THE #RDATATABLE PACKAGE

for fast, flexible and memory efficient data wrangling

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CO-DEVELOPER, DATA.TABLE

USER BRUSSELS, JUL'17

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ASSISTING ME TODAY

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- >5800 Q on StackOverflow. 3rd amongst R packages

OBJECTIVE

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- If time permits, will discuss fread, fwrite, rbindlist, reshape etc.

BASE R REFRESHER

```
set.seed(20170703L)
DF1 = data.frame(id = sample(1:2, 9L, TRUE),
                 code = sample(letters[1:3], 9, TRUE),
                 valA = 1:9, valB = 10:18,
                 stringsAsFactors = FALSE)


DF2 = data.frame(id = c(3L, 1L, 1L, 2L, 3L),
                 code = c("b", "a", "c", "c", "d"),
                  mul = 5:1, stringsAsFactors = FALSE)
```

EXERCISE 1A

1a. Subset all rows where `id` column equals `1` & code column is not equal to `"c"`

1b. Same as (1) but perform the subset using `with()`. See `?with` if necessary

2. Select `valA` and `valB` columns from `DF1` and store it in variable `tmp1`

3. Get `sum(valA)` and `sum(valB)` for `id > 1` as a 1-row, 2-col data.frame

4. Replace `valB` with `valB+1` for all rows where `code == "c"`

5. Add a new column `valC` column with values equal to `valB^2 - valA^2`

6. Get `sum(valA)` and `sum(valB)` grouped by `id` and `code` (i.e., for each unique combination of `id,code`)

7. Get `sum(valA)` and `sum(valB)` grouped by `id` for `id >= 2 & code %in% c("a", "c")`

8. Replace `valA` with `max(valA)-min(valA)` grouped by `code`

9. Create a new col named `valD` with `max(valB)-min(valA)` grouped by `code`

EXERCISE 1B

10. Subset **`DF1`** by **`DF2`** on **`id,code`** column. That is, for each row of **`DF2$id`**, **`DF2$code`**, get **`valA`** and **`valB`** cols from **`DF1`**. Include rows that have no matches as well.

11. Same as (**10**), but fetch just the **`first`** matching row of **`DF1`** for each row of **`DF2$id`**, **`DF2$code`**. Exclude non-matching rows.

12. For every row of **`DF2$id`**, **`DF2$code`** that matches with **`DF1`**'s, update **`valA`** with **`valA*mul`**.

13. Add a new column **`val`** to **`DF1`** with values from **`DF2$mul`** where **`DF2$id`**, **`DF2$code`** matches with **`DF1`**'s. Rows that don't match should have **`NA`**.

14. Compute **`sum(valA)*mul`** for every row of **`DF2$id`**, **`DF2$code`** by matching it against **`DF1`**.

15. For every row of **`DF2$id`**, **`DF2$code`** that matches with **`DF1`**'s, update **`valB`** with **`valB*mul`**.

Every question is a good question!
Feel free to interrupt.

COMMON OPERATIONS - 1 TABLE

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A	B	C	D
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A	B	C	D
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A	B	C	D
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COMMON OPERATIONS - 1 TABLE

A	B	C	D
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A	B	C	D
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COMMON OPERATIONS - 1 TABLE

A	B	C	D
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A	B	C	D
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COMMON OPERATIONS - 1 TABLE

A	B	C	D
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A	B	C	D
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A	B	C	D
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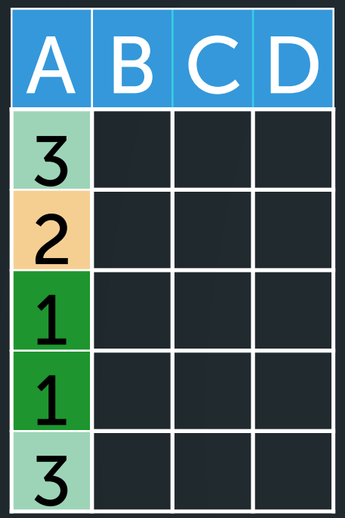
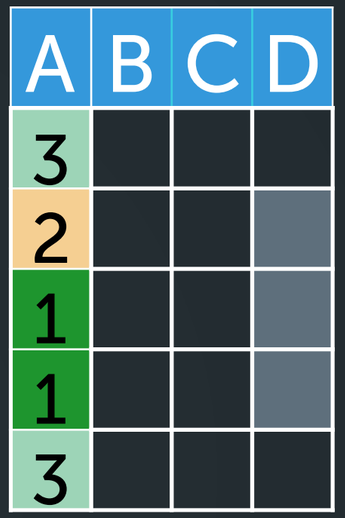
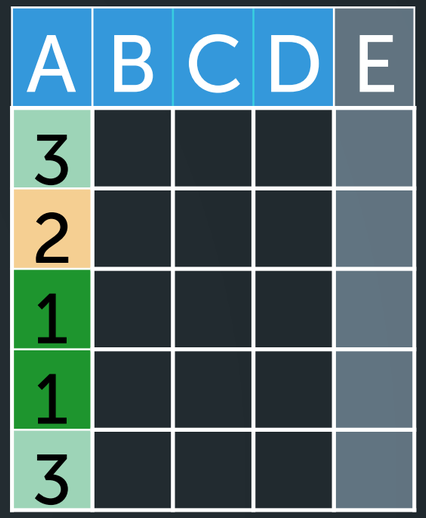
COMMON OPERATIONS - 1 TABLE







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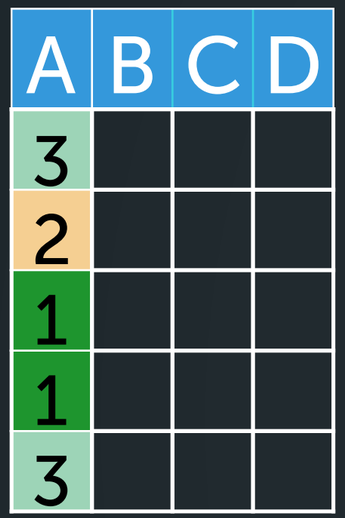

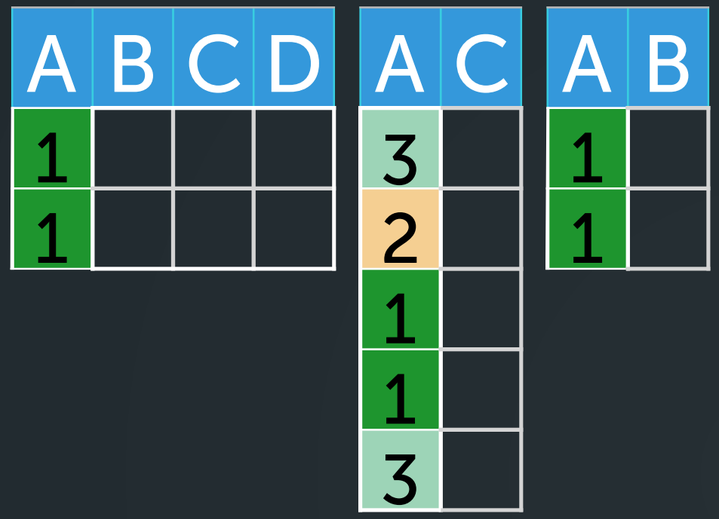

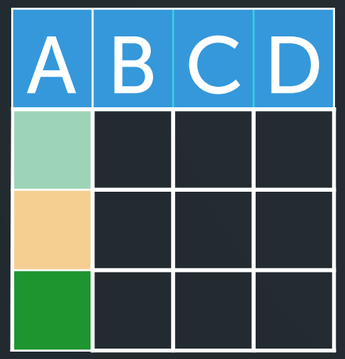

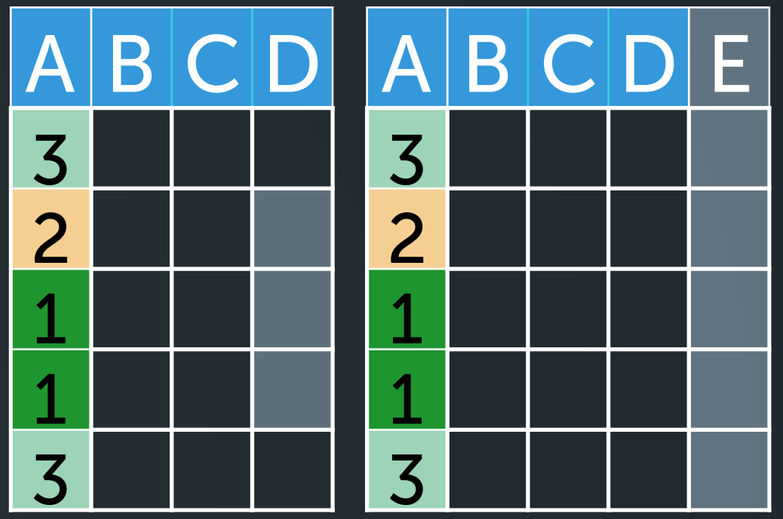

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A	B	C	D
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A	B	C	D

