# Designing Programs for Tables



CMPU 101 § 53 · Computer Science I

1 February 2024



We won't cover everything in class! You need to follow along with the assigned readings. Practice active reading: Keep Pyret open and try examples. Take notes.

In lab and on assignments, you will be expected to try things that may only be in the readings – or may be new altogether.

Lab and homework are additional opportunities for learning!

l w
Data processing
<ul> <li>Read 5.1 From tables to lists</li> <li>Assignment 3: Sunrise, sunset</li> </ul>
Defining data
<ul> <li>Read 6.1 Introduction to structured data</li> <li>Read 7 Trees</li> <li>Assignment 4: Decision trees</li> </ul>
Recursive programs
Simulation and interaction
<ul> <li>Read 26 Interactive games as reactive systems</li> </ul>
Spring Break

www.cs.vassar.edu/~cs10	1/53/		+
Feb. 6	Feb. 8	Feb. 9	
Quiz 1	Tables and lis	sts Lab 4: Squirrels!	
Feb. 13	Feb. 15	Feb. 16	
Data defini	tions Trees	Lab 5: Call the plur	nber
Feb. 20	Feb. 22	Feb. 23	
Review ses	sion Generative r	ecursion Exam 1	
Feb. 27	Feb. 29	Mar. 1	
s Reactive pr	ograms Graphs and s	simulation Lab 6: 99 red ballo	ons
Mar. 5	Mar. 7	Mar. 8	
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Think of the quiz as a check-in to see how well you understand the basics of what we've been doing before we get to Exam 1.

# Tables and functional programming

We've seen we can select certain rows using **filter-with** and sort the rows a table with order-by, but these functions don't change the original table!

Just as the expression 2 + 3 doesn't change the value of 2 or of 3, functions that take a table as input don't change the original table. Instead, they return a *new* table.

## This is a paradigm called *functional programming*.

If you have experience working in other languages, this may seem strange, but it can be extremely useful! We'll explore the idea of functional programming more over the coming weeks.

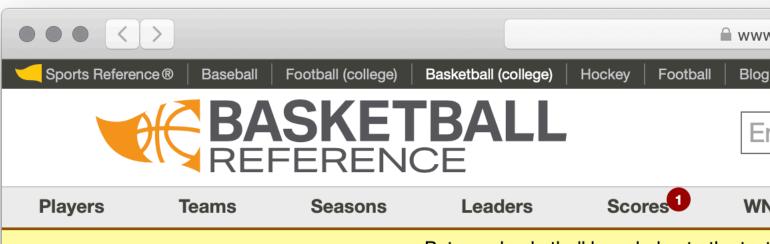
# Loading tabular data





## Step o: Get data





Put your basketball knowledge to the test

Basketball Stats and History Statistics, scores, and history for the NBA, ABA, WNBA, ar

### Every NBA & Every WNBA Player **Every NBA Team** 2023-24 NBA Sta Summary · Schedule WLW East <u>MIA</u> <u>F</u> <u>\$</u> 0 0 <u>ME</u> <u>WAS F \$</u> 0 0 DE TOR <u>F</u> <u>\$</u> 0 0 <u>DA</u> <u>PHI F \$ 0 0 MI</u> ORL F \$ 0 0 NC <u>NYK F \$</u> 0 0 <u>GS</u> <u>MIL</u> <u>F</u> <u>\$</u> 0 0 <u>OK</u> Play Immaculate Grid ATL <u>F</u> <u>\$</u> 0 0 LAI Put your men's basketball <u>IND</u> <u>F</u> <u>\$</u> 0 0 <u>LA</u> knowledge to the test with our daily men's basketball <u>CLE F \$</u> 0 0 <u>PH</u> trivia game. Can you

**Play Now** 

complete the grid?

### Select Team Page:

### **Recent Debuts**

Chance Comanche (POR), Jacob Gilyard (MEM), RaiQuan Gray (BRK), Justin Minaya (POR), Donovan Williams (ATL) and Jeenathan Williams (POR)

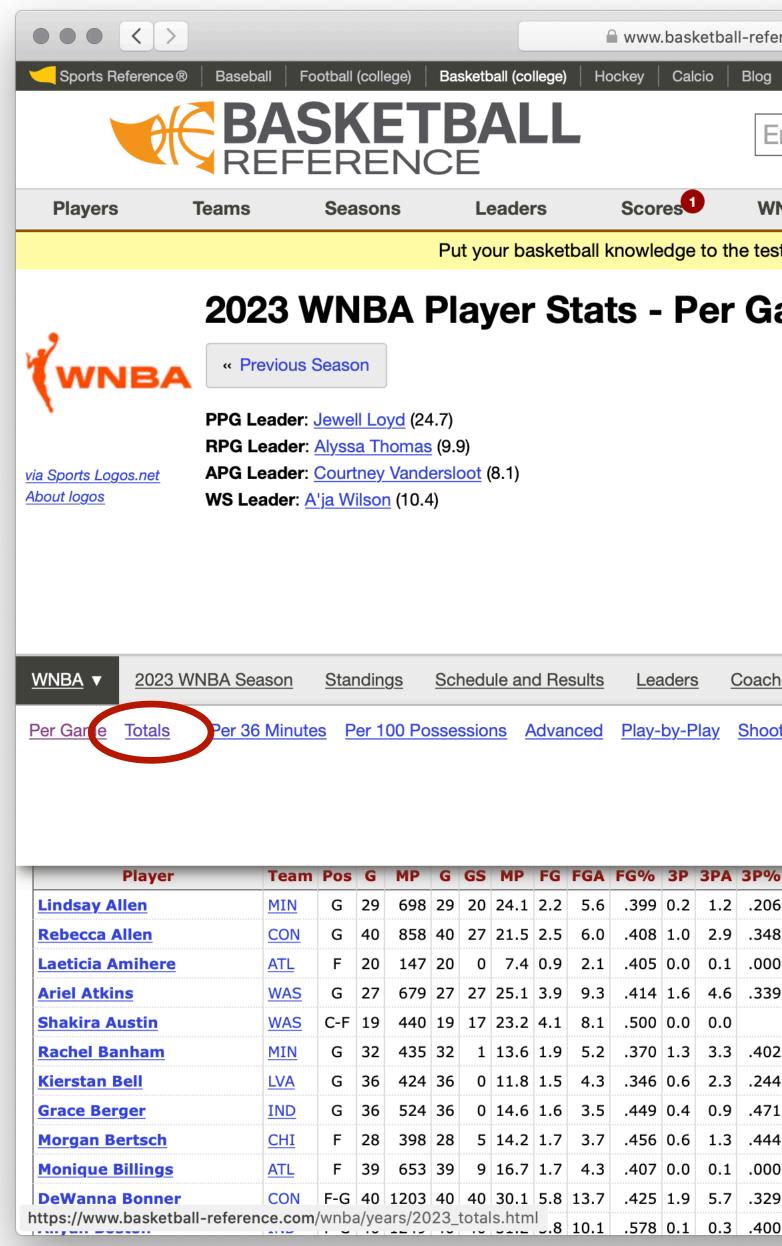
### NBA & ABA, WNBA, NBL, G League, and top International players

Includes indexed lists of players. International leagues include top European leagues and EuroLeague and EuroCup competitions, as well as China's CBA, Australia's NBL, and Men's Olympics.

