

CMPU 101 § 54 · Computer Science I

Designing Programs for Tables

6 February 2023



Where are we?

docs.google.com/spreadsheets/d/1DU-4daAJsHVRybRIUC-_SaVkBWf1sOaC

New York municipalities ☆ 📁 ☁

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A1 Municipality

	A	B	C	D
1	Municipality	Class	2010	2020
2	Adams	Town	5,143	4,973
3	Adams	Village	1,775	1,633
4	Addison	Town	2,595	2,397
5	Addison	Village	1,763	1,561
6	Afton	Town	2,851	2,769
7	Afton	Village	822	794
8	Airmont	Village	8,628	10,166
9	Akron	Village	2,868	2,888
10	Alabama	Town	1,869	1,602
11	Albany	City	97,856	99,224
12	Albion	Town	8,468	7,639
13	Albion	Town	2,073	2,009
14	Albion	Village	6,056	5,637
15	Alden	Town	10,865	9,706
16	Alden	Village	2,605	2,604
17	Alexander	Town	2,534	2,491
18	Alexander	Village	509	518
19	Alexandria	Town	4,061	3,741
20	Alexandria Bay	Village	1,078	924
21	Alfred	Town	5,237	5,157
22	Alfred	Village	4,174	4,026
23	Allegany	Town	8,004	7,493
24	Allegany	Village	1,816	1,544

+ municipalities Explore <

```
include gdrive-sheets
```

```
include shared-gdrive("dcic-2021",  
  "1wyQZj_L0qqV9Ekgr9au6RX2iqt2Ga8Ep")
```

```
ssid = "1DU-4daAJsHVRybRIUC-_SaVkBWf1sOaGIfrWfgktlls"
```

```
spreadsheet = load-spreadsheet(ssid)
```

```
municipalities =
```

```
  load-table:
```

```
    name, kind, pop-2010, pop-2020
```

```
  source:
```

```
    spreadsheet.sheet-by-name("municipalities",  
      true)
```

```
end
```

Now we can work with this table the same as if we'd entered it manually:

››› **municipalities**

name	kind	pop-2010	pop-2020
"Adams"	"Town"	5143	4973
"Adams"	"Village"	1775	1633
"Addison"	"Town"	2595	2397
"Addison"	"Village"	1763	1561
"Afton"	"Town"	2851	2769
"Afton"	"Village"	822	794
"Airmont"	"Village"	8628	10166

What can we do with a table of data?

Get a row

Get the value for a column in a row

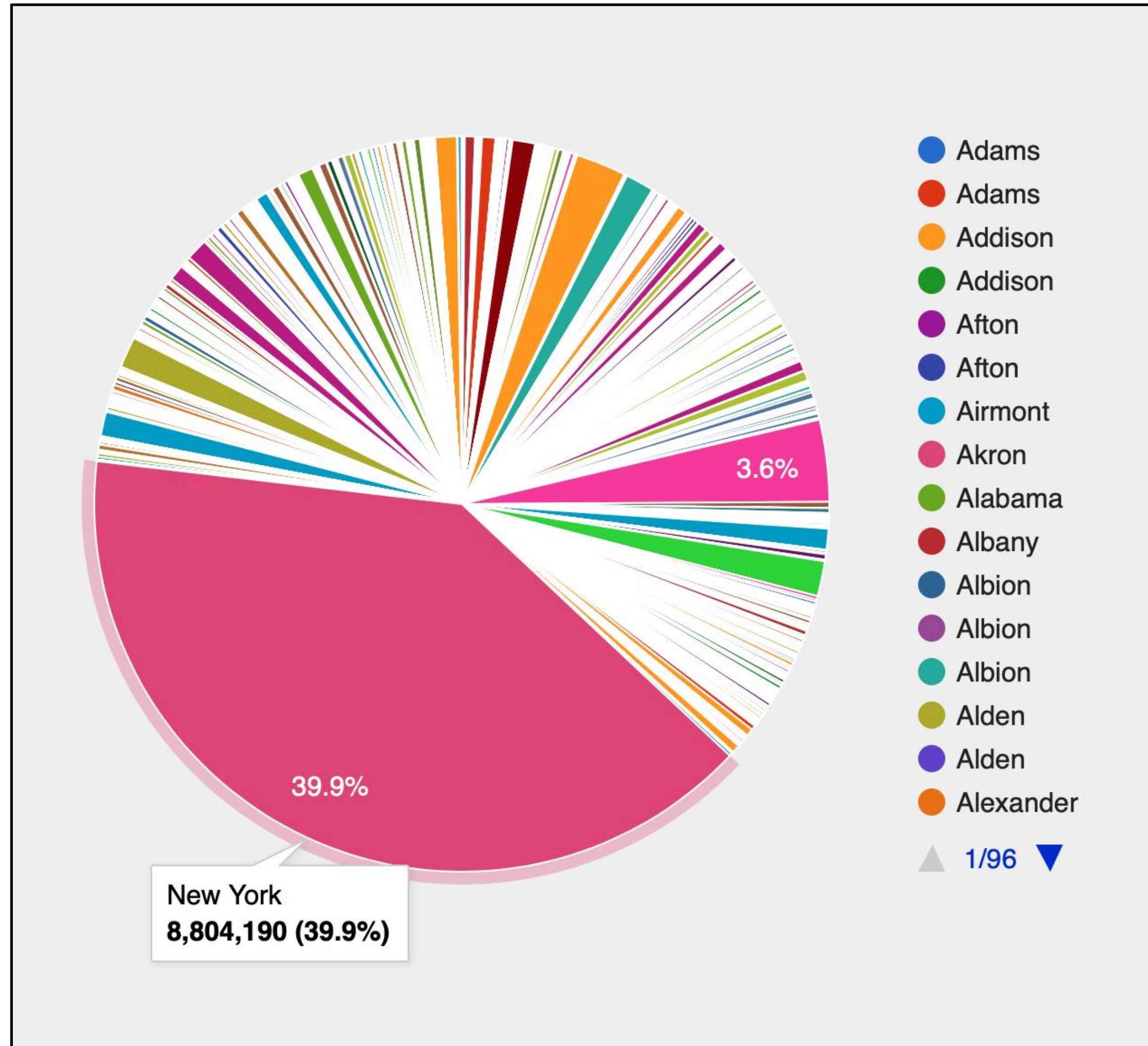
Order by the values in a column

Filter by asking a question about each row

Add a column, computing a value for each row

How is population distributed in the state?

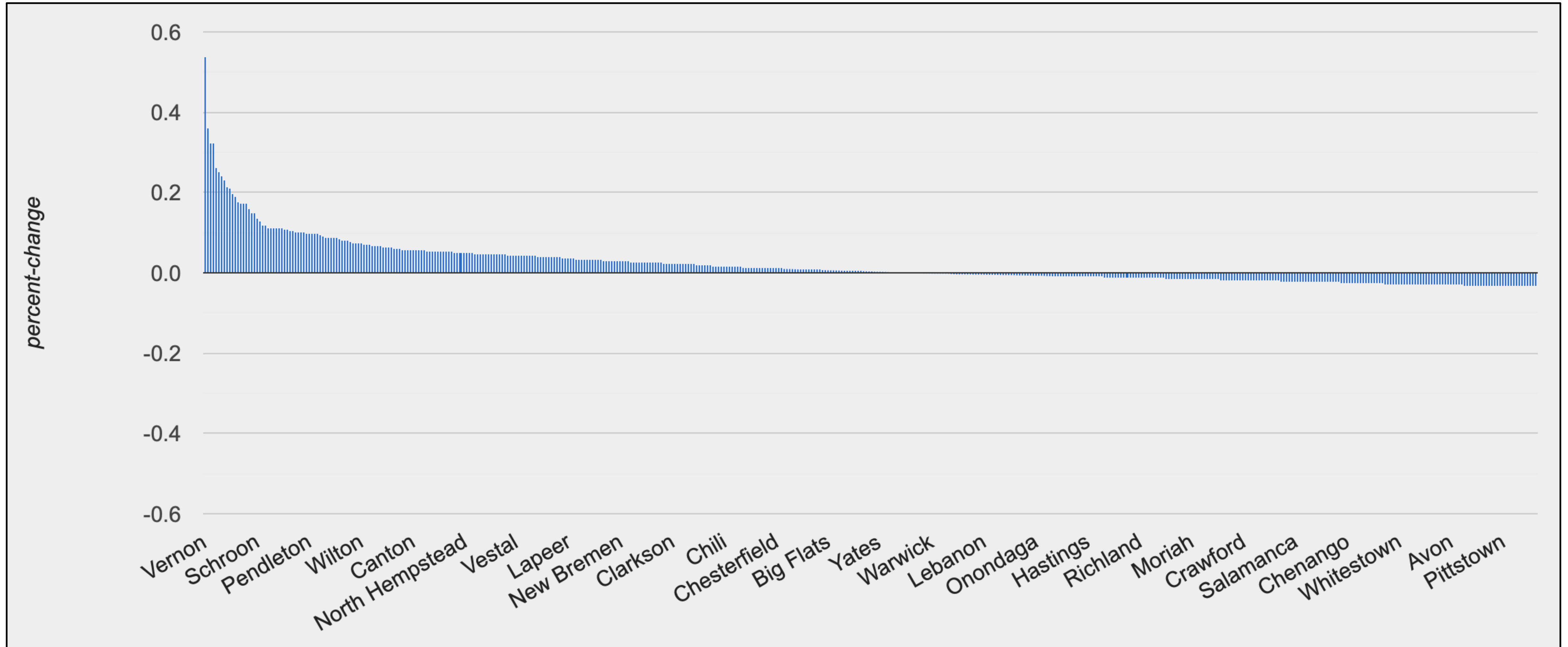
pie-chart(municipalities, "name", "pop-2020")



ft = fastest-growing-towns(municipalities)