A	C

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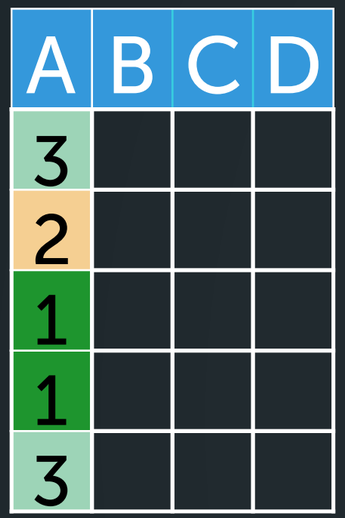

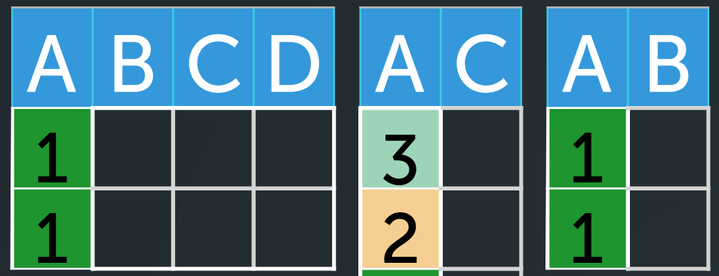

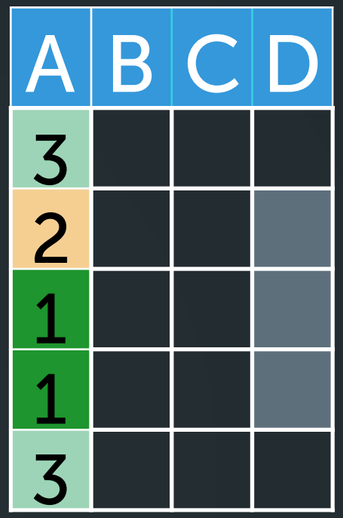

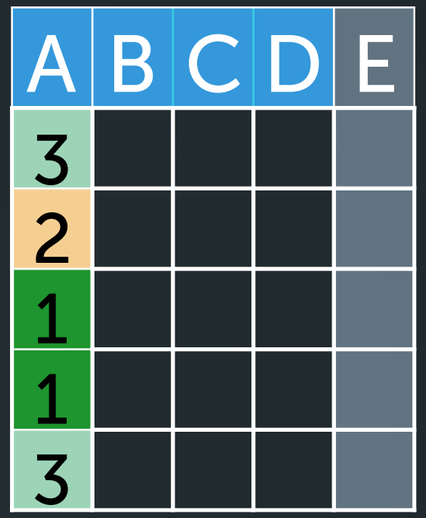

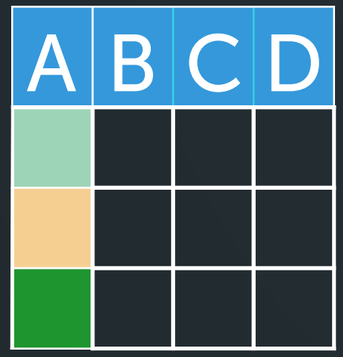

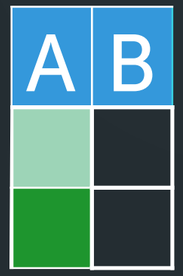

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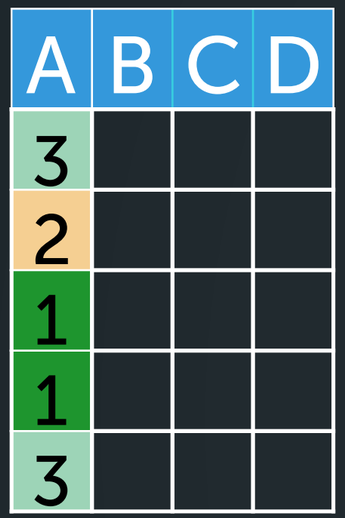

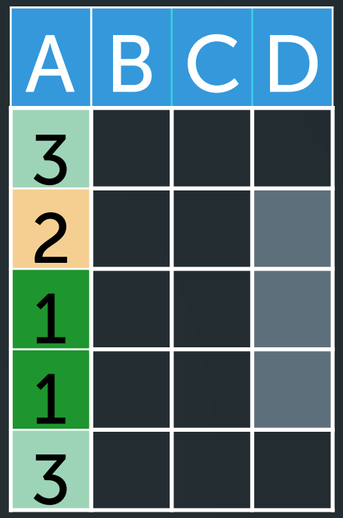

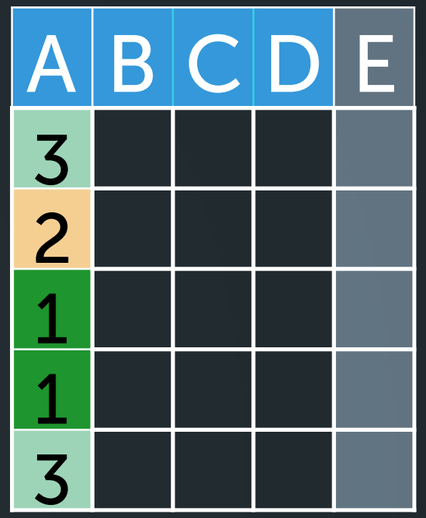

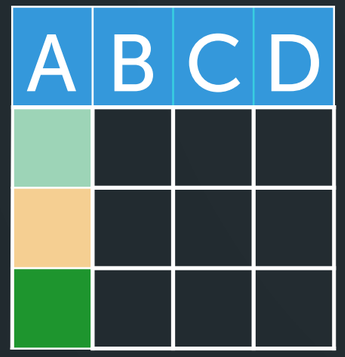

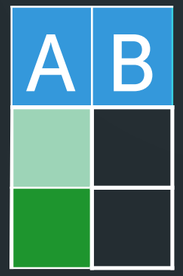

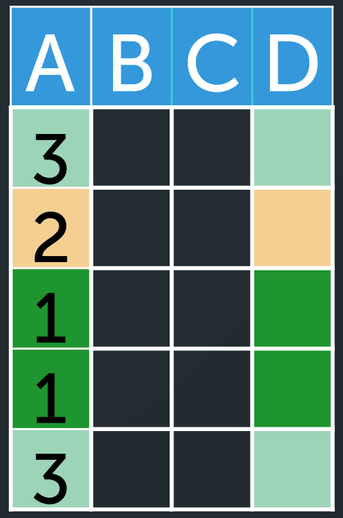

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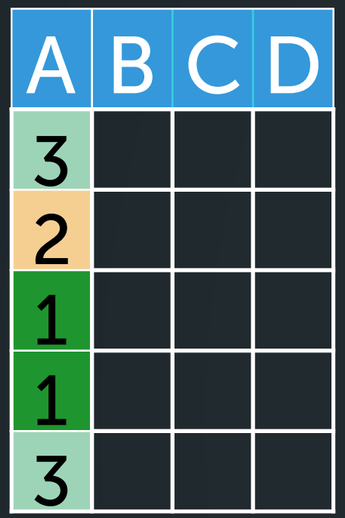