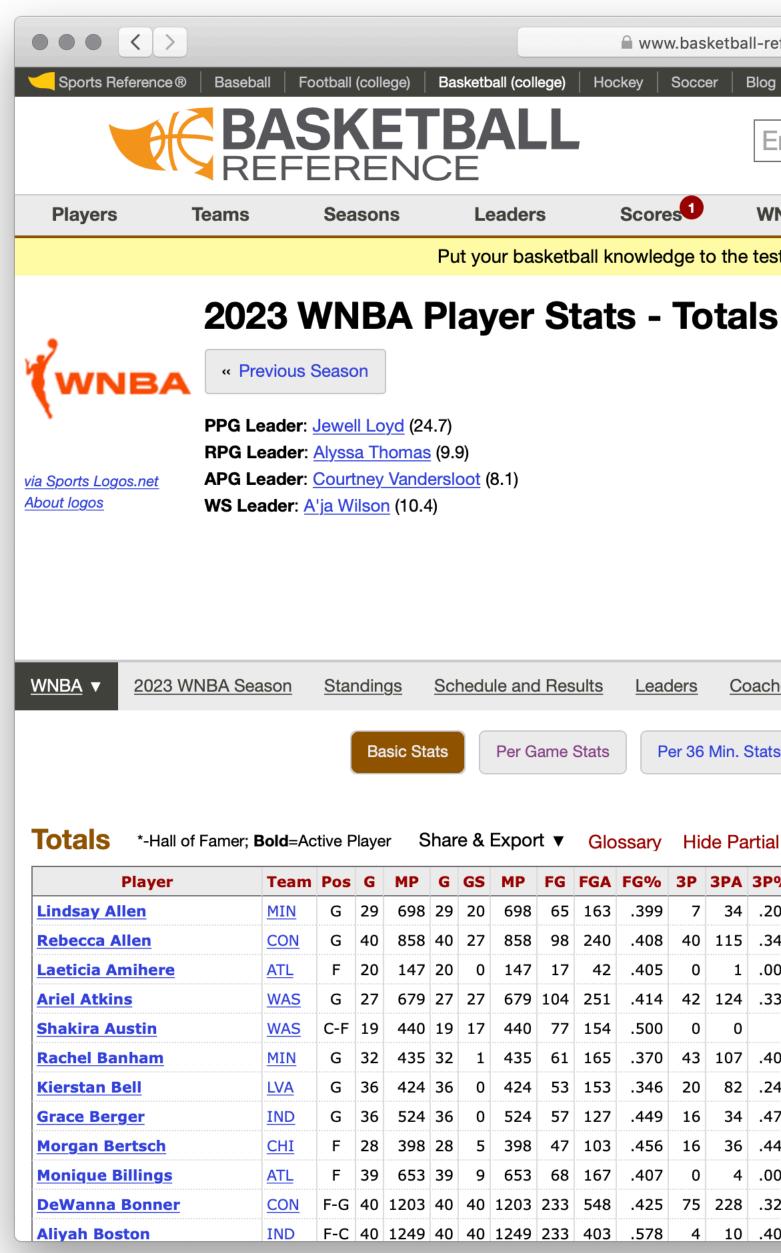
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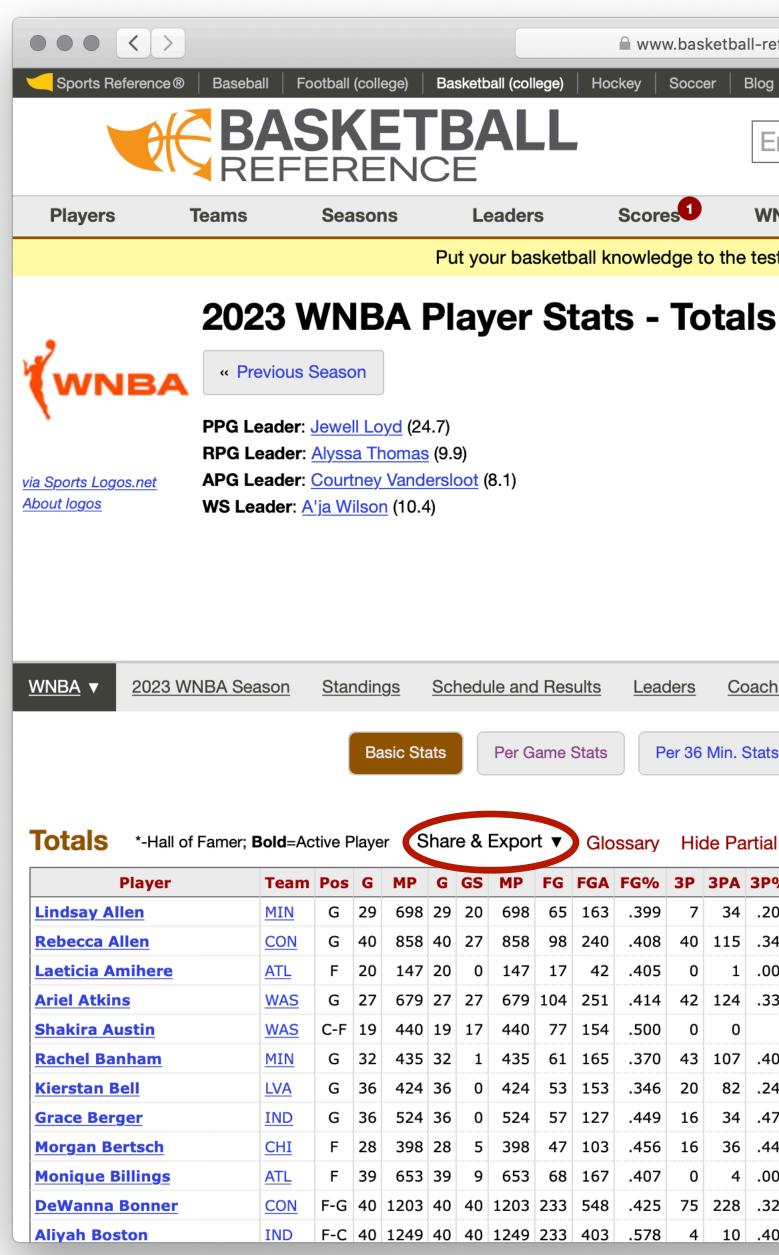
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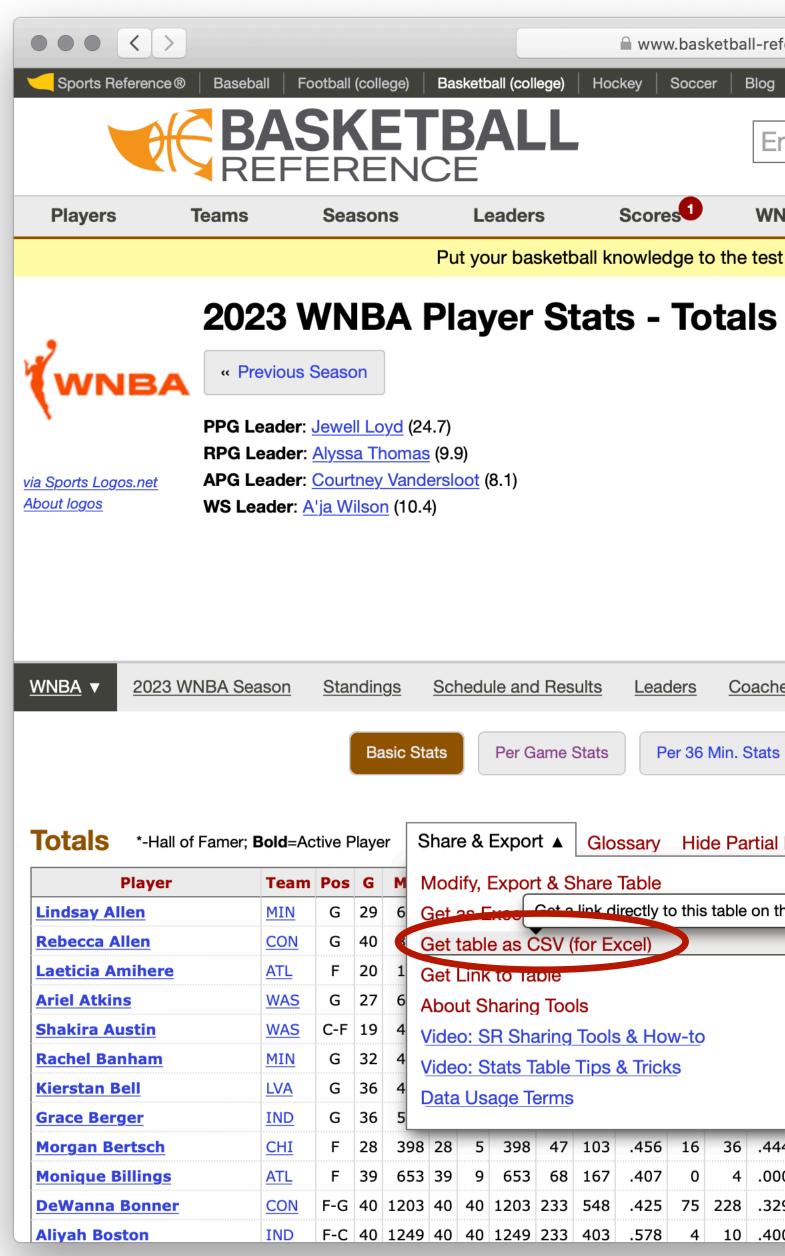
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2         2         2         2         2         7         FTA         FTA         ORB         TR         AST         STL         BLK         TOV         P         PTS           6         2.0         4.4         4.55         1.4         1.8         .792         0.6         2.4         4.5         0.6         0.1         1.3         2.1         6.2           8         1.5         3.1         .464         0.5         0.7         .704         0.7         2.8         0.9         0.1         1.3         2.1         6.2           9         2.1         .415         1.1         2.1         .537         0.3         1.0         0.2         0.3         0.5         0.6         1.1         2.8           9         2.3         4.7         .488         2.3         2.5         .897         0.7         3.1         2.3         1.2         0.3         1.3         2.6         1.15           4.1         8.1         .500         1.9         3.1         6.10         1.5         7.0         0.9         0.8         0.9         1.8         2.3         10.0           2         0.6         1.8         .310																		
2         2         2         2         2         7         FTA         FTA         ORB         TR         AST         STL         BLK         TOV         P         PTS           6         2.0         4.4         4.55         1.4         1.8         .792         0.6         2.4         4.5         0.6         0.1         1.3         2.1         6.2           8         1.5         3.1         .464         0.5         0.7         .704         0.7         2.8         0.9         0.1         1.3         2.1         6.2           9         2.1         .415         1.1         2.1         .537         0.3         1.0         0.2         0.3         0.5         0.6         1.1         2.8           9         2.3         4.7         .488         2.3         2.5         .897         0.7         3.1         2.3         1.2         0.3         1.3         2.6         1.15           4.1         8.1         .500         1.9         3.1         6.10         1.5         7.0         0.9         0.8         0.9         1.8         2.3         10.0           2         0.6         1.8         .310																		
2         2         2         2         2         7         FTA         FTA         ORB         TRE         AST         STL         BLK         TOV         PF         PTS           5         2.0         4.4         4.50         1.4         1.8         7.704         0.7         2.8         0.6         0.1         1.3         0.1         6.2           6         3.1         .464         0.5         0.7         7.04         0.7         2.8         0.9         1.3         0.9         1.9         6.4           0         9         2.1         .415         1.1         2.1         5.37         0.3         1.0         0.2         0.3         1.5         0.6         1.1         2.1         6.2           2         3         4.7         .488         2.3         2.5         .897         0.7         3.1         2.3         1.2         0.3         1.3         2.6         1.15           4         1.3         5.50         1.9         3.1         6.10         1.5         7.0         0.9         0.8         0.9         1.8         2.3         10.0           2         0.6         1.8         .310																		
2         2         2         2         2         7         FTA         FTA         ORB         TRE         AST         STL         BLK         TOV         PF         PTS           5         2.0         4.4         4.50         1.4         1.8         7.704         0.7         2.8         0.6         0.1         1.3         0.1         6.2           6         3.1         .464         0.5         0.7         7.04         0.7         2.8         0.9         1.3         0.9         1.9         6.4           0         9         2.1         .415         1.1         2.1         5.37         0.3         1.0         0.2         0.3         1.5         0.6         1.1         2.1         6.2           2         3         4.7         .488         2.3         2.5         .897         0.7         3.1         2.3         1.2         0.3         1.3         2.6         1.15           4         1.3         5.50         1.9         3.1         6.10         1.5         7.0         0.9         0.8         0.9         1.8         2.3         10.0           2         0.6         1.8         .310																		
2         2         2         2         2         7         FTA         FTA         ORB         TRE         AST         STL         BLK         TOV         PF         PTS           5         2.0         4.4         4.50         1.4         1.8         7.704         0.7         2.8         0.6         0.1         1.3         0.1         6.2           6         3.1         .464         0.5         0.7         7.04         0.7         2.8         0.9         1.3         0.9         1.9         6.4           0         9         2.1         .415         1.1         2.1         5.37         0.3         1.0         0.2         0.3         1.5         0.6         1.1         2.1         6.2           2         3         4.7         .488         2.3         2.5         .897         0.7         3.1         2.3         1.2         0.3         1.3         2.6         1.15           4         1.3         5.50         1.9         3.1         6.10         1.5         7.0         0.9         0.8         0.9         1.8         2.3         10.0           2         0.6         1.8         .310	105	Tran	sactions	Dlay	vor Sta	to A												
2P         2PA         2P9%         FT         FTA         FTW         ORB         TRB         AST         STL         BLK         TOV         PF         PTS           3         2.0         4.4         4.50         1.4         1.8         792         0.6         2.4         4.5         0.6         0.1         1.3         2.1         6.2           3         1.5         3.1         .464         0.5         0.7         7.04         0.7         2.8         0.9         0.9         1.3         0.9         1.9         6.4           0.9         2.1         .415         1.1         2.1         .537         0.3         1.0         0.2         0.3         0.5         0.6         1.1         2.8           0.9         2.1         .415         1.1         2.1         .537         0.3         1.2         0.3         1.5         0.6         1.1         2.8           1.4         8.1         .500         1.9         3.1         6.10         1.5         7.0         0.4         0.3         1.1         1.4         5.5           0.4         1.8         .310         0.3         0.4         1.6         0.5	162	<u>       </u>	Sactions	Fia	yer Sta													
3       2.0       4.4       .450       1.4       1.8       .792       0.6       2.4       4.5       0.6       0.1       1.3       2.1       6.2         3       1.5       3.1       .464       0.5       0.7       .704       0.7       2.8       0.9       0.9       1.1       0.9       1.9       6.4         0       9       2.1       .415       1.1       2.1       .537       0.3       1.0       0.2       0.3       0.5       0.6       1.1       2.8         2       2.3       4.7       .488       2.3       2.5       .897       0.7       3.1       2.3       1.2       0.3       1.3       2.6       11.5         4.1       8.1       .500       1.9       3.1       .610       1.5       7.0       0.9       0.8       0.9       1.8       2.3       10.0         2       0.6       1.8       .310       0.3       0.4       .786       0.1       1.0       1.7       0.3       0.1       1.4       5.5         4       0.9       2.0       .465       0.2       0.3       0.4       0.1       0.4       1.3       3.7	ting																	
3       2.0       4.4       .450       1.4       1.8       .792       0.6       2.4       4.5       0.6       0.1       1.3       2.1       6.2         3       1.5       3.1       .464       0.5       0.7       .704       0.7       2.8       0.9       0.9       1.1       0.9       1.9       6.4         0       9       2.1       .415       1.1       2.1       .537       0.3       1.0       0.2       0.3       0.5       0.6       1.1       2.8         2       2.3       4.7       .488       2.3       2.5       .897       0.7       3.1       2.3       1.2       0.3       1.3       2.6       11.5         4.1       8.1       .500       1.9       3.1       .610       1.5       7.0       0.9       0.8       0.9       1.8       2.3       10.0         2       0.6       1.8       .310       0.3       0.4       .786       0.1       1.0       1.7       0.3       0.1       1.4       5.5         4       0.9       2.0       .465       0.2       0.3       0.4       0.1       0.4       1.3       3.7																		
3       2.0       4.4       .450       1.4       1.8       .792       0.6       2.4       4.5       0.6       0.1       1.3       2.1       6.2         3       1.5       3.1       .464       0.5       0.7       .704       0.7       2.8       0.9       0.9       1.1       0.9       1.9       6.4         0       9       2.1       .415       1.1       2.1       .537       0.3       1.0       0.2       0.3       0.5       0.6       1.1       2.8         2       2.3       4.7       .488       2.3       2.5       .897       0.7       3.1       2.3       1.2       0.3       1.3       2.6       11.5         4.1       8.1       .500       1.9       3.1       .610       1.5       7.0       0.9       0.8       0.9       1.8       2.3       10.0         2       0.6       1.8       .310       0.3       0.4       .786       0.1       1.0       1.7       0.3       0.1       1.4       5.5         4       0.9       2.0       .465       0.2       0.3       0.4       0.1       0.4       1.3       3.7																		
3       2.0       4.4       .450       1.4       1.8       .792       0.6       2.4       4.5       0.6       0.1       1.3       2.1       6.2         3       1.5       3.1       .464       0.5       0.7       .704       0.7       2.8       0.9       0.9       1.1       0.9       1.9       6.4         0       9       2.1       .415       1.1       2.1       .537       0.3       1.0       0.2       0.3       0.5       0.6       1.1       2.8         2       2.3       4.7       .488       2.3       2.5       .897       0.7       3.1       2.3       1.2       0.3       1.3       2.6       11.5         4.1       8.1       .500       1.9       3.1       .610       1.5       7.0       0.9       0.8       0.9       1.8       2.3       10.0         2       0.6       1.8       .310       0.3       0.4       .786       0.1       1.0       1.7       0.3       0.1       1.4       5.5         4       0.9       2.0       .465       0.2       0.3       0.4       0.1       0.4       1.3       3.7																		
3       2.0       4.4       .450       1.4       1.8       .792       0.6       2.4       4.5       0.6       0.1       1.3       2.1       6.2         3       1.5       3.1       .464       0.5       0.7       .704       0.7       2.8       0.9       0.9       1.3       0.9       1.9       6.4         0       9       2.1       .415       1.1       2.1       .537       0.3       1.0       0.2       0.3       0.5       0.6       1.1       2.8         2.3       4.7       .488       2.3       2.5       .897       0.7       3.1       2.3       1.2       0.3       1.3       2.6       11.5         4.1       8.1       .500       1.9       3.1       .610       1.5       7.0       0.9       0.8       0.9       1.8       2.3       10.0         2       0.6       1.8       .310       0.3       0.4       7.60       0.4       0.1       1.4       5.5         4       0.9       2.0       .465       0.2       0.3       0.4       1.1       0.4       1.3       3.7         4       1.1       2.6       1.8																	_	
3       1.5       3.1       .464       0.5       0.7       .704       0.7       2.8       0.9       1.3       0.9       1.9       6.4         0       0.9       2.1       .415       1.1       2.1       .537       0.3       1.0       0.2       0.3       0.5       0.6       1.1       2.8         2.3       4.7       .488       2.3       2.5       .897       0.7       3.1       2.3       1.2       0.3       1.3       2.6       11.5         4.1       8.1       .500       1.9       3.1       .610       1.5       7.0       0.9       0.8       0.9       1.8       2.3       10.0         2       0.6       1.8       .310       0.3       0.4       .786       0.1       1.0       1.7       0.3       0.1       1.1       1.4       5.5         4       0.9       2.0       .465       0.2       0.3       1.60       0.5       0.4       0.1       0.4       1.3       3.7         4       1.1       2.6       .441       0.6       0.7       .840       0.2       1.6       1.9       0.5       0.2       1.0       1.1       4.4	_											 						
0       0.9       2.1       .415       1.1       2.1       .537       0.3       1.0       0.2       0.3       0.5       0.6       1.1       2.8         2       3       4.7       .488       2.3       2.5       .897       0.7       3.1       2.3       1.2       0.3       1.3       2.6       11.5         4.1       8.1       .500       1.9       3.1       .610       1.5       7.0       0.9       0.8       0.9       1.8       2.3       10.0         2       0.6       1.8       .310       0.3       0.4       .786       0.1       1.0       1.7       0.3       0.1       1.1       1.4       5.5         4       0.9       2.0       .465       0.2       0.3       .600       0.4       1.6       0.5       0.4       0.1       1.4       5.5         4       1.1       2.6       .441       0.6       0.7       .840       0.2       1.6       1.9       0.5       0.2       1.0       1.1       4.2         4       1.1       2.4       .463       0.4       0.6       .750       0.4       1.7       0.7       0.4       0.3 <td< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></td<>																		
2.3       4.7       .488       2.3       2.5       .897       0.7       3.1       2.3       1.2       0.3       1.3       2.6       11.5         4.1       8.1       .500       1.9       3.1       .610       1.5       7.0       0.9       0.8       0.9       1.8       2.3       10.0         2       0.6       1.8       .310       0.3       0.4       .786       0.1       1.0       1.7       0.3       0.1       1.4       5.5         4       0.9       2.0       .465       0.2       0.3       .600       0.4       1.6       0.5       0.4       0.1       1.4       5.5         4       0.9       2.0       .465       0.2       0.3       .600       0.4       1.6       0.5       0.4       0.1       1.4       5.5         4       1.1       2.6       .441       0.6       0.7       .840       0.2       1.6       1.9       0.5       0.2       1.0       1.1       4.2         4       1.1       2.4       .463       0.4       0.6       .750       0.4       1.7       0.7       0.4       0.3       1.1       1.8       4.4																		
4.1       8.1       .500       1.9       3.1       .610       1.5       7.0       0.9       0.8       0.9       1.8       2.3       10.0         2       0.6       1.8       .310       0.3       0.4       .786       0.1       1.0       1.7       0.3       0.1       1.1       1.4       5.5         4       0.9       2.0       .465       0.2       0.3       .600       0.4       1.6       0.5       0.4       0.1       0.4       1.3       3.7         4       1.1       2.6       .441       0.6       0.7       .840       0.2       1.6       1.9       0.5       0.2       1.0       1.1       4.2         4       1.1       2.4       .463       0.4       0.6       .750       0.4       1.7       0.7       0.4       0.3       1.1       1.8       4.4																		
2       0.6       1.8       .310       0.3       0.4       .786       0.1       1.7       0.3       0.1       1.1       1.4       5.5         4       0.9       2.0       .465       0.2       0.3       .600       0.4       1.6       0.5       0.4       0.1       0.4       1.3       3.7         4       1.1       2.6       .441       0.6       0.7       .840       0.2       1.6       1.9       0.5       0.2       1.0       1.1       4.2         4       1.1       2.4       .463       0.4       0.6       .750       0.4       1.7       0.7       0.4       0.3       1.1       1.8       4.4					•••••													
A       0.9       2.0       .465       0.2       0.3       .600       0.4       1.6       0.5       0.4       0.1       0.4       1.3       3.7         A       1.1       2.6       .441       0.6       0.7       .840       0.2       1.6       1.9       0.5       0.2       1.0       1.1       4.2         A       1.1       2.4       .463       0.4       0.6       .750       0.4       1.7       0.7       0.4       0.3       1.1       1.8       4.4																		
1.1       2.6       .441       0.6       0.7       .840       0.2       1.6       1.9       0.5       0.2       1.0       1.1       4.2         4       1.1       2.4       .463       0.4       0.6       .750       0.4       1.7       0.7       0.4       0.3       1.1       1.8       4.4					•••••													
1.1       2.4       .463       0.4       0.6       .750       0.4       1.7       0.7       0.4       0.3       1.1       1.8       4.4																		
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4.0 8.0 .494 3.9 4.5 .862 0.9 5.6 2.2 1.1 0.6 1.5 1.6 17.4					•••••													
0     5.7     9.8     .583     2.7     3.6     .745     3.1     8.4     2.2     1.3     1.3     1.9     3.1     14.5																		



