837300009	0.815205160	0.988502587	0.737479437	1.064816534
## 100	1.015309873	0.821579730	0.811182165	0.982545478	0.729665546	1.050804566
## 101	1.085773167	0.907041615	0.874913589	1.049860491	0.801151742	1.133166194
## 102	1.175267062	1.001124188	0.962212937	1.138197958	0.891545473	1.226411728
## 103	1.112409730	0.990407844	0.891157457	1.068240662	0.844850115	1.197358661
## 104	1.005557477	0.816944061	0.799346714	0.971848746	0.719989713	1.045071630
## 105	0.955186019	0.839202064	0.733901111	0.910970449	0.689110946	1.042358581
## 106	1.063143254	0.885485297	0.852147853	1.027145509	0.778602988	1.111238456
## 107	1.115782222	1.000704735	0.894322634	1.070821501	0.851442487	1.204761038
## 108	1.092455376	0.904937689	0.884730913	1.058114309	0.807026808	1.133152463
## 109	1.038448440	0.862304642	0.827207017	1.002305642	0.754043274	1.087546590
## 110	1.118705136	0.932740477	0.910107168	1.083959293	0.833414344	1.160704088
## 111	1.018579870	0.803561180	0.825940207	0.990451763	0.735273738	1.035704124
## 112	1.172837803	1.004468903	0.958193206	1.134821399	0.890186595	1.228160741
## 113	1.081951637	0.903298694	0.871102750	1.046042237	0.797330976	1.129387496
## 114	0.966897912	0.749244420	0.777024698	0.939694924	0.684547589	0.981497862
## 115	0.956479152	0.777464450	0.747224319	0.921282325	0.671500653	1.003038774
## 116	1.013931374	0.805141883	0.817565314	0.984370176	0.729455173	1.036707720
## 117	1.004649776	0.856073930	0.786741711	0.964349300	0.726286565	1.072503568
## 118	1.036760662	0.874898714	0.821451019	0.998281430	0.754998486	1.095979342
## 119	1.222026044	1.040320571	1.011020511	1.186107867	0.937315083	1.267642142
## 120	1.211108166	1.028387311	1.000530229	1.175410970	0.926261321	1.255910744
##	31	32	33	34	35	36
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## 32 0.054507066
## 33 0.178701763 0.172872631
## 34 0.073253656 0.062948585 0.234025239
## 35 0.277389225 0.279865077 0.108977380 0.339251399
## 36 0.317274664 0.264328179 0.283402297 0.299335821 0.361190994
## 37 0.303392976 0.267034331 0.175797854 0.325395944 0.213212566 0.169936652
## 38 0.297728811 0.297858117 0.125403401 0.358085040 0.022902540 0.363409683
## 39 0.082226269 0.065165462 0.107719515 0.126725806 0.214963049 0.259435750
## 40 0.205454153 0.154144927 0.277054064 0.156381298 0.382946073 0.171462087
## 41 0.329119998 0.325637573 0.152924774 0.386943926 0.059044267 0.366545961
## 42 0.230822899 0.176332119 0.256244538 0.198796080 0.355272537 0.108019895
## 43 0.263375815 0.248011053 0.088975414 0.310900055 0.090959901 0.273757648
## 44 0.103606635 0.120024333 0.086894919 0.171145107 0.174866029 0.318045025
## 45 0.098235247 0.048491239 0.206212718 0.063580582 0.315073811 0.236193490
## 46 0.179637694 0.185425848 0.038783056 0.242901232 0.097771370 0.321510888
## 47 0.063685134 0.087048409 0.120549206 0.132696988 0.214422457 0.314824477
## 48 0.268881684 0.237524552 0.131147099 0.298367380 0.173552435 0.193700235
## 49 0.412701221 0.419846419 0.250132361 0.477864047 0.141157287 0.480891531
## 50 0.211602753 0.214093915 0.047684320 0.273097198 0.066193914 0.324920283
## 51 0.250177433 0.196164072 0.247733746 0.227298200 0.340297614 0.072697228
## 52 0.346068575 0.322486930 0.179275245 0.384904685 0.159002400 0.269512924
## 53 0.249224252 0.210728092 0.144044504 0.268460404 0.209656702 0.151788229
## 54 0.399031960 0.345707547 0.358507243 0.377622657 0.426748358 0.082220507
## 55 0.311239515 0.256732526 0.316702766 0.277847103 0.406189345 0.069271768
## 56 0.271327000 0.288695424 0.141560501 0.341079568 0.077639033 0.419917890
## 57 0.208303361 0.156452568 0.275750256 0.160715333 0.381158317 0.165381135
## 58 0.016644649 0.043221385 0.186487527 0.057467612 0.287818881 0.307547509
## 59 0.380293943 0.346025590 0.236151898 0.404963533 0.241017020 0.219614994
## 60 0.252613384 0.237510803 0.078572819 0.300374359 0.091313830 0.270815876
## 61 0.661005575 0.650519297 0.822657810 0.592600656 0.930375468 0.728703330
## 62 0.481580984 0.457120058 0.621726622 0.408499223 0.730683836 0.492775867
## 63 0.230318759 0.255989714 0.408197252 0.198219955 0.500624470 0.486916865
## 64 0.727864485 0.713162455 0.883591281 0.657563350 0.992151104 0.767174728
## 65 0.488596200 0.486443368 0.659043542 0.425141012 0.764049162 0.614400744
## 66 0.815812117 0.806509604 0.978813887 0.748136610 1.086372296 0.879467371
## 67 0.259215767 0.303980522 0.416101004 0.263310455 0.488554860 0.562345060
## 68 0.498261253 0.520853614 0.676055751 0.460039903 0.766237845 0.725657430

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## 69	0.357837159	0.359450619	0.530931436	0.297095893	0.634458320	0.517278976