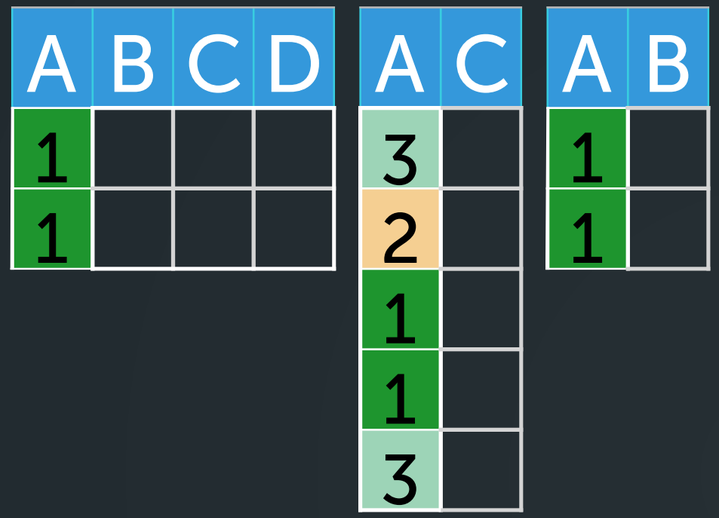

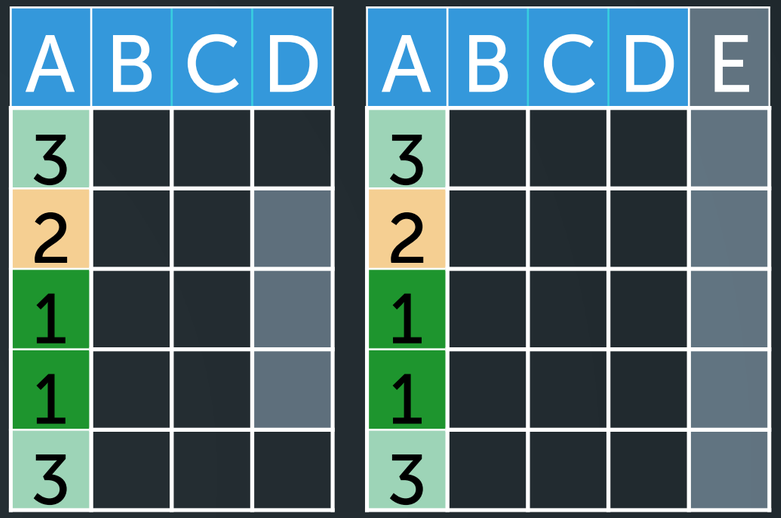

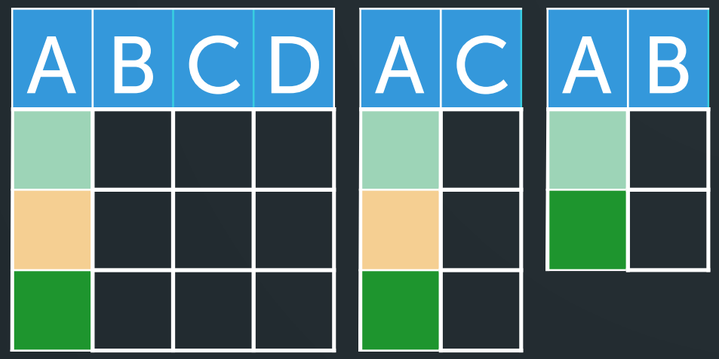

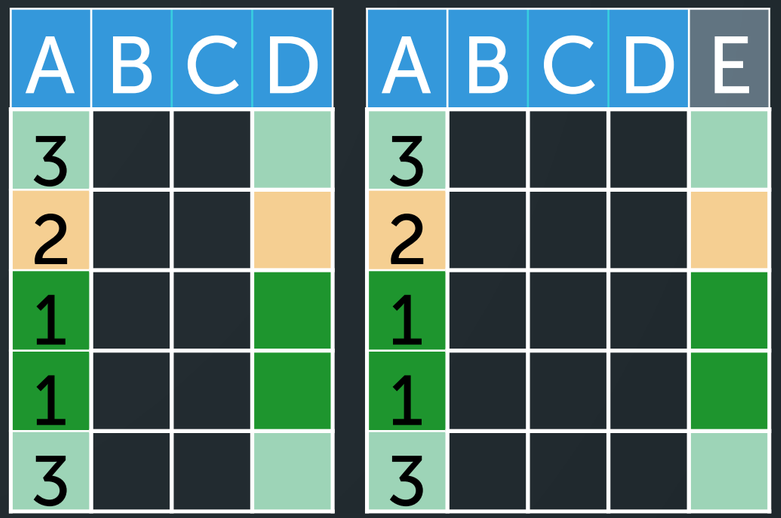

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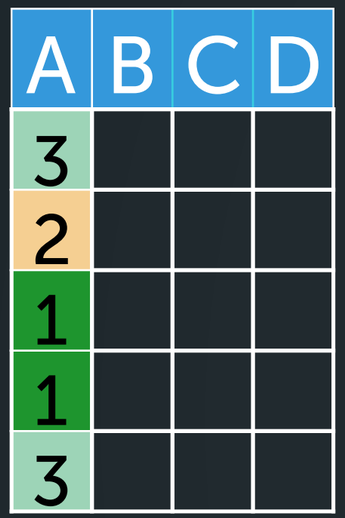