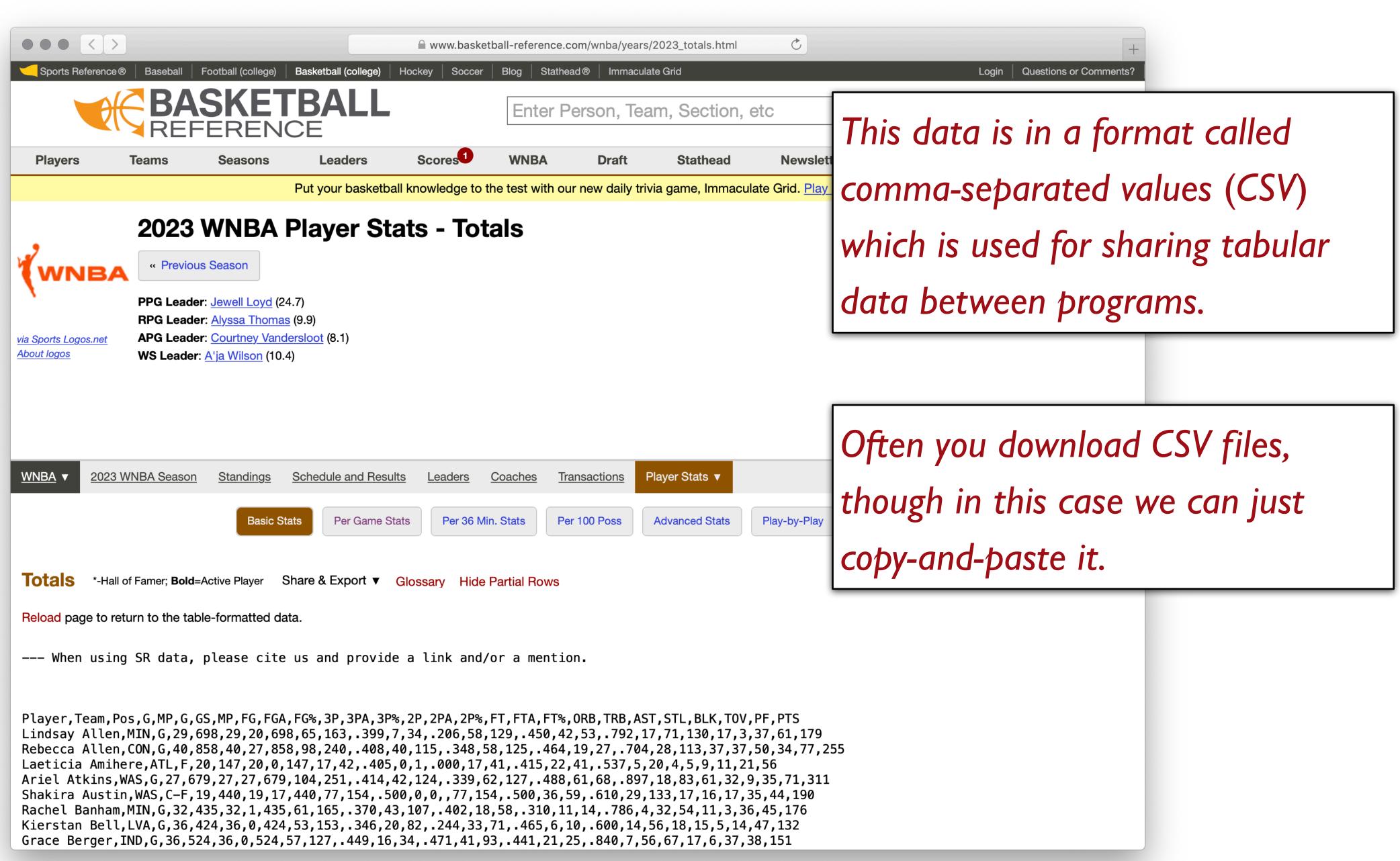
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s al R	F ows 2P	<sup>D</sup> er 10 <b>2PA</b> 129	0 Poss 2P%	FT	Adva FTA	anced S	orb	TRB	AST	STL	BLK	τον	PF					
s al R % 06	F OWS 2P 58	Per 10 2PA 129	0 Poss 2P% .450	<b>FT</b> 42	Adva FTA 53	enced S FT% .792	orbana or	<b>TRB</b> 71	<b>AST</b> 130	<b>STL</b> 17	BLK 3	<b>TOV</b> 37	<b>PF</b> 61	179				
s al R % 06	F OWS 2P 58 58	Per 10 2PA 129 125	0 Poss 2 <b>P%</b> .450 .464	<b>FT</b> 42 19	Adva <b>FTA</b> 53 27	<b>FT%</b> .792 .704	orea 17 28	<b>TRB</b> 71 113	<b>AST</b> 130 37	<b>STL</b> 17 37	<b>BLK</b> 3 50	<b>TOV</b> 37 34	<b>PF</b> 61 77	179 255				
s al R % 06 48	F ows 2P 58 58 17 62	Per 10 2PA 129 125 41 127	0 Poss 2 <b>P%</b> .450 .464 .415 .488	FT 42 19 22 61	Adva FTA 53 27 41 68	<b>FT%</b> .792 .704 .537 .897	orea 17 28 5 18	<b>TRB</b> 71 113 20 83	AST 130 37 4 61	<b>STL</b> 17 37 5 32	BLK 3 50 9 9	<b>TOV</b> 37 34 11 35	<b>PF</b> 61 77 21 71	179 255 56 311				
s al R % 06 48 00 39	F OWS 2P 58 58 17 62 77	Per 10 2PA 129 125 41 127 154	0 Poss 2P% .450 .464 .415 .488 .500	FT 42 19 22 61 36	Adva FTA 53 27 41 68 59	<b>FT%</b> .792 .704 .537 .897 .610	oreal 0real 17 28 5 18 29	<b>TRB</b> 71 113 20 83 133	AST 130 37 4 61 17	<b>STL</b> 17 37 5 32 16	<b>BLK</b> 3 50 9 9 17	<b>TOV</b> 37 34 11 35 35	<b>PF</b> 61 77 21 71 44	179 255 56 311 190				
s al R 06 48 00 39	F OWS 2P 58 58 17 62 77 18	Per 10 2PA 129 125 41 127 154 58	0 Poss 2P% .450 .464 .415 .488 .500 .310	FT 42 19 22 61 36 11	Adva <b>FTA</b> 53 27 41 68 59 14	FT% .792 .704 .537 .897 .610 .786	oreal 0real 17 28 5 18 29 4	<b>TRB</b> 71 113 20 83 133 32	AST 130 37 4 61 17 54	<b>STL</b> 17 37 5 32 16 11	BLK 3 50 9 9 17 3	<b>TOV</b> 37 34 11 35 35 35	<b>PF</b> 61 77 21 71 44 45	179 255 56 311 190 176				
s al R 06 48 00 39 02 44	F OWS 2P 58 58 17 62 77 18 33	Per 10 2PA 129 125 41 127 154 58 71	0 Poss 2P% .450 .464 .415 .488 .500 .310 .465	FT 42 19 22 61 36 11 6	Adva <b>FTA</b> 53 27 41 68 59 14 10	<b>FT%</b> .792 .704 .537 .897 .610 .786 .600	oreal orealo	TRB           71           113           20           83           133           32           56	AST 130 37 4 61 17 54 18	<b>STL</b> 17 37 5 32 16 11 15	BLK 3 50 9 9 17 3 5	<b>TOV</b> 37 34 11 35 35 35 36 14	PF 61 77 21 71 44 45 47	179 255 56 311 190 176 132				
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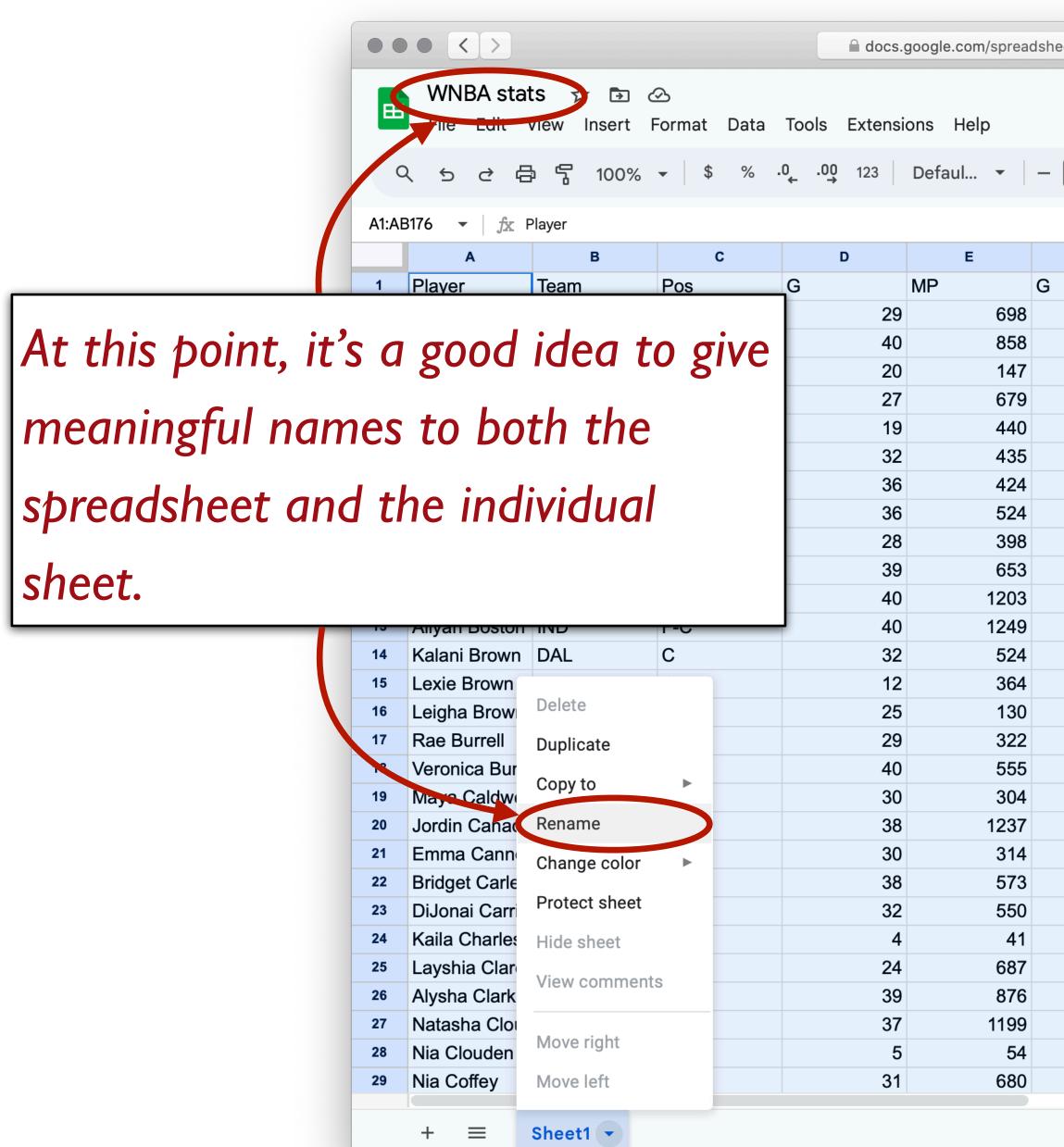
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<ol> <li>Player, Team, Pos, G, MP, G, GS, MP, FG, FGA, FG%, 3P, 3PA, 3P%, 2P, 2PA, 2P%</li> <li>Lindsay Allen, MIN, G, 29, 698, 29, 20, 698, 65, 163, .399, 7, 34, .206, 58, 129, .450,</li> <li>Rebecca Allen, CON, G, 40, 858, 40, 27, 858, 98, 240, .408, 40, 115, .348, 58, 125, .</li> <li>Laeticia Amihere, ATL, F, 20, 147, 20, 0, 147, 17, 42, .405, 0, 1, .000, 17, 41, .415, 22</li> <li>Ariel Atkins, WAS, G, 27, 679, 27, 27, 679, 104, 251, .414, 42, 124, .339, 62, 127, .48</li> </ol>	TA,FT%
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6 Shakira Austin, WAS, C-F, 19, 440, 19, 17, 440, 77, 154, .500, 0, 0, ,77, 154, .500, 36	38,61,
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7 Rachel Banham, MIN, G, 32, 435, 32, 1, 435, 61, 165, .370, 43, 107, .402, 18, 58, .37	10,11,
8 Kierstan Bell,LVA,G,36,424,36,0,424,53,153,.346,20,82,.244,33,71,.465,6,*	10,.60
9 Grace Berger, ND,G,36,524,36,0,524,57,127,.449,16,34,.471,41,93,.441,2	1,25,.8
<sup>10</sup> Morgan Bertsch,CHI,F,28,398,28,5,398,47,103,.456,16,36,.444,31,67,.463	,12,16
11 Monique Billings,ATL,F,39,653,39,9,653,68,167,.407,0,4,.000,68,163,.417,	51,61,
12 DeWanna Bonner,CON,F-G,40,1203,40,40,1203,233,548,.425,75,228,.329	),158,
13 Aliyah Boston, ND,F-C,40,1249,40,40,1249,233,403,.578,4,10,.400,229,39	3,.58
14 Kalani Brown, DAL, C, 32, 524, 32, 5, 524, 90, 143, .629, 0, 1, .000, 90, 142, .634, 69	,86,.8
15 Lexie Brown,LAS,G,12,364,12,11,364,54,111,.486,27,65,.415,27,46,.587,1	4,16,.
16 Leigha Brown, CON,G,25,130,25,0,130,8,26,.308,1,10,.100,7,16,.438,4,6,.6	367,6,
17 Rae Burrell,LAS,G-F,29,322,29,3,322,36,93,.387,16,41,.390,20,52,.385,17	,21,.8
18 Veronica Burton, DAL, G, 40, 555, 40, 13, 555, 25, 85, .294, 13, 48, .271, 12, 37, .324	4,31,3
<sup>19</sup> Maya Caldwell, IND, G, 30, 304, 30, 1, 304, 21, 72, .292, 4, 29, .138, 17, 43, .395, 12	,14,.8
<sup>20</sup> Jordin Canada, LAS, G, 38, 1237, 38, 38, 1237, 163, 403, .404, 41, 123, .333, 122, 2	280,.4
<sup>21</sup> Emma Cannon, IND, F, 30, 314, 30, 3, 314, 61, 134, .455, 13, 34, .382, 48, 100, .480	,40,44
22 Bridget Carleto n,MIN,F,38,573,38,4,573,41,119,.345,30,89,.337,11,30,.367	,11,15
23 DiJonai Carrington,CON,G-F,32,550,32,0,550,93,223,.417,23,62,.371,70,1	61,.43
24 Kaila Charles, SEA, G-F, 4, 41, 4, 0, 41, 3, 12, .250, 0, 2, .000, 3, 10, .300, 0, 0, 3, 5, 1,	1,0,0,9
25 Layshia Claren don,LAS,G,24,687,24,24,687,96,193,.497,21,46,.457,75,14	7,.510
<sup>26</sup> Alysha Clark,LVA,F,39,876,39,1,876,91,205,.444,51,132,.386,40,73,.548,2	7,33,.8
27 Natasha Cloud 37,1199,37,37,1199,149,395,.377,45,151,.298,104,	,244,.4
28 Nia Clouden,L4,5,1,54,3,10,.300,1,3,.333,2,7,.286,1,2,.500,0,2,9,	0,0,8,
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6,.750,12,47,19,10,7,30,50,122				
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2	Lindsay Allen, MIN, G, 29, 698, 29, 20, 69	ШШ	Filter views
3	Rebecca Allen, CON, G, 40, 858, 40, 27,	Ŧ	Add a slicer
4	Laeticia Amihere,ATL,F,20,147,20,0,1		
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7	Rachel Banham, MIN, G, 32, 435, 32, 1, 4	⊞	Named ranges
3	Kierstan Bell,LVA,G,36,424,36,0,424,	Σ	Named functions
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0	Morgan Bertsch,CHI,F,28,398,28,5,3		
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3	Aliyah Boston, ND,F-C,40,1249,40,40	眨	Data validation
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5	Lexie Brown,LAS,G,12,364,12,11,364	л,	Colit toxt to columno
6	Leigha Brown, CON, G, 25, 130, 25, 0, 13	1	Split text to columns
7	Rae Burrell,LAS,G-F,29,322,29,3,322	(→	Data extraction
8	Veronica Burton, DAL, G, 40, 555, 40, 13		
9	Maya Caldwell, IND, G, 30, 304, 30, 1, 30	8	Data connectors New
0	Jordin Canada, LAS, G, 38, 1237, 38, 38,	/	
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2	Bridget Carleton, MIN, F, 38, 573, 38, 4, 57	-	
23	DiJonai Carrington, CON, G-F, 32, 550, 3		
24	Kaila Charles, \$EA, G-F, 4, 41, 4, 0, 41, 3, 1		
25	Layshia Clarendon,LAS,G,24,687,24,2		
6	Alysha Clark,LVA,F,39,876,39,1,876,9		
7			9,149,395,.377,45,151,.298,104,244,.4
8 9	Nia Clouden,LA, , , , , , , , , , 5, 1, 54, 3, 10,		
'	Nia Coffey,ATL,F,31,680,31,31,680,83	, 192	,.432,33,82,.402,50,110,.455,15,24,.6