## 70	0.371106343	0.392132208	0.549525177	0.331162921	0.642438047	0.600833618
## 71	0.622523380	0.621309423	0.793846048	0.559881229	0.898560768	0.740396674
## 72	0.546236098	0.565895044	0.724677465	0.504138897	0.816923538	0.760033886
## 73	0.552290872	0.529953632	0.695890054	0.479566124	0.804866969	0.565026156
## 74	0.505294529	0.509596214	0.680348053	0.446992064	0.782616891	0.658331374
## 75	0.494246169	0.493858783	0.666128978	0.432104747	0.770462253	0.627490758
## 76	0.454206710	0.457717216	0.628715231	0.395181406	0.731397569	0.608899282
## 77	0.453488724	0.438400439	0.609434793	0.382751445	0.717744358	0.521348475
## 78	0.425925227	0.435869667	0.603398156	0.372929242	0.702923464	0.609964475
## 79	0.244622989	0.296277531	0.377539962	0.270295526	0.437108846	0.560538922
## 80	0.414414777	0.417080497	0.588325594	0.354630718	0.691404458	0.570190342
## 81	0.450825149	0.439938905	0.612288935	0.381959554	0.719803496	0.540226184
## 82	0.686339800	0.681868329	0.854737977	0.621478963	0.960726812	0.783451862
## 83	0.564276479	0.574799051	0.742103443	0.511854418	0.840836728	0.739651804
## 84	0.576936827	0.583606735	0.753313384	0.520790559	0.854275377	0.734684205
## 85	0.492287758	0.480992671	0.653168916	0.423287101	0.760847981	0.573628312
## 86	0.317378470	0.342252340	0.494989035	0.283089889	0.585919951	0.563894779
## 87	0.208968871	0.236091291	0.386583321	0.179591010	0.478730033	0.471587744
## 88	0.474161700	0.481219584	0.650582039	0.418341737	0.751514553	0.641857310
## 89	0.584087890	0.583440399	0.755845378	0.521835819	0.860314417	0.707712318
## 90	0.463023080	0.480140314	0.641724101	0.417934667	0.736540834	0.671861638
## 91	0.663666183	0.716753662	0.691225193	0.718853247	0.670518395	0.958719264
## 92	1.185881805	1.229758294	1.130434134	1.255124822	1.055431867	1.412023982
## 93	0.915268033	0.965606853	0.906990148	0.977133516	0.859931139	1.187396825
## 94	0.831694731	0.881500875	0.820436985	0.894621187	0.773315200	1.101140536
## 95	0.951566620	0.996602796	0.905328022	1.020039413	0.837407922	1.188429655
## 96	0.877796417	0.924793260	0.844949735	0.944461023	0.785206853	1.128236956
## 97	0.964803654	1.014318649	0.948817541	1.028036561	0.896732309	1.230685510
## 98	0.989158862	1.037361670	0.962859237	1.054271412	0.904861969	1.245890204
## 99	0.889936879	0.936964121	0.857079823	0.956555508	0.797119683	1.140376991
## 100	0.851646531	0.899042551	0.821959035	0.917893921	0.764388396	1.105051879
## 101	0.955638752	1.003608038	0.928165977	1.021083825	0.870024466	1.211241411
## 102	1.033266959	1.082539377	1.014386670	1.096812653	0.959778980	1.296766420
## 103	1.182010848	1.226449666	1.129715399	1.250828691	1.056285380	1.411809488
## 104	0.867737619	0.914531879	0.833737635	0.934630203	0.773560584	1.117059523
## 105	1.092528138	1.133209894	1.021687927	1.163706759	0.940108439	1.300022887
## 106	0.945931516	0.993345877	0.914763970	1.012057540	0.854801285	1.198034762
## 107	1.207499156	1.251492181	1.152502828	1.276646470	1.077551534	1.434123355
## 108	0.923151717	0.971876721	0.901690255	0.987623169	0.847287638	1.184175912
## 109	0.936949740	0.983701563	0.901519363	1.003818285	0.839438287	1.184907593
## 110	0.946235937	0.995362798	0.927470425	1.010094859	0.874159346	1.209678402
## 111	0.756115358	0.805078235	0.739824680	0.820476489	0.691678414	1.021125462
## 112	1.055082460	1.103907623	1.032482965	1.119278182	0.975605139	1.315287447
## 113	0.953566230	1.001451045	0.925530022	1.019119161	0.867118783	1.208640244
## 114	0.719030436	0.766666306	0.693992788	0.785181999	0.642041104	0.976373749
## 115	0.879208280	0.924012999	0.832742712	0.947930274	0.765808515	1.115921234
## 116	0.783700789	0.832101885	0.762532127	0.848796711	0.711027386	1.044645328
## 117	1.018033257	1.062101110	0.965379876	1.087224007	0.893361484	1.247750896
## 118	0.990498477	1.036226020	0.947854179	1.058333559	0.881262097	1.231117885
## 119	1.033702653	1.084200292	1.025042627	1.095125744	0.975992431	1.305843092
## 120	1.021707216	1.072121344	1.012468482	1.083303474	0.963260559	1.293349464
##	37	38	39	40	41	42
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## 38 0.209030799
## 39 0.222280070 0.232729486
## 40 0.272305974 0.394959240 0.192346113
## 41 0.204165422 0.036200090 0.260553938 0.413104326
## 42 0.216854332 0.364134242 0.193537602 0.064840582 0.377594964
## 43 0.122537706 0.089809588 0.185487926 0.319063131 0.096353052 0.281437393
## 44 0.248660602 0.195930111 0.068504487 0.260529119 0.228778439 0.260766346
## 45 0.269252518 0.331369654 0.102723088 0.107226263 0.356407548 0.138473365
## 46 0.212069556 0.118558049 0.122054247 0.304821235 0.151566372 0.289286034
## 47 0.267290343 0.235190634 0.055392860 0.236363252 0.267440261 0.245544846
## 48 0.044937916 0.172161505 0.186750055 0.266927260 0.172867635 0.218629395
## 49 0.316303587 0.127218108 0.355349863 0.522174519 0.114594277 0.490173145
## 50 0.199979170 0.086140877 0.149486578 0.324646389 0.118723114 0.303390678
## 51 0.184379659 0.346988802 0.201200769 0.103651571 0.357224602 0.038901649
## 52 0.099885940 0.145377007 0.264877897 0.361190233 0.126245701 0.310931535
## 53 0.057092707 0.211667842 0.169582586 0.221748238 0.216543330 0.171589558
## 54 0.220001582 0.425966849 0.341431210 0.238300549 0.423940247 0.180419519
## 55 0.231788122 0.411421420 0.269015273 0.129247772 0.418942720 0.080592385
## 56 0.284388451 0.094256932 0.228604082 0.414574353 0.126108651 0.397623912

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## 57	0.267650110	0.392879988	0.192823420	0.006088497	0.410584926	0.058904301
