

A modern conference room with large windows and a long table. The room is empty, with several office chairs arranged around the table. The view outside the windows shows a cityscape. The image has a warm, orange-toned overlay.

# Basic Database Terminology

A modern conference room with large windows and a long table. The room is empty, with several chairs arranged around the table. The windows offer a view of a city skyline. The image has a blue tint and a stylized, torn-paper-like border.

# Relational Schemas: Primary Key

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Sales				
purchase_number	date_of_purchase	customer_id	item_code	
1	9/3/2016	1	A_1	
2	12/2/2016	2	C_1	
3	4/15/2017	3	D_1	
4	5/24/2017	1	B_2	
5	5/25/2017	4	B_2	
6	6/6/2017	2	B_1	
7	6/10/2017	4	A_2	
8	6/13/2017	3	C_1	
9	7/20/2017	1	A_1	
10	8/11/2017	2	B_1	

# Relational Schemas: Primary Key

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
1	John	McKinley	<a href="mailto:john.mackinley@365careers.com">john.mackinley@365careers.com</a>	0
2	Elizabeth	McFarlane	<a href="mailto:e.mcfarlane@365careers.com">e.mcfarlane@365careers.com</a>	2
3	Kevin	Lawrence	<a href="mailto:kevin.lawrence@365careers.com">kevin.lawrence@365careers.com</a>	1
4	Catherine	Winnfield	<a href="mailto:c.winnfield@365careers.com">c.winnfield@365careers.com</a>	0

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9	7/20/2017	1	A_1	
10	8/11/2017	2	B_1	

Items						
item_code	item	unit_price_usd	company_id	company	headquarters_phone_number	
A_1	Lamp	20	1	Company A	+1 (202) 555-0196	
A_2	Desk	250	1	Company A	+1 (202) 555-0196	
B_1	Lamp	30	2	Company B	+1 (202) 555-0152	
B_2	Desk	350	2	Company B	+1 (202) 555-0152	
C_1	Chair	150	3	Company C	+1 (229) 853-9913	
D_1	Loudspeakers	400	4	Company D	+1 (618) 369-7392	



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# Relational Schemas: Primary Key

- these tables have a tabular shape

# Relational Schemas: Primary Key

- these tables have a tabular form
- a relational schema can be applied to represent them



# Relational Schemas: Primary Key

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## sales per customer of our company

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the dates of a few purchases may coincide

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the ID of a customer may appear a few times

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there is a possibility to see the same item code a few times

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all the numbers in this column will be different

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## primary key

a column (or a set of columns) whose value exists and is unique for every record in a table is called a **primary key**

# Relational Schemas: Primary Key

- Primary Key

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# Relational Schemas: Primary Key

- Primary Key

may be composed of a set of columns

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may be composed of a set of columns

e.g. “purchase\_number” + “date\_of\_purchase”

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# Relational Schemas: Primary Key

## Primary Key

one-column primary key = all purchases will be recorded under a different number

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# Relational Schemas: Primary Key

# Relational Schemas: Primary Key

Sales

purchase number

date\_of\_purchase

customer\_id (FK)

item\_code (FK)

# Relational Schemas: Primary Key

Sales

purchase number

date\_of\_purchase

customer\_id (FK)

item\_code (FK)

Table name: Sales

Primary key: purchase number

Other fields: date\_of\_purchase, customer\_id, item\_code

# Relational Schemas: Primary Key

Sales

purchase\_number

date\_of\_purchase

customer\_id (FK)

item\_code (FK)

=

Sales

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- in one table, you cannot have 3 or 4 primary keys
- primary keys are the unique identifiers of a table
- cannot contain null values!
- not all tables you work with will have a primary key