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2	Lindsay Allen MIN	١	G	29	698	29	20	698	3 65	163	0.399	-
3	Rebecca Allen CO	Ν	G	40	858	40	27	858	3 98	240	0.408	40
ļ	Laeticia Amihe ATL	-	F	20	147	20	C	14	7 17	42	0.405	
5	Ariel Atkins WA	S	G	27	679	27	27	679	9 104	251	0.414	42
6	Shakira Austin WA	S	C-F	19	440	19	17	440	77	154	0.5	
7	Rachel Banhar MIN	١	G	32	435	32	1	43	5 61	165	0.37	4;
8	Kierstan Bell LVA	A	G	36	424	36	C	424	4 53	153	0.346	20
9	Grace Berger IND	)	G	36	524	36	C	524	4 57	127	0.449	10
0	Morgan Bertsc CH	I	F	28	398	28	5	398	3 47	103	0.456	10
1	Monique Billin (ATL	-	F	39	653	39	9	65	3 68	167	0.407	
12	DeWanna Bon CO	Ν	F-G	40	1203	40	40	1203	3 233	548	0.425	7
13	Aliyah Boston IND	)	F-C	40	1249	40	40	1249	233	403	0.578	
14	Kalani Brown DAI	L	С	32	524	32	5	524	4 90	143	0.629	
15	Lexie Brown LAS	S	G	12	364	12	11	364	4 54	111	0.486	2
16	Leigha Brown CO	Ν	G	25	130	25	C	130	8 0	26	0.308	
17	Rae Burrell LAS	S	G-F	29	322	29	3	322	2 36	93	0.387	10
18	Veronica Burto DAI	L	G	40	555	40	13	55	5 25	85	0.294	1:
19	Maya Caldwell IND	)	G	30	304	30	1	304	4 21	72	0.292	4
20	Jordin Canada LAS	S	G	38	1237	38	38	123	7 163	403	0.404	4
21	Emma Cannor IND	)	F	30	314	30	3	314	4 61	134	0.455	1:
22	Bridget Carletc MIN	١	F	38	573	38	4	573	3 41	119	0.345	30
23	DiJonai Carrin CO	Ν	G-F	32	550	32	C	550	93	223	0.417	23
24	Kaila Charles SEA	A	G-F	4	41	4	C	) 4	1 3	12	0.25	
25	Layshia Clarer LAS	S	G	24	687	24	24	68	7 96	193	0.497	2
26	Separator: Detect auto	matically	F	39	876	39	1	87	6 91	205	0.444	5
27	Separator. Detect autor		G	37	1199	37	37	<b>7</b> 1199	9 149	395	0.377	4
28	Nia Clouden LAS	S	G	5	54	5	1	54	4 3	10	0.3	
29	Nia Coffey ATL		F	31	680	31	31	68	0 83	192	0.432	33



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	GS	MP	FG	FGA	FG%	3P
29	20	698	65	163	0.399	7
40	27	858	98	240	0.408	40
20	0	147	17	42	0.405	0
27	27	679	104	251	0.414	42
19	17	440	77	154	0.5	0
32	1	435	61	165	0.37	43
36	0	424	53	153	0.346	20
36	0	524	57	127	0.449	16
28	5	398	47	103	0.456	16
39	9	653	68	167	0.407	0
40	40	1203	233	548	0.425	75
40	40	1249	233	403	0.578	4
32	5	524	90	143	0.629	0
12	11	364	54	111	0.486	27
25	0	130	8	26	0.308	1
29	3	322	36	93	0.387	16
40	13	555	25	85	0.294	13
30	1	304	21	72	0.292	4
38	38	1237	163	403	0.404	41
30	3	314	61	134	0.455	13
38	4	573	41	119	0.345	30
32	0	550	93	223	0.417	23
4	0	41	3	12	0.25	0
24	24	687	96	193	0.497	21
39	1	876	91	205	0.444	51
37	37	1199	149	395	0.377	45
5	1	54	3	10	0.3	1
31	31	680	83	192	0.432	33 -

# Step o: Get dataStep 1: Make a spreadsheetStep 2: Load the spreadsheet as a table

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1	Player	Team	Pos	G		PTS		
	Lindsay Allen	MIN	G		29		179	
3	Rebecca Allen		G		40		255	
L I	Laeticia Amihe	ATL	F					
5	Ariel Atkins	WAS	G		Share	e "WN	IBA st	ats
6	Shakira Austin	WAS	C-F					
7	Rachel Banhar	MIN	G					
В	Kierstan Bell	LVA	G		Add	people a	and grou	ps
9	Grace Berger	IND	G					
0	Morgan Bertsc	CHI	F		People	e with a	ccess	
1	Monique Billing	ATL	F			lonatha	o Cordor	
2	DeWanna Bon	CON	F-G		Contraction of the local division of the loc		<b>n Gordor</b> /assar.edu	
3	Aliyah Boston	IND	F-C			•		
4	Kalani Brown	DAL	С		Conor	al acce	~~	
5	Lexie Brown	LAS	G		Gener	aracce	55	
6	Leigha Brown	CON	G		ð F	Restricte	ed 🔻	
7	Rae Burrell	LAS	G-F		-			
8	Veronica Burto	DAL	G			🗸 F	Restricte	ed
9	Maya Caldwell	IND	G		<b>G</b>			
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1	Emma Cannor	IND	F		_	```	/assar (	2006
22	Bridget Carletc	MIN	F		38			
23	DiJonai Carrin	CON	G-F		3;	A	Anyone	with
24	Kaila Charles	SEA	G-F			,	any on o	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
25	Layshia Clarer	LAS	G		24		207	
26	Alysha Clark	LVA	F		39		260	
27	Natasha Cloud	WAS	G		37		469	
28	Nia Clouden	LAS	G		5		8	
9	Nia Coffev	ATL	F		31		214	

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		Team	Pos	G	MP	G	GS	MP	FG	FGA		3P
	Lindsay Allen	MIN	G	29	698	29	20	698	65	163	0.399	
	Rebecca Allen		G	40						240		
	Laeticia Amihe		F	20		20			17	42	0.405	
		WAS	G	27					104	251	0.414	
	Shakira Austin		C-F	19						154	0.5	
	Rachel Banhar	MIN	G	32	435	32	1	435	61	165	0.37	
	Kierstan Bell	LVA	G	36	424	36	0	424	53	153	0.346	
	Grace Berger	IND	G	36	524	36	0	524	57	127	0.449	
)	Morgan Bertsc	CHI	F	28	398	28	5	398	47	103	0.456	
	Monique Billing		F	39	653	39	9	653	68	167	0.407	
2	DeWanna Bon		F-G	40	1203	40	40	1203	233	548	0.425	
3	Aliyah Boston	IND	F-C	40	1249	40	40	1249	233	403	0.578	
Ļ	Kalani Brown	DAL	С	32	524	32	5	524	90	143	0.629	
	Lexie Brown	LAS	G	12	364	12	11	364	54	111	0.486	
6	Leigha Brown	CON	G	25	130	25	0	130	8	26	0.308	
	Rae Burrell	LAS	G-F	29	322	29	3	322	36	93	0.387	
;	Veronica Burto	DAL	G	40	555	40	13	555	25	85	0.294	
)	Maya Caldwell	IND	G	30	304	30	1	304	21	72	0.292	
	Jordin Canada	LAS	G	38	1237	38	38	1237	163	403	0.404	
	Emma Cannor	IND	F	30	314	30	3	314	61	134	0.455	
	Bridget Carletc	MIN	F	38	573	38	4	573	41	119	0.345	
	DiJonai Carrin	CON	G-F	32	550	32	0	550	93	223	0.417	
	Kaila Charles	SEA	G-F	4	41	4	0	41	3	12	0.25	
	Layshia Clarer	LAS	G	24	687	24	24	687	96	193	0.497	
	Alysha Clark	LVA	F	39	876	39	1	876	91	205	0.444	
	Natasha Cloud	WAS	G	37	1199	37	37	1199	149	395	0.377	
	Nia Clouden	LAS	G	5	54	5	1	54	3	10	0.3	
	Nia Coffev	ATL	F	31	680	31	31	680	83	192	0.432	

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### include gdrive-sheets

include shared-gdrive("dcic-2021",
 "1wyQZj\_L0qqV9Ekgr9au6RX2iqt2Ga8Ep")

# Load spreadsheet as a table

ssid = "1PfaNDQabnwIEwAMzmrQcND6\_Iph3M0XK1YrflhLJE0s"
spreadsheet = load-spreadsheet(ssid)

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•••	A	В	С	D	E	F		
1		Team	Pos			G GS		
2	Lindsay Allen		G	29	698	29		
3	Rebecca Allen		G	40	858	40		
4	Laeticia Amihe A		F	20	147	20		
5	Ariel Atkins V		G	27	679	27		
6	Shakira Austin V		C-F	19	440	19		
7	Rachel Banhar		G	32	435	32		
8	Kierstan Bell L		G	36	424	36		
9	Grace Berger		G	36	524	36		
10	Morgan Bertsc (		F	28	398	28		
11	Monique Billing A		F	39	653	39		>>> spreadsheet
12	DeWanna Bon (	CON	F-G	40	1203	40		Spi cuusiice c
13	Aliyah Boston	ND	F-C	40	1249	40		cnradchart(!!wnba ctate!!)
14	Kalani Brown	DAL	С	32	524	32		<pre>spreadsheet("wnba-stats")</pre>
15	Lexie Brown L	AS	G	12	364	12		•
16	Leigha Brown	CON	G	25	130	25		
17	Rae Burrell L	AS	G-F	29	322	29		
18	Veronica Burto	DAL	G	40	555	40		
19	Maya Caldwell I		G	30	304	30		
20	Jordin Canada L		G	38	1237	38		
21	Emma Cannor I		F	30	314	30		
22	Bridget Carletc		F	38	573	38		
23	DiJonai Carrin(		G-F	32	550	32	0	
24	Kaila Charles		G-F	4	41	4		
25	Layshia Clarer L		G	24	687	24	24	
26	Alysha Clark L		F	39	876	39		
27	Natasha Cloud V		G	37	1109	37		
28	Nia Clouden L		G		54	5		
29	Nia Coffev	AIL	IF	31	680	31		

## include gdrive-sheets

include shared-gdrive("dcic-2021",
 "1wyQZj\_L0qqV9Ekgr9au6RX2iqt2Ga8Ep")

# Load spreadsheet as a table

ssid = "1PfaNDQabnwIEwAMzmrQcND6\_Iph3M0XK1YrflhLJE0s"
spreadsheet = load-spreadsheet(ssid)

stats =
load-table:

source: spreadsheet.sheet-by-name("wnba-stats", true) This means we should skip the first row of the spreadsheet, which consists of column names.

