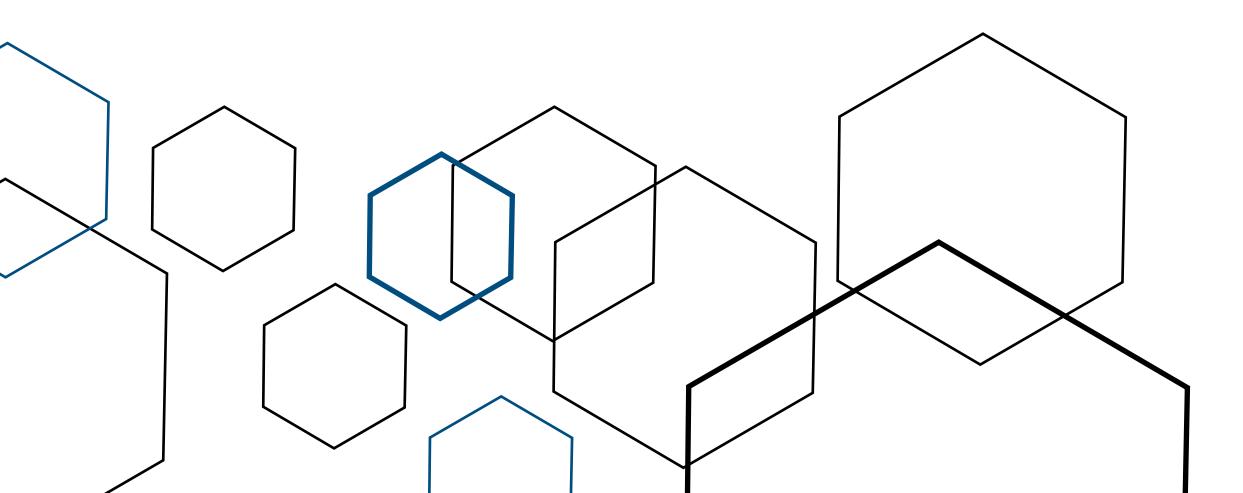






Starting with Data





Questions

- What is a data frame?
- How can I get data into and out of R?
- How can I get summary information about my data?
- How can I change the formatting of my data?

Objectives

- Describe what a data frame is
- Create a data frame manually
- Load external data into a data frame
- Summarize data frame contents
- Describe the various variable formats R recognizes



Data frame structure

Most of us are familiar with viewing data in a form like this:

	A	В	С	D	E	F	G	Н	1	J
1	geoid	state	Designated	county	Туре	dec_score	SE_Flag	Population	medhhincome2014_tract	PovertyRate
2	01001020200	Alabama		Autauga	Low-Income Community	4		2,196	\$ 41,107	24.0%
3	01001020300	Alabama		Autauga	Non-LIC Contiguous	6		3,136	\$ 51,250	10.7%
4	01001020700	Alabama	1	Autauga	Low-Income Community	9		3,047	\$ 45,234	19.0%
5	01001020802	Alabama		Autauga	Non-LIC Contiguous	10		10,743	\$ 61,242	15.3%
6	01001021000	Alabama		Autauga	Non-LIC Contiguous	5		2,899	\$ 49,567	15.1%
7	01001021100	Alabama		Autauga	Low-Income Community	6		3,247	\$ 40,801	19.4%
8	01003010100	Alabama		Baldwin	Non-LIC Contiguous	6		4,013	\$ 45,667	14.0%
9	01003010200	Alabama	1	Baldwin	Low-Income Community	9		3,067	\$ 33,333	27.2%
10	01003010300	Alabama		Baldwin	Non-LIC Contiguous	10		8,079	\$ 47,443	6.8%
11	01003010400	Alabama	1	Baldwin	Non-LIC Contiguous	9		4,578	\$ 46,696	14.8%
12	01003010500	Alabama	1	Baldwin	Low-Income Community	8		5,115	\$ 45,825	16.8%
13	01003010600	Alabama	1	Baldwin	Low-Income Community	9		3,503	\$ 28,219	28.2%
14	01003010904	Alabama	1.07	Baldwin	Non-LIC Contiguous	10		6,523	\$ 48,521	16.3%
15	01003010906	Alabama		Baldwin	Non-LIC Contiguous	10		5,272	\$ 42,120	11.5%
16	01003011000	Alabama		Baldwin	Low-Income Community	10		3,885	\$ 34,883	21.8%
17	01003011401	Alabama		Baldwin	Non-LIC Contiguous	10		10,021	\$ 44,886	11.9%
18	01003011406	Alabama	ļ,	Baldwin	Low-Income Community	10		3,810	\$ 41,867	19.0%
19	01003011407	Alabama		Baldwin	Low-Income Community	10		4,970	\$ 41,840	20.8%
20	01003011501	Alabama	1	Baldwin	Non-LIC Contiguous	9		5,947	\$ 48,191	17.9%
21	01003011502	Alabama	1	Baldwin	Low-Income Community	10		11,575	\$ 39,563	20.3%
22	01003011601	Alabama		Baldwin	Low-Income Community	10		6,640	\$ 39,586	24.3%
23	01005950100	Alabama	1	Barbour	Low-Income Community	6		3,477	\$ 38,571	33.2%
24	01005950200	Alabama		Barbour	Low-Income Community	1		4,404	\$ 32,742	27.2%
25	01005950300	Alabama		Barbour	Low-Income Community	1		1,657	\$ 29,911	36.1%
26	01005950400	Alabama		Barbour	Non-LIC Contiguous	1		3,693	\$ 33,241	19.6%
27	01005950500	Alabama		Barbour	Low-Income Community	8		3,438	\$ 38,859	19.1%
28	01005950600	Alabama		Barbour	Low-Income Community	4		2,003	\$ 27,708	31.0%
29	01005950700	Alabama		Barbour	Low-Income Community	6		1,959	\$ 28,409	31.3%
30	01005950800	Alabama		Barbour	Non-LIC Contiguous	5		2,195	\$ 40,724	14.2%
31	01005950900	Alabama		Barbour	Low-Income Community	4		3,788	\$ 27,027	28.5%
32	01007010001	Alabama		Bibb Cou	Low-Income Community	7		2,783	\$ 44,422	9.6%