## 58	0.302307210	0.307664030	0.084675032	0.190307766	0.338252577	0.218190669
## 59	0.079767573	0.229509367	0.298389719	0.346662537	0.212008644	0.287617805
## 60	0.124399336	0.092831624	0.174822621	0.310964679	0.102919677	0.274741827
## 61	0.856873898	0.948026382	0.715453743	0.584569004	0.974233633	0.642698048
## 62	0.630573319	0.745837513	0.518845891	0.361127211	0.768100063	0.413856907
## 63	0.522707317	0.522242288	0.310342536	0.322467403	0.555486148	0.380130948
## 64	0.904838612	1.008889241	0.777444317	0.633831110	1.033542451	0.688442346
## 65	0.718537441	0.783174954	0.551421620	0.452012405	0.811955204	0.515502555
## 66	1.011653596	1.104154385	0.871510001	0.739473106	1.130509947	0.796540758
## 67	0.561814047	0.511378450	0.339535423	0.412796527	0.547077110	0.461579096
## 68	0.784998298	0.788231562	0.577723991	0.554276671	0.822088565	0.617962048
## 69	0.603382869	0.654068165	0.423821617	0.347623092	0.683753541	0.412459089
## 70	0.656133685	0.664088879	0.449698904	0.430055424	0.697331264	0.492848264
## 71	0.851161330	0.917823216	0.686257572	0.582305467	0.946767109	0.644761143
## 72	0.827615169	0.838716584	0.624459983	0.588689258	0.872179198	0.653092485
## 73	0.705191875	0.820256564	0.592319679	0.436164313	0.842825518	0.488380301
## 74	0.752743965	0.802640164	0.573645969	0.491902706	0.832942404	0.556349568
## 75	0.729123489	0.789841919	0.558660959	0.463925491	0.819048592	0.527725547
## 76	0.701008364	0.751291547	0.521873305	0.441430644	0.781397173	0.506041906
## 77	0.642716172	0.734824233	0.502868355	0.370581601	0.760238871	0.430302385
## 78	0.688961457	0.723566567	0.498331981	0.439419345	0.754982445	0.504208840
## 79	0.536529409	0.459991888	0.317530460	0.426336808	0.496148338	0.466888741
## 80	0.660350850	0.711170751	0.481348308	0.401903308	0.741081715	0.466623958
## 81	0.654988434	0.737603362	0.504938693	0.384100033	0.764201502	0.445637480
## 82	0.902793530	0.979449836	0.747019472	0.631495045	1.007448194	0.692201037
## 83	0.826171386	0.861679792	0.637251920	0.571105737	0.893396473	0.635884760
## 84	0.829033930	0.874648075	0.647179951	0.568555132	0.905529021	0.632973518
## 85	0.692641566	0.778524229	0.545929368	0.420947517	0.804884140	0.481473676
## 86	0.608372396	0.607761484	0.397408584	0.395344859	0.641376745	0.456082317
## 87	0.503060015	0.500360852	0.289389716	0.309363992	0.533640549	0.365493481
## 88	0.729369453	0.771866373	0.544590269	0.473193421	0.802752008	0.537972259
## 89	0.815474832	0.879662572	0.648318059	0.547712468	0.908769933	0.610661956
## 90	0.740331265	0.757986893	0.539858817	0.500475347	0.790823323	0.564831035
## 91	0.864245221	0.686000358	0.701275326	0.868852973	0.713502737	0.890482358
## 92	1.267426272	1.058405962	1.189538480	1.380530122	1.067317538	1.379426783
## 93	1.069206273	0.870170336	0.939282121	1.119732547	0.890123435	1.132620559
## 94	0.982473521	0.783694597	0.853972523	1.035643470	0.803945223	1.047427628
## 95	1.050593026	0.842674261	0.958727212	1.148512852	0.855309735	1.150239912
## 96	0.997858897	0.792676830	0.890731383	1.078043934	0.808668123	1.083695367
## 97	1.107760876	0.905813907	0.985670690	1.168436032	0.924044842	1.179202497
## 98	1.117312184	0.912556334	1.005551313	1.191142737	0.928736370	1.198903938
## 99	1.009814587	0.804513765	0.902929256	1.090226548	0.820376710	1.095892960
## 100	0.976631201	0.772426145	0.865866061	1.052507403	0.789282599	1.059039029
## 101	1.082474607	0.877736823	0.971364154	1.157302742	0.893980966	1.164661824
## 102	1.171549852	0.968197232	1.053131611	1.236618219	0.985394216	1.246665632
## 103	1.268666007	1.059720440	1.187141494	1.377726271	1.069337964	1.377629205
## 104	0.986269253	0.780946252	0.880097904	1.067674557	0.796829374	1.072972594
## 105	1.149736367	0.941152004	1.088542622	1.280769923	0.947201524	1.274745284
## 106	1.067537742	0.862094571	0.959952397	1.146790370	0.877735686	1.153037519
## 107	1.289540131	1.080518889	1.211426151	1.402357345	1.089400622	1.401397395
## 108	1.058898305	0.855918509	0.941411879	1.125839089	0.873540890	1.134910817
## 109	1.052426999	0.846229011	0.949000579	1.136791188	0.861142410	1.141757159
## 110	1.085511126	0.882997521	0.965796063	1.149419396	0.900894725	1.159329788


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## 111 0.901063077 0.702017243 0.775701916 0.959118738 0.722319672 0.969238484
## 112 1.187892195 0.983471113 1.073377694 1.257884138 0.999837499 1.266856407
## 113 1.079614852 0.874770644 0.969029806 1.155110730 0.890928580 1.162299360
## 114 0.852626372 0.651674406 0.734460657 0.920287788 0.671045969 0.927845846
## 115 0.979020924 0.771470255 0.885924428 1.075797360 0.784802084 1.077417022
## 116 0.921611280 0.720583981 0.801317111 0.985989426 0.739731348 0.994815750
## 117 1.106127303 0.897399956 1.022473614 1.213162643 0.908107333 1.212940254
## 118 1.094473052 0.886816500 0.999479610 1.188626757 0.899830039 1.191469067
## 119 1.186137674 0.985637953 1.058047662 1.238308634 1.004623220 1.251387030
## 120 1.173446210 0.972887874 1.045755625 1.226240805 0.991856957 1.239120924
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## 45 0.271821266 0.165390764