Visually present the growth data

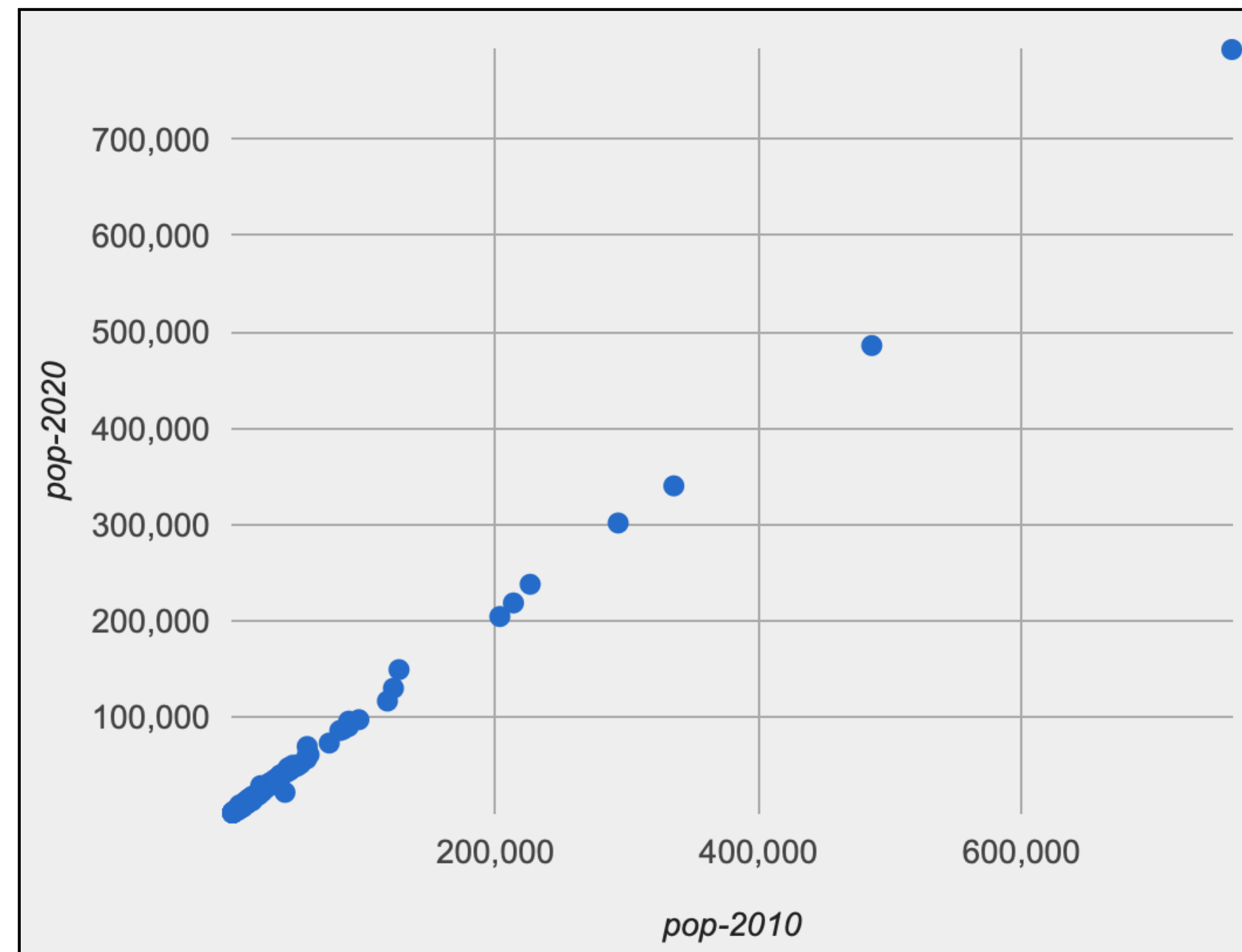
bar-chart(*ft*, "name", "percent-change")



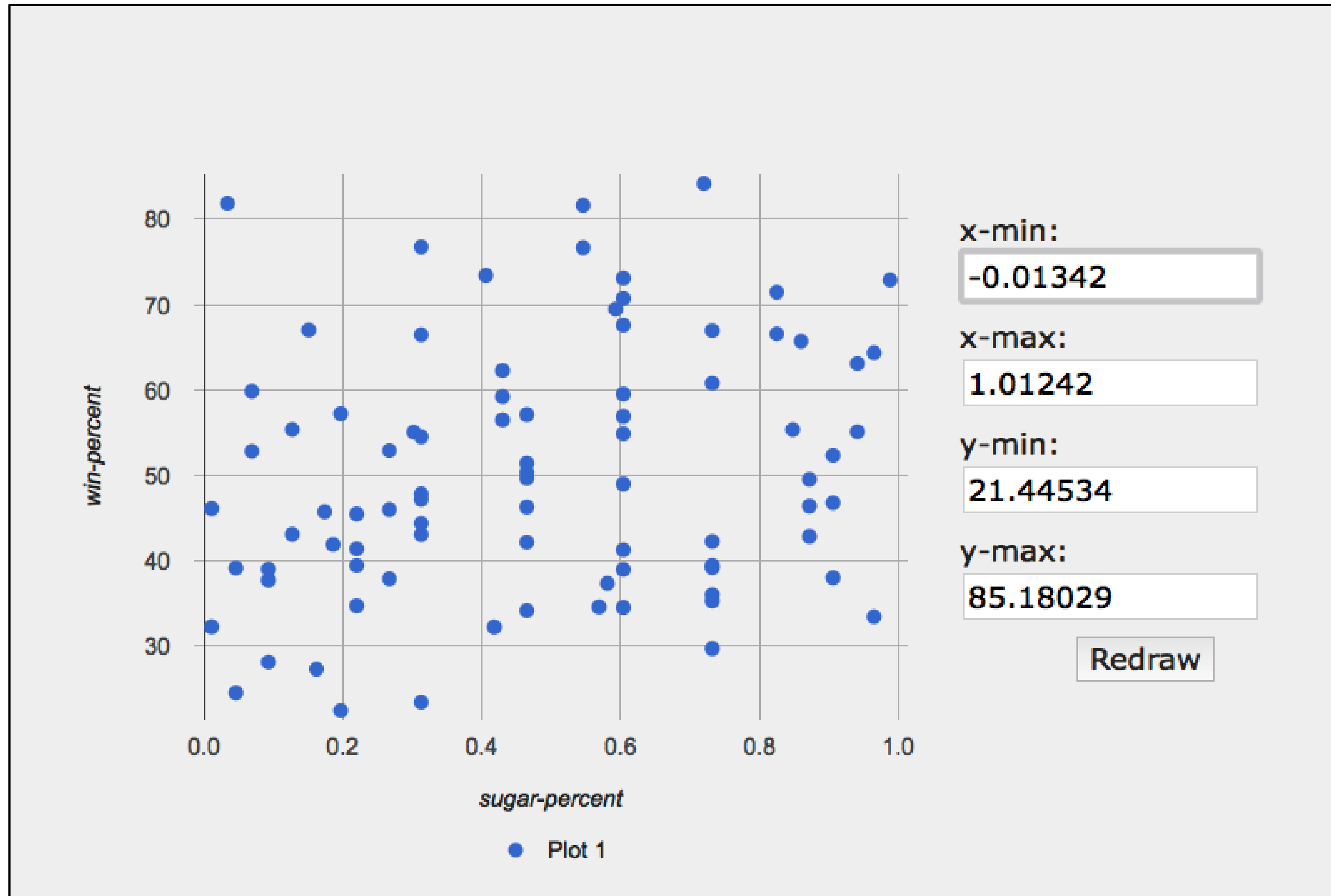
ft = fastest-growing-towns(municipalities)

*# Is a town's population in 2010 correlated with
its population in 2020?*

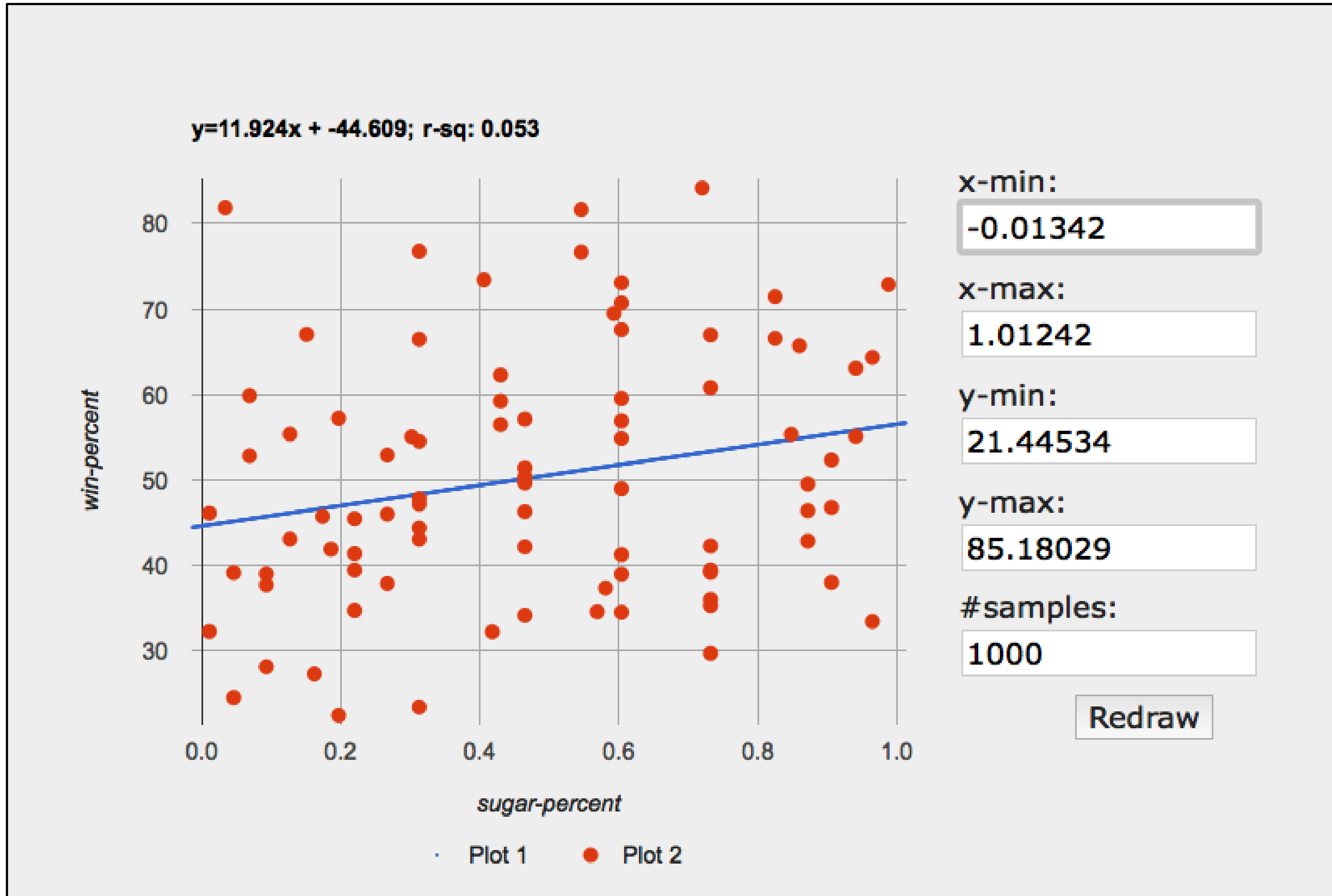
scatter-plot(*ft*, "pop-2010", "pop-2020")



```
scatter-plot(candy-data,  
            "sugar-percent", "win-percent")
```



```
lr-plot(candy-data,  
"sugar-percent", "win-percent")
```