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1	Player	Team	Pos	G	MP	G
2	Lindsay Allen	MIN	G	29	698	
3	Rebecca Allen	CON	G	40	858	
4	Laeticia Amihe	ATL	F	20	147	
5	Ariel Atkins	WAS	G	27	679	
6	Shakira Austin	WAS	C-F	19	440	
7	Rachel Banhar	MIN	G	32	435	
8	Kierstan Bell	LVA	G	36	424	
9	Grace Berger	IND	G	36	524	
10	Morgan Bertsc	CHI	F	28	398	
1	Monique Billing	ATL	F	39	653	
2	DeWanna Bon	CON	F-G	40	1203	
13	Aliyah Boston	IND	F-C	40	1249	
14	Kalani Brown	DAL	С	32	524	
15	Lexie Brown	LAS	G	12	364	
16	Leigha Brown	CON	G	25	130	
17	Rae Burrell	LAS	G-F	29	322	
18	Veronica Burto	DAL	G	40	555	
19	Maya Caldwell	IND	G	30	304	
20	Jordin Canada	LAS	G	38	1237	
21	Emma Cannor	IND	F	30	314	
22	Bridget Carleto	MIN	F	38	573	
23	DiJonai Carrin	CON	G-F	32	550	
24	Kaila Charles	SEA	G-F	4	41	
25	Layshia Clarer	LAS	G	24	687	
26	Alysha Clark	LVA	F	39	876	
27	Natasha Cloud	WAS	G	37	1199	
28	Nia Clouden	LAS	G	5	54	
29	Nia Coffev	ATL	F	31	680	

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This is a lot of columns!

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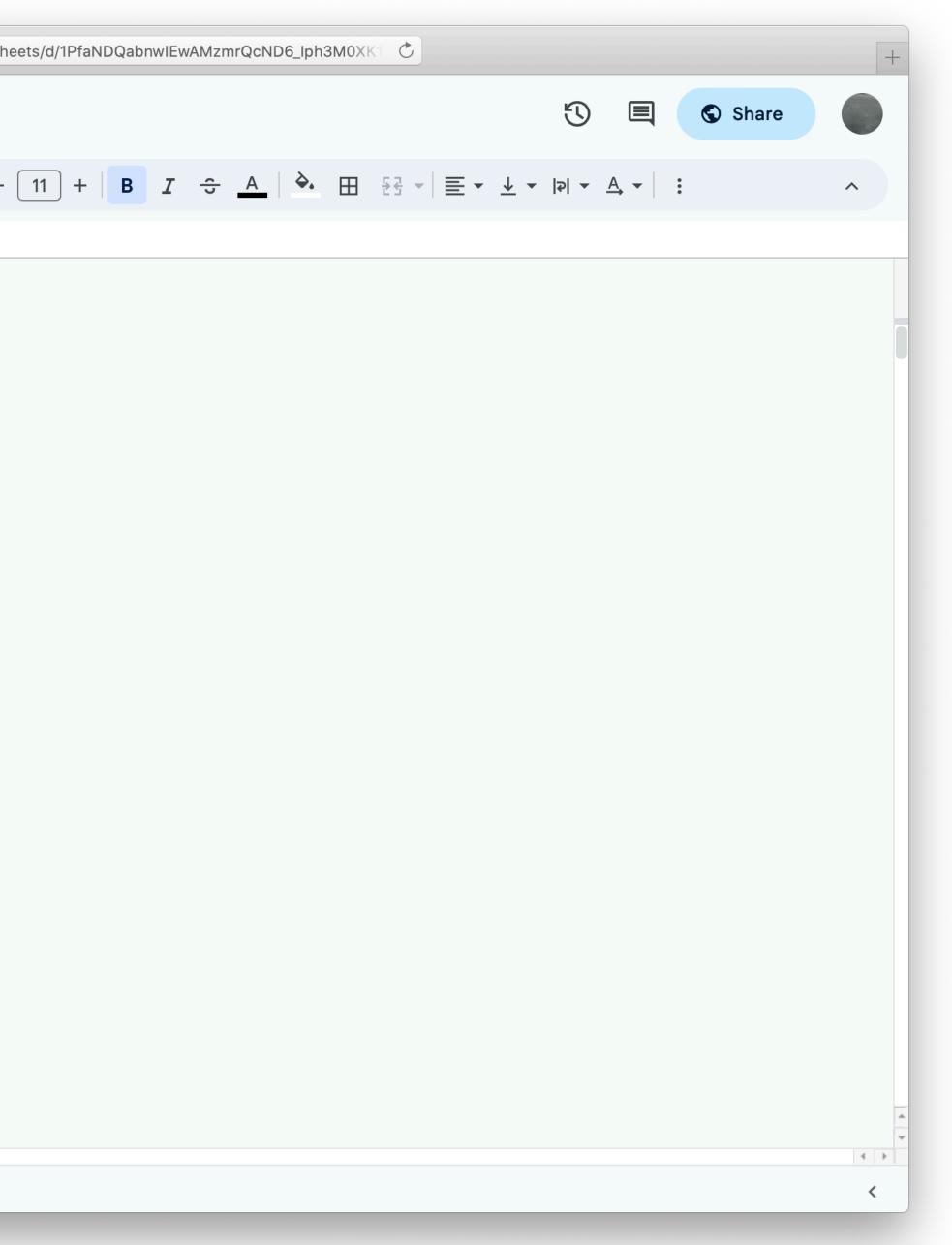


## Step o: Get data Step 1: Make a spreadsheet Step 1<sup>1</sup>/<sub>2</sub>: Rethink that spreadsheet Step 2: Load the spreadsheet as a table

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	Α	В	С	D	E	F	G	Н	I	J	К	L
1	Player	Team	Pos	G	MP	G	GS	MP	FG	FGA FG	3% 3P	
	Lindsay Allen	MIN	G	29	698	29	20	698	65	163	0.399	7
	Rebecca Aller	CON	G	40	858	40	27	858	98	240	0.408	40
	Laeticia Amihe	e ATL	F	20	147	20	0	147	17	42	0.405	C
	Ariel Atkins	WAS	G	27	679	27	27	679	104	251	0.414	42
	Shakira Austir	WAS	C-F	19	440	19	17	440	77	154	0.5	C
	Rachel Banha		G	32	435	32	1	435	61	165	0.37	43
	Kierstan Bell	LVA	G	36	424	36	0	424	53	153	0.346	20
	Grace Berger	IND	G	36	524	36	0	524	57	127	0.449	16
-	Morgan Bertso		F	28		28	5	398	47	103	0.456	16
	Monique Billin	1	F	39					68	167	0.407	C
	DeWanna Bor		F-G	40		40			233	548	0.425	75
_	Aliyah Boston		F-C	40		40			233	403	0.578	4
	Kalani Brown	DAL	С	32		32			90		0.629	C
	Lexie Brown	Delete		12		12			54	111	0.486	27
	Leigha Brow			25					8	26	0.308	1
	Rae Burrell	Duplicate		29		29		322	36		0.387	16
	Veronica Bur	Copy to	•	40					25	85	0.294	13
	Maya Caldwo		_	30		30		304	21	72	0.292	4
	Jordin Canac	Rename	_	38		38			163	403	0.404	41
	Emma Cann	Change color	•	30		30			61	134	0.455	13
	Bridget Carle	Protect sheet		38				573	41	119	0.345	30
_	DiJonai Carri			32		32			93		0.417	23
_	Kaila Charles	Hide sheet	_	4	41	4	0		3		0.25	0
	Layshia Clar	View comments	S	24		24			96		0.497	21
	Alysha Clark		_	39				876	91	205	0.444	51
_	Natasha Cloudan	Move right	_	37					149	395	0.377	45
	Nia Clouden			5	54	5	1	54	3	10	0.3	1

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4	69	86	0.802	55	143	33	7	22	42	65	249	
5	14	16	0.875	2	25	29	11	3	16	14	149	
6	4	6	0.667	6	21	10	5	2	11	19	21	
7	17	21	0.81	13	36	18	13	3	15	26	105	
8	31	34	0.912	22	70	88	29	10	17	57	94	
19	12	14	0.857	9	27	19	9	3	22	27	58	
20	138	158	0.873	9	116	228	86	9	103	89	505	
1	40	44	0.909	24	94	14	4	2	33	42	175	
22	11	15	0.733	19	89	34	13	3	16	49	123	
23	56	74	0.757	27	92	41	20	3	36	68	265	
24	0	0	0.045	3	5	1	1	0	0	9	6	
25	54	59	0.915	23	73	82	27	0	54	63	267	
6	27	33	0.818	21	133	42	24	6	28	85	260	
7	126	140	0.9	8	138	229	39	10	95	95	469	
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	Α	В	С	D	Е
1	Player	Team	Pos	G	PTS
2	Lindsay Allen	MIN	G	29	179
3	Rebecca Allen		G	40	255
4	Laeticia Amihe	ATL	F	20	56
5	Ariel Atkins	WAS	G	27	311
6	Shakira Austin	WAS	C-F	19	190
7	Rachel Banhar	MIN	G	32	176
8	Kierstan Bell	LVA	G	36	132
9	Grace Berger	IND	G	36	151
0	Morgan Bertsc	CHI	F	28	122
11	Monique Billinç	ATL	F	39	187
2	DeWanna Bon	CON	F-G	40	697
3	Aliyah Boston	IND	F-C	40	578
4	Kalani Brown	DAL	С	32	249
15	Lexie Brown	LAS	G	12	149
6	Leigha Brown	CON	G	25	21
17	Rae Burrell	LAS	G-F	29	105
18	Veronica Burto	DAL	G	40	94
9	Maya Caldwell	IND	G	30	58
20	Jordin Canada	LAS	G	38	505
21	Emma Cannor	IND	F	30	175
22	Bridget Carleto	MIN	F	38	
23	DiJonai Carrin	CON	G-F	32	265
24	Kaila Charles		G-F	4	
25	Layshia Clarer		G	24	
26	-	LVA	F	39	
27	Natasha Cloud		G	37	
28	Nia Clouden	LAS	G	5	8



# Step o: Get data Step 1: Make a spreadsheet Step 1<sup>1</sup>/<sub>2</sub>: 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 = "1PfaNDQabnwIEwAMzmrQcND6\_Iph3M0XK1YrflhLJE0s"
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 = "1PfaNDQabnwIEwAMzmrQcND6\_Iph3M0XK1YrflhLJE0s"
spreadsheet = load-spreadsheet(ssid)

stats =
 load-table:
 player, team, pos, games, pts
 source: spreadsheet.sheet-by-name("wnba-stats simple",
 true)
 end

player	team
"Lindsay Allen"	"MIN"
"Rebecca Allen"	"CON"
"Laeticia Amihere"	"ATL"
"Ariel Atkins"	"WAS"
"Shakira Austin"	"WAS"
"Rachel Banham"	"MIN"
"Kierstan Bell"	"LVA"

pos	games	pts
"G"	29	179
"G"	40	255
"F"	20	56
"G"	27	311
"C-F"	19	190
"G"	32	176
"G"	36	132

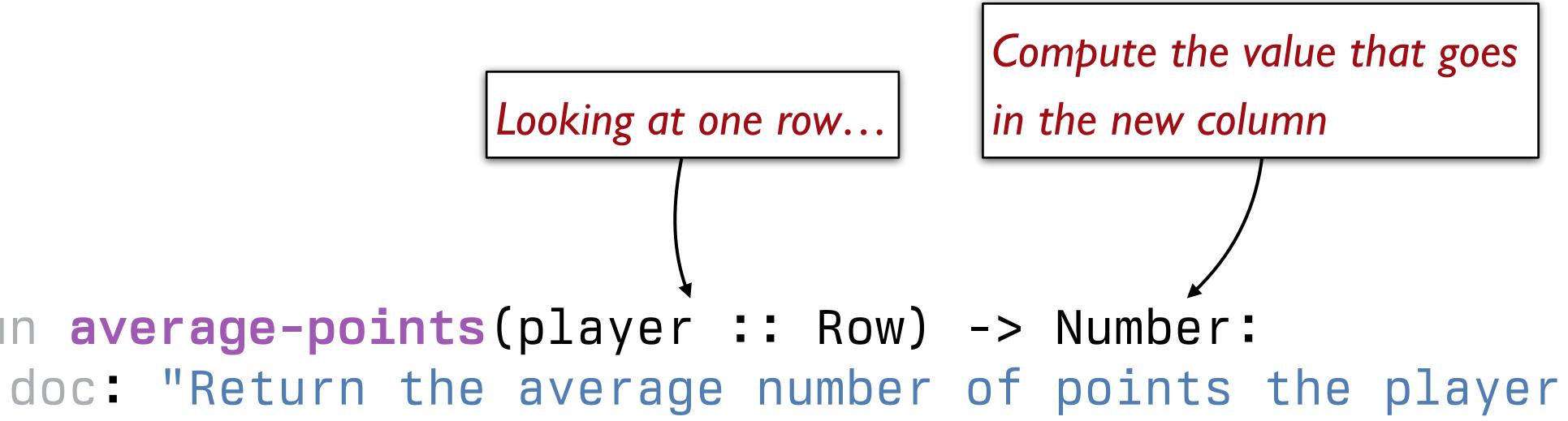
Exercise: Who scores the most points per game?