# Relational Schemas: Primary Key

relational schema

Sales

purchase number

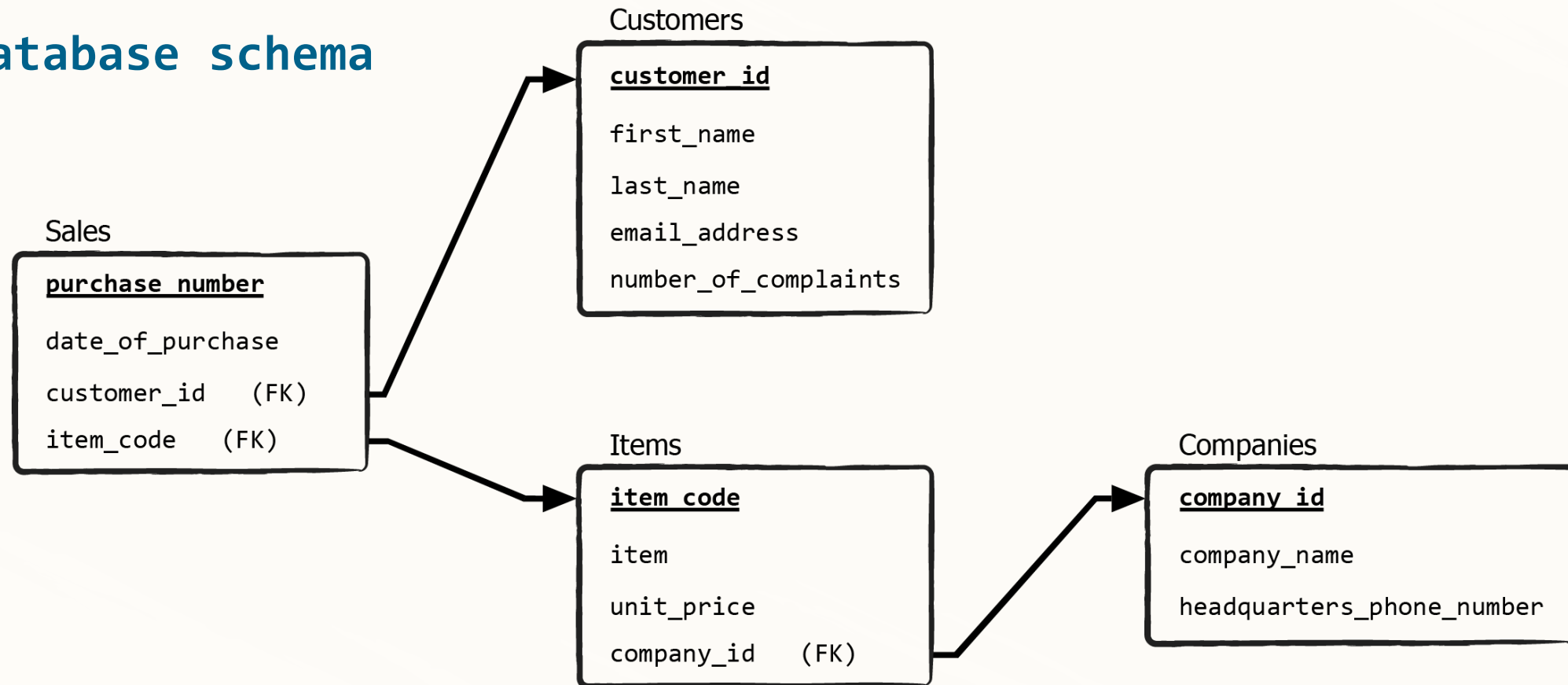
date\_of\_purchase

customer\_id (FK)

item\_code (FK)