Exercise: Loading data



WNBA

Step 0: Get data



Enter Person, Team, Section, etc

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Every NBA Team

2022-23 NBA Standings
[Summary](#) · [Schedule](#) · [Scores](#) · [Leaders](#) · [Rookies](#)

East				West			
		W	L			W	L
BOS (1)	F	\$	37 16	DEN (1)	F	\$	37 16
MIL (2)	F	\$	36 17	MEM (2)	F	\$	32 20
PHI (3)	F	\$	34 17	SAC (3)	F	\$	29 22
BRK (4)	F	\$	32 20	LAC (4)	F	\$	30 26
CLE (5)	F	\$	32 22	PHO (5)	F	\$	29 26
MIA (6)	F	\$	29 25	DAL (6)	F	\$	28 26
NYK (7)	F	\$	28 26	GSW (7)	F	\$	27 26
ATL (8)	F	\$	27 27	MIN (8)	F	\$	28 27
CHI (9)	F	\$	25 27	UTA (9)	F	\$	27 27
IND (10)	F	\$	25 29	NOP (10)	F	\$	27 27
WAS (11)	F	\$	24 28	POR (11)	F	\$	26 27
TOR (12)	F	\$	24 30	OKC (12)	F	\$	25 27
ORL (13)	F	\$	21 32	LAL (13)	F	\$	25 29
CHO (14)	F	\$	15 39	SAS (14)	F	\$	14 39
DET (15)	F	\$	14 40	HOU (15)	F	\$	13 40

Playoff Probabilities:
 East: [BOS](#) - Div (88.6%), Conf (34.7%), Win Finals (23.0%)
 West: [DEN](#) - Div (100.0%), Conf (32.8%), Win Finals (17.4%)

Projected Draft Order: [SAS](#) [HOU](#) [DET](#) [CHO](#) [ORL](#) ...

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[Team Season Finder](#)

Game Finder
 Find individual or groups of games matching a variety of criteria. Includes every game in NBA/BAA regular season and postseason history.

Ex: [What is the largest FTA differential in a game in NBA history?](#)

[Team Game Finder](#)



Enter Person, Team, Section, etc

Search

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2022 WNBA Player Stats - Totals



[« Previous Season](#)

League Champion: [Las Vegas Aces](#)

Most Valuable Player: [A'ja Wilson](#)

PPG Leader: [Breanna Stewart](#) (21.8)


RPG Leader: [Sylvia Fowles](#) (9.8)

APG Leader: [Natasha Cloud](#) (7.0)

WS Leader: [Breanna Stewart](#) (7.4)

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Dunk by Wendell Carter Jr.



Dunk by Wendell Carter Jr.
NBA | 0:11

Dunk by Jonathan Isaac
NBA | 0:12

3-pointer by LaMelo Ball
NBA | 0:11

Game Recap: Bucks 123, Heat 115
NBA | 2:50

Totals *-Hall of Famer; **Bold**=Active Player

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Player	Team	Pos	G	MP	G	GS	MP	FG	F	FT	R	ORB	AST	STL	BLK	TOV	PF	PTS										
Natalie Achonwa	MIN	F	22	332	22	0	0	0	0	0	0	0	0	0	0	0	0	0										
Julie Allemand	CHI	G	25	402	25	4	4	0	0	0	0	0	0	0	0	0	0	0										
Lindsay Allen	MIN	G	9	134	9	0	134	0	0	0	0	0	0	0	0	0	0	0										
Rebecca Allen	NYL	G	25	523	25	19	523	64	169	.379	26	83	.313	38	86	.442	20	24	.833	8	84	31	21	24	24	48	174	
Yvonne Anderson	CON	G	11	101	11	0	101	12	26	.462	4	10	.400	8	16	.500	7	7	1.000	3	9	12	3	2	11	14	35	
Kristine Anigwe	PHO	F-C	10	65	10	1	65	5	10	.500	0	0	.5	10	.500	5	10	.500	5	13	2	1	2	6	12	15		
Ariel Atkins	WAS	G	36	1081	36	36	1081	185	440	.420	70	192	.365	115	248	.464	87	103	.845	34	117	83	49	9	51	99	527	
Amy Atwell	LAS	F	4	32	4	1	32	1	9	.111	1	6	.167	0	3	.000	0	0	.1	2	2	0	0	2	1	3		
Shakira Austin	WAS	C-F	36	776	36	32	776	122	223	.547	0	1	.000	122	222	.550	68	109	.624	63	233	33	26	30	54	84	312	
Rachel Banham	MIN	G	36	630	36	5	630	101	235	.430	57	149	.383	44	86	.512	24	30	.800	3	48	81	9	4	48	62	283	
Kierstan Bell	LVA	G	21	121	21	1	121	10	33	.303	3	22	.136	7	11	.636	4	4	1.000	4	19	7	2	3	5	10	27	
Katie Benzan	WAS	G	3	27	3	0	27	5	9	.556	5	7	.714	0	2	.000	3	4	.750	1	2	1	0	1	2	7	18	
Monique Billings	ATL	F	23	401	23	8	401	55	117	.470	0	1	.000	55	116	.474	39	51	.765	45	146	26	19	8	31	54	149	
Sue Bird	SEA	G	31	818	31	31	818	85	211	.403	56	144	.389	29	67	.433	16	16	1.000	6	59	186	38	4	60	23	242	
DeWanna Bonner	CON	F-G	33	991	33	33	991	156	355	.439	46	140	.329	110	215	.512	86	104	.827	25	156	91	41	11	52	59	444	
Lexie Brown	LAS	G	34	850	34	16	850	93	211	.441	53	133	.398	40	78	.513	4	6	.667	8	78	70	34	7	28	44	243	
Kennedy Burke	WAS	G-F	16	222	16	4	222	33	74	.446	11	32	.344	22	42	.524	10	17	.588	8	35	7	16	4	8	17	87	
Rae Burrell	LAS	G-F	3	44	3	1	44	1	9	.111	1	6	.167	0	3	.000	2	2	1.000	1	3	1	2	0	1	4	5	
Veronica Burton	DAL	G	36	548	36	6	548	25	76	.329	12	43	.279	13	33	.394	32	32	1.000	18	54	68	34	11	35	51	94	
Maya Caldwell	ATL	G	9	214	9	7	214	38	74	.514	18	32	.563	20	42	.476	4	5	.800	5	22	20	7	2	14	15	98	
Liz Cambage	LAS	C	25	584	25	24	584	117	230	.509	4	14	.286	113	216	.523	87	111	.784	33	160	52	16	41	57	79	325	
Jordin Canada	LAS	G	32	865	32	25	865	104	271	.384	7	50	.140	97	221	.439	79	98	.806	7	73	176	44	5	75	58	294	
Bridget Carleton	MIN	F	36	606	36	2	606	54	134	.403	29	82	.354	25	52	.481	19	26	.731	12	77	40	16	5	23	56	156	
DiJonai Carrington	CON	G-F	36	631	36	2	631	84	203	.414	19	62	.306	65	141	.461	57	76	.750	38	111	38	30	3	59	70	244	
Chennedy Carter	LAS	G	24	393	24	2	393	85	189	.450	2	10	.200	83	179	.464	41	55	.745	9	45	46	15	9	43	52	213	
Kaila Charles	ATL	G-F	1	2	1	0	2	0	0	.0	0	0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	0	1	0
Alysha Clark	WAS	F	29	766	29	29	766	91	196	.464	30	99	.303	61	97	.629	21	23	.913	23	131	59	27	8	38	55	233	
Natasha Cloud	WAS	G	34	1065	34	34	1065	123	308	.399	43	135	.319	80	173	.462	75	91	.824	16	122	239	34	10	94	55	364	
Nia Clouden	CON	G	28	250	28	0	250	18	53	.340	12	29	.414	6	24	.250	10	17	.588	2	23	21	6	1	12	26	58	
Alaina Coates	IND	C	8	75	8	0	75	7	11	.636	0	0	.7	11	.636	14	15	.933	6	16	2	2	3	5	18	28		
Nia Coffey	ATL	F	16	226	16	16	226	25	101	.247	0	21	.200	26	70	.271	22	21	.742	7	82	12	10	2	25	25	102	

Step 0: Get data

Step 1: Make a spreadsheet

docs.google.com/spreadsheets/d/15QrIChqLouVS5jsC6-BCjc8KpM0lcYU...