Data frame structure

Most of us are familiar with viewing data in a form like this:

- What does each row represent?
- What does each column represent?

	A	В	С	D	E	F	G	Н	1	J
1	geoid	state	Designated	county	Туре	dec_score	SE_Flag	Population	medhhincome2014_tract	PovertyRate
2	01001020200	Alabama	1010	Autauga	Low-Income Community	4		2,196	\$ 41,107	24.0%
3	01001020300	Alabama		Autauga	Non-LIC Contiguous	6		3,136	\$ 51,250	10.7%
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6	01001021000	Alabama		Autauga	Non-LIC Contiguous	5		2,899	\$ 49,567	15.1%
7	01001021100	Alabama		Autauga	Low-Income Community	6		3,247	\$ 40,801	19.4%
8	01003010100	Alabama		Baldwin	Non-LIC Contiguous	6		4,013	\$ 45,667	14.0%
9	01003010200	Alabama	1	Baldwin	Low-Income Community	9		3,067	\$ 33,333	27.2%
10	01003010300	Alabama		Baldwin	Non-LIC Contiguous	10		8,079	\$ 47,443	6.8%
11	01003010400	Alabama	1	Baldwin	Non-LIC Contiguous	9		4,578	\$ 46,696	14.8%
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15	01003010906	Alabama		Baldwin	Non-LIC Contiguous	10		5,272	\$ 42,120	11.5%
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32	01007010001	Alabama		Bibb Cou	Low-Income Community	7	1	2,783	\$ 44,422	9.6%