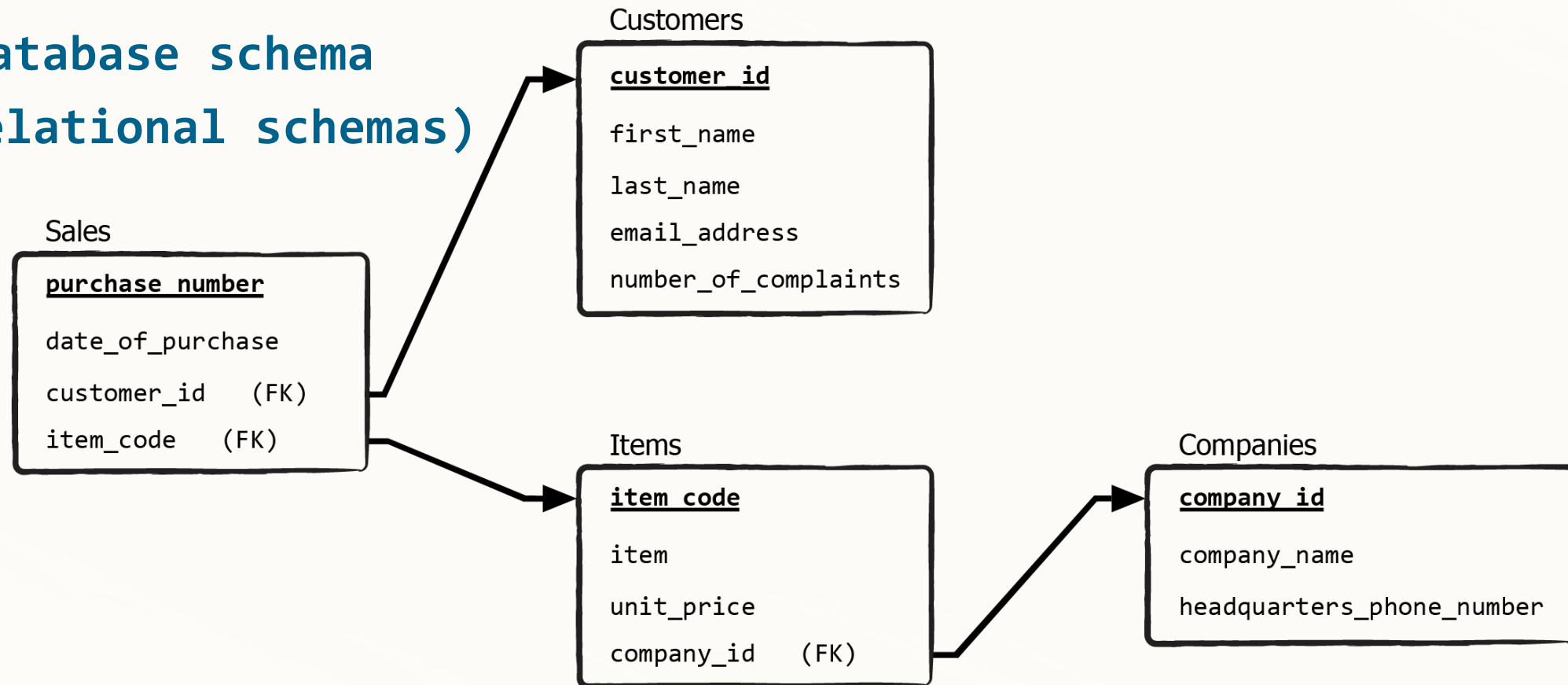
# Relational Schemas: Primary Key

## database schema



# Relational Schemas: Primary Key

database schema  
(relational schemas)



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# Relational Schemas: Foreign Key

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purchase_number	date_of_purchase	customer_id	item_code
1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
5	5/25/2017	4	B_2
6	6/6/2017	2	B_1
7	6/10/2017	4	A_2
8	6/13/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1



# Relational Schemas: Foreign Key

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
1	John	McKinley	<a href="mailto:john.mackinley@365careers.com">john.mackinley@365careers.com</a>	0
2	Elizabeth	McFarlane	<a href="mailto:e.mcfarlane@365careers.com">e.mcfarlane@365careers.com</a>	2
3	Kevin	Lawrence	<a href="mailto:kevin.lawrence@365careers.com">kevin.lawrence@365careers.com</a>	1
4	Catherine	Winnfield	<a href="mailto:c.winnfield@365careers.com">c.winnfield@365careers.com</a>	0

Sales				
purchase_number	date_of_purchase	customer_id	item_code	
1	9/3/2016	1	A_1	
2	12/2/2016	2	C_1	
3	4/15/2017	3	D_1	
4	5/24/2017	1	B_2	
5	5/25/2017	4	B_2	
6	6/6/2017	2	B_1	
7	6/10/2017	4	A_2	
8	6/13/2017	3	C_1	
9	7/20/2017	1	A_1	
10	8/11/2017	2	B_1	

# Relational Schemas: Foreign Key

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
1	John	McKinley	<a href="mailto:john.mackinley@365careers.com">john.mackinley@365careers.com</a>	0
2	Elizabeth	McFarlane	<a href="mailto:e.mcfarlane@365careers.com">e.mcfarlane@365careers.com</a>	2
3	Kevin	Lawrence	<a href="mailto:kevin.lawrence@365careers.com">kevin.lawrence@365careers.com</a>	1
4	Catherine	Winnfield	<a href="mailto:c.winnfield@365careers.com">c.winnfield@365careers.com</a>	0