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A1:A199 fx Player,Team,Pos,G,MP,G,GS,MP,FG,FGA,FG%,3P,3PA,3P%,2P,2PA,2P%,FT,FTA,FT%,ORB,TRB,AST,STL,BLK,TOV,PF,PTS

	A	B	C	D	E	F	G	H	I	J	K
1	Player,Team,Pos,G,MP,G,GS,MP,FG,FGA,FG%,3P,3PA,3P%,2P,2PA,2P%,FT,FTA,FT%,ORB,TRB,AST,STL,BLK,TOV,PF,PTS										
2	Natalie Achonwa,MIN,F,22,332,22,0,332,47,91,.516,0,2,.000,47,89,.528,22,27,.815,25,90,37,9,7,22,36,116										
3	Julie Allemand,CHI,G,25,402,25,4,402,25,60,.417,9,31,.290,16,29,.552,15,18,.833,9,39,85,14,3,33,23,74										
4	Lindsay Allen,MIN,G,9,134,9,0,134,20,38,.526,8,14,.571,12,24,.500,12,13,.923,0,14,31,2,0,7,11,60										
5	Rebecca Allen,NYL,G,25,523,25,19,523,64,169,.379,26,83,.313,38,86,.442,20,24,.833,8,84,31,21,24,24,48,174										
6	Yvonne Anderson,CON,G,11,101,11,0,101,12,26,.462,4,10,.400,8,16,.500,7,7,1.000,3,9,12,3,2,11,14,35										
7	Kristine Anigwe,PHO,F-C,10,65,10,1,65,5,10,.500,0,0,.5,10,.500,5,10,.500,5,13,2,1,2,6,12,15										
8	Ariel Atkins,WAS,G,36,1081,36,36,1081,185,440,.420,70,192,.365,115,248,.464,87,103,.845,34,117,83,49,9,51,99,527										
9	Amy Atwell,LAS,F,4,32,4,1,32,1,9,.111,1,6,.167,0,3,.000,0,0,.1,2,2,0,0,2,1,3										
10	Shakira Austin,WAS,C-F,36,776,36,32,776,122,223,.547,0,1,.000,122,222,.550,68,109,.624,63,233,33,26,30,54,84,312										
11	Rachel Banham,MIN,G,36,630,36,5,630,101,235,.430,57,149,.383,44,86,.512,24,30,.800,3,48,81,9,4,48,62,283										
12	Kierstan Bell,LVA,G,21,121,21,1,121,10,33,.303,3,22,.136,7,11,.636,4,4,1.000,4,19,7,2,3,5,10,27										
13	Katie Benzan,WAS,G,3,27,3,0,27,5,9,.556,5,7,.714,0,2,.000,3,4,.750,1,2,1,0,1,2,7,18										
14	Monique Billings,ATL,F,23,401,23,8,401,55,117,.470,0,1,.000,55,116,.474,39,51,.765,45,146,26,19,8,31,54,149										
15	Sue Bird,SEA,G,31,818,31,31,818,85,211,.403,56,144,.389,29,67,.433,16,16,1.000,6,59,186,38,4,60,23,242										
16	DeWanna Bonner,CON,F-G,33,991,33,33,991,156,355,.439,46,140,.329,110,215,.512,86,104,.827,25,156,91,41,11,52,59,444										
17	Lexie Brown,LAS,G,34,850,34,16,850,93,211,.441,53,133,.398,40,78,.513,4,6,.667,8,78,70,34,7,28,44,243										
18	Kennedy Burke,WAS,G-F,16,222,16,4,222,33,74,.446,11,32,.344,22,42,.524,10,17,.588,8,35,7,16,4,8,17,87										
19	Rae Burrell,LAS,G-F,3,44,3,1,44,1,9,.111,1,6,.167,0,3,.000,2,2,1.000,1,3,1,2,0,1,4,5										
20	Veronica Burton,DAL,G,36,548,36,6,548,25,76,.329,12,43,.279,13,33,.394,32,32,1.000,18,54,68,34,11,35,51,94										
21	Maya Caldwell,ATL,G,9,214,9,7,214,38,74,.514,18,32,.563,20,42,.476,4,5,.800,5,22,20,7,2,14,15,98										
22	Liz Cambage,LAS,C,25,584,25,24,584,117,230,.509,4,14,.286,113,216,.523,87,111,.784,33,160,52,16,41,57,79,325										
23	Jordin Canada, 2,865,32,25,865,104,271,.384,7,50,.140,97,221,.439,79,98,.806,7,73,176,44,5,75,58,294										
24	Bridget Carleton, 36,606,36,2,606,54,134,.403,29,82,.354,25,52,.481,19,26,.731,12,77,40,16,5,23,56,156										
25	Dilani Carrington, 526,621,26,2,621,84,202,.414,10,62,.206,65,141,.461,57,76,.750,28,111,28,20,2,50,70,244										

Sheet1 Count: 199

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A1:A199 fx Player,Team,Pos,G,MP,G

Player,Team,Pos,G,MP,G,GS,MP,FG,...

1 Natalie Achonwa,MIN,F,22,332,22,0,...

2 Julie Allemand,CHI,G,25,402,25,4,40...

3 Lindsay Allen,MIN,G,9,134,9,0,134,2...

4 Rebecca Allen,NYL,G,25,523,25,19,5...

5 Yvonne Anderson,CON,G,11,101,11,1...

6 Kristine Anigwe,PHO,F-C,10,65,10,1...

7 Ariel Atkins,WAS,G,36,1081,36,36,10...

8 Amy Atwell,LAS,F,4,32,4,1,32,1,9,..

9 Shakira Austin,WAS,C-F,36,776,36,3...

10 Rachel Banham,MIN,G,36,630,36,5,6...

11 Kierstan Bell,LVA,G,21,121,21,1,121...

12 Katie Benzan,WAS,G,3,27,3,0,27,5,9...

13 Monique Billings,ATL,F,23,401,23,8,4...

14 Sue Bird,SEA,G,31,818,31,31,818,85...

15 DeWanna Bonner,CON,F-G,33,991,33...

16 Lexie Brown,LAS,G,34,850,34,16,850...

17 Kennedy Burke,WAS,G-F,16,222,16,4...

18 Rae Burrell,LAS,G-F,3,44,3,1,44,1,9...

19 Veronica Burton,DAL,G,36,548,36,6,548,25,76,..329,12,43,..279,13,33,..394,32,32,1.000,18,54,68,34,11,35,51,94

20 Maya Caldwell,ATL,G,9,214,9,7,214,38,74,..514,18,32,..563,20,42,..476,4,5,..800,5,22,20,7,2,14,15,98

21 Liz Cambage,LAS,C,25,584,25,24,584,117,230,..509,4,14,..286,113,216,..523,87,111,..784,33,160,52,16,41,57,79,325

22 Jordin Canada,MIN,F,2,865,32,25,865,104,271,..384,7,50,..140,97,221,..439,79,98,..806,7,73,176,44,5,75,58,294

23 Bridget Carleton,MIN,F,36,606,36,2,606,54,134,..403,29,82,..354,25,52,..481,19,26,..731,12,77,40,16,5,23,56,156

24 DiLani Carrington,CON,C,26,621,26,2,621,84,202,..414,19,62,..206,65,141,..461,57,76,..750,28,111,28,20,2,50,70,244

Sort sheet

Sort range

Create a filter

Filter views

Add a slicer

Protect sheets and ranges

Named ranges

Named functions

Randomize range

Column stats

Data validation

Data cleanup

Split text to columns

Data connectors

ORB,TRB,AST,STL,BLK,TOV,PF,PTS

% ,ORB,TRB,AST,STL,BLK,TOV,PF,PTS

5,90,37,9,7,22,36,116

39,85,14,3,33,23,74

11,2,0,7,11,60

3,8,84,31,21,24,24,48,174

9,12,3,2,11,14,35

6,12,15

03,.845,34,117,83,49,9,51,99,527

9,.624,63,233,33,26,30,54,84,312

800,3,48,81,9,4,48,62,283

2,3,5,10,27

45,146,26,19,8,31,54,149

59,186,38,4,60,23,242

2,86,104,.827,25,156,91,41,11,52,59,444

78,70,34,7,28,44,243

38,8,35,7,16,4,8,17,87

Count: 199

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100% \$ % .0 .00 123 Default (Ari... 11 B I S A

A1 fx Player

	A	B	C	D	E	F	G	H	I	J	K	
1	Player	Team	Pos	G	MP	G	GS	MP	FG	FGA	FG%	3P
2	Natalie Achon	MIN	F	22	332	22	0	332	47	91	0.516	
3	Julie Allemand	CHI	G	25	402	25	4	402	25	60	0.417	
4	Lindsay Allen	MIN	G	9	134	9	0	134	20	38	0.526	
5	Rebecca Allen	NYL	G	25	523	25	19	523	64	169	0.379	
6	Yvonne Anders	CON	G	11	101	11	0	101	12	26	0.462	
7	Kristine Anigwa	PHO	F-C	10	65	10	1	65	5	10	0.5	
8	Ariel Atkins	WAS	G	36	1081	36	36	1081	185	440	0.42	
9	Amy Atwell	LAS	F	4	32	4	1	32	1	9	0.111	
10	Shakira Austin	WAS	C-F	36	776	36	32	776	122	223	0.547	
11	Rachel Banham	MIN	G	36	630	36	5	630	101	235	0.43	
12	Kierstan Bell	LVA	G	21	121	21	1	121	10	33	0.303	
13	Katie Benzan	WAS	G	3	27	3	0	27	5	9	0.556	
14	Monique Billing	ATL	F	23	401	23	8	401	55	117	0.47	
15	Sue Bird	SEA	G	31	818	31	31	818	85	211	0.403	
16	DeWanna Bonner	CON	F-G	33	991	33	33	991	156	355	0.439	
17	Lexie Brown	LAS	G	34	850	34	16	850	93	211	0.441	
18	Kennedy Burke	WAS	G-F	16	222	16	4	222	33	74	0.446	
19	Rae Burrell	LAS	G-F	3	44	3	1	44	1	9	0.111	
20	Veronica Burton	DAL	G	36	548	36	6	548	25	76	0.329	
21	Maya Caldwell	ATL	G	9	214	9	7	214	38	74	0.514	
22	Liz Cambage	LAS	C	25	584	25	24	584	117	230	0.509	
23	Jordin Canada	LAS	G	32	865	32	25	865	104	271	0.384	
24	Bridget Carleton	MIN	F	36	606	36	2	606	54	134	0.403	
25	Dijana Carrion	CON	C-F	26	621	26	0	621	84	202	0.414	