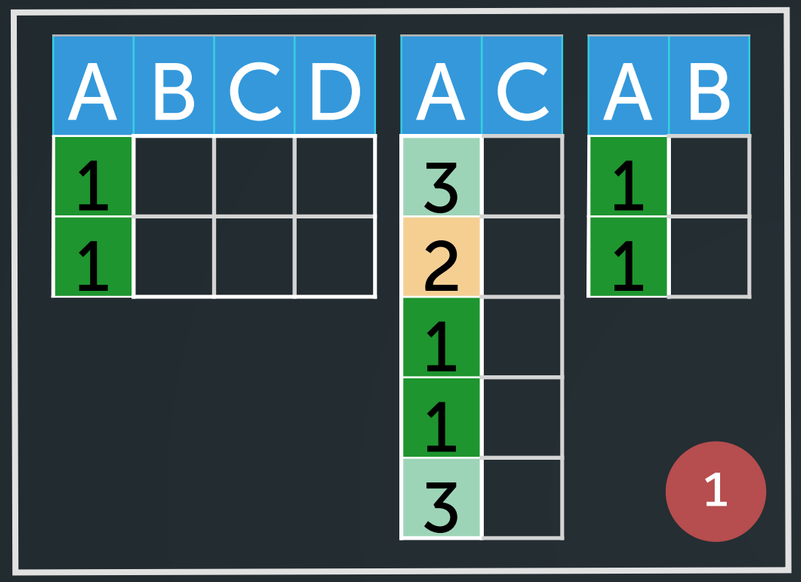

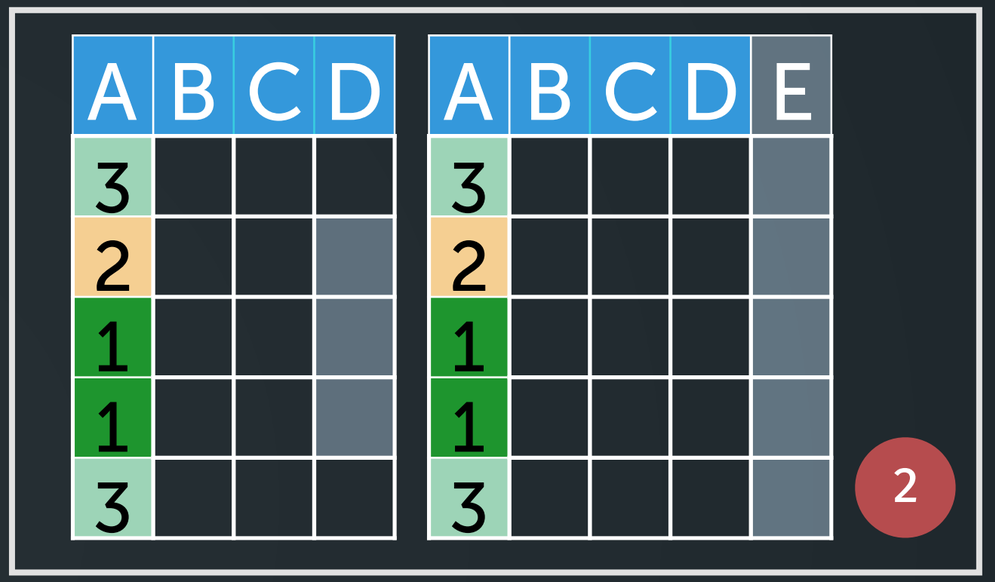

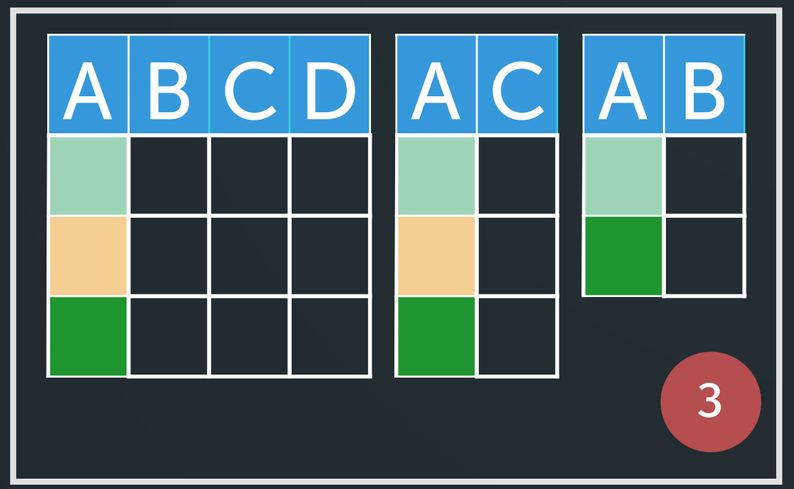

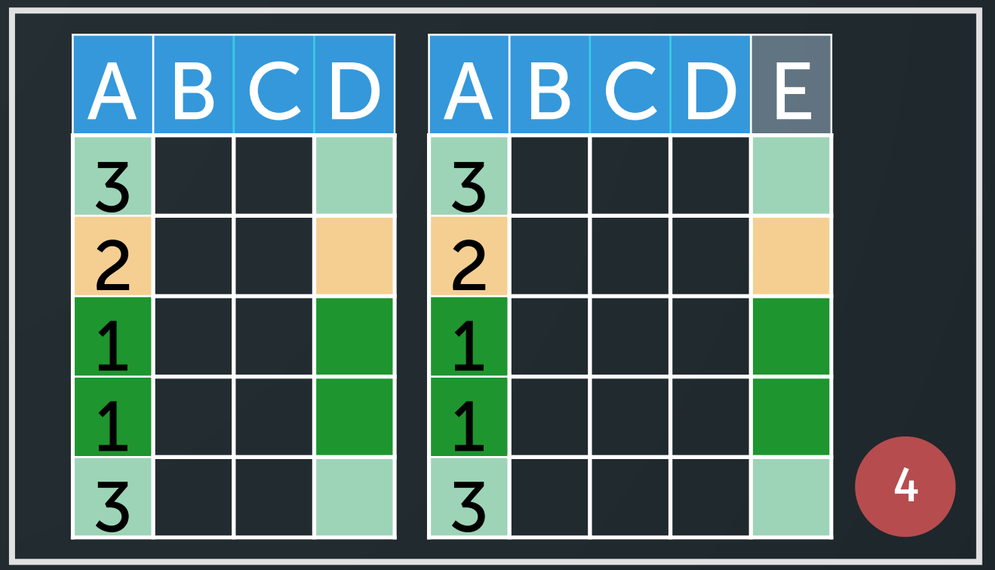

COMMON OPERATIONS - 2 TABLES

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A	B	C	D
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COMMON OPERATIONS - 2 TABLES

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COMMON OPERATIONS - 2 TABLES

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COMMON OPERATIONS - 2 TABLES

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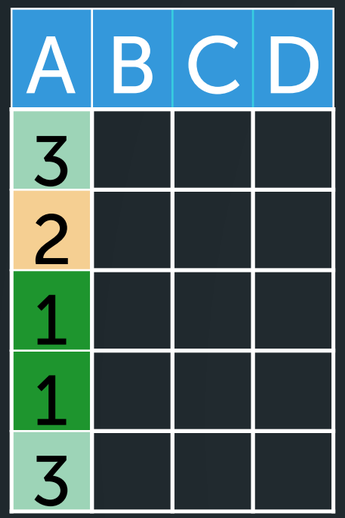
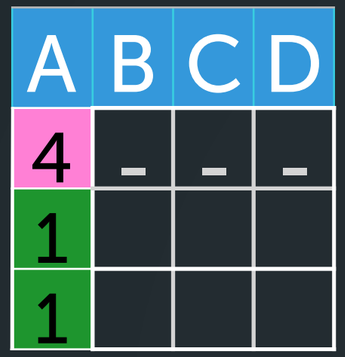
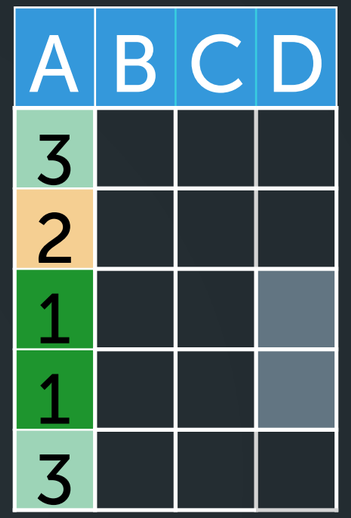
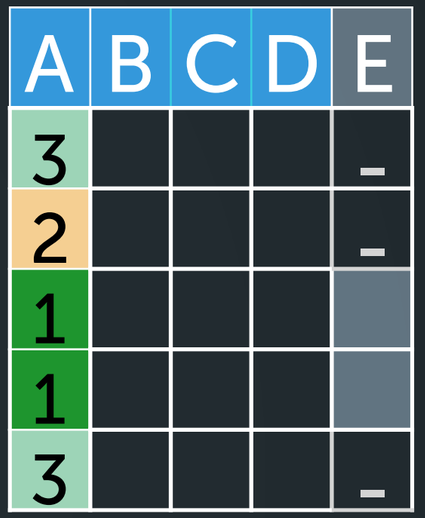
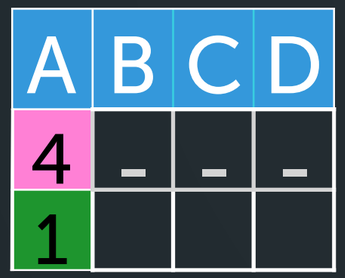