## 46 0.111893589 0.077389898 0.224570153
## 47 0.208458199 0.039946321 0.134882037 0.116698208
## 48 0.082830206 0.206566711 0.246647517 0.167151673 0.227939346
## 49 0.210283043 0.309095791 0.456127830 0.234980285 0.349022606 0.287200772
## 50 0.088228794 0.110105192 0.250734747 0.032861023 0.149110240 0.155471507
## 51 0.260953633 0.265261616 0.164600659 0.283323340 0.255689545 0.191651811
## 52 0.091916030 0.265679308 0.337281485 0.203753226 0.295664671 0.094472093
## 53 0.122186619 0.204572764 0.212200350 0.182675499 0.218078235 0.047307900
## 54 0.336561206 0.398848613 0.315261935 0.397135572 0.396822912 0.253829044
## 55 0.323475758 0.334218283 0.218752634 0.352718217 0.322691509 0.248443932
## 56 0.162564023 0.170074048 0.331143216 0.109773262 0.208587142 0.242003407
## 57 0.316237203 0.261160786 0.110095508 0.304071589 0.237769651 0.262989109
## 58 0.269075398 0.115798116 0.083308281 0.190332934 0.076373625 0.269531468
## 59 0.160721943 0.316859782 0.349005432 0.267936608 0.339859551 0.112087277
## 60 0.010763199 0.165453134 0.261854456 0.102923637 0.197784996 0.082685294
## 61 0.888531092 0.763286915 0.617953474 0.835200553 0.723995492 0.849085674
## 62 0.676983861 0.576463733 0.416450325 0.640889530 0.539948526 0.628001182
## 63 0.493694357 0.326713235 0.259360487 0.403974086 0.288589906 0.493253627
## 64 0.945180791 0.828707310 0.677549824 0.898565117 0.790006459 0.900533973
## 65 0.732212360 0.592155519 0.461005771 0.666962954 0.552274176 0.703728875
## 66 1.044845575 0.918486947 0.774270105 0.990922733 0.879035258 1.004739929
## 67 0.505076144 0.329206838 0.326153013 0.400088257 0.299151225 0.525259879
## 68 0.761630732 0.593635003 0.516511473 0.670549440 0.556108300 0.758202964
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## 77 0.673606162 0.553878306 0.403842393 0.623755202 0.515302842 0.634012177
## 78 0.683560910 0.528139426 0.420941762 0.605187901 0.488501761 0.667527017
## 79 0.465422195 0.292228607 0.328421783 0.355737520 0.269239169 0.496714588
## 80 0.664738479 0.517936158 0.396244193 0.593822941 0.477991457 0.642090137
## 81 0.679727527 0.552772571 0.408338104 0.624524378 0.513594737 0.643997831
## 82 0.925321640 0.789785957 0.653500871 0.864027502 0.749972594 0.891669475
## 83 0.822505553 0.665972981 0.559064069 0.743188092 0.626498590 0.805710892
## 84 0.831604071 0.679708300 0.564545572 0.756504021 0.639931324 0.810671881
## 85 0.719832023 0.594165667 0.448765543 0.665740938 0.555021811 0.682707809
## 86 0.580743684 0.412754084 0.342511221 0.489810580 0.375065520 0.579735678
## 87 0.472310489 0.304875917 0.241613513 0.382115899 0.266841185 0.472996287
## 88 0.729228966 0.576993073 0.463316409 0.653743813 0.537195453 0.709814533
## 89 0.829575073 0.687693988 0.558474898 0.763005693 0.647760571 0.801095097
## 90 0.725136275 0.562150248 0.471078968 0.639527648 0.523428756 0.715924562
## 91 0.749442032 0.640747871 0.761796428 0.653259037 0.646636330 0.819396515
## 92 1.146254586 1.121042302 1.278247096 1.093759115 1.144491132 1.228980294
## 93 0.947797439 0.873541531 1.012891592 0.868228375 0.887409980 1.025905000
## 94 0.861089005 0.787912281 0.929019194 0.781684764 0.802481775 0.939170674
## 95 0.928295420 0.890383731 1.045074753 0.867822367 0.912161026 1.010353227
## 96 0.875348579 0.822950636 0.973073921 0.806726213 0.842061299 0.956152651
## 97 0.985711968 0.919157300 1.061961481 0.910165285 0.934659546 1.065033528
## 98 0.994843116 0.938194878 1.085409992 0.924476173 0.955863918 1.075392906

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## 99	0.887297973	0.835148544	0.985240774	0.818866115	0.854251342	0.968147918
## 100	0.854204771	0.798274322	0.947254003	0.783602299	0.816750770	0.934593756
## 101	0.960004574	0.903924344	1.051709359	0.889802885	0.921859757	1.040563971
## 102	1.049264540	0.986362063	1.130274446	0.975817185	1.002443865	1.129163004
## 103	1.147188342	1.118676875	1.274939731	1.092803229	1.141511103	1.229825154
## 104	0.863750288	0.812252459	0.962842042	0.795551060	0.831610139	0.944623730
## 105	1.030217855	1.020242077	1.181466995	0.986288616	1.046682930	1.113022207
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## 107	1.168373661	1.142933145	1.299982307	1.115809578	1.166283340	1.251099864
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## 109	0.929890188	0.881082753	1.032021504	0.863447452	0.900679466	1.011124025
## 110	0.963351846	0.899032307	1.043142366	0.888866620	0.915138209	1.042933225
## 111	0.779569566	0.709146432	0.852895537	0.701105337	0.724868173	0.857854933
## 112	1.065463368	1.006301332	1.151789598	0.994017990	1.023157704	1.145829844
## 113	0.957135079	0.901551640	1.049571039	0.887184518	0.919606036	1.037743454
## 114	0.730689333	0.667177728	0.814820197	0.655408034	0.684811291	0.809821414
## 115	0.856628772	0.817572881	0.972492257	0.795174284	0.839457127	0.938528175
## 116	0.799689181	0.734340214	0.880084557	0.723904819	0.751081668	0.878773804
## 117	0.984315378	0.954002844	1.110592227	0.928353799	0.977004081	1.066809854
## 118	0.972094313	0.931250108	1.084657791	0.910179256	0.952276604	1.054006990
## 119	1.064416282	0.992271652	1.131411685	0.986302035	1.006163627	1.143062792
## 120	1.051708011	0.979917065	1.119374642	0.973732057	0.993939603	1.130387805
##	49	50	51	52	53	54
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## 50 0.205863396
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## 53 0.331135808 0.179046438 0.144401213 0.139844154