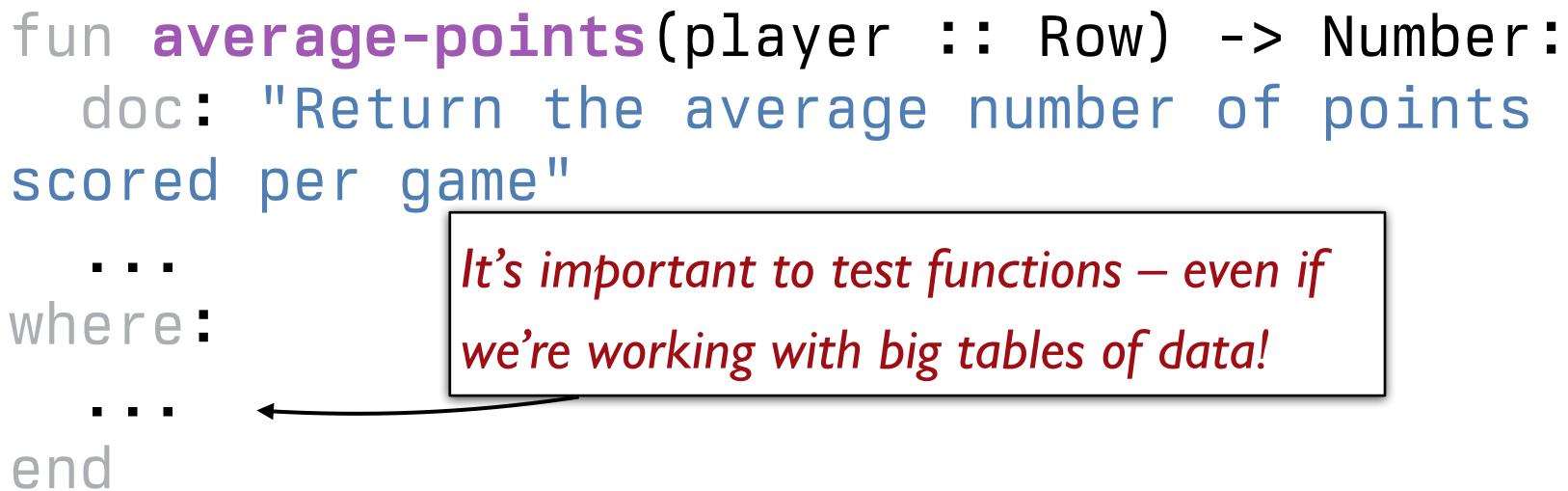
To compute the average points per game for each player, we need to *build a new column*.

Looking at one row...

## fun average-points(player :: Row) -> Number: scored per game"

end





doc: "Return the average number of points the player

We can test table program by using test tables. These are tables that have the same structure as the table for our real data, but which are smaller and contain data that are useful for testing.





#### test-stats =

- table: player, team, pos, games, pts
  - row: "Michael Jordan", "TUS", "F", 22, 116
  - row: "Bugs Bunny", "TUS", "G", 25, 74
  - row: "Nawt", "MST", "G", 9, 60
  - row: "Blanko", "MST", "G", 25, 174

end

fun average-points(player :: Row) -> Number: scored per game"

```
where:
  average-points(test-stats.row-n(0)) is 116 / 22
  average-points(test-stats.row-n(1)) is 74 / 25
end
```

```
doc: "Return the average number of points the player
```

## test-stats = table: player, team, pos, games, pts row: "Michael Jordan", "TUS", "F", 22, 116 row: "Bugs Bunny", "TUS", "G", 25, 74 row: "Nawt", "MST", "G", 9, 60 row: "Blanko", "MST", "G", 25, 174 end

fun average-points(player :: Row) -> Number: scored per game" player["pts"] / player["games"] where: average-points(test-stats.row-n(1)) is 74 / 25 end

```
doc: "Return the average number of points the player
```

```
average-points(test-stats.row-n(0)) is 116 / 22
```

#### >>> build-column(stats, "avg", average-points)



Name of the

## >>> build-column(stats, "avg", average-points)

new column

### >>> build-column(stats, "avg",



Name of the

new column

Name of the

function to use

### >>> build-column(stats, "avg", average-points)

player	team	pos	games	pts	avg
"Lindsay Allen"	"MIN"	"G"	29	179	179/29
"Rebecca Allen"	"CON"	"G"	40	255	6.375
"Laeticia Amihere"	"ATL"	"F"	20	56	2.8
"Ariel Atkins"	"WAS"	"G"	27	311	11.518
"Shakira Austin"	"WAS"	"C-F"	19	190	10
"Rachel Banham"	"MIN"	"G"	32	176	5.5

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

build-column(stats, "avg", average-points)

## We can sort by the values in our new column, but first let's give a name to that table: stats-with-avgs =

## >>> order-by(stats-with-avgs, "avg", false)

player	team	pos	games	pts	avg
"Jewell Loyd"	"SEA"	"G"	38	939	24.7105263157894736842
"Breanna Stewart"	"NYL"	"F"	40	919	22.975
"A'ja Wilson"	"LVA"	"F"	40	912	22.8
"Napheesa Collier"	"MIN"	"F"	37	796	21.513
"Arike Ogunbowale"	"DAL"	"G"	40	849	21.225
				(	

#### build-column(stats, "avg", average-points)

How does Breanna compare with other NY Liberty players?

player	team	pos	games	pts	avg
"Jewell Loyd"	"SEA"	"G"	38	939	24.7105263157894736842
"Breanna Stewart"	"NYL"	"F"	40	919	22.975
"A'ja Wilson"	"LVA"	"F"	40	912	22.8
"Napheesa Collier"	"MIN"	"F"	37	796	21.513
"Arike Ogunbowale"	"DAL"	"G"	40	849	21.225
			- /	(	

# stats-with-avgs =

#### top-scorers = order-by(stats-with-avgs, "avg", false)

#### build-column(stats, "avg", average-points)

### >>> fun nyl(player): player["team"] == "NYL" end

### >>> fun nyl(player): player["team"] == "NYL" end >>> filter-with(top-scorers, nyl)

player	team	pos	games	pts	avg
"Breanna Stewart"	"NYL"	"F"	40	919	22.975
"Sabrina Ionescu"	"NYL"	"G"	36	613	17.027
"Betnijah Laney"	"NYL"	"G-F"	40	513	12.825
"Jonquel Jones"	"NYL"	"F"	40	453	11.325
"Courtney Vandersloot"	"NYL"	"G"	39	410	10.512820
"Marine Johannes"	"NYL"	"G"	35	249	7.1142857



# Exercise: Generalizing the question

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



player	team	pos	games	pts
"Lindsay Allen"	"MIN"	"G"	29	179
"Rebecca Allen"	"CON"	"G"	40	255
"Laeticia Amihere"	"ATL"	"F"	20	56
"Ariel Atkins"	"WAS"	"G"	27	311
"Shakira Austin"	"WAS"	"C-F"	19	190
"Rachel Banham"	"MIN"	"G"	32	176
"Kierstan Bell"	"LVA"	"G"	36	132
"Grace Berger"	"IND"	"G"	36	151
"Morgan Bertsch"	"CHI"	"F"	28	122
"Monique Billings"	"ATL"	"F"	39	187
<u>Click to show the re</u>	<u>maining</u>	<u>165 rows.</u>	<u></u>	

"NYL"



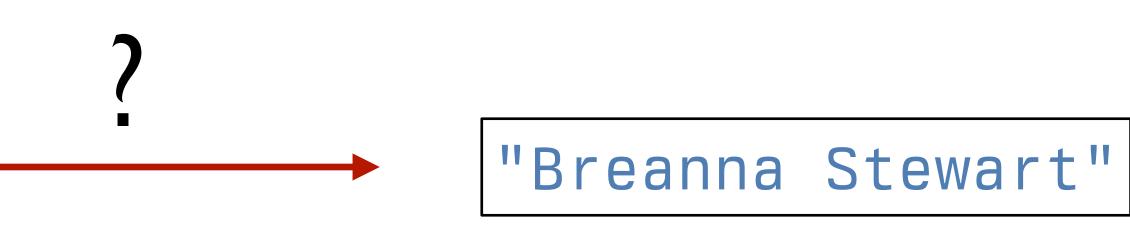
### "Breanna Stewart"

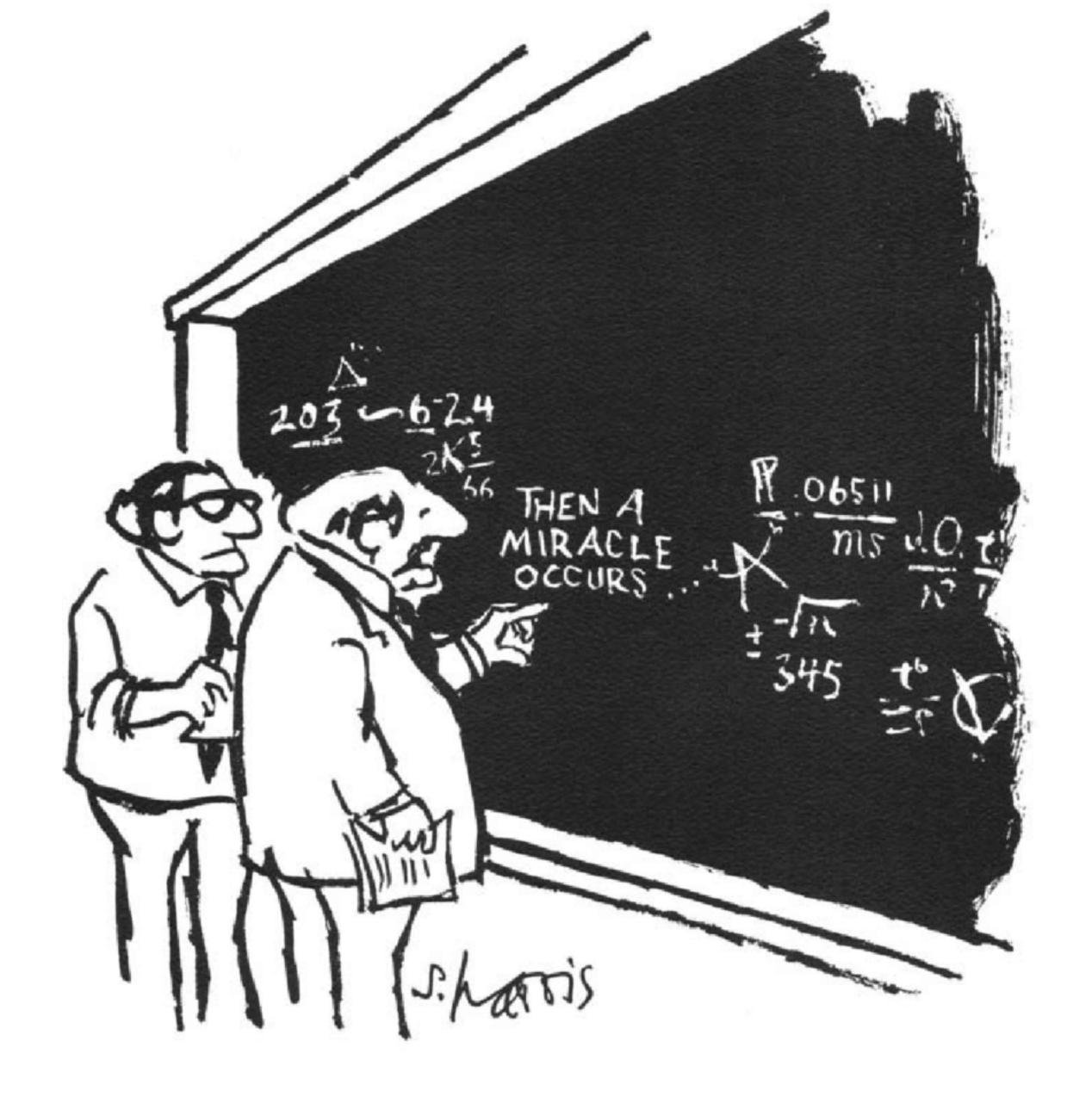


player	team	pos	games	pts
"Lindsay Allen"	"MIN"	"G"	29	179
"Rebecca Allen"	"CON"	"G"	40	255
"Laeticia Amihere"	"ATL"	"F"	20	56
"Ariel Atkins"	"WAS"	"G"	27	311
"Shakira Austin"	"WAS"	"C-F"	19	190
"Rachel Banham"	"MIN"	"G"	32	176
"Kierstan Bell"	"LVA"	"G"	36	132
"Grace Berger"	"IND"	"G"	36	151
"Morgan Bertsch"	"CHI"	"F"	28	122
"Monique Billings"	"ATL"	"F"	39	187
<u>Click to show the re</u>	maining	165 rows.	<u></u>	

"NYL"







#### 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.

player	team	þos	games	þts
Michael Jordan	TUS	F	22	11
Bugs Bunny	TUS	G	25	7-
Nawt	MST	G	9	6
Blanko	MST	G	25	17.

"TUS"

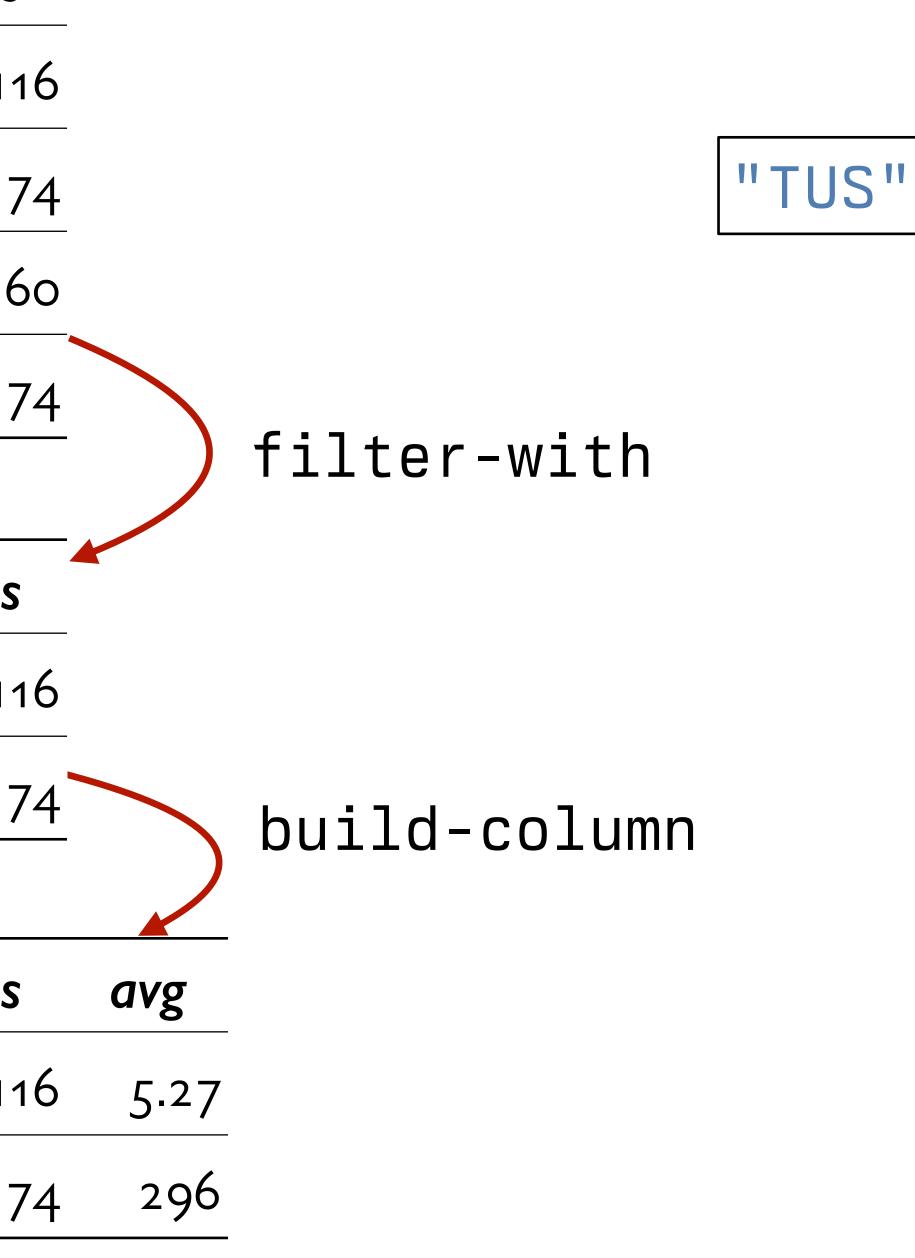
player	team	þos	games	þts
Michael Jordan	TUS	F	22	11
Bugs Bunny	TUS	G	25	7
Nawt	MST	G	9	6
Blanko	MST	G	25	17