Data frame structure

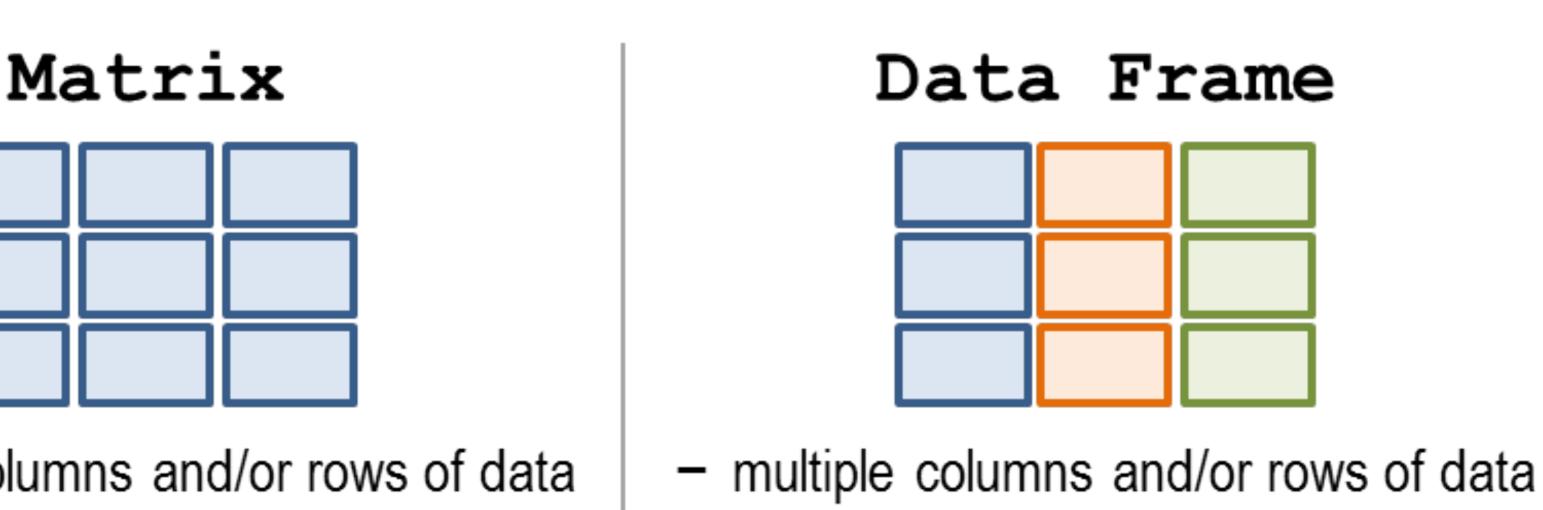
A data frame is R's version of a table. Each column is a vector of the same data type.

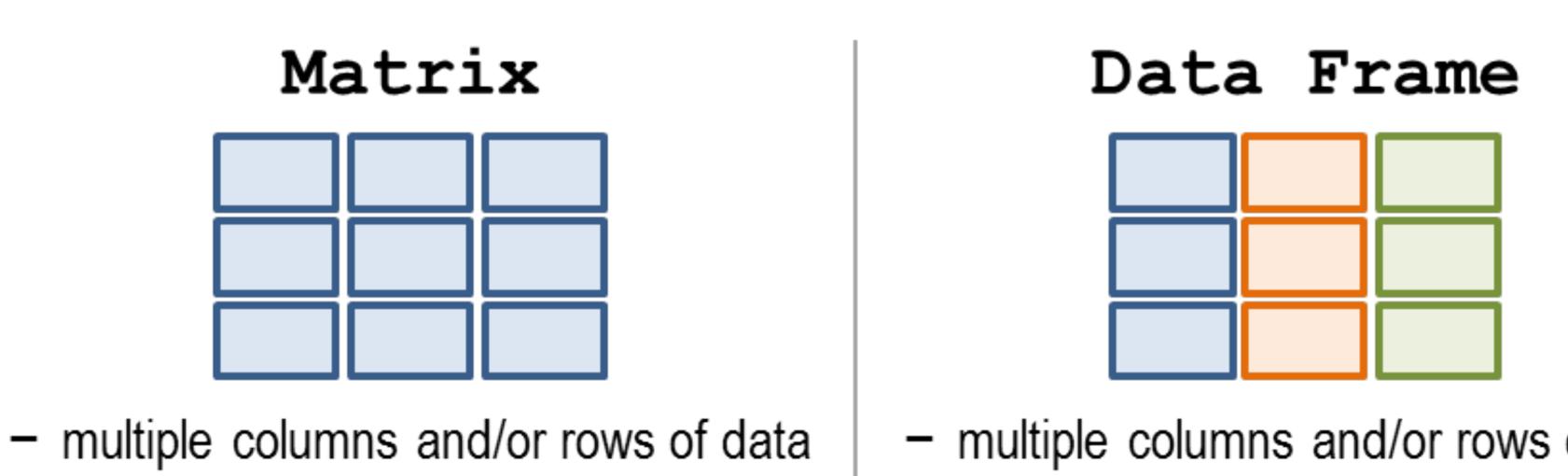
	A	В	С	D	E	F	G	н	1 T	J
1	geoid	state	Designated	county	Туре	dec_score	SE_Flag	Population	medhhincome2014_tract	PovertyRate
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31	01005950900	Alabama		Barbour	Low-Income Community	4		3,788	\$ 27,027	28.5%
32	01007010001	Alabama	· T	Bibb Cou	Low-Income Community	7	8	2,783		9.6%

What's a vector?