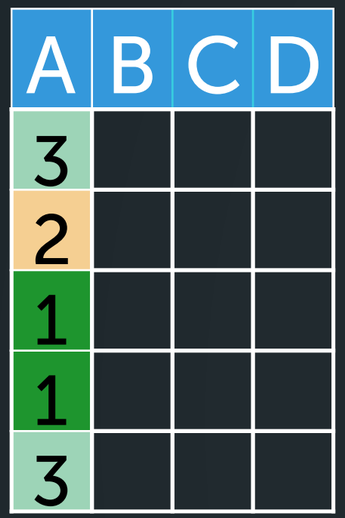


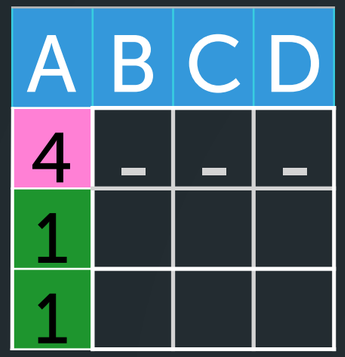


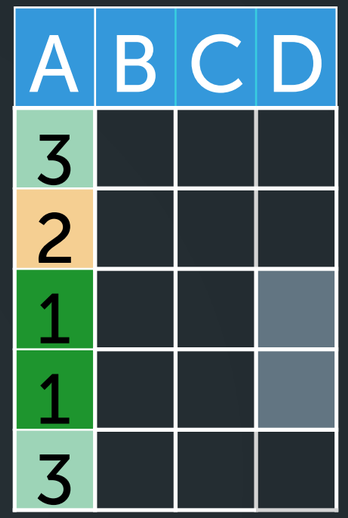


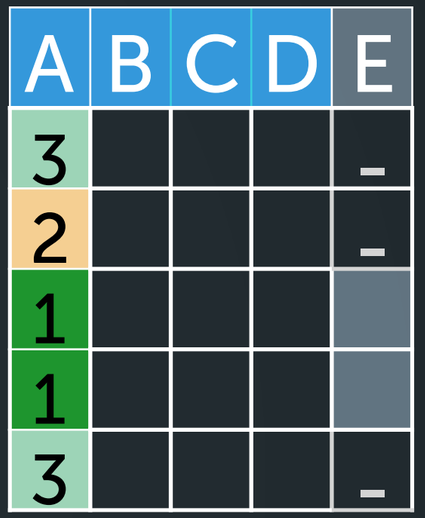


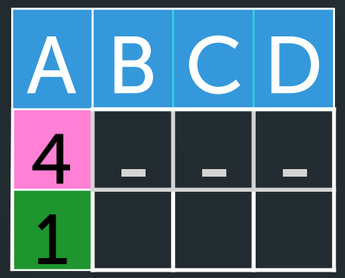
COMMON OPERATIONS - 2 TABLES

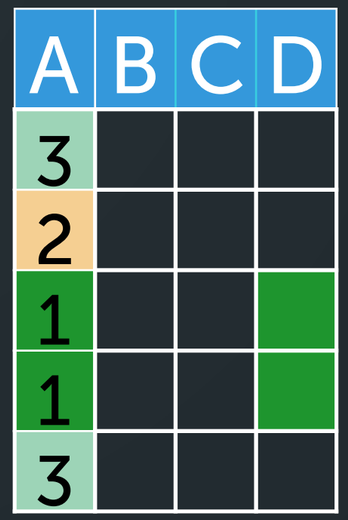




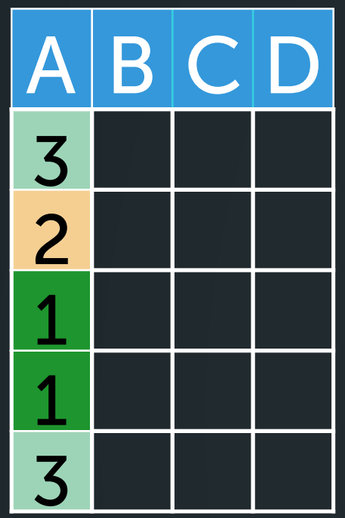


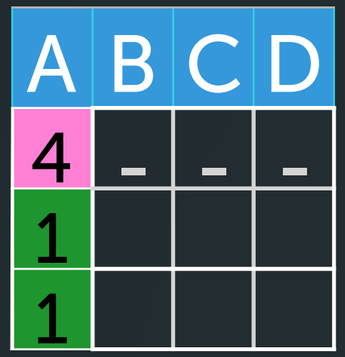


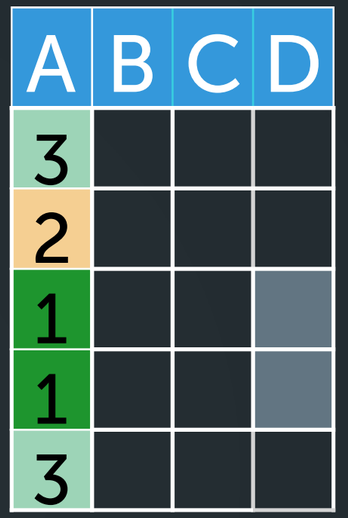


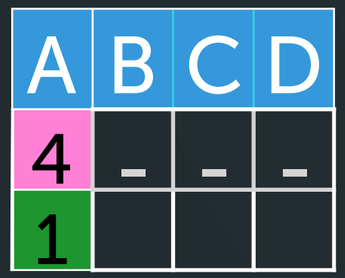


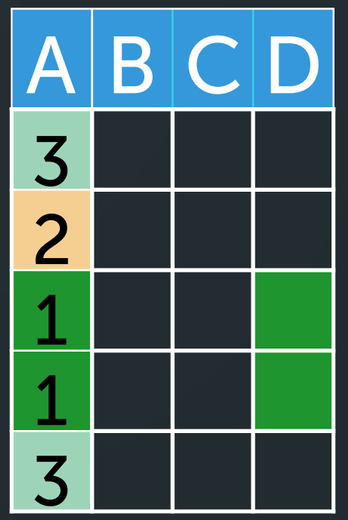
COMMON OPERATIONS - 2 TABLES

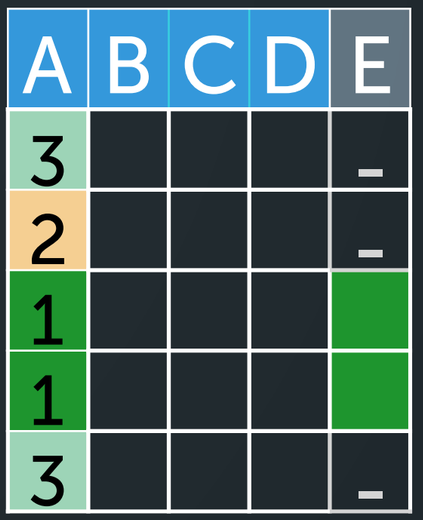












COMMON OPERATIONS - 2 TABLES

A	B	C	D
3			
2			
1			
1			
3			

A	E
4	
1	

A	B	C	D
4	_	_	_
1			
1			

A	B	E
1		
1		

1

A	B	C	D
4	_	_	_
1			

A	B	E
1		

3

A	B	C	D
3			
2			
1			
1			
3			

A	B	C	D	E
3				_
2				_
1				
1				
3				_

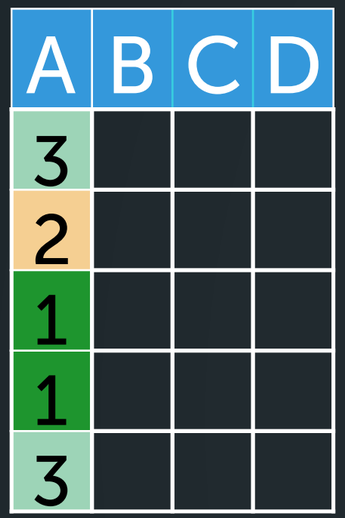
2

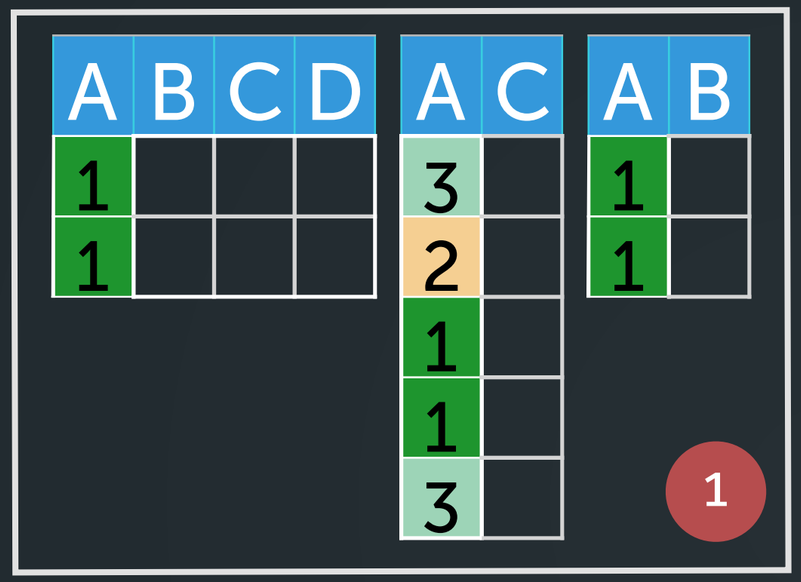
A	B	C	D
3			
2			
1			
1			
3			

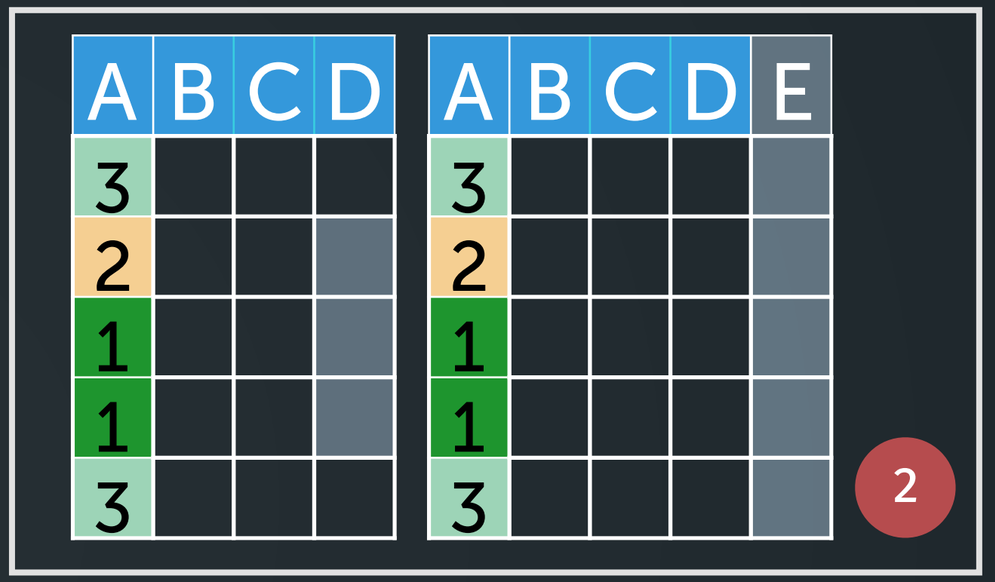
A	B	C	D	E
3				_
2				_
1				
1				
3				_

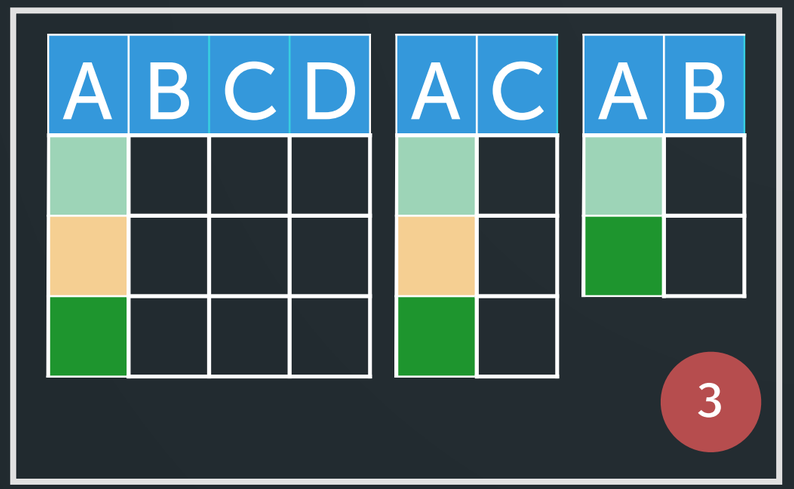
4

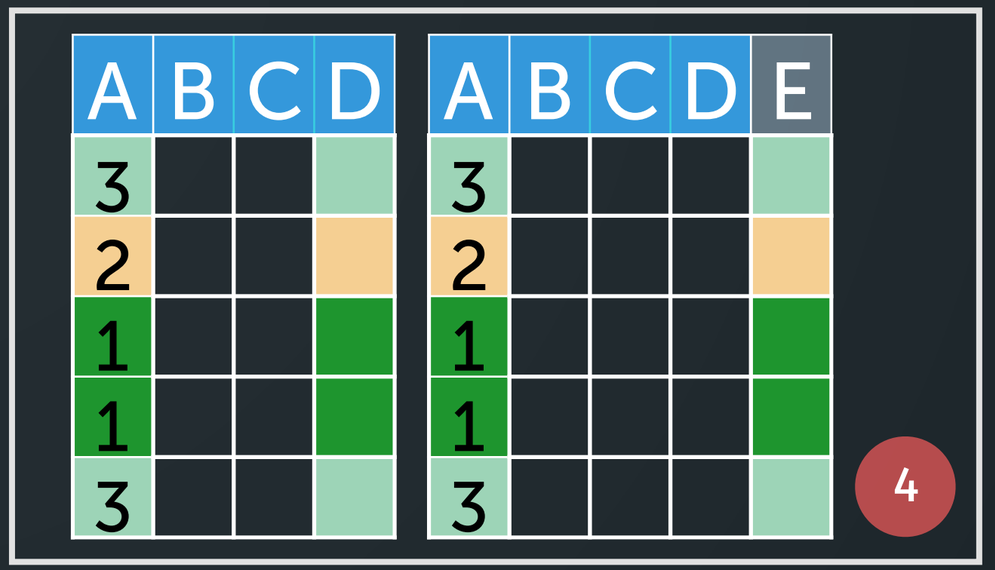
COMMON OPERATIONS - 1 TABLE











COMMON OPERATIONS - 2 TABLES

A	B	C	D
3			
2			
1			
1			
3			

A	E
4	
1	

A	B	C	D
4	_	_	_
1			
1			

A	B	E
1		
1		

1

A	B	C	D
4	_	_	_
1			

A	B	E
1		

3

A	B	C	D
3			
2			
1			