## 54 0.536256287 0.397276011 0.150720963 0.313330783 0.218926065
## 55 0.533464284 0.361850262 0.069724223 0.331556276 0.202647348 0.111542060
## 56 0.151653991 0.095699391 0.388947327 0.236632234 0.271717849 0.490637089
## 57 0.520074426 0.323392052 0.097757262 0.357147962 0.217554544 0.232322753
## 58 0.424490105 0.221736648 0.239206634 0.349544889 0.247147816 0.388913557
## 59 0.311401920 0.248333338 0.251972523 0.085772607 0.136858031 0.245724325
## 60 0.215888344 0.081001560 0.255358778 0.101440171 0.119028562 0.335434848
## 61 1.070124210 0.864577782 0.679375137 0.943508558 0.805438408 0.758260711
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## 64 1.132793751 0.926930839 0.723554013 0.994926919 0.855572987 0.788779121
## 65 0.901202701 0.697855469 0.554205345 0.796674430 0.663668691 0.660588253
## 66 1.225894182 1.020498077 0.832671971 1.099197653 0.960773371 0.904404286
## 67 0.598390508 0.431928256 0.490560424 0.594264599 0.508333025 0.640926583
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## 72 0.941202885 0.753457372 0.691286004 0.888202363 0.770531663 0.820380237
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## 75 0.906945637 0.704287934 0.566506296 0.806105668 0.673955449 0.674775624
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## 79 0.537029423 0.385842968 0.491253077 0.556725642 0.486432840 0.641597231
## 80 0.826862350 0.625322646 0.505509541 0.733516091 0.604318479 0.623945733
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## 84 0.987208567 0.788535778 0.671866440 0.901804828 0.773026774 0.784136063
## 85 0.900636236 0.695056933 0.519205348 0.776935557 0.639964549 0.611888574
## 86 0.710768688 0.522660201 0.491884620 0.662237776 0.551509310 0.633624933

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## 87	0.605976104	0.414928067	0.398904414	0.554266576	0.446529418	0.545658375
## 88	0.884723886	0.685757311	0.576836470	0.800360118	0.673030301	0.695644544
## 89	0.996782001	0.794137039	0.649191928	0.894122424	0.760809645	0.750559243
## 90	0.863850503	0.672245999	0.602995736	0.802627067	0.683275319	0.732821321
## 91	0.668394540	0.664744128	0.902313102	0.829449107	0.834673765	1.039563613
## 92	0.966933234	1.087224099	1.376868631	1.191858648	1.263041062	1.481660089
## 93	0.815564922	0.871735482	1.138772417	1.014925552	1.049949470	1.265009259
## 94	0.730957177	0.785031635	1.053059047	0.928554830	0.963303873	1.178565082
## 95	0.762616229	0.863817094	1.149671037	0.981339383	1.041740270	1.260640410
## 96	0.723913550	0.805683554	1.085588048	0.934832527	0.984658936	1.202803145
## 97	0.844364949	0.912008687	1.184013314	1.049671077	1.090834244	1.307300718
## 98	0.843711579	0.924247730	1.201884046	1.054885274	1.103288139	1.321080753
## 99	0.735222996	0.817765421	1.097773969	0.946557722	0.996730829	1.214902646
## 100	0.706869319	0.783304561	1.061502575	0.915293942	0.962346479	1.180143947
## 101	0.809306964	0.889474247	1.167449811	1.020117712	1.068511134	1.286348172
## 102	0.902643469	0.976860750	1.250953955	1.111348957	1.155844488	1.372883392
## 103	0.970136529	1.086904975	1.375676425	1.194248750	1.263314029	1.482088315
## 104	0.711892206	0.794329639	1.074671927	0.923006041	0.973279795	1.191493271
## 105	0.842751812	0.976866901	1.269355771	1.069912803	1.149380023	1.366745433
## 106	0.791678513	0.875516692	1.155175913	1.003943117	1.054488245	1.272637580
## 107	0.988915984	1.109316310	1.398902335	1.213914840	1.285155817	1.503778034
## 108	0.792536631	0.864103344	1.138770936	0.999364682	1.043089152	1.260176503
## 109	0.773452254	0.861640150	1.143144317	0.987386888	1.040455957	1.258903496
## 110	0.820451832	0.890252974	1.163655936	1.026635171	1.069174996	1.285977667
## 111	0.650301075	0.703941916	0.974025711	0.846881772	0.882411523	1.098155251
## 112	0.914923775	0.994277257	1.270473903	1.125963565	1.173322072	1.390856676
## 113	0.806058545	0.886754720	1.164988603	1.017077648	1.065785833	1.283672650
## 114	0.596818221	0.656817839	0.931191728	0.796121819	0.835701313	1.052497899
## 115	0.694005816	0.791424138	1.076902362	0.910958855	0.969529666	1.188393916
## 116	0.664064682	0.725633497	0.998776048	0.864934719	0.904459051	1.121033872
## 117	0.811365856	0.922831746	1.211111070	1.033558764	1.099686194	1.318557734
## 118	0.807711236	0.906746150	1.191508551	1.025922732	1.084945899	1.303789846
## 119	0.926584311	0.989283712	1.257489031	1.129946048	1.167748361	1.383241962
## 120	0.913838989	0.976645607	1.245119375	1.117185700	1.155135842	1.370696067
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## 59 0.287528127 0.318020891 0.341651160 0.380154259
## 60 0.318862210 0.159991235 0.308262597 0.258340010 0.167331811
## 61 0.661585763 0.932331193 0.589252788 0.647629477 0.930198809 0.878896362
## 62 0.424639025 0.745814919 0.365013348 0.465965620 0.700565724 0.668156200
## 63 0.451702606 0.477972176 0.328278800 0.225667657 0.601934712 0.482931802
## 64 0.698615419 0.998576033 0.638045332 0.713769991 0.975519612 0.935899767
## 65 0.553340919 0.758331922 0.457548835 0.476773288 0.795939688 0.722024992
## 66 0.811495990 1.087070775 0.744027225 0.802723705 1.084156385 1.035221694
## 67 0.539356669 0.447222451 0.417979971 0.263018011 0.637308724 0.494643470
## 68 0.677644499 0.737376478 0.560364607 0.493142358 0.864709864 0.750869168
## 69 0.462842814 0.626556043 0.353558927 0.346665523 0.682271070 0.596645856
## 70 0.555812290 0.618065991 0.436134257 0.365298564 0.735836375 0.623475036
## 71 0.676928350 0.891300235 0.587655767 0.611019867 0.927905025 0.856878017
## 72 0.708964756 0.790054537 0.594752841 0.540223617 0.907381561 0.798502750
## 73 0.496414785 0.818503265 0.440017940 0.536975296 0.774614049 0.743079737
## 74 0.599732811 0.770857945 0.497665264 0.494979884 0.831259112 0.746980443

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## 75	0.567038774	0.763098747	0.469527918	0.482819875	0.806853407	0.730139285