- 1 column or row of data
- 1 type (numeric or text)





- 1 type (numeric or text)
- A vector is a collection of observations that have the same format and are describing the same thing.
- A data frame is a collection of vectors.

- multiple types

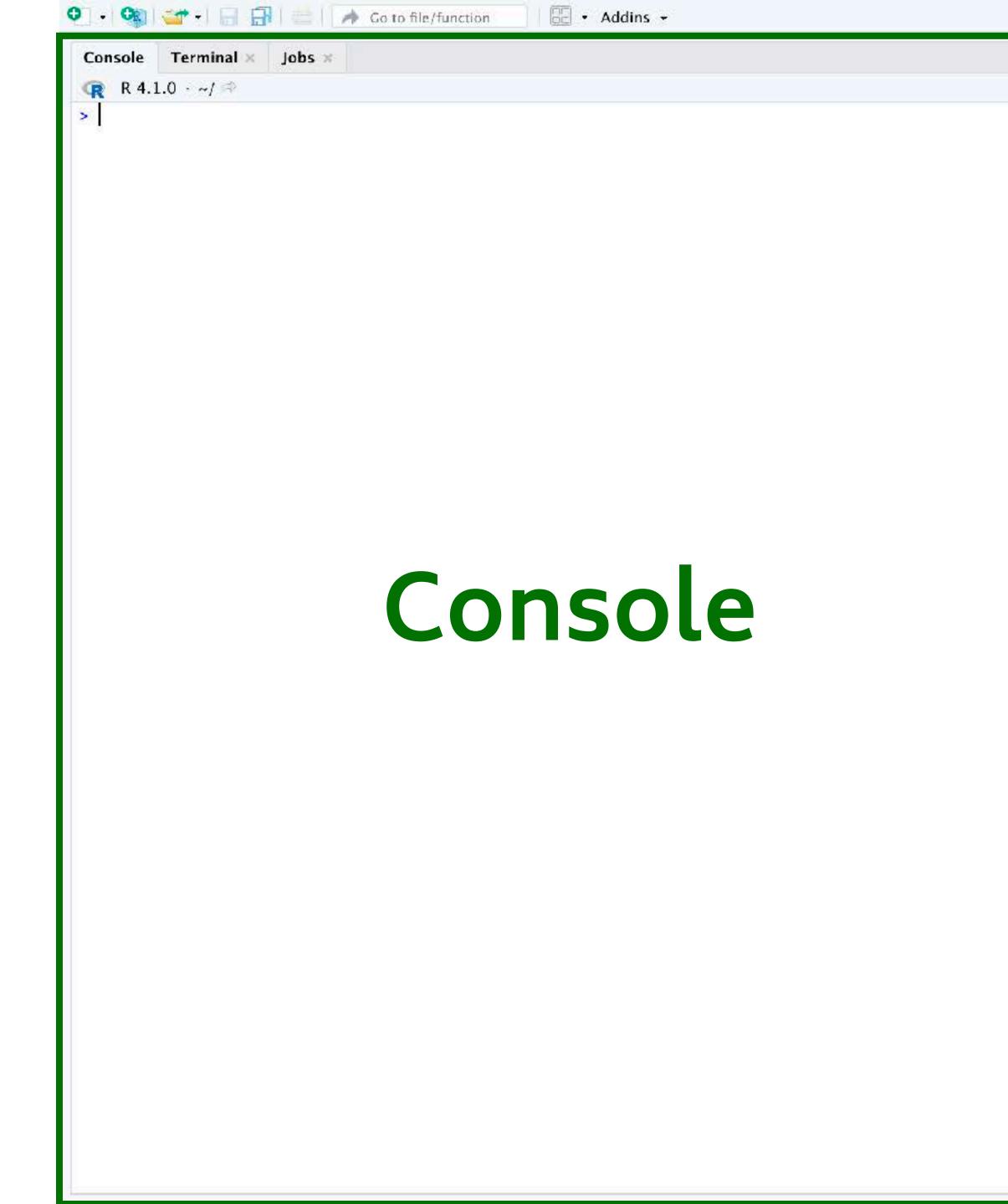


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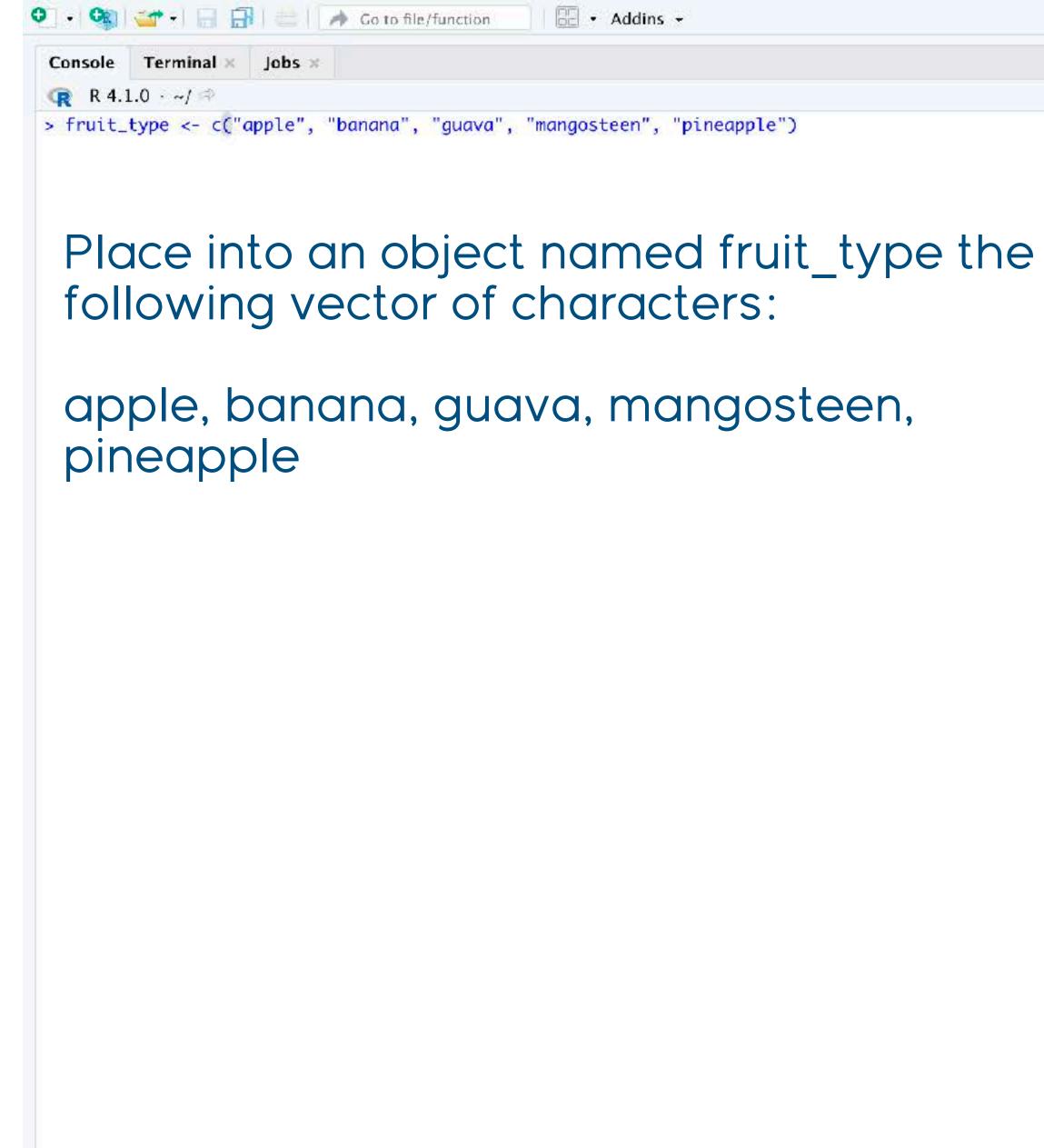
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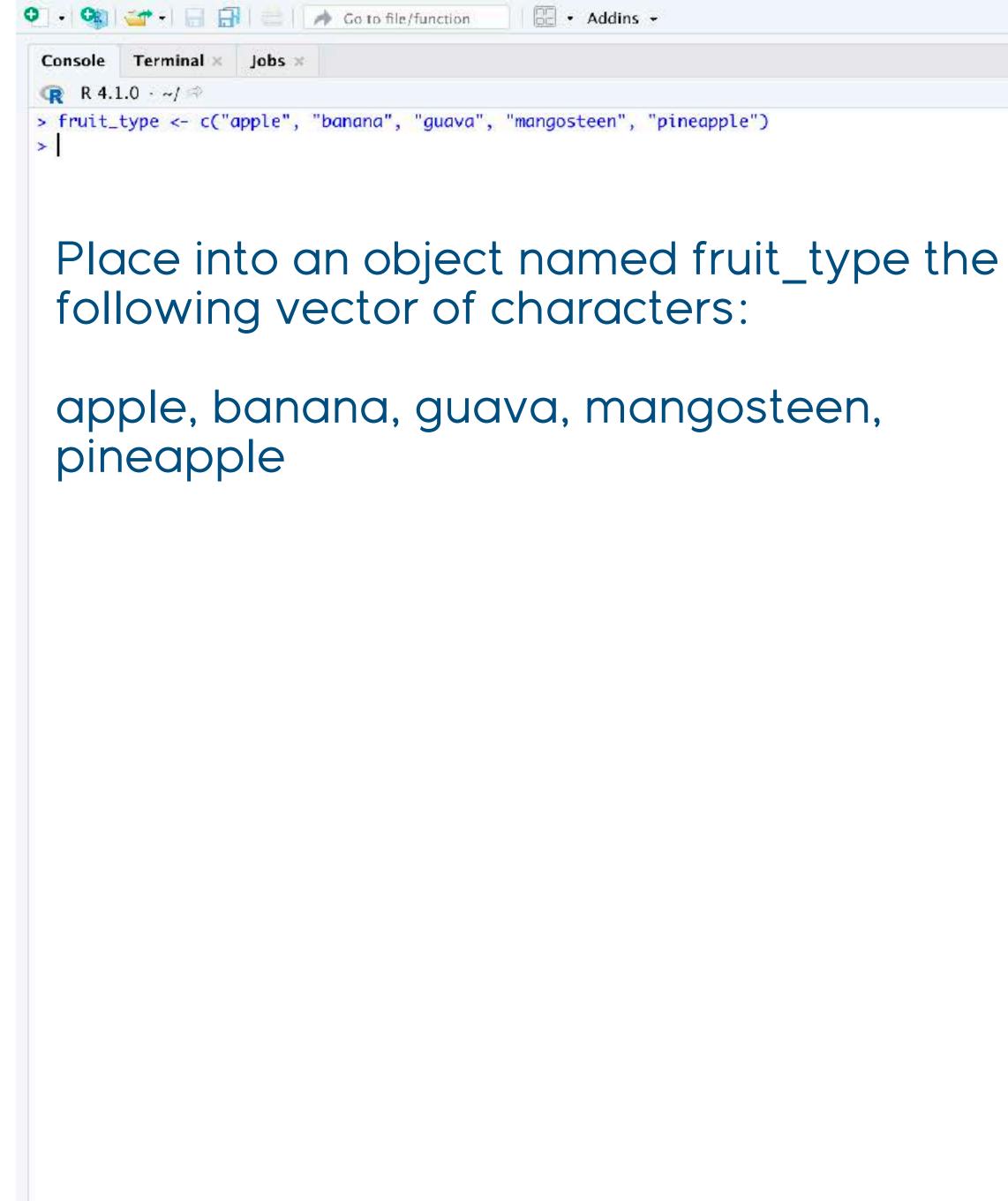