1			
3			

A	B	C	D	E
3				_
2				_
1				
1				
3				_

2

A	B	C	D
3			
2			
1			
1			
3			

A	B	C	D	E
3				_
2				_
1				
1				
3				_

4

OUTLINE

OUTLINE

- Discuss each group (1-4) one by one and learn data.table with these exercises you just attempted (~10 min for each group)
- You will internalise the concepts by solving exercises immediately after each group (~15-20 min)
- We will go through the answers (~5-10 min)
- If time permits, discuss other functions.

DATA TABLES

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- think in terms of basic units — rows, columns and groups

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- data.table syntax provides *placeholder* for each of them

General form: `DT[i, j, by]`

DATA TABLES

- think in terms of basic units — rows, columns and groups
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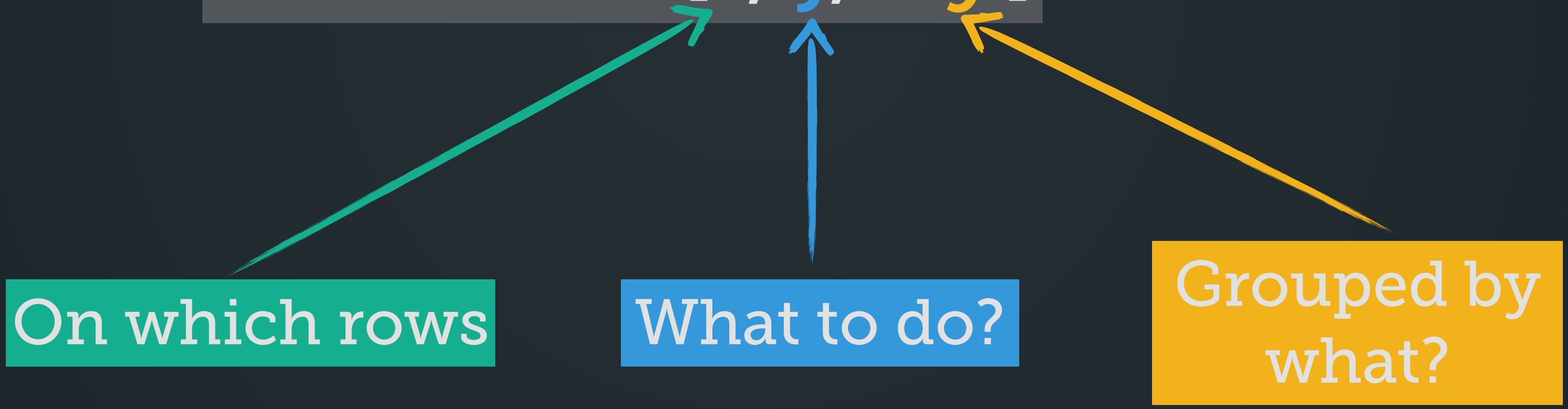
General form: `DT[i, j, by]`



CREATING DATA.TABLE

```
require(data.table)
DT1 = as.data.table(DF1)
DT2 = as.data.table(DF2)
```

Group 1

EXERCISE 1A

EXERCISE 1A

1a. Subset all rows where `id` column equals `1` & code column is not equal to `"c"`

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

EXERCISE 1A

1a. Subset all rows where **`id`** column equals **`1`** & code column is not equal to **`"c"`**