Sales			
purchase_number	date_of_purchase	customer_id	item_code
1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
5	5/25/2017	4	B_2
6	6/6/2017	2	B_1
7	6/10/2017	4	A_2
8	6/13/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

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Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
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purchase_number	date_of_purchase	customer_id	item_code
1	9/3/2016	1	A_1
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6	6/6/2017	2	B_1
7	6/10/2017	4	A_2
8	6/13/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

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customer_id	first_name	last_name	email_address	number_of_complaints
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Sales				
purchase_number	date_of_purchase	ID	item_code	
1	9/3/2016	1	A_1	
2	12/2/2016	2	C_1	
3	4/15/2017	3	D_1	
4	5/24/2017	1	B_2	
5	5/25/2017	4	B_2	
6	6/6/2017	2	B_1	
7	6/10/2017	4	A_2	
8	6/13/2017	3	C_1	
9	7/20/2017	1	A_1	
10	8/11/2017	2	B_1	

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Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
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Sales			
purchase_number	date_of_purchase	customer_id	item_code
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7	6/10/2017	4	A_2
8	6/13/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

# Relational Schemas: Foreign Key

# Relational Schemas: Foreign Key

Sales

purchase number

date\_of\_purchase

customer\_id

item\_code

Customers

customer id

first\_name

last\_name

email\_address

number\_of\_complaints

# Relational Schemas: Foreign Key

Sales

purchase number

date\_of\_purchase

customer\_id

item\_code

Customers

customer id

first\_name

last\_name

email\_address

number\_of\_complaints

always look for the foreign keys, as  
they show us where the relations are



# Relational Schemas: Foreign Key

Sales

purchase number

date\_of\_purchase

customer\_id (FK)

item\_code

Customers

customer id

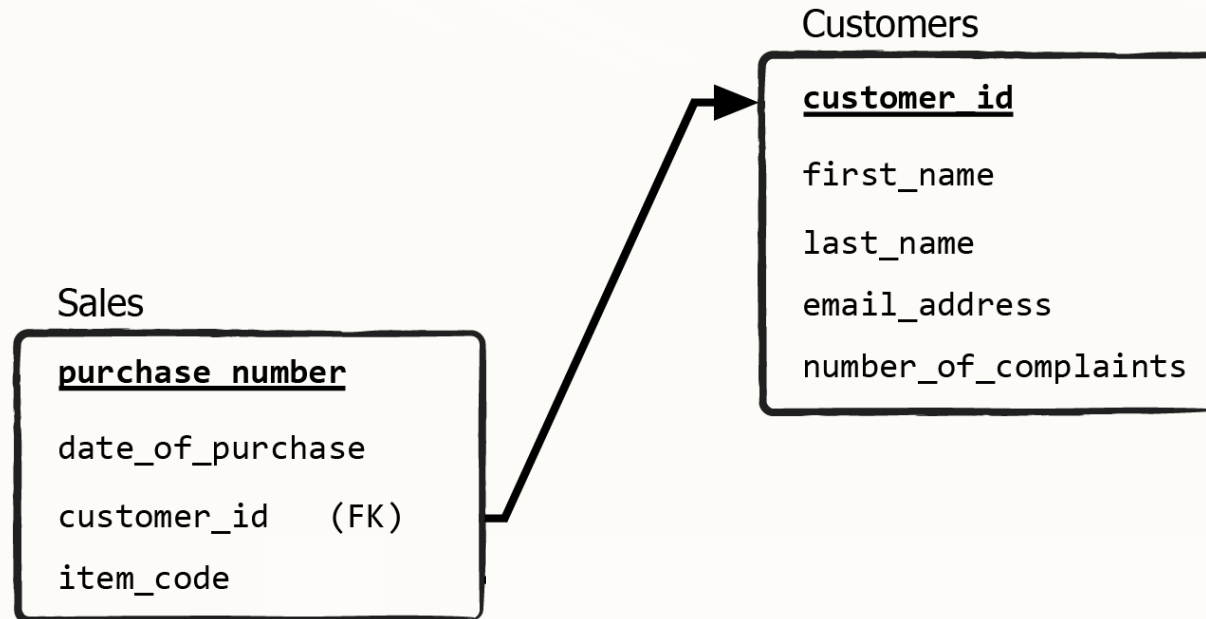
first\_name

last\_name

email\_address

number\_of\_complaints

# Relational Schemas: Foreign Key



# Relational Schemas: Foreign Key

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
1	John	McKinley	<a href="mailto:john.mackinley@365careers.com">john.mackinley@365careers.com</a>	0
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Sales				
purchase_number	date_of_purchase	customer_id	item_code	
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3	4/15/2017	3	D_1	
4	5/24/2017	1	B_2	
5	5/25/2017	4	B_2	
6	6/6/2017	2	B_1	
7	6/10/2017	4	A_2	
8	6/10/2017	3	C_1	
9	7/20/2017		A_1	
10	8/11/2017	2	B_1	