## 76	0.551416149	0.720846571	0.447244605	0.443640283	0.779632874	0.695048137
## 77	0.456412625	0.723820203	0.375460225	0.439168197	0.717043845	0.664051461
## 78	0.556645249	0.687054311	0.445420380	0.416953809	0.768395727	0.672966872
## 79	0.546995197	0.387885431	0.430853486	0.253099585	0.608211641	0.455463889
## 80	0.513721820	0.682000620	0.407759905	0.403590278	0.739056199	0.654339906
## 81	0.476829343	0.722074532	0.389273346	0.437221955	0.730621219	0.669928611
## 82	0.717907037	0.956519368	0.636563032	0.674168527	0.978148719	0.915339640
## 83	0.682808141	0.822600323	0.576992682	0.555619914	0.905365614	0.811909388
## 84	0.675587224	0.839628249	0.574310844	0.567279732	0.907665315	0.821116871
## 85	0.508951028	0.763520650	0.425962722	0.478651199	0.767603993	0.710101283
## 86	0.523494541	0.559986300	0.401344923	0.312737838	0.687808134	0.569980625
## 87	0.438542157	0.456234012	0.315066868	0.204737919	0.582115664	0.461547295
## 88	0.585483386	0.737560791	0.479079945	0.464500470	0.808386670	0.718714218
## 89	0.645133032	0.852681049	0.553149537	0.572683816	0.892591415	0.819364578
## 90	0.621336351	0.713564188	0.506542959	0.456141861	0.820080041	0.714417204
## 91	0.968997888	0.592888747	0.871886461	0.678556628	0.909217991	0.744195041
## 92	1.446411714	0.992122598	1.381590549	1.202498864	1.276890591	1.146590094
## 93	1.207723755	0.785233612	1.122034419	0.931173587	1.099673114	0.944930841
## 94	1.122130517	0.698526427	1.037834895	0.847725159	1.013203949	0.858203367
## 95	1.219382255	0.770029761	1.149808318	0.968141578	1.067063215	0.927667964
## 96	1.155247719	0.714227060	1.079688212	0.894232447	1.020495508	0.873769728
## 97	1.253278631	0.823373882	1.170554346	0.980882571	1.134943052	0.983361723
## 98	1.271443878	0.833398942	1.192993311	1.005449792	1.140532648	0.993119183
## 99	1.167435040	0.726239135	1.091873968	0.906369354	1.032234938	0.885747885
## 100	1.131111067	0.692590649	1.054227815	0.868043062	1.000839911	0.852382854
## 101	1.237030016	0.798572139	1.159112794	0.971962164	1.105755670	0.958284621
## 102	1.320323040	0.887242346	1.238679863	1.049387219	1.196844838	1.047194501
## 103	1.445287956	0.992045233	1.378879325	1.198608278	1.279462669	1.147322058
## 104	1.144344806	0.702727870	1.069285125	0.884193166	1.008679854	0.862213719
## 105	1.338376519	0.881183774	1.281362463	1.109160949	1.154046592	1.031395842
## 106	1.224819151	0.783998690	1.148498303	0.962321187	1.089644445	0.943489183
## 107	1.468452105	1.014224945	1.403433011	1.224112355	1.298930640	1.168709899
## 108	1.208203711	0.774561975	1.127799709	0.939370062	1.084774278	0.934529323
## 109	1.212837989	0.769447602	1.138381317	0.953406001	1.073137583	0.928591917
## 110	1.233011698	0.801133408	1.151458527	0.962386814	1.111985927	0.961121642
## 111	1.043273826	0.617006141	0.961147976	0.772307918	0.931526547	0.776755048
## 112	1.339952705	0.903826922	1.259851434	1.071277935	1.211590445	1.063639596
## 113	1.234579525	0.795759313	1.156905077	0.969900416	1.102725921	0.955443309
## 114	1.000683034	0.568259964	0.922078107	0.735409289	0.881087466	0.728229474
## 115	1.146616725	0.697858343	1.077072660	0.895796212	0.996722184	0.855850748
## 116	1.068179867	0.637251847	0.987906765	0.799976842	0.949961740	0.797215988
## 117	1.280742071	0.828189969	1.214286807	1.034646589	1.119040549	0.984209864
## 118	1.261232001	0.813296377	1.190029612	1.007032383	1.111667215	0.971329155
## 119	1.326465108	0.901894465	1.240641309	1.049561593	1.215009088	1.061776676
## 120	1.314120772	0.889191212	1.228554547	1.037587530	1.202254055	1.049081437
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## 63 0.492606047 0.384685452
## 64 0.084762901 0.275068000 0.570922603
## 65 0.189592211 0.202978728 0.304220159 0.271067113
## 66 0.156335364 0.386877023 0.637954451 0.119393501 0.334391736
## 67 0.600904261 0.512110764 0.128314357 0.682393026 0.411511783 0.738154784
## 68 0.382328593 0.424155977 0.267965910 0.466350376 0.231635587 0.484742448
## 69 0.316577234 0.229573788 0.177816652 0.393460684 0.132342685 0.465848345
## 70 0.399824647 0.364155157 0.141855802 0.483433157 0.214445980 0.530999806
## 71 0.114401723 0.282316298 0.427734450 0.194376574 0.134895539 0.216977618
## 72 0.349787944 0.423001459 0.316776514 0.432056096 0.222075490 0.440182700
## 73 0.177860526 0.075072846 0.437469819 0.202208243 0.202606358 0.316983599
## 74 0.215916124 0.265149805 0.301332269 0.300582919 0.062197768 0.343660930
## 75 0.193501987 0.220129281 0.303989175 0.276452952 0.017193704 0.333988599
## 76 0.244573402 0.242602360 0.255652126 0.327443401 0.058303649 0.383291316
## 77 0.215256041 0.087647542 0.320415003 0.274894814 0.119566530 0.371394083
## 78 0.300654459 0.289271829 0.212721629 0.384282191 0.116697800 0.434144470
## 79 0.675706029 0.573402175 