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
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6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
DT1[id == 1 & code != "c"]
```

EXERCISE 1A

1a. Subset all rows where **`id`** column equals **`1`** & code column is not equal to **`"c"`**

	id	code	valA	valB
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5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
DT1[id == 1 & code != "c"]
```

EXERCISE 1A

1a. Subset all rows where **`id`** column equals **`1`** & code column is not equal to **`"c"`**

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4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
DT1[id == 1 & code != "c"]
```

	id	code	valA	valB
1:	1	b	2	11
2:	1	b	7	16

EXERCISE 1A

EXERCISE 1A

2. Select **`valA`** and **`valB`** columns from **`DF1`**

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

EXERCISE 1A

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	id	code	valA	valB
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2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
DT1[, list(valA, valB)]
   .() alias to list()
```

EXERCISE 1A

2. Select **`valA`** and **`valB`** columns from **`DF1`**

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
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   .() alias to list()
```

EXERCISE 1A

2. Select **`valA`** and **`valB`** columns from **`DF1`**

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2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
DT1[, list(valA, valB)]
   .() alias to list()
```

	valA	valB
1:	1	10
2:	2	11
3:	3	12
4:	4	13
5:	5	14
6:	6	15
7:	7	16
8:	8	17
9:	9	18

EXERCISE 1A

EXERCISE 1A

3. Get **`sum(valA)`** and **`sum(valB)`** for **`id > 1`** as a 1-row, 2-col data.frame

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
DT1[id > 1,
    .(valA=sum(valA),
      valB=sum(valB))]
```

EXERCISE 1A

3. Get **`sum(valA)`** and **`sum(valB)`** for **`id > 1`** as a 1-row, 2-col data.frame

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
DT1[id > 1,
    .(valA=sum(valA),
      valB=sum(valB))]
```

EXERCISE 1A

3. Get **`sum(valA)`** and **`sum(valB)`** for **`id > 1`** as a 1-row, 2-col data.frame

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
DT1[id > 1,
    .(valA=sum(valA),
      valB=sum(valB))]
```

	valA	valB
1:	19	46

EXERCISE 1B

EXERCISE 1B

10. Subset **`DF1`** by **`DF2`** on **`id,code`** column. That is, for each row of **`DF2$id`**, **`DF2$code`**, get **`valA`** and **`valB`** cols from **`DF1`**. Include rows that have no matches as well.

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

	id	code	mul
1:	3	b	5
2:	1	a	4
3:	1	c	3
4:	2	c	2
5:	3	d	1

EXERCISE 1B

10. Subset **`DF1`** by **`DF2`** on **`id,code`** column. That is, for each row of **`DF2$id`**, **`DF2$code`**, get **`valA`** and **`valB`** cols from **`DF1`**. Include rows that have no matches as well.

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

	id	code	mul
1:	3	b	5
2:	1	a	4
3:	1	c	3
4:	2	c	2
5:	3	d	1

EXERCISE 1B

10. Subset **`DF1`** by **`DF2`** on **`id,code`** column. That is, for each row of **`DF2$id`**, **`DF2$code`**, get **`valA`** and **`valB`** cols from **`DF1`**. Include rows that have no matches as well.

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

	id	code	mul
1:	3	b	5
2:	1	a	4
3:	1	c	3
4:	2	c	2
5:	3	d	1

```
DT1[DT2, on=.(id, code),
   .(valA, valB)]
```

EXERCISE 1B

10. Subset **`DF1`** by **`DF2`** on **`id,code`** column. That is, for each row of **`DF2$id`**, **`DF2$code`**, get **`valA`** and **`valB`** cols from **`DF1`**. Include rows that have no matches as well.

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

	id	code	mul
1:	3	b	5
2:	1	a	4
3:	1	c	3
4:	2	c	2
5:	3	d	1

```
DT1[DT2, on=.(id, code),
   .(valA, valB)]
```

	valA	valB
1:	NA	NA
2:	NA	NA
3:	1	10
4:	3	12
5:	4	13
6:	9	18
7:	NA	NA
8:	NA	NA

EXERCISE 1B

11. Same as (**10**), but fetch just the **`first`** matching row of **`DF1`** for each row of **`DF2$id`**, **`DF2$code`**. Exclude non-matching rows.

```
??
```

EXERCISE 1B

11. Same as (**10**), but fetch just the **`first`** matching row of **`DF1`** for each row of **`DF2$id`**, **`DF2$code`**. Exclude non-matching rows.

```
DT1[DT2, on=.(id, code),
  .(valA, valB),
  mult="first", nomatch=0L]
```

Practice

GROUP 1 WRAP UP

Easy-moderate:

1. Get all rows where valA > 5 and valB is <= 16 from DT1.
2. Get all rows where valA is in between 5 and 8 (both included) from DT1.
3. Order DT1 by code in increasing order, and within that by valA in decreasing order.
4. Return the last two rows of DT1.
5. Return a random sample of 4 rows.
6. Get median of valA and valB cols where code is not “a”. Name the columns ‘mA’ and ‘mB’.
7. Remove all rows in DT2 where DT2$code is duplicated. Store the result in DT3. Hint: see ?duplicated.

Moderate-Hard:

8. Return all unique combinations of id, code (as a two column data.table) where valA^2 > valB. Hint: you’ll need to use the function `unique()` in `j`.
9. Read ?`.SD` and check explanation and examples and try to use `.SD` in `j` to solve (8).
10. For every DT3$code, return the last matching values of valA from DT1 along with ‘id’ column from DT3. i.e., result should contain code, valA and id (from DT3) columns. Do not remove non-matching rows.

Group 2

EXERCISE 1A

EXERCISE 1A

4. Replace **`valB`** with **`valB+1`** for all rows where **`code == "c"`**

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
DT1[code == "c",
    valB := valB+1L]
          (Or)
DT1[code == "c",
    `:=`(valB = valB+1L)]
```

EXERCISE 1A

4. Replace **`valB`** with **`valB+1`** for all rows where **`code == "c"`**

	id	code	valA	valB
1:	1	c	1	11
2:	1	b	2	11
3:	1	c	3	13
4:	1	c	4	14
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	19

```
DT1[code == "c",
    valB := valB+1L]
          (Or)
DT1[code == "c",
    `:=`(valB = valB+1L)]
```

EXERCISE 1A

??

EXERCISE 1A

5. Add a new column **`valC`** column with values equal to **`valB^2 - valA^2`**

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

EXERCISE 1A

5. Add a new column **`valC`** column with values equal to **`valB^2 - valA^2`**

	id	code	valA	valB	valC
1:	1	c	1	10	99
2:	1	b	2	11	117
3:	1	c	3	12	135
4:	1	c	4	13	153
5:	2	a	5	14	171
6:	2	a	6	15	189
7:	1	b	7	16	207
8:	2	a	8	17	225
9:	1	c	9	18	243

??

EXERCISE 1A

5. Add a new column **`valC`** column with values equal to **`valB^2 - valA^2`**

	id	code	valA	valB	valC
1:	1	c	1	10	99
2:	1	b	2	11	117
3:	1	c	3	12	135
4:	1	c	4	13	153
5:	2	a	5	14	171
6:	2	a	6	15	189
7:	1	b	7	16	207
8:	2	a	8	17	225
9:	1	c	9	18	243

```
DT1[, valC := valB^2-valA^2]
```

EXERCISE 1B

EXERCISE 1B

12. For every row of **`DF2$id`**, **`DF2$code`** that matches with **`DF1`**'s, update **`valA`** with **`valA*mul`**.

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

	id	code	mul
1:	3	b	5
2:	1	a	4
3:	1	c	3
4:	2	c	2
5:	3	d	1

EXERCISE 1B

12. For every row of **`DF2$id`**, **`DF2$code`** that matches with **`DF1`**'s, update **`valA`** with **`valA*mul`**.

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

	id	code	mul
1:	3	b	5
2:	1	a	4
3:	1	c	3
4:	2	c	2
5:	3	d	1

EXERCISE 1B

12. For every row of **`DF2$id`**, **`DF2$code`** that matches with **`DF1`**'s, update **`valA`** with **`valA*mul`**.

	id	code	valA	valB
1:	1	c	3	10
2:	1	b	2	11
3:	1	c	9	12
4:	1	c	12	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	27	18

	id	code	mul
1:	3	b	5
2:	1	a	4
3:	1	c	3
4:	2	c	2
5:	3	d	1

```
DT1[DT2, on=.(id, code),
     valA := valA*i.mul]
```

EXERCISE 1B

EXERCISE 1B

13. Add a new column **`val`** to **`DF1`** with values from **`DF2$mul`** where **`DF2$id`**, **`DF2$code`** matches with **`DF1`**'s. Rows that don't match should have **`NA`**.