# Relational Schemas: Foreign Key

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
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4	Catherine	Winnfield	<a href="mailto:c.winnfield@365careers.com">c.winnfield@365careers.com</a>	0

no repeating and missing values

Sales				
purchase_number	date_of_purchase	customer_id	item_code	
1	9/3/2016	1	A_1	
2	12/2/2016	2	C_1	
3	4/15/2017	3	D_1	
4	5/24/2017	1	B_2	
5	5/25/2017	4	B_2	
6	6/6/2017	2	B_1	
7	6/10/2017	4	A_2	
8	6/10/2017	3	C_1	
9	7/20/2017		A_1	
10	8/11/2017	2	B_1	

# Relational Schemas: Foreign Key

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
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3	Kevin	Lawrence	<a href="mailto:kevin.lawrence@365careers.com">kevin.lawrence@365careers.com</a>	1
4	Catherine	Winnfield	<a href="mailto:c.winnfield@365careers.com">c.winnfield@365careers.com</a>	0

no repeating and missing values  
(unique values only)

Sales				
purchase_number	date_of_purchase	customer_id	item_code	
1	9/3/2016	1	A_1	
2	12/2/2016	2	C_1	
3	4/15/2017	3	D_1	
4	5/24/2017	1	B_2	
5	5/25/2017	4	B_2	
6	6/6/2017	2	B_1	
7	6/10/2017	4	A_2	
8	6/10/2017	3	C_1	
9	7/20/2017		A_1	
10	8/11/2017	2	B_1	

# Relational Schemas: Foreign Key

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
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4	Catherine	Winnfield	<a href="mailto:c.winnfield@365careers.com">c.winnfield@365careers.com</a>	0

no repeating and missing values  
(unique values only)

Sales				
purchase_number	date_of_purchase	customer_id	item_code	
1	9/3/2016	1	A_1	
2	12/2/2016	2	C_1	
3	4/15/2017	3	D_1	
4	5/24/2017	1	B_2	
5	5/25/2017	4	B_2	
6	6/6/2017	2	B_1	
7	6/10/2017	4	A_2	
8	6/10/2017	3	C_1	
9	7/20/2017		A_1	
10	8/11/2017	2	B_1	

repeating and missing values

# Relational Schemas: Foreign Key

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
1	John	McKinley	<a href="mailto:john.mackinley@365careers.com">john.mackinley@365careers.com</a>	0
2	Elizabeth	McFarlane	<a href="mailto:e.mcfarlane@365careers.com">e.mcfarlane@365careers.com</a>	2
3	Kevin	Lawrence	<a href="mailto:kevin.lawrence@365careers.com">kevin.lawrence@365careers.com</a>	1
4	Catherine	Winnfield	<a href="mailto:c.winnfield@365careers.com">c.winnfield@365careers.com</a>	0

Sales				
purchase_number	date_of_purchase	customer_id	item_code	
1	9/3/2016	1	A_1	
2	12/2/2016	2	C_1	
3	4/15/2017	3	D_1	
4	5/24/2017	1	B_2	
5	5/25/2017	4	B_2	
6	6/6/2017	2	B_1	
7	6/10/2017	4	A_2	
8	6/10/2017	3	C_1	
9	7/20/2017		A_1	
10	8/11/2017	2	B_1	

# Relational Schemas: Foreign Key

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
1	John	McKinley	<a href="mailto:john.mackinley@365careers.com">john.mackinley@365careers.com</a>	0
2	Elizabeth	McFarlane	<a href="mailto:e.mcfarlane@365careers.com">e.mcfarlane@365careers.com</a>	2
3	Kevin	Lawrence	<a href="mailto:kevin.lawrence@365careers.com">kevin.lawrence@365careers.com</a>	1
4	Catherine	Winnfield	<a href="mailto:c.winnfield@365careers.com">c.winnfield@365careers.com</a>	0