+ Sheet1 Explore

Step 0: Get data

Step 1: Make a spreadsheet

Step 2: Load the spreadsheet as a table

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WNBA stats

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	A	B	C	D	E	F	G	H	I	J	K	
1	Player	Team	Pos						FG	FGA	FG%	
2	Natalie Achonwa	MIN	F						332	47	91	0.51
3	Julie Allemand	CHI	G						402	25	60	0.41
4	Lindsay Allen	MIN	G						134	20	38	0.52
5	Rebecca Allen	NYL	G						523	64	169	0.37
6	Yvonne Anderson	CON	G						101	12	26	0.46
7	Kristine Anigwe	PHO	F-C						65	5	10	0.
8	Ariel Atkins	WAS	G						1081	185	440	0.4
9	Amy Atwell	LAS	F						32	1	9	0.11
10	Shakira Austin	WAS	C-F						776	122	223	0.54
11	Rachel Banham	MIN	G						630	101	235	0.4
12	Kierstan Bell	LVA	G						121	10	33	0.30
13	Katie Benzan	WAS	G						27	5	9	0.55
14	Monique Billings	ATL	F						401	55	117	0.4
15	Sue Bird	SEA	G						818	85	211	0.40
16	DeWanna Bonner	CON	F-G						991	156	355	0.43
17	Lexie Brown	LAS	G						850	93	211	0.44
18	Kennedy Burke	WAS	G-F						222	33	74	0.44
19	Rae Burrell	LAS	G-F						44	1	9	0.11
20	Veronica Burton	DAL	G						548	25	76	0.32
21	Maya Caldwell	ATL	G		9	214	9	7	214	38	74	0.51
22	Liz Cambage	LAS	C		25	584	25	24	584	117	230	0.50
23	Jordin Canada	LAS	G		32	865	32	25	865	104	271	0.38
24	Bridget Carleton	MIN	F		36	606	36	2	606	54	134	0.40

Share "WNBA stats"

Add people and groups

+ Marc Smith

People with access

- Jonathan Gordon (you) jgordon@vassar.edu Owner

General access

- Anyone with the link Anyone on the internet with the link can view Viewer

Copy link Done

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This is the spreadsheet ID

dsheets/d/15QrIChqLouVS5jsC6-BCjc8KpM0lcYUmswFIHgWG-kl/edit?gid=0

WNBA stats

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100% \$ % .0 .00 123 Default (Ari... 11 B I S A

C7 fx F-C

	A	B	C	D	E	F	G	H	I	J	K	
1	Player	Team	Pos	G	MP	G	GS	MP	FG	FGA	FG%	
2	Natalie Achonwa	MIN	F		22	332	22	0	332	47	91	0.51
3	Julie Allemand	CHI	G		25	402	25	4	402	25	60	0.41
4	Lindsay Allen	MIN	G		9	134	9	0	134	20	38	0.52
5	Rebecca Allen	NYL	G		25	523	25	19	523	64	169	0.37
6	Yvonne Anderson	CON	G		11	101	11	0	101	12	26	0.46
7	Kristine Anigwe	PHO	F-C		10	65	10	1	65	5	10	0.
8	Ariel Atkins	WAS	G		36	1081	36	36	1081	185	440	0.4
9	Amy Atwell	LAS	F		4	32	4	1	32	1	9	0.11
10	Shakira Austin	WAS	C-F		36	776	36	32	776	122	223	0.54
11	Rachel Banham	MIN	G		36	630	36	5	630	101	235	0.4
12	Kierstan Bell	LVA	G		21	121	21	1	121	10	33	0.30
13	Katie Benzan	WAS	G		3	27	3	0	27	5	9	0.55
14	Monique Billings	ATL	F		23	401	23	8	401	55	117	0.4
15	Sue Bird	SEA	G		31	818	31	31	818	85	211	0.40
16	DeWanna Bonner	CON	F-G		33	991	33	33	991	156	355	0.43
17	Lexie Brown	LAS	G		34	850	34	16	850	93	211	0.44
18	Kennedy Burke	WAS	G-F		16	222	16	4	222	33	74	0.44
19	Rae Burrell	LAS	G-F		3	44	3	1	44	1	9	0.11
20	Veronica Burton	DAL	G		36	548	36	6	548	25	76	0.32
21	Maya Caldwell	ATL	G		9	214	9	7	214	38	74	0.51
22	Liz Cambage	LAS	C		25	584	25	24	584	117	230	0.50
23	Jordin Canada	LAS	G		32	865	32	25	865	104	271	0.38
24	Bridget Carleton	MIN	F		36	606	36	2	606	54	134	0.40

wnba-stats Explore


```
include gdrive-sheets
```

```
include shared-gdrive("dcic-2021",  
"1wyQZj_L0qqV9Ekgr9au6RX2iqt2Ga8Ep")
```

```
#
```

```
# Load spreadsheet as a table
```

```
#
```

```
ssid = "15QrIChqLouVS5jsC6-BCjc8KpM0lcYUmswFlHgWG-kl"
```

```
spreadsheet = load-spreadsheet(ssid)
```

docs.google.com/spreadsheets/d/15QrlChqLouVS5jsC6-BCjc8KpM0lcYU

WNBA stats

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A1 fx Player

	A	B	C	D	E	F	G	H
1	Player	Team	Pos	G	MP	G	GS	MP
2	Natalie Achonwa	MIN	F		22	332	22	0
3	Julie Allemand	CHI	G		25	402	25	4
4	Lindsay Allen	MIN	G		9	134	9	0
5	Rebecca Allen	NYL	G		25	523	25	19
6	Yvonne Anderson	CON	G		11	101	11	0
7	Kristine Anigwe	PHO	F-C		10	65	10	1
8	Ariel Atkins	WAS	G		36	1081	36	36
9	Amy Atwell	LAS	F		4	32	4	1
10	Shakira Austin	WAS	C-F		36	776	36	32
11	Rachel Banham	MIN	G		36	630	36	5
12	Kierstan Bell	LVA	G		21	121	21	1
13	Katie Benzan	WAS	G		3	27	3	0
14	Monique Billings	ATL	F		23	401	23	8
15	Sue Bird	SEA	G		31	818	31	31
16	DeWanna Bonner	CON	F-G		33	991	33	33
17	Lexie Brown	LAS	G		34	850	34	16
18	Kennedy Burke	WAS	G-F		16	222	16	4
19	Rae Burrell	LAS	G-F		3	44	3	1
20	Veronica Burton	DAL	G		36	548	36	6
21	Maya Caldwell	ATL	G		9	214	9	7
22	Liz Cambage	LAS	C		25	584	25	24
23	Jordin Canada	LAS	G		32	865	32	25
24	Bridget Carleton	MIN	F		36	606	36	2

+ ≡ wnba-stats

>>> spreadsheet
spreadsheet("wnba-stats")



```
include gdrive-sheets
```

```
include shared-gdrive("dcic-2021",  
  "1wyQZj_L0qqV9Ekgr9au6RX2iqt2Ga8Ep")
```

```
#
```

```
# Load spreadsheet as a table
```

```
#
```

```
ssid = "15QrlChqLouVS5jsC6-BCjc8KpM0lcYUmswFlHgWG-kl"
```

```
spreadsheet = load-spreadsheet(ssid)
```

```
stats =
```

```
  load-table:
```

```
    ...
```

```
    source: spreadsheet.sheet-by-name("wnba-stats", true)
```

```
  end
```

Step 0: Get data

Step 1: Make a spreadsheet

Step 1.5: Rethink that spreadsheet

Step 2: Load the spreadsheet as a table

WNBA stats

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100% \$ % .0 .00 123 Default (Ari... 11 B I S A

C7 fx F-C

	A	B	C	D	E	F	G	H	I	J	K
1	Player	Team	Pos	G	MP	G	GS	MP	FG	FGA	FG%
2	Natalie Achonwa	MIN	F	22	332	22	0	332	47	91	0.51
3	Julie Allemand	CHI	G	25	402	25	4	402	25	60	0.41
4	Lindsay Allen	MIN	G	9	134	9	0	134	20	38	0.52
5	Rebecca Allen	NYL	G	25	523	25	19	523	64	169	0.37
6	Yvonne Anderson	CON	G	11	101	11	0	101	12	26	0.46
7	Kristine Anigwe	PHO	F-C	10	65	10	1	65	5	10	0.
8	Ariel Atkins	WAS	G	36	1081	36	36	1081	185	440	0.4
9	Amy Atwell	LAS	F	4	32	4	1	32	1	9	0.11
10	Shakira Austin	WAS	C-F	36	776	36	32	776	122	223	0.54
11	Rachel Banham	MIN	G	36	630	36	5	630	101	235	0.4
12	Kierstan Bell	LVA	G	21	121	21	1	121	10	33	0.30
13	Katie Benzan	WAS	G	3	27	3	0	27	5	9	0.55
14	Monique Billings	ATL	F	23	401	23	8	401	55	117	0.4
15	Sue Bird	SEA	G	31	818	31	31	818	85	211	0.40
16	DeWanna Bonner	CON	F-G	33	991	33	33	991	156	355	0.43
17	Lexie Brown	LAS	G	34	850	34	16	850	93	211	0.44
18	Kennedy Burke	WAS	G-F	16	222	16	4	222	33	74	0.44
19	Rae Burrell	LAS	G-F	3	44	3	1	44	1	9	0.11
20	Veronica Burton	DAL	G	36	548	36	6	548	25	76	0.32
21	Maya Caldwell	ATL	G	9	214	9	7	214	38	74	0.51
22	Liz Cambage	LAS	C	25	584	25	24	584	117	230	0.50
23	Jordin Canada	LAS	G	32	865	32	25	865	104	271	0.38
24	Bridget Carleton	MIN	F	36	606	36	2	606	54	134	0.40

wnba-stats Explore

This is a lot of columns!