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

EXERCISE 1B

13. Add a new column **`val`** to **`DF1`** with values from **`DF2$mul`** where **`DF2$id`**, **`DF2$code`** matches with **`DF1`**'s. Rows that don't match should have **`NA`**.

	id	code	valA	valB	val
1:	1	c	1	10	3
2:	1	b	2	11	NA
3:	1	c	3	12	3
4:	1	c	4	13	3
5:	2	a	5	14	NA
6:	2	a	6	15	NA
7:	1	b	7	16	NA
8:	2	a	8	17	NA
9:	1	c	9	18	3

```
DT1[DT2, on=.(id, code),
     val := i.mul]
```

Practice

GROUP 2 WRAP UP

Easy-moderate: (unless specified, assume DT1)

1. On those rows where id != 2, replace valA and valB with valA+1 and valB+1 respectively.
2. On those rows where id == 2, replace valA with valB if valA is <= 7, else with valB^2.
3. Create a new column `tmp` and assign `NA` to it by reference.
4. What's the type (or class) of `tmp` column that we just created?
5. Do DT1[, tmp := NULL] and observe the output.. What's the difference compared to (3)?

Moderate-Hard:

6. Create a new column named "rank" which takes value 1 where code == "a", 2 where code == "b" and 3 where code == "c". Do it in as many different ways you could think of :-).
7. Let DT3 = DT2[!duplicated(code)]. Update both valA and valB columns with 'valA*mul' and 'valB*mul' wherever DT3$code matches DT1$code.. What happens to those rows where there are no matches in DT1? Why?
8. Add the column 'mul' from DT2 to DT1 by reference where DT2$id matches DT1$id. What happens to those values where DT2$id has the same value occurring more than once?
9. Replace DT2$mul with NA where DT1$id, DT1$code matches DT2$id, DT2$code.

Group 3

EXERCISE 1A

6. Get **`sum(valA)`** and **`sum(valB)`** grouped by **`id`** and **`code`** (i.e., for each unique combination of **`id,code`**)

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
DT1[, .(sum(valA), sum(valB)),
    by=.(id, code)]
```

	id	code	V1	V2
1:	1	c	17	53
2:	1	b	9	27
3:	2	a	19	46

EXERCISE 1A

7. Get **`sum(valA)`** and **`sum(valB)`** grouped by **`id`** for **`id >= 2 & code %in% c("a", "c")`**

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
DT1[id >= 2 & code %in% c("a", "c"),
    lapply(.SD, sum),
    by=.(id, code)]
```

	id	code	V1	V2
1:	2	a	19	46

EXERCISE 1B

14. Compute **`sum(valA)*mul`** for every row of **`DF2$id`**, **`DF2$code`** by matching it against **`DF1`**.

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

	id	code	mul
1:	3	b	5
2:	1	a	4
3:	1	c	3
4:	2	c	2
5:	3	d	1

```
DT1[DT2, on=.(id, code),
    sum(valA)*mul,
    by=.EACHI]
```

	id	code	V1
1:	3	b	NA
2:	1	a	NA
3:	1	c	51
4:	2	c	NA
5:	3	d	NA

GROUP 3 WRAP UP

Easy-moderate: (unless specified, assume DT1)

1. Get max(valB) - min(valA) grouped by code. Name the column ‘diff’.
2. Get max(valA) - min(valB) grouped by code and id. Name the column ‘diff’
3. Get the median of valA grouped by code.
4. Get the median of valA and log(sum(valB)) grouped by code. Why does it fail? Hint: Read the error message and use verbose = TRUE for both (3) and (4) and observe the difference.
5. For each code (i.e., grouped by code) randomly sample one row of the rest of the columns. Hint: you could do it with `.SD` and `.N` and `sample()`.

Moderate-Hard:

6. Get the most frequently occurring code grouped by id. This might require multiple steps.
7. Get the count of values where valA > sqrt(valB) is TRUE and the count of values where the condition isn’t TRUE.
8. Get min(valA) of DT1 from rows that match id, code from DT2 and NA if it doesn't match.
9. Get max(valB) of DT1 from rows that match id, code from DT2. Only keep matching rows
10. Let DT3 = DT2[!duplicated(id)]. For each DT3$id, get sum of valB only where valA >= mul.

Group 4

EXERCISE 1A

EXERCISE 1A

8. Replace **`valA`** with **`max(valA)-min(valA)`** grouped by **`code`**

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
DT1[, valA :=
  max(valA)-min(valA),
    by=code]
```

EXERCISE 1A

8. Replace **`valA`** with **`max(valA)-min(valA)`** grouped by **`code`**

	id	code	valA	valB
1:	1	c	8	10
2:	1	b	5	11
3:	1	c	8	12
4:	1	c	8	13
5:	2	a	3	14
6:	2	a	3	15
7:	1	b	5	16
8:	2	a	3	17
9:	1	c	8	18

```
DT1[, valA :=
  max(valA)-min(valA),
    by=code]
```

EXERCISE 1A

EXERCISE 1A

9. Create a new col named **`valD`** with **`max(valB)-min(valA)`** grouped by **`code`**

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

```
DT1[, valD :=
    max(valB)-min(valA),
    by=code]
```

EXERCISE 1A

9. Create a new col named **`valD`** with **`max(valB)-min(valA)`** grouped by **`code`**

	id	code	valA	valB	valD
1:	1	c	1	10	17
2:	1	b	2	11	14
3:	1	c	3	12	17
4:	1	c	4	13	17
5:	2	a	5	14	12
6:	2	a	6	15	12
7:	1	b	7	16	14
8:	2	a	8	17	12
9:	1	c	9	18	17

```
DT1[, valD :=
    max(valB)-min(valA),
    by=code]
```

EXERCISE 1B

EXERCISE 1B

15. For every row of **`DF2$id`**, **`DF2$code`** that matches with **`DF1`**'s, update **`valB`** with **`valB*mul`**.

	id	code	valA	valB
1:	1	c	1	10
2:	1	b	2	11
3:	1	c	3	12
4:	1	c	4	13
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	18

	id	code	mul
1:	3	b	5
2:	1	a	4
3:	1	c	3
4:	2	c	2
5:	3	d	1

```
DT1[DT2, on=.(id, code),
    valB := valB*i.mul,
     by=.EACHI]
```

EXERCISE 1B

15. For every row of **`DF2$id`**, **`DF2$code`** that matches with **`DF1`**'s, update **`valB`** with **`valB*mul`**.

	id	code	valA	valB
1:	1	c	1	30
2:	1	b	2	11
3:	1	c	3	36
4:	1	c	4	39
5:	2	a	5	14
6:	2	a	6	15
7:	1	b	7	16
8:	2	a	8	17
9:	1	c	9	54

	id	code	mul
1:	3	b	5
2:	1	a	4
3:	1	c	3
4:	2	c	2
5:	3	d	1

```
DT1[DT2, on=.(id, code),
    valB := valB*i.mul,
     by=.EACHI]
```

GROUP 4 WRAP UP

Easy-moderate: (unless specified, assume DT1)

1) Update valB with valB*<no: of rows in that group> grouped by code

2) Update both valA and valB with valA*max(valA) and valB*max(valB) respectively grouped by id, code

3) Create two new columns ‘A2’, ‘B2’, while grouped by code, by randomly sampling (with replacement) the same number of rows in the group from valA and valB respectively.

4. Add a column named ‘uniq_N’ which contains the count of unique ‘code’ values, while grouped by ‘id’.

Moderate-Hard:

5. Update all rows of valB with NA where DT3$id, DT3$code *don’t* match with DT1$id, DT1$code.

6. Let DT3 = DT2[!duplicated(id)]. For each DT3$id, find all rows in DT1$id that is <= DT3$id and compute sum(valA)*mul.