0.190504876 0.756319707 0.486114714 0.814891365
## 80 0.271509316 0.231002504 0.222162345 0.351996158 0.082183729 0.415946334
## 81 0.210676972 0.122839258 0.301464963 0.278437270 0.086237936 0.366573508
## 82 0.079826146 0.304622437 0.498240806 0.138746429 0.198335610 0.143508296
## 83 0.250864494 0.349597369 0.345066961 0.332945554 0.147817199 0.345827118
## 84 0.208457790 0.322220067 0.364732703 0.290417962 0.126688650 0.306323664
## 85 0.169527488 0.123518532 0.339292956 0.237188663 0.082332074 0.325656364
## 86 0.446527821 0.382572343 0.087103857 0.528770830 0.257722532 0.582985149
## 87 0.509768805 0.393536228 0.021905531 0.587207418 0.322190381 0.656370016
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## 92 1.747704245 1.639456872 1.264850487 1.829849764 1.558801638 1.878727455
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## 116 1.319229559 1.218780485 0.839690675 1.401690352 1.130629216 1.449718107

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## 117 1.584235054 1.472357510 1.099220963 1.665903783 1.394999082 1.717304301
## 118 1.542542712 1.437430731 1.060914733 1.624818484 1.353754022 1.673354638
## 119 1.520049710 1.444980971 1.060660167 1.604247738 1.335525322 1.639149251
## 120 1.510363587 1.434132276 1.049909939 1.594508389 1.325591574 1.630016589
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## 68 0.303814626
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## 71 0.522339120 0.275038548 0.264847265 0.314371077
## 72 0.359419786 0.055976053 0.248712872 0.175152738 0.237927806
## 73 0.562278580 0.433990049 0.269001707 0.395267559 0.244248776 0.423051283
## 74 0.394642814 0.176251086 0.150586446 0.187571969 0.127939629 0.161023719
## 75 0.407751149 0.216832189 0.136570240 0.207146106 0.128294444 0.205559026
## 76 0.356890968 0.182053599 0.098551674 0.156522200 0.172465586 0.182696161
## 77 0.444454644 0.336508646 0.151358879 0.281264036 0.222333721 0.336346139
## 78 0.304010879 0.138562855 0.094321712 0.099178010 0.218841570 0.154700772
## 79 0.078124212 0.379843564 0.366191093 0.286834420 0.599569281 0.435691745
## 80 0.330508956 0.196987495 0.057730331 0.141732456 0.209613961 0.207906950
## 81 0.422539896 0.301410865 0.126569734 0.250791016 0.200194635 0.301012329
## 82 0.595309437 0.345066997 0.330612503 0.387672510 0.073469430 0.304187181
## 83 0.416340767 0.138927005 0.223966725 0.210325581 0.138899450 0.099110557
## 84 0.445209145 0.179574811 0.226041631 0.236692198 0.096471009 0.141638404
## 85 0.458024089 0.312287736 0.162230527 0.277382711 0.169809820 0.304405464
## 86 0.155219831 0.181070219 0.154248645 0.058810068 0.367499700 0.231033977
## 87 0.124625786 0.289485955 0.193748294 0.163728576 0.447292597 0.338577031
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## 89 0.485610569 0.248978375 0.226317844 0.278456914 0.038701428 0.217453622
## 90 0.298871957 0.065127560 0.164058287 0.095795613 0.237839927 0.088310541
## 91 0.542667858 0.772172535 0.837707521 0.730252588 1.036957117 0.822972342
## 92 1.147629719 1.403717463 1.441523309 1.349268332 1.661803534 1.455816211
## 93 0.822773257 1.053744235 1.118705606 1.013329498 1.319967298 1.103643605
## 94 0.749600708 0.992056399 1.045736279 0.944720608 1.254382624 1.043362050
## 95 0.911493574 1.172880600 1.204791128 1.114405408 1.427709359 1.225807237
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## 99 0.834489518 1.089889601 1.129322411 1.035087538 1.347428719 1.142326417
## 100 0.794505628 1.050588945 1.089344704 0.995209828 1.307658353 1.103162388
## 101 0.887980990 1.133587332 1.183854266 1.085027062 1.395390390 1.184913189
## 102 0.948885937 1.180218764 1.244947077 1.140218063 1.446843885 1.229843500
## 103 1.139221958 1.392795350 1.433647840 1.339969769 1.652040268 1.444624281
## 104 0.815605116 1.073699468 1.110005981 1.017109372 1.329894805 1.126435215

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## 105	1.081588669	1.353540823	1.370306118	1.287894662	1.602207593	1.407363543
## 106	0.884223904	1.133821628	1.179742002	1.082819100	1.394054208	1.185576707
## 107	1.167720038	1.422453436	1.461859673	1.368929608	1.681224172	1.474381211
## 108	0.848937139	1.091809801	1.145000222	1.044718366	1.354449574	1.142924111
## 109	0.882008188	1.135865444	1.176962740	1.082199655	1.394273846	1.188067320
## 110	0.866667879	1.105027513	1.162822817	1.060649813	1.369253605	1.155618662
## 111	0.688149180	0.943133726	0.983487600	0.887983266	1.200214722	0.995811355
## 112	0.974879946	1.208316561	1.271012240	1.167227117	1.474437700	1.258124813
## 113	0.886850393	1.133121336	1.182675784	1.084156186	1.394670133	1.184520122
## 114	0.667696802	0.933062247	0.961087210	0.871167742	1.184867801	0.986720041
## 115	0.844430241	1.110831791	1.136535102	1.048778477	1.362652519	1.164331529
## 116	0.720098297	0.975932517	1.015215719	0.920405394	1.232790871	1.028622640
## 117	0.983515692	1.245798950	1.276305467	1.186883842	1.500329535	1.298732010
## 118	0.942784787	1.198831429	1.237194629	1.143947580	1.456428907	1.251169733
## 119	0.934882182	1.155403829	1.230126695	1.121306070	1.424623616	1.203818687
## 120	0.924315379	1.146486332	1.219711453	1.111442277	1.415306034	1.195120782
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## 79 0.627881963 0.471715780 0.483178235 0.432597202 0.510919552 0.380895160