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WNBA stats ☆ 📁 Saved to Drive 📈 💬 Share

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A1 fx Player

	A	B	C	D	E	F	G	H	I	J	K	
1	Player	Team	Pos	G	MP	G	GS	MP	FG	FGA	FG%	
2	Natalie Achonwa	MIN	F		22	332	22	0	332	47	91	0.51
3	Julie Allemand	CHI	G		25	402	25	4	402	25	60	0.41
4	Lindsay Allen	MIN	G		9	134	9	0	134	20	38	0.52
5	Rebecca Allen	NYL	G		25	523	25	19	523	64	169	0.37
6	Yvonne Anderson	CON	G		11	101	11	0	101	12	26	0.46
7	Kristine Anigwe	PHO	F-C		10	65	10	1	65	5	10	0.
8	Ariel Atkins	WAS	G		36	1081	36	36	1081	185	440	0.4
9	Amy Atwell	LAS	F		4	32	4	1	32	1	9	0.11
10	Shakira Austin	WAS	C-F		36	776	36	32	776	122	223	0.54
11	Rachel Ba		G		36	630	36	5	630	101	235	0.4
12	Kierstan E		G		21	121	21	1	121	10	33	0.30
13	Katie Bern		G		3	27	3	0	27	5	9	0.55
14	Monique E		F		23	401	23	8	401	55	117	0.4
15	Sue Bird		G		31	818	31	31	818	85	211	0.40
16	DeWanna		F-G		33	991	33	33	991	156	355	0.43
17	Lexie Bro		G		34	850	34	16	850	93	211	0.44
18	Kennedy I		G-F		16	222	16	4	222	33	74	0.44
19	Rae Burre		G-F		3	44	3	1	44	1	9	0.11
20	Veronica E		G		36	548	36	6	548	25	76	0.32
21	Maya Cal		G		9	214	9	7	214	38	74	0.51
22	Liz Camb		C		25	584	25	24	584	117	230	0.50
23	Jordin Car		G		32	865	32	25	865	104	271	0.38
24	Bridget Ca		F		36	606	36	2	606	54	134	0.40

Delete
Duplicate
 Copy to
 Rename
 Change color
 Protect sheet
 Hide sheet
 View comments
 Move right
 Move left

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WNBA stats

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A1 fx Player

	A	B	C	D	E	F	G	H	I	J	K	
1	Player	Team	Pos	G	MP	G	GS	MP	FG	FGA	FG%	
2	Natalie Achonwa	MIN	F		22	332	22	0	332	47	91	0.51
3	Julie Allemand	CHI	G		25	402	25	4	402	25	60	0.41
4	Lindsay Allen	MIN	G		9	134	9	0	134	20	38	0.52
5	Rebecca Allen	NYL	G		25	523	25	19	523	64	169	0.37
6	Yvonne Anderson	CON	G		11	101	11	0	101	12	26	0.46
7	Kristine Anigwe	PHO	F-C		10	65	10	1	65	5	10	0.
8	Ariel Atkins	WAS	G		36	1081	36	36	1081	185	440	0.4
9	Amy Atwell	LAS	F		4	32	4	1	32	1	9	0.11
10	Shakira Austin	WAS	C-F		36	776	36	32	776	122	223	0.54
11	Rachel Banham	MIN			36	630	36	5	630	101	235	0.4
12	Kierstan Bell	LVA			21	121	21	1	121	10	33	0.30
13	Katie Benzan	WAS			3	27	3	0	27	5	9	0.55
14	Monique Billings	ATL			23	401	23	8	401	55	117	0.4
15	Sue Bird	SEA			31	818	31	31	818	85	211	0.40
16	DeWanna Bonner	CON			33	991	33	33	991	156	355	0.43
17	Lexie Brown	LAS			34	850	34	16	850	93	211	0.44
18	Kennedy Burke	WAS			16	222	16	4	222	33	74	0.44
19	Rae Burrell	LAS			3	44	3	1	44	1	9	0.11
20	Veronica Burton	DAL			36	548	36	6	548	25	76	0.32
21	Maya Caldwell	ATL			9	214	9	7	214	38	74	0.51
22	Liz Cambage	LAS			25	584	25	24	584	117	230	0.50
23	Jordin Canada	LAS			32	865	32	25	865	104	271	0.38
24	Bridget Carleton	MIN			36	606	36	2	606	54	134	0.40

- Delete
- Duplicate
- Copy to
- Rename
- Change color
- Protect sheet
- Hide sheet
- View comments
- Move right
- Move left

+ wnba-stats Copy of wnba-stats Explore

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WNBA stats

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Undo ⌘Z
Redo ⌘Y
Cut ⌘X
Copy ⌘C
Paste ⌘V
Paste special
Move
Delete
Find and replace ⌘+Shift+H

Columns E - AA

	V	W	X	Y	Z	AA	AB				
	TRB	AST	STL	BLK	TOV	PF	PTS				
1	25	90	37	9	7	22	36	116			
2	9	39	85	14	3	33	23	74			
3	0	14	31	2	0	7	11	60			
4	8	84	31	21	24	24	48	174			
5	3	9	12	3	2	11	14	35			
6	5	13	2	1	2	6	12	15			
7	24	117	22	49	9	51	99	527			
8	0	0	0	0	0	2	1	3			
9	26	30	54	84	312	283	27				
10	9	4	48	62	283	27	18				
11	4	4	1	1	2	7	18				
12	39	51	0.765	45	146	26	19	8	31	54	149
13	16	16	1	6	59	186	38	4	60	23	242
14	86	104	0.827	25	156	91	41	11	52	59	444
15	4	6	0.667	8	78	70	34	7	28	44	243
16	10	17	0.588	8	35	7	16	4	8	17	87
17	2	2	1	1	3	1	2	0	1	4	5
18	32	32	1	18	54	68	34	11	35	51	94
19	4	5	0.8	5	22	20	7	2	14	15	98
20	87	111	0.784	33	160	52	16	41	57	79	325
21	79	98	0.806	7	73	176	44	5	75	58	294
22	19	26	0.731	12	77	40	16	5	23	56	156

Sum: 3404... Explore

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WNBA stats

File Edit View Insert Format Data Tools Extensions Help Last edit was seconds ago

100% \$ % .0 .00 123 Default (Ari... 11 B I S A

A1 fx Player

	A	B	C	D	E
1	Player	Team	Pos	G	PTS
2	Natalie Achonwa	MIN	F		22 116
3	Julie Allemand	CHI	G		25 74
4	Lindsay Allen	MIN	G		9 60
5	Rebecca Allen	NYL	G		25 174
6	Yvonne Anderson	CON	G		11 35
7	Kristine Anigwe	PHO	F-C		10 15
8	Ariel Atkins	WAS	G		36 527
9	Amy Atwell	LAS	F		4 3
10	Shakira Austin	WAS	C-F		36 312
11	Rachel Banham	MIN	G		36 283
12	Kierstan Bell	LVA	G		21 27
13	Katie Benzan	WAS	G		3 18
14	Monique Billings	ATL	F		23 149
15	Sue Bird	SEA	G		31 242
16	DeWanna Bonner	CON	F-G		33 444
17	Lexie Brown	LAS	G		34 243
18	Kennedy Burke	WAS	G-F		16 87
19	Rae Burrell	LAS	G-F		3 5
20	Veronica Burton	DAL	G		36 94
21	Maya Caldwell	ATL	G		9 98
22	Liz Cambage	LAS	C		25 325
23	Jordin Canada	LAS	G		32 294
24	Bridget Carleton	MIN	F		36 156

wnba-stats wnba-stats-simple Explore

Step 0: Get data

Step 1: Make a spreadsheet

Step 1.5: Rethink that spreadsheet

Step 2: Load the spreadsheet as a table

```
include gdrive-sheets
```

```
include shared-gdrive("dcic-2021",  
  "1wyQZj_L0qqV9Ekgr9au6RX2iqt2Ga8Ep")
```

```
#
```

```
# Load spreadsheet as a table
```

```
#
```

```
ssid = "15QrlChqLouVS5jsC6-BCjc8KpM0lcYUmswFlHgWG-kl"
```

```
spreadsheet = load-spreadsheet(ssid)
```

```
stats =
```

```
  load-table:
```

```
    ...
```

```
    source: spreadsheet.sheet-by-name("wnba-stats", true)
```

```
  end
```

```
include gdrive-sheets
```

```
include shared-gdrive("dcic-2021",  
  "1wyQZj_L0qqV9Ekgr9au6RX2iqt2Ga8Ep")
```

```
#
```

```
# Load spreadsheet as a table
```

```
#
```

```
ssid = "15QrlChqLouVS5jsC6-BCjc8KpM0lcYUmswFlHgWG-kl"
```

```
spreadsheet = load-spreadsheet(ssid)
```

```
stats =
```

```
  load-table:
```

```
    player, team, pos, games, pts
```

```
    source: spreadsheet.sheet-by-name("wnba-stats-simple", true)
```

```
  end
```

>>> stats

player	team	pos	games	pts
"Natalie Achonwa"	"MIN"	"F"	22	116
"Julie Allemand"	"CHI"	"G"	25	74
"Lindsay Allen"	"MIN"	"G"	9	60
"Rebecca Allen"	"NYL"	"G"	25	174
"Yvonne Anderson"	"CON"	"G"	11	35
"Kristine Anigwe"	"PHO"	"F-C"	10	15
"Ariel Atkins"	"WAS"	"G"	36	527

Exercise: Who scores the most points per game?