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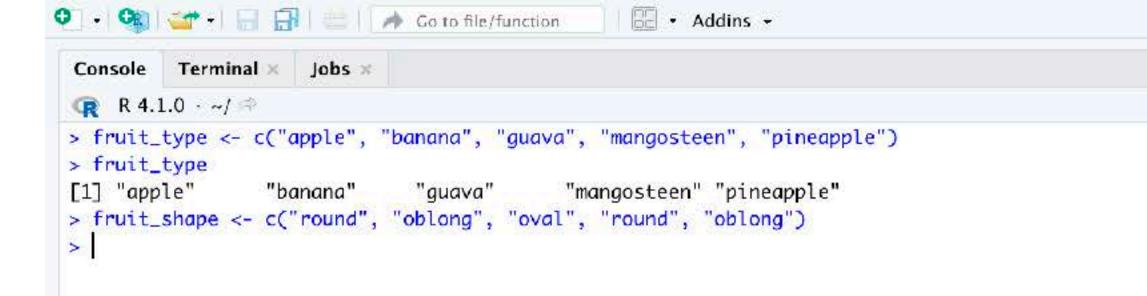
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Place into an object named fruit_shape the following vector of characters:

round, oblong, oval, round, oblong

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	fruit_shape	chr [1:	:5] "round" "oblong	" "oval" "round" "oblong"			
	fruit_type	chr [1:	:5] "apple" "banana	" "guava" "mangosteen" "pinea	apple"		