## 80 0.254531318 0.092891764 0.082453583 0.040856014 0.144395420 0.058892590
## 81 0.144667865 0.146550374 0.103097601 0.119773253 0.035378173 0.168052912
## 82 0.250771417 0.200669059 0.195192610 0.242614894 0.262325339 0.291452484
## 83 0.338053100 0.087753602 0.130708751 0.131551990 0.267382718 0.138946203
## 84 0.304110119 0.076671283 0.110792063 0.128034164 0.244098474 0.152647901
## 85 0.122191674 0.144007823 0.098974249 0.131911849 0.052704037 0.186982419
## 86 0.422825396 0.239641546 0.253082779 0.202073006 0.305519814 0.148861781
## 87 0.448761789 0.321428675 0.322619897 0.274944777 0.332568840 0.233464959
## 88 0.284317901 0.038918133 0.068471819 0.037483397 0.190725957 0.052810507
## 89 0.232955689 0.091017182 0.089863954 0.133899193 0.194200333 0.181672364
## 90 0.372697378 0.122703723 0.158521052 0.118947692 0.272219621 0.073560267
## 91 1.104927379 0.915014377 0.937386080 0.886612977 0.987049270 0.829365622
## 92 1.699509831 1.536635834 1.554207409 1.503143845 1.584188260 1.447929621

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## 93	1.384619503	1.198226789	1.220431203	1.169605011	1.267017953	1.112471182
## 94	1.309929358	1.130976156	1.151363674	1.100362137	1.192730691	1.043868559
## 95	1.462374074	1.301934526	1.318611866	1.267578459	1.347105539	1.212784460
## 96	1.378009962	1.211478673	1.229289462	1.178218117	1.261960986	1.122855503
## 97	1.441428780	1.257640451	1.279358350	1.228469525	1.324002255	1.171507799
## 98	1.477280401	1.299708574	1.320108353	1.269101057	1.360310654	1.212629303
## 99	1.389627195	1.222377626	1.240367339	1.189293959	1.273517264	1.133848304
## 100	1.349753488	1.182528177	1.200428433	1.149355728	1.233600944	1.093946640
## 101	1.446556235	1.271609972	1.291380839	1.240339219	1.329778530	1.184115563
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## 103	1.692598948	1.527201978	1.545297559	1.494224475	1.576976099	1.438762549
## 104	1.369589170	1.204522876	1.222000513	1.170935552	1.253684527	1.115732095
## 105	1.621343402	1.475272069	1.489237721	1.438453338	1.508241941	1.385154490
## 106	1.441416814	1.269739215	1.288788017	1.237721642	1.324925825	1.181803345
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## 108	1.408558789	1.231031032	1.251300055	1.200286694	1.291542143	1.143856326
## 109	1.437400655	1.269411110	1.287654310	1.236579638	1.321265679	1.181022274
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## 111	1.245129409	1.075222116	1.093458281	1.042383560	1.128594185	0.986799804
## 112	1.535968451	1.352452498	1.374258129	1.323373786	1.418608611	1.266394968
## 113	1.445217100	1.270799231	1.290452131	1.239405342	1.328483548	1.183230325
## 114	1.219633633	1.058736915	1.074949302	1.023933257	1.103972959	0.969350465
## 115	1.392680443	1.236347492	1.252016079	1.201044906	1.277828054	1.146773397
## 116	1.276332844	1.107696826	1.125733561	1.074659314	1.159954206	1.019174275
## 117	1.532939848	1.374434820	1.390831684	1.339815288	1.417991521	1.285171885
## 118	1.496491155	1.331287829	1.349040880	1.297971479	1.380711941	1.242651072
## 119	1.497154071	1.304624627	1.328403136	1.277814959	1.379330341	1.220229488
## 120	1.486560247	1.295029186	1.318564847	1.267933682	1.368769824	1.210412906
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## 91 0.481355341 0.866435169 0.964275836 1.110011913 0.909262410 0.946987820
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## 106 1.341922956 1.036326215 0.992657580 1.230984709 1.359892935 1.157289142
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## 111 0.188657847 0.461607604 0.168259990 0.081678022 0.230333545 0.136578604
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## 114 0.219222037 0.233501409 0.055025320 0.339285761 0.234826976
## 115 0.084886770 0.162892478 0.175041702 0.228314823 0.126453448 0.177987759
## 116 0.161951735 0.165037656 0.032813006 0.272091787 0.170571654 0.069001642
## 117 0.119614666 0.194513796 0.303188471 0.182668636 0.146187393 0.315882417
## 118 0.063557899 0.133255721 0.256248304 0.137016442 0.084947502 0.276888880
## 119 0.183830331 0.108318334 0.285348212 0.082443169 0.140090886 0.333986169
## 120 0.173371989 0.096001677 0.272725476 0.081850447 0.129427586 0.321244233
##          115          116          117          118          119
## 2
## 3
## 4
## 5
## 6
## 7
## 8

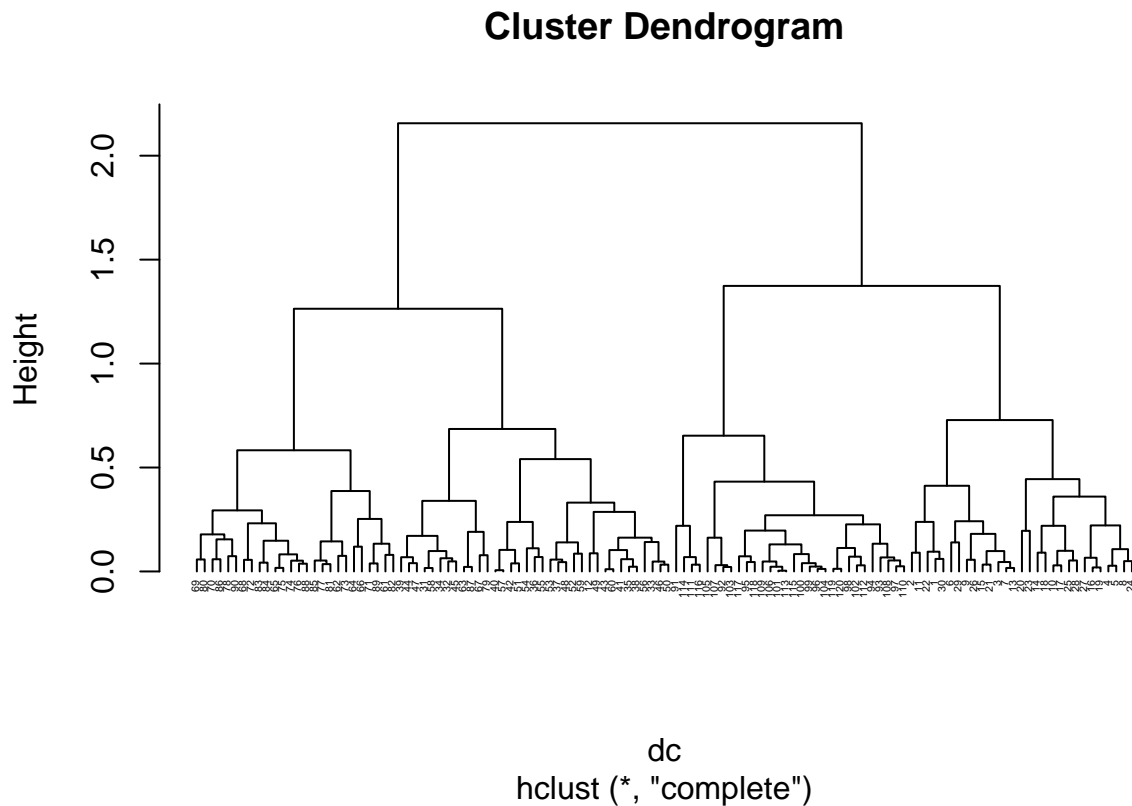
```

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116 0.143862620

```
## 117 0.140307380 0.270401469
## 118 0.115479147 0.223638058 0.061284836
## 119 0.265952730 0.265054135 0.255323495 0.201228099
## 120 0.254779679 0.252304098 0.249072211 0.193654761 0.012770276
```

```
cc <- hclust(dc, method = "complete")
plot(cc, cex = 0.3, hang = -1)
```



Interpretation

According to the numbers you could argue for 3 and 4 clusters. However, 4 clusters seems to be more appropriate considering the domain of the data set.

1. Those who learn little and have a bad grade
2. Those who learn an average amount and have an average grade
3. Those who learn a lot and have good performance
4. Those who learn a lot and still have bad performance (maybe not an appropriate learning technique)