To compute the average points per game for each player we need to build a new column.

```
fun average-pts(r :: Row) -> Number:  
  doc: "Return the average number of points the player scored per game"  
  r["pts"] / r["games"]  
where:  
  ...  
end
```


test-table =

table: player, team, pos, games, pts

row: "A", "X", "F", 10, 100

row: "B", "X", "F", 1, 3

end

fun **average-pts**(r :: Row) -> Number:

doc: "Return the average number of points the player scored per game"

r["pts"] / r["games"]

where:

average-pts(test-table.row-n(0)) is 10

average-pts(test-table.row-n(1)) is 3

end

››› build-column(stats, "avg", average-pts)

player	team	pos	games	pts	avg
"Natalie Achonwa"	"MIN"	"F"	22	116	5.27
"Julie Allemand"	"CHI"	"G"	25	74	2.96
"Lindsay Allen"	"MIN"	"G"	9	60	6.6
"Rebecca Allen"	"NYL"	"G"	25	174	6.96
"Yvonne Anderson"	"CON"	"G"	11	35	3.18
"Kristine Anigwe"	"PHO"	"F-C"	10	15	1.5

Interlude: Introducing λ

A *lambda expression* defines an anonymous function – a function that can be passed as an argument but doesn't have an associated name.

Lambda expressions can be convenient for giving to higher-order functions like `filter-with` and `build-column`.

```
››› build-column(stats, "avg",  
lam(r): r["pts"] / r["games"] end)
```

player	team	pos	games	pts	avg
"Natalie Achonwa"	"MIN"	"F"	22	116	5.27
"Julie Allemand"	"CHI"	"G"	25	74	2.96
"Lindsay Allen"	"MIN"	"G"	9	60	6.6
"Rebecca Allen"	"NYL"	"G"	25	174	6.96
"Yvonne Anderson"	"CON"	"G"	11	35	3.18
"Kristine Anigwe"	"PHO"	"F-C"	10	15	1.5

Exercise: Who scores the most points per game?

Back to our question!

We can sort by the values in our new column, but first let's give a name to that table:

```
with-avg = build-column(stats, "avg",  
lam(r): r["pts"] / r["games"] end)
```

```
>>> order-by(with-avg, "avg", false)
```



player	team	pos	games	pts	avg
"Breanna Stewart"	"SEA"	"F"	34	741	21.79411764705882352
"Kelsey Plum"	"LVA"	"G"	36	726	20.16
"Skylar Diggins-Smith"	"PHO"	"G"	30	591	19.7
"Arike Ogunbowale"	"DAL"	"G"	30	590	19.6
"A'ja Wilson"	"LVA"	"F"	36	703	19.527

www.nytimes.com/2023/02/01/sports/basketball/breanna-stewart-lib

☰ 🔍 N.B.A. **The New York Times** GIVE THE TIMES Account ▾

Breanna Stewart Will Sign With Liberty, Joining Fellow M.V.P. Jonquel Jones

Stewart, a two-time W.N.B.A. and four-time N.C.A.A. champion, had been outspoken about player travel leading up to the free-agent signing period.

 Give this article  



www.nytimes.com/2023/02/01/sports/basketball/breanna-stewart-lib...

The New York Times


N.B.A. | Breanna Stewart Will Sign With Liberty, Joining Fellow M.V.P. Jonquel Jones

Give this article

Stewart, who has averaged 20.3 points per game over her seven years in the league — all with the Seattle Storm — could form an exciting Big Three along with the point guard Sabrina Ionescu and the power forward Jonquel Jones, who arrived from the Connecticut Sun through a January trade, making the Liberty an instant title contender.

By bolstering the roster with Jones, who won the 2021 W.N.B.A. Most Valuable Player Award with the Sun, and the 6-foot-4 Stewart, who was the M.V.P. in 2018, the Liberty endeavor to change their fortunes for good. Despite being one of the original eight W.N.B.A. franchises in 1997, the team has never won a championship. Stewart, meanwhile, has done it twice in the last five seasons, with the Storm winning the finals in 2018 and 2020. She is also a four-time All-Star in six years of play.

Breanna Stewart
@breannastewart · Follow



Making 21.8 points per game in 2022 an above-average season for her!

We can sort by the values in our new column, but first let's give a name to that table:

```
with-avg = build-column(stats, "avg",  
lam(r): r["pts"] / r["games"] end)
```

```
>>> order-by(with-avg, "avg", false)
```

player	team	pos	games	pts	avg
"Breanna Stewart"	"SEA"	"F"	34	741	21.79411764705882352
"Kelsey Plum"	"LVA"	"G"	36	726	20.16
"Skylar Diggins-Smith"	"PHO"	"G"	30	591	19.7
"Arike Ogunbowale"	"DAL"	"G"	30	590	19.6
"A'ja Wilson"	"LVA"	"F"	36	703	19.527

```
with-avg = build-column(stats, "avg",  
lam(r): r["pts"] / r["games"] end)
```

```
top-scorers = order-by(with-avg, "avg", false)
```

```
with-avg = build-column(stats, "avg",  
lam(r): r["pts"] / r["games"] end)
```

```
top-scorers = order-by(with-avg, "avg", false)
```

```
>>> filter-with(top-scorers,  
lam(r): r["team"] == "SEA" end)
```

player	team	pos	games	pts	avg
"Breanna Stewart"	"SEA"	"F"	34	741	21.79411764705882352
"Jewell Loyd"	"SEA"	"G"	36	586	16.27
"Tina Charles"	"SEA"	"C"	18	226	12.5

Exercise: Let's dig a bit deeper

More specific question:

For a given team, who scores the most points per game?

Inputs

player	team	pos	games	pts
"Natalie Achonwa"	"MIN"	"F"	22	116
"Julie Allemand"	"CHI"	"G"	25	74
"Lindsay Allen"	"MIN"	"G"	9	60
"Rebecca Allen"	"NYL"	"G"	25	174
"Yvonne Anderson"	"CON"	"G"	11	35
"Kristine Anigwe"	"PHO"	"F-C"	10	15
"Ariel Atkins"	"WAS"	"G"	36	527
"Amy Atwell"	"LAS"	"F"	4	3
"Shakira Austin"	"WAS"	"C-F"	36	312
"Rachel Banham"	"MIN"	"G"	36	283

[Click to show the remaining 188 rows...](#)

"SEA"

Output

"Breanna Stewart"

Inputs

Output

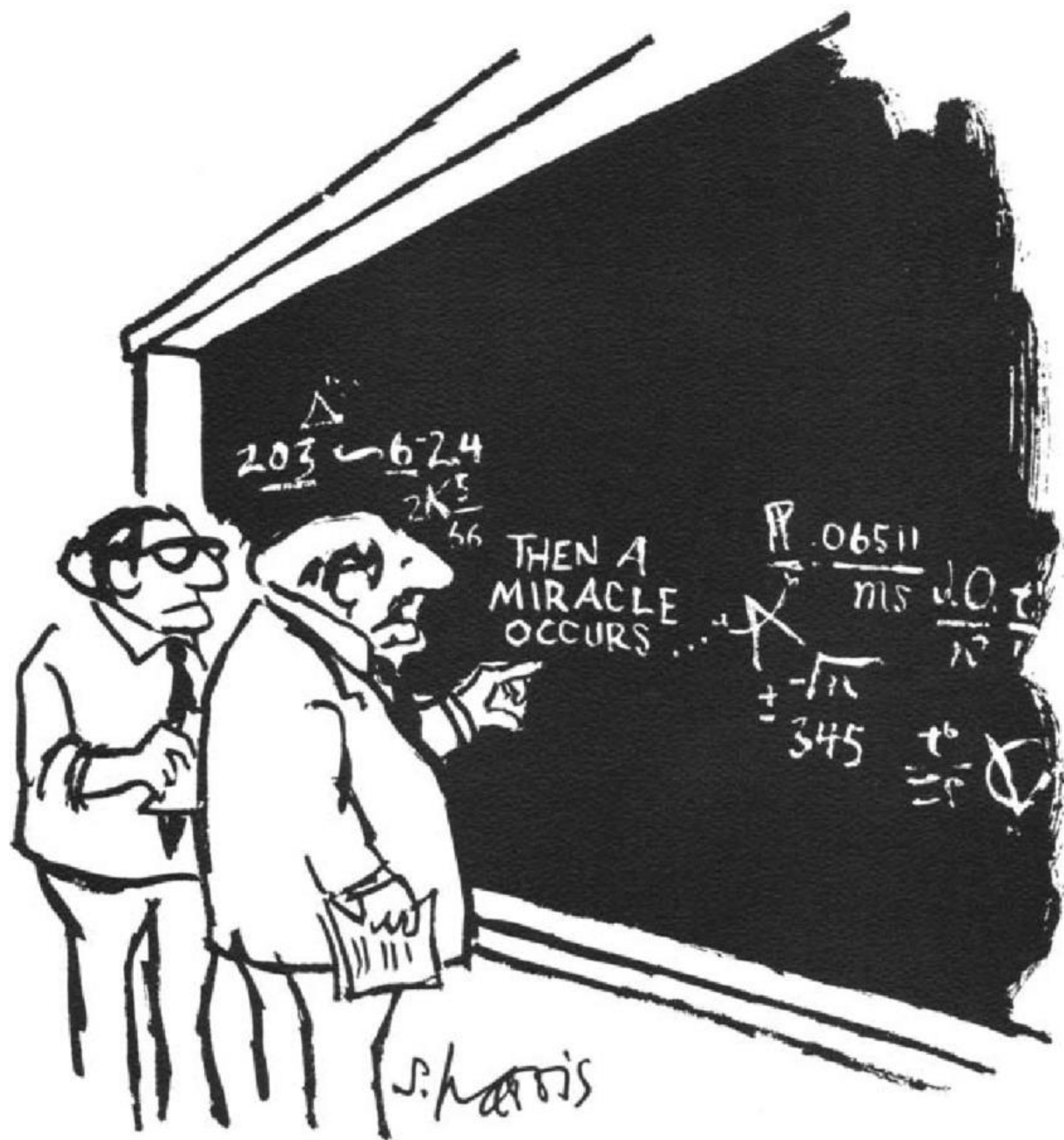
player	team	pos	games	pts
"Natalie Achonwa"	"MIN"	"F"	22	116
"Julie Allemand"	"CHI"	"G"	25	74
"Lindsay Allen"	"MIN"	"G"	9	60
"Rebecca Allen"	"NYL"	"G"	25	174
"Yvonne Anderson"	"CON"	"G"	11	35
"Kristine Anigwe"	"PHO"	"F-C"	10	15
"Ariel Atkins"	"WAS"	"G"	36	527
"Amy Atwell"	"LAS"	"F"	4	3
"Shakira Austin"	"WAS"	"C-F"	36	312
"Rachel Banham"	"MIN"	"G"	36	283