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Place into an object named fruits a data frame consisting of the fruit_type and fruit_shape vectors

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> fruit_type <- c("apple", "banana", "guava", "mangosteen", "pineapple")</pre>
> fruit_type
[1] "apple"
                 "banana"
                                         "mangosteen" "pineapple"
                             "guava"
> fruit_shape <- c("round", "oblong", "oval", "round", "oblong")</pre>
> fruits<-data.frame(fruit_type, fruit_shape)</pre>
> fruits
  fruit_type fruit_shape
       apple
                  round
 1
                  oblong
      banana
 2
                   oval
 3
       guava
 4 mangosteen
                  round
5 pineapple
                 oblong
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> fruit_type <- c("apple", "banana", "guava", "mangosteen", "pineapple")</pre>
> fruit_type
 [1] "apple"
                  "banana"
                                             "mangosteen" "pineapple"
                                "guava"
 > fruit_shape <- c("round", "oblong", "oval", "round", "oblong")</pre>
 > fruits<-data.frame(fruit_type, fruit_shape)</pre>
 > fruits
   fruit_type fruit_shape
        apple
                    round
 2
       banana
                   oblong
 3
                     oval
        guava
 4 mangosteen
                    round
 5 pineapple
                   oblong
 > weight<-c(85, 120, 55, 82, 905)
 > fruits<-data.frame(fruit_type, fruit_shape, weight)</pre>
 > fruits
   fruit_type fruit_shape weight
                              85
        apple
                    round
                             120
       banana
                   oblong
                              55
 3
        guava
                     oval
                              82
 4 mangosteen
                    round
 5 pineapple
                             905
                   oblong
 >
```

Place into an object named weight the following vector of numbers:

85, 120, 55, 82, 905

Place into an object named fruits a data frame consisting of the fruit type, fruit shape, and weight vectors.

Note that this overwrites the existing fruits object

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	, it_shape		chr [1-9	J "round	" "oblona"	"oval" "roun	d" "oblona"		
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> fruit_type <- c("apple", "banana", "guava", "mangosteen", "pineapple")</pre>
> fruit_type
 [1] "apple"
                                            "mangosteen" "pineapple"
                  "banana"
                               "guava"
 > fruit_shape <- c("round", "oblong", "oval", "round", "oblong")</pre>
> fruits<-data.frame(fruit_type, fruit_shape)</pre>
> fruits
  fruit_type fruit_shape
        apple
                    round
 2
       banana
                   oblong
 3
        guava
                     oval
 4 mangosteen
                    round
 5 pineapple
                   oblong
 > weight<-c(85, 120, 55, 82, 905)
 > fruits<-data.frame(fruit_type, fruit_shape, weight)</pre>
 > fruits
  fruit_type fruit_shape weight
        apple
                              85
                    round
 1
                             120
 2
       banana
                   oblong
 3
                              55
                     oval
        guava
                              82
 4 mangosteen
                    round
 5 pineapple
                   oblong
                             905
 > str(fruits)
 'data.frame': 5 obs. of 3 variables:
  $ fruit_type : chr "apple" "banana" "guava" "mangosteen" ...
  $ fruit_shape: chr "round" "oblong" "oval" "round" ...
  $ weight
             : num 85 120 55 82 905
 >
```

Tell me about the structure of the object fruits.

R tells us about the number of observations (rows) and number of columns. It also tells us about the type of data in each column and shows us the first few values. 📳 Project: (None) 🚽

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0 fru	2000-52-2422		50	05. OT	3 variabl	es		
Value	s it_shap	10	chr	F1-57	"round" "	oblona"	"oval" "round	d" "oblona"
	it_type							gosteen" "pineapple
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Reading in data

- existing data which we can then work with.
- or structures.
- read_csv() for instance, is designed to read comma separated value files

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• Most of the time, we will not create data frames manually, but will import

• There are different functions that read external data with particular formats



Your Lab

- Review the basic structure of vectors and data frames
- Importing external data
- Describing the structure of data
- Indexing or referencing specific data components





Questions