player	team	þos	games	þts
Michael Jordan	TUS	F	22	11
Bugs Bunny	TUS	G	25	7



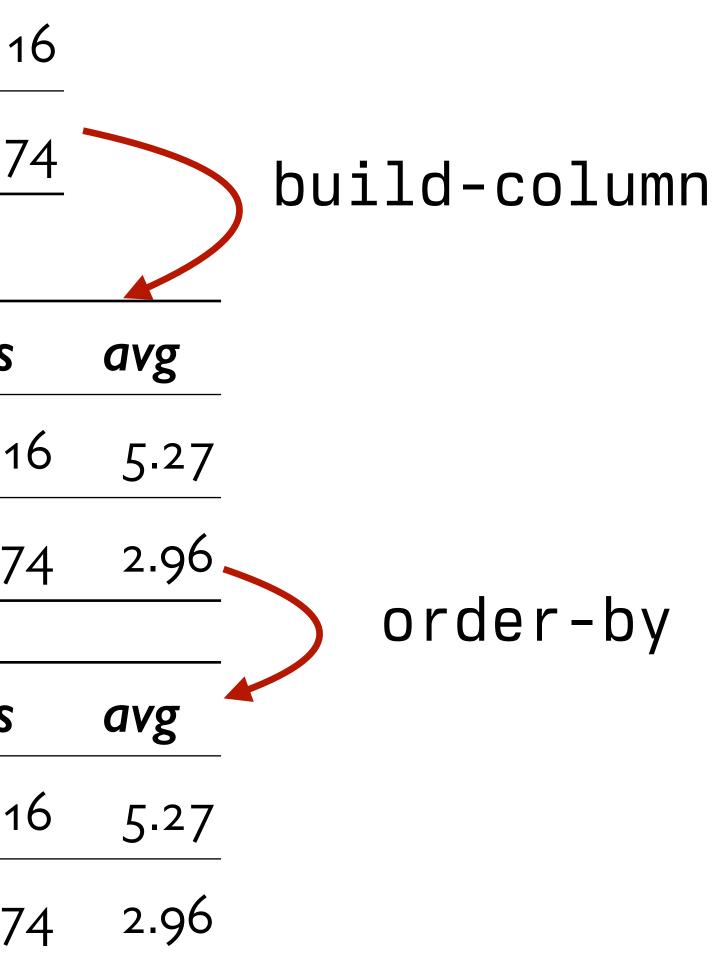
player	team	þos	games	þts
Michael Jordan	TUS	F	22	11
Bugs Bunny	TUS	G	25	7
Nawt	MST	G	9	6
Blanko	MST	G	25	17

player	team	þos	games	þts
Michael Jordan	TUS	F	22	11
Bugs Bunny	TUS	G	25	7
player	team	þos	games	þts
Michael Jordan	TUS	F	22	11
Bugs Bunny	TUS	G	25	7



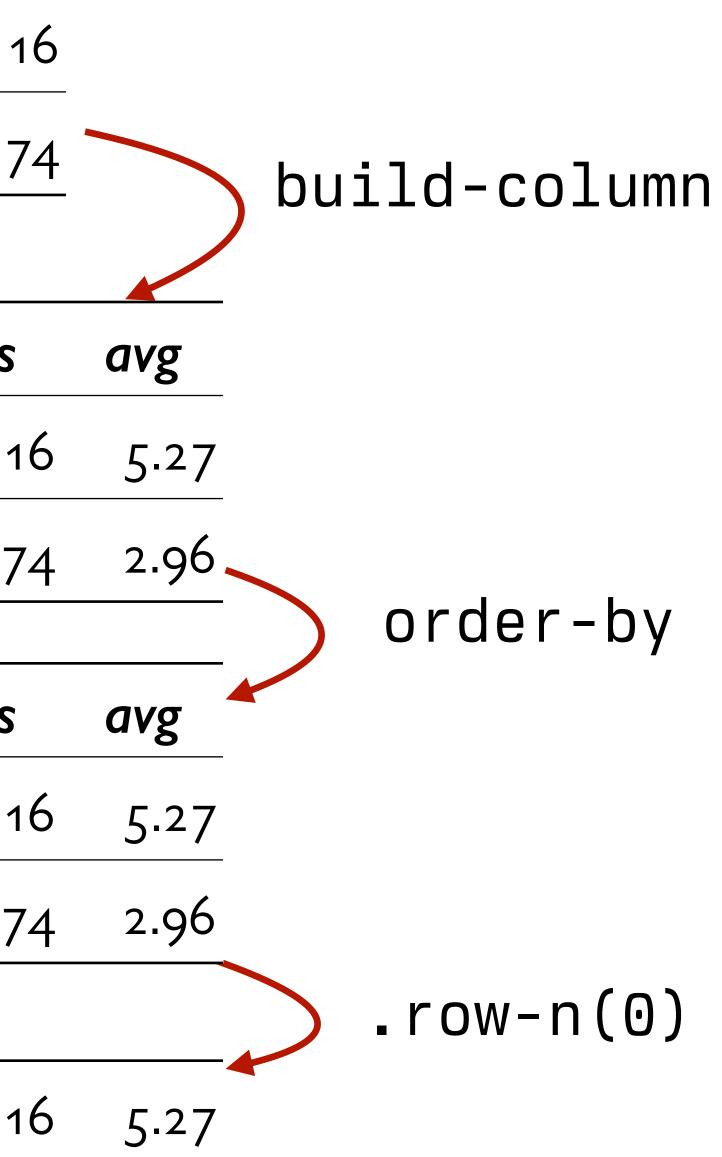
player	team	þos	games	þts
Michael Jordan	TUS	F	22	11
Bugs Bunny	TUS	G	25	7

team	þos	games	þts
TUS	F	22	11
TUS	G	25	7
team	þos	games	þts
TUS	F	22	11
TUS	G	25	7
	TUS TUS <i>team</i> TUS	TUSFTUSGteamposTUSF	TUSF22TUSG25teamposgamesTUSF22TUSC



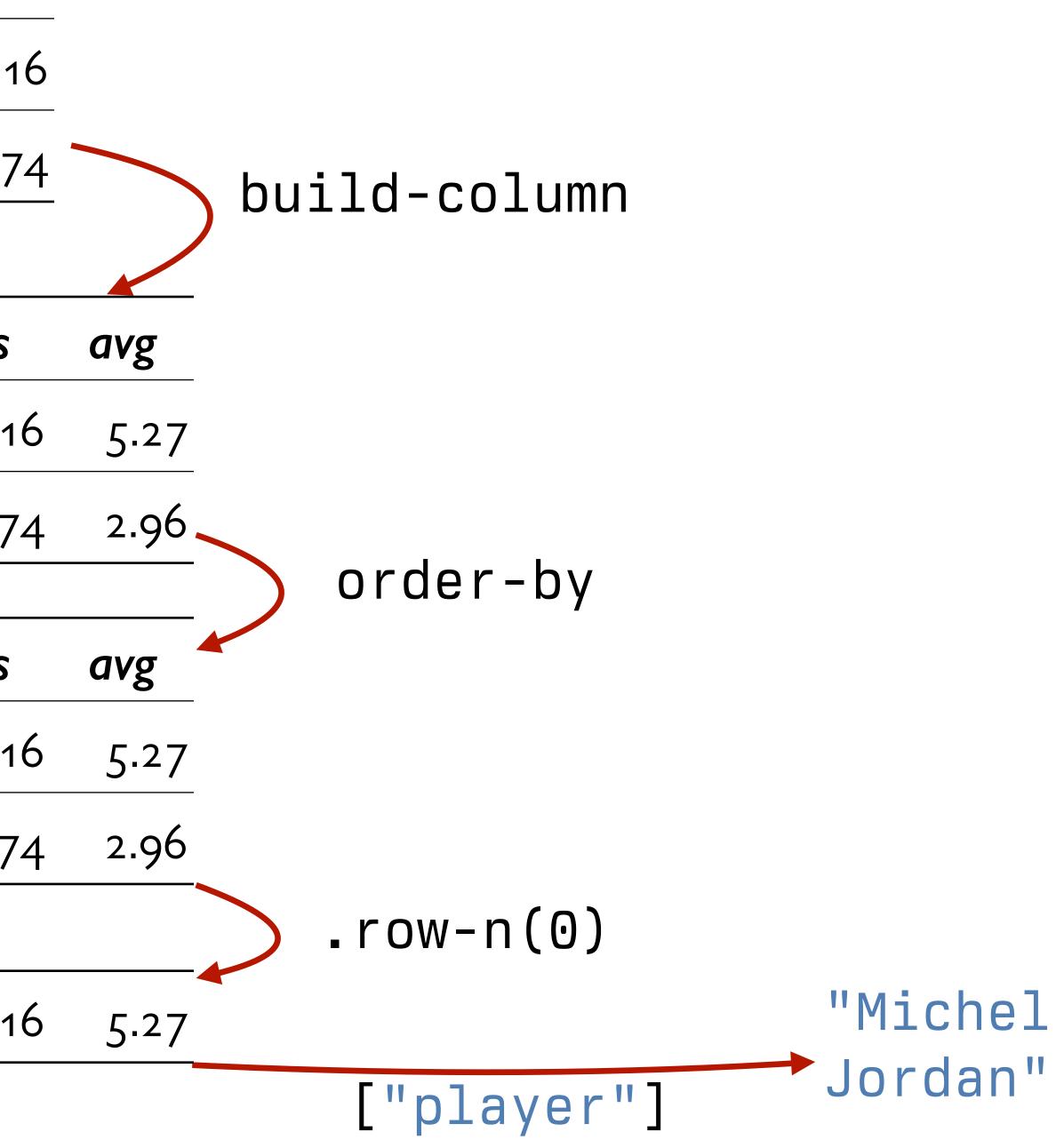
player	team	þos	games	þts
Michael Jordan	TUS	F	22	11
Bugs Bunny	TUS	G	25	7

player	team	þos	games	þts
Michael Jordan	TUS	F	22	11
Bugs Bunny	TUS	G	25	7
player	team	þos	games	þts
Michael Jordan	TUS	F	22	11
Bugs Bunny	TUS	G	25	7
Michael Jordan	TUS	F	22	11



player	team	þos	games	þts
Michael Jordan	TUS	F	22	11
Bugs Bunny	TUS	G	25	7

player	team	þos	games	þts
Michael Jordan	TUS	F	22	11
Bugs Bunny	TUS	G	25	7
player	team	þos	games	þts
Michael Jordan	TUS	F	22	11
Bugs Bunny	TUS	G	25	7
Michael Jordan	TUS	F	22	11



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

test-stats =
 table: player, team, pos, games, pts
 row: "Michael Jordan", "TUS", "F", 22, 116
 row: "Bugs Bunny", "TUS", "G", 25, 74
 row: "Nawt", "MST", "G", 9, 60
 row: "Blanko", "MST", "G", 25, 174
 end

fun top-scorer-on-team(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-stats =
 table: player, team, pos, games, pts
 row: "Michael Jordan", "TUS", "F", 22, 116
 row: "Bugs Bunny", "TUS", "G", 25, 74
 row: "Nawt", "MST", "G", 9, 60
 row: "Blanko", "MST", "G", 25, 174
 end

fun top-scorer-on-team(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-on-team(test-stats, "TUS") is "Michael Jordan"
top-scorer-on-team(test-stats, "MST") is "Blanko"
end

fun top-scorer-on-team(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-on-team(test-stats, "TUS") is "Michael Jordan"

top-scorer-on-team(test-stats, "MST") is "Blanko" end

fun top-scorer-on-team(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-on-team(test-stats, "TUS") is "Michael Jordan" top-scorer-on-team(test-stats, "MST") is "Blanko" end

fun top-scorer(players :: Table) -> String: . . . where top-scorer(test-stats) is "Blanko" # Ideally, add at least one more test case... end

fun top-scorer-on-team(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-on-team(test-stats, "TUS") is "Michael Jordan"
top-scorer-on-team(test-stats, "MST") is "Blanko"
end

```
fun top-scorer(players :: Table) ->
   doc: "Return the name of the play
points"
   ...
where:
   top-scorer(test-stats) is "Blanko
   # Ideally, add at least one more
end
```

<pre>&gt; String: ver with the hid</pre>	hest average number of
	This is just putting the expressions
	we wrote before into a function an
0"	then returning the name of the
test case	player in the first row.



fun top-scorer-on-team(players :: Table, team :: String) -> String: ... end

fun top-scorer(players :: Table) -> String: doc: "Return the name of the player with the highest average number of points" ... where: top-scorer(test-stats) is "Blanko"

top-scorer(test-stats) is "Blanko"
 # Ideally, add at least one more test case...
end

fun top-scorer(players :: Table) -> String:

players-with-avgs = build-column(players, "avg", average-points)

sorted-by-avg = order-by(players-with-avgs, "avg", false)

top-player = sorted-by-avg.row-n(0)

top-player["player"] where

top-scorer(test-stats) is "Blanko" # Ideally, add at least one more test case... end

fun top-scorer-on-team(players :: Table, team :: String) -> String: ... end

```
doc: "Return the name of the player with the highest average number of points"
```

. . .

here:

fun top-scorer-on-team(players :: Table, team :: String) -> String: doc: "Return the name of the player on the given team with the highest average points per game"

top-scorer-on-team(test-stats, "TUS") is "Michael Jordan" top-scorer-on-team(test-stats, "MST") is "Blanko" end

fun top-scorer(players :: Table) -> String: ... end

Ok, we've got **top-scorer** to use, so let's start filling in this body.