Sales				
purchase_number	date_of_purchase	customer_id	item_code	
1	9/3/2016	1	A_1	
2	12/2/2016	2	C_1	
3	4/15/2017	3	D_1	
4	5/24/2017	1	B_2	
5	5/25/2017	4	B_2	
6	6/6/2017	2	B_1	
7	6/10/2017	4	A_2	
8	6/10/2017	3	C_1	
9	7/20/2017		A_1	
10	8/11/2017	2	B_1	

**ERROR**



# Relational Schemas: Foreign Key

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
1	John	McKinley	<a href="mailto:john.mackinley@365careers.com">john.mackinley@365careers.com</a>	0
2	Elizabeth	McFarlane	<a href="mailto:e.mcfarlane@365careers.com">e.mcfarlane@365careers.com</a>	2
3	Kevin	Lawrence	<a href="mailto:kevin.lawrence@365careers.com">kevin.lawrence@365careers.com</a>	1
4	Catherine	Winnfield	<a href="mailto:c.winnfield@365careers.com">c.winnfield@365careers.com</a>	0

Sales			
purchase_number	date_of_purchase	customer_id	item_code
1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
5	5/25/2017	4	B_2
6	6/6/2017	2	B_1
7	6/10/2017	4	A_2
8	6/13/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

Items					
item_code	item	unit_price_usd	company_id	company	headquarters_phone_number
A_1	Lamp	20	1	Company A	+1 (202) 555-0196
A_2	Desk	250	1	Company A	+1 (202) 555-0196
B_1	Lamp	30	2	Company B	+1 (202) 555-0152
B_2	Desk	350	2	Company B	+1 (202) 555-0152
C_1	Chair	150	3	Company C	+1 (229) 853-9913
D_1	Loudspeakers	400	4	Company D	+1 (618) 369-7392

# Relational Schemas: Foreign Key

Customers					
customer_id	first_name	last_name	email_address	number_of_complaints	
1	John	McKinley	<a href="mailto:john.mackinley@365careers.com">john.mackinley@365careers.com</a>	0	
2	Elizabeth	McFarlane	<a href="mailto:e.mcfarlane@365careers.com">e.mcfarlane@365careers.com</a>	2	
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Sales				
purchase_number	date_of_purchase	customer_id	item_code	
1	9/3/2016	1	A_1	
2	12/2/2016	2	C_1	
3	4/15/2017	3	D_1	
4	5/24/2017	1	B_2	
5	5/25/2017	4	B_2	
6	6/6/2017	2	B_1	
7	6/10/2017	4	A_2	
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10	8/11/2017	2	B_1	

Items						
item_code	item	unit_price_usd	company_id	company	headquarters_phone_number	
A_1	Lamp	20	1	Company A	+1 (202) 555-0196	
A_2	Desk	250	1	Company A	+1 (202) 555-0196	
B_1	Lamp	30	2	Company B	+1 (202) 555-0152	
B_2	Desk	350	2	Company B	+1 (202) 555-0152	
C_1	Chair	150	3	Company C	+1 (229) 853-9913	
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purchase_number	date_of_purchase	customer_id	item_code	
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10	8/11/2017	2	B_1	

Items						
item_code	item	unit_price_usd	company_id	company	headquarters_phone_number	
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A_2	Desk	250	1	Company A	+1 (202) 555-0196	
B_1	Lamp	30	2	Company B	+1 (202) 555-0152	
B_2	Desk	350	2	Company B	+1 (202) 555-0152	
C_1	Chair	150	3	Company C	+1 (229) 853-9913	
D_1	Loudspeakers	400	4	Company D	+1 (618) 369-7392	

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Items						
item_code	item	unit_price_usd	company_id	company	headquarters_phone_number	
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A_2	Desk	250	1	Company A	+1 (202) 555-0196	
B_1	Lamp	30	2	Company B	+1 (202) 555-0152	
B_2	Desk	350	2	Company B	+1 (202) 555-0152	
C_1	Chair	150	3	Company C	+1 (229) 853-9913	
D_1	Loudspeakers	400	4	Company D	+1 (618) 369-7392	

no repeating and missing values

# Relational Schemas: Foreign Key

Customers					
customer_id	first_name	last_name	email_address	number_of_complaints	
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