[Click to show the remaining 188 rows...](#)



"Breanna Stewart"

"SEA"



Sydney Harris

"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

If you aren't sure how to approach a problem,
don't start by trying to write code!

Plan until you understand the problem.

<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>
"Natalie Achonwa"	"MIN"	"F"	22	116
"Julie Allemand"	"CHI"	"G"	25	74
"Lindsay Allen"	"MIN"	"G"	9	60
"Rebecca Allen"	"NYL"	"G"	25	174

"MIN"

<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>
---------------	-------------	------------	-------------	------------

s

"Natalie Achonwa"	"MIN"	"F"	22	116
-------------------	-------	-----	----	-----

"Julie Allemand"	"CHI"	"G"	25	74
------------------	-------	-----	----	----

"Lindsay Allen"	"MIN"	"G"	9	60
-----------------	-------	-----	---	----

"Rebecca Allen"	"NYL"	"G"	25	174
-----------------	-------	-----	----	-----

<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>
---------------	-------------	------------	-------------	------------

s

"Natalie Achonwa"	"MIN"	"F"	22	116
-------------------	-------	-----	----	-----

"Lindsay Allen"	"MIN"	"G"	9	60
-----------------	-------	-----	---	----

"MIN"

filter-with



<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>
---------------	-------------	------------	-------------	------------

"Natalie Achonwa"	"MIN"	"F"	22	116
-------------------	-------	-----	----	-----

"Julie Allemand"	"CHI"	"G"	25	74
------------------	-------	-----	----	----

"Lindsay Allen"	"MIN"	"G"	9	60
-----------------	-------	-----	---	----

"Rebecca Allen"	"NYL"	"G"	25	174
-----------------	-------	-----	----	-----

"MIN"

filter-with

<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>
---------------	-------------	------------	-------------	------------

"Natalie Achonwa"	"MIN"	"F"	22	116
-------------------	-------	-----	----	-----

"Lindsay Allen"	"MIN"	"G"	9	60
-----------------	-------	-----	---	----

build-column

<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>	<i>avg</i>
---------------	-------------	------------	-------------	------------	------------

"Natalie Achonwa"	"MIN"	"F"	22	116	5,27
-------------------	-------	-----	----	-----	------

<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>
---------------	-------------	------------	-------------	------------

s

"Natalie Achonwa"	"MIN"	"F"	22	116
-------------------	-------	-----	----	-----

"Lindsay Allen"	"MIN"	"G"	9	60
-----------------	-------	-----	---	----

<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>	<i>avg</i>
---------------	-------------	------------	-------------	------------	------------

s

"Natalie Achonwa"	"MIN"	"F"	22	116	5,27
-------------------	-------	-----	----	-----	------

"Lindsay Allen"	"MIN"	"G"	9	60	6,67
-----------------	-------	-----	---	----	------

<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>	<i>avg</i>
---------------	-------------	------------	-------------	------------	------------

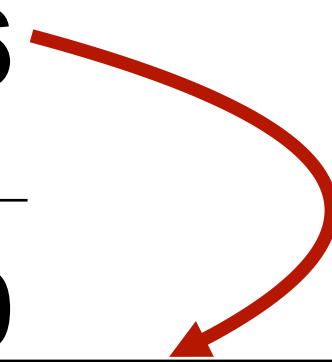
s

"Lindsay Allen"	"MIN"	"G"	9	60	6,67
-----------------	-------	-----	---	----	------

"Natalie Achonwa"	"MIN"	"F"	22	116	5,27
-------------------	-------	-----	----	-----	------

build-column

order-by



<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>
s				

"Natalie Achonwa"	"MIN"	"F"	22	116
-------------------	-------	-----	----	-----

"Lindsay Allen"	"MIN"	"G"	9	60
-----------------	-------	-----	---	----

<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>	<i>avg</i>
s					

"Natalie Achonwa"	"MIN"	"F"	22	116	5,27
-------------------	-------	-----	----	-----	------

"Lindsay Allen"	"MIN"	"G"	9	60	6,67
-----------------	-------	-----	---	----	------

<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>	<i>avg</i>
s					

"Lindsay Allen"	"MIN"	"G"	9	60	6,67
-----------------	-------	-----	---	----	------

"Natalie Achonwa"	"MIN"	"F"	22	116	5,27
-------------------	-------	-----	----	-----	------

"Lindsay Allen"	"MIN"	"G"	9	60	6,67
-----------------	-------	-----	---	----	------

build-column

order-by

.row-n(0)

<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>
s				

"Natalie Achonwa"	"MIN"	"F"	22	116
-------------------	-------	-----	----	-----

"Lindsay Allen"	"MIN"	"G"	9	60
-----------------	-------	-----	---	----

<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>	<i>avg</i>
s					

"Natalie Achonwa"	"MIN"	"F"	22	116	5,27
-------------------	-------	-----	----	-----	------

"Lindsay Allen"	"MIN"	"G"	9	60	6,67
-----------------	-------	-----	---	----	------

<i>player</i>	<i>team</i>	<i>pos</i>	<i>game</i>	<i>pts</i>	<i>avg</i>
s					

"Lindsay Allen"	"MIN"	"G"	9	60	6,67
-----------------	-------	-----	---	----	------

"Natalie Achonwa"	"MIN"	"F"	22	116	5,27
-------------------	-------	-----	----	-----	------

"Lindsay Allen"	"MIN"	"G"	9	60	6,67
-----------------	-------	-----	---	----	------

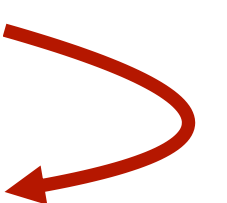
build-column

order-by

.row-n(0)

["player"]

"Lindsay Allen"



That's a plan; let's implement it!

test-table-2 =

table: player, team, pos, games, pts

row: "Natalie Achonwa", "MIN", "F", 22, 116

row: "Julie Allemand", "CHI", "G", 25, 74

row: "Lindsay Allen", "MIN", "G", 9, 60

row: "Rebecca Allen", "NYL", "G", 25, 174

end

fun **top-scorer**(players :: Table, team :: String) -> String:

doc: "Return the name of the player on the given team with the highest average points per game"

...

end

test-table-2 =

table: player, team, pos, games, pts

row: "Natalie Achonwa", "MIN", "F", 22, 116

row: "Julie Allemand", "CHI", "G", 25, 74

row: "Lindsay Allen", "MIN", "G", 9, 60

row: "Rebecca Allen", "NYL", "G", 25, 174

end

fun **top-scorer**(players :: Table, team :: String) -> String:

doc: "Return the name of the player on the given team with the highest average points per game"

...

where:

top-scorer(test-table-2, "MIN") is "Lindsay Allen"

top-scorer(test-table-2, "CHI") is "Julie Allemand"

end

test-table-2 =

table: player, team, pos, games, pts

row: "Natalie Achonwa", "MIN", "F", 22, 116

row: "Julie Allemand", "CHI", "G", 25, 74

row: "Lindsay Allen", "MIN", "G", 9, 60

row: "Rebecca Allen", "NYL", "G", 25, 174

end

fun **top-scorer**(players :: Table, team :: String) -> String:

doc: "Return the name of the player on the given team with the highest average points per game"

players-on-team = filter-with(players, on-team)

where:

top-scorer(test-table-2, "MIN") is "Lindsay Allen"

top-scorer(test-table-2, "CHI") is "Julie Allemand"

end

fun **on-team**(player :: Row) -> Boolean:

doc: "Return true if the player is on the team we're interested in"

player["team"] == team

end

Wait – we can't write a test for this because what team are we even talking about?

test-table-2 = ...

```
fun top-scorer(players :: Table, team :: String) -> String:
```

```
  doc: "Return the name of the player on the given team with the highest average points per game"
```

```
  fun on-team(player :: Row) -> Boolean:
```

```
    doc: "Return true if the player is on the team we're interested in"
```

```
    player["team"] == team
```

```
  end
```

```
players-on-team = filter-with(players, on-team)
```

```
where:
```

```
  top-scorer(test-table-2, "MIN") is "Lindsay Allen"
```

```
  top-scorer(test-table-2, "CHI") is "Julie Allemand"
```

```
end
```

*We can nest function definitions, so now the team that **on-team** is considering is whatever team was passed to **top-scorer**.*



Did I do basketball?

Acknowledgments

This lecture incorporates material from:

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Suraj Rampure and colleagues, University of California,
Berkeley

basketball-reference.com