fun top-scorer-on-team(players :: Table, team :: String) -> String: doc: "Return the name of the player on the given team with the highest average points per game" team-players = ... top-scorer(team-players) where: top-scorer-on-team(test-stats, "TUS") is "Michael Jordan"

top-scorer-on-team(test-stats, "MST") is "Blanko"
end

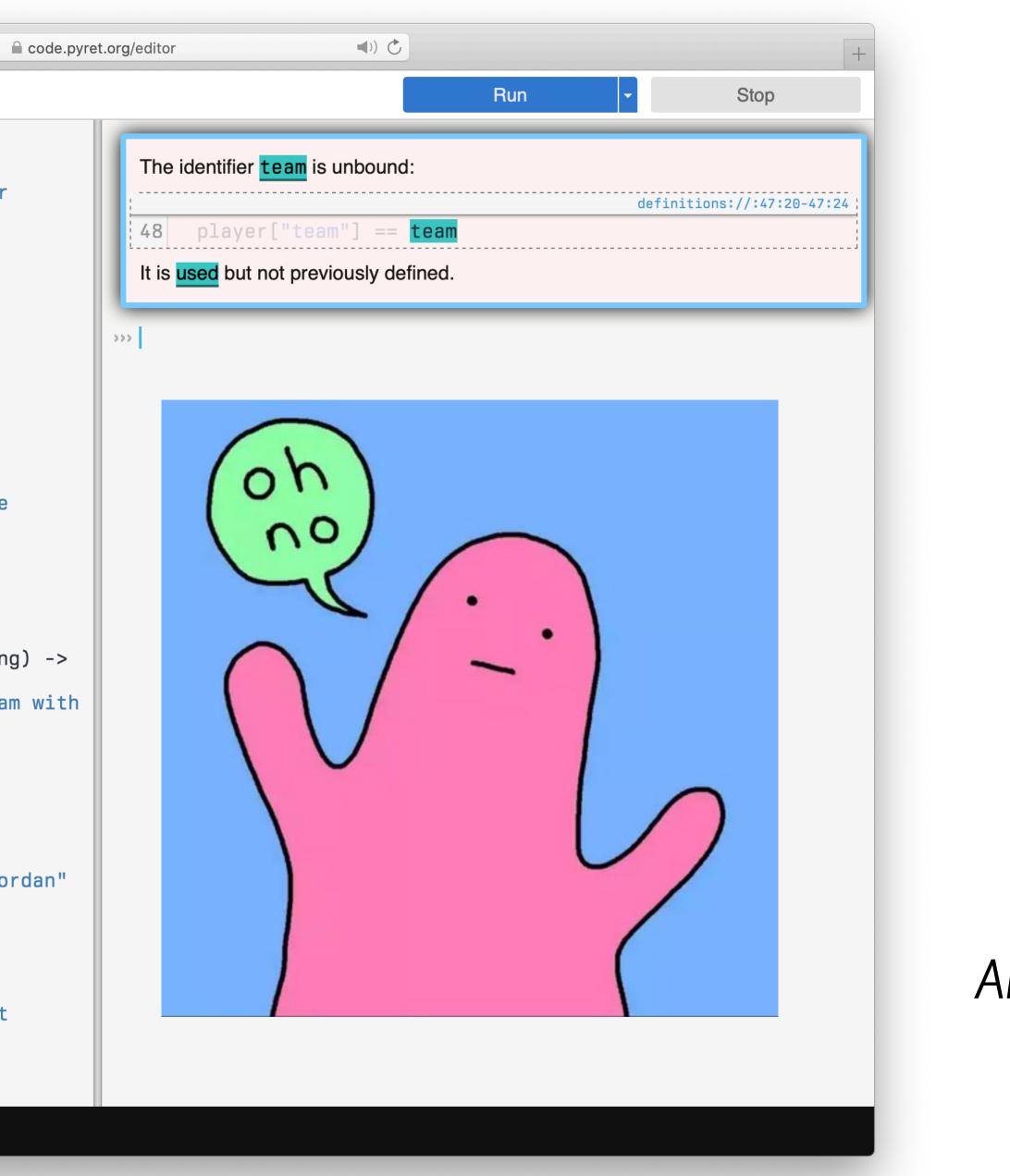
fun top-scorer(players :: Table) -> String: ... end

fun top-scorer-on-team(players :: Table, team :: String) -> String: doc: "Return the name of the player on the given team with the highest average points per game" team-players = filter-with(players, is-on-team) top-scorer(team-players) where: top-scorer-on-team(test-stats, "TUS") is "Michael Jordan" top-scorer-on-team(test-stats, "MST") is "Blanko" end

fun is-on-team(player :: Row) -> Boolean:
 doc: "Return true if the player is on the team we're interested in"
 player["team"] == team
end

fun top-scorer(players :: Table) -> String: ... end

•	
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31 32	
	<pre>fun average-points(player :: Row) -&gt; Number:</pre>
34	doc: "Return the average number of points the player
	scored per game"
35 🔻	
36	where:
37 38	average-points(test-stats.row-n(0)) is 116 / 22 average-points(test-stats.row-n(1)) is 74 / 25
39	end
40	
41	
42	#
43	# Who is the individual top scorer for a given team?
44 45	#
	<pre>fun is-on-team(player :: Row) -&gt; Boolean:</pre>
47	doc: "Return true if the player is on the team we're
	interested in"
48 •	player["team"] == team
49	end
50 51	
52	
	<pre>fun top-scorer-on-team(players :: Table, team :: String)</pre>
	String:
54	doc: "Return the name of the player on the given team
	the highest average points per game"
55 56	$t_{n} = n = n = t_{n} = t_{n$
57	<pre>team-players = filter-with(players, is-on-team)</pre>
58	top-scorer(team-players)
59	
60	where:
61	top-scorer-on-team(test-stats, "TUS") is "Michael Jord
62 63	<pre>top-scorer-on-team(test-stats, "MST") is "Blanko" end</pre>
64	enu
65	
	<pre>fun top-scorer(players :: Table) -&gt; String:</pre>
67	doc: "Return the name of the player with the highest
	average number of points"
68	playara with aver
59 70	<pre>players-with-avgs =     build-column(players, "avg", average-points)</pre>





```
test-stats = ...
```

```
un top-scorer-on-team(players :: Table, team :: String) -> String:
average points per game"
  team-players = filter-with(players, is-on-team)
 top-scorer(team-players)
where
  top-scorer-on-team(test-stats, "TUS") is "Michael Jordan"
  top-scorer-on-team(test-stats, "MST") is "Blanko"
end
```

```
fun is-on-team(player :: Row) -> Boolean:
 player["team"] == team
end
```

fun top-scorer(players :: Table) -> String: ... end

doc: "Return the name of the player on the given team with the highest

team is only defined inside this function

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

But we're trying to use it here!



fun top-scorer-on-team(players :: Table, team :: String) -> String: doc: "Return the name of the player on the given team with the highest average points per game"

fun is-on-team(player :: Row) -> Boolean: player["team"] == team end

*team-players* = filter-with(players, is-on-team) top-scorer(team-players) wherel top-scorer-on-team(test-stats, "TUS") is "Michael Jordan" top-scorer-on-team(test-stats, "MST") is "Blanko" end

fun top-scorer(players :: Table) -> String: ... end

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

```
test-table = ...
```

```
fun top-scorer-on-team(players :: Table, team :: String) -> String:
average points per game"
```

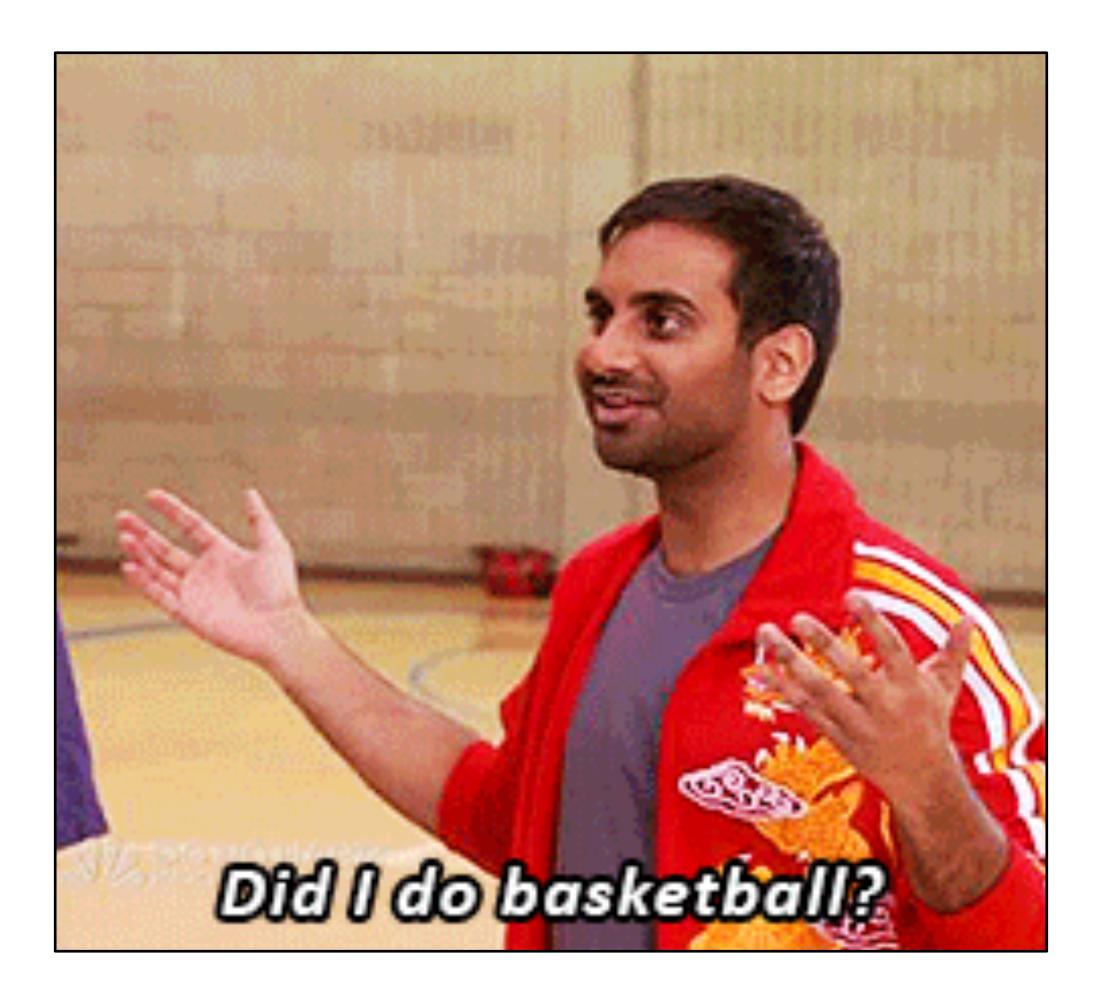
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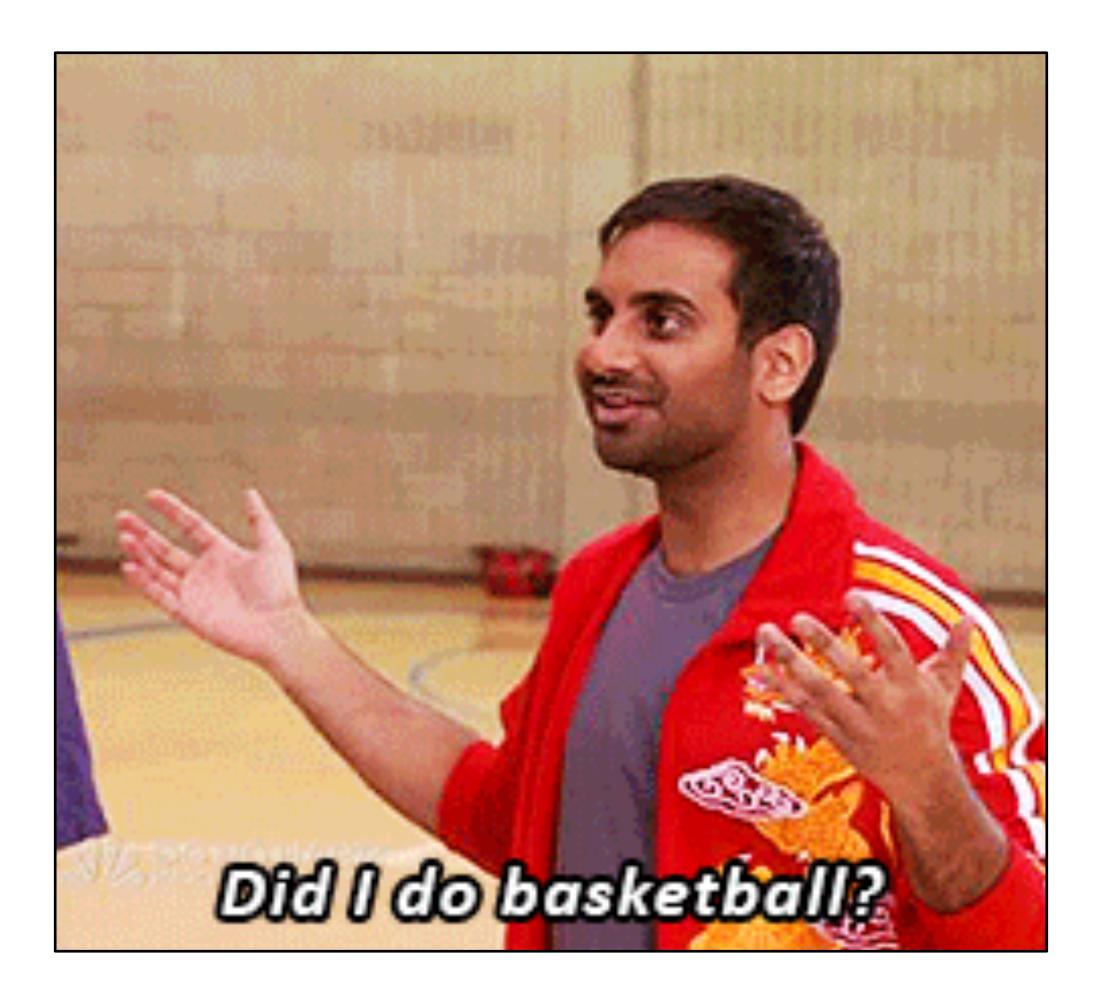
*team-players* = filter-with(players, is-on-team) top-scorer(team-players) where top-scorer-on-team(test-stats, "TUS") is "Michael Jordan" top-scorer-on-team(test-stats, "MST") is "Blanko" end

fun top-scorer(players :: Table) -> String: ... end



Class code: tinyurl.com/101-2024-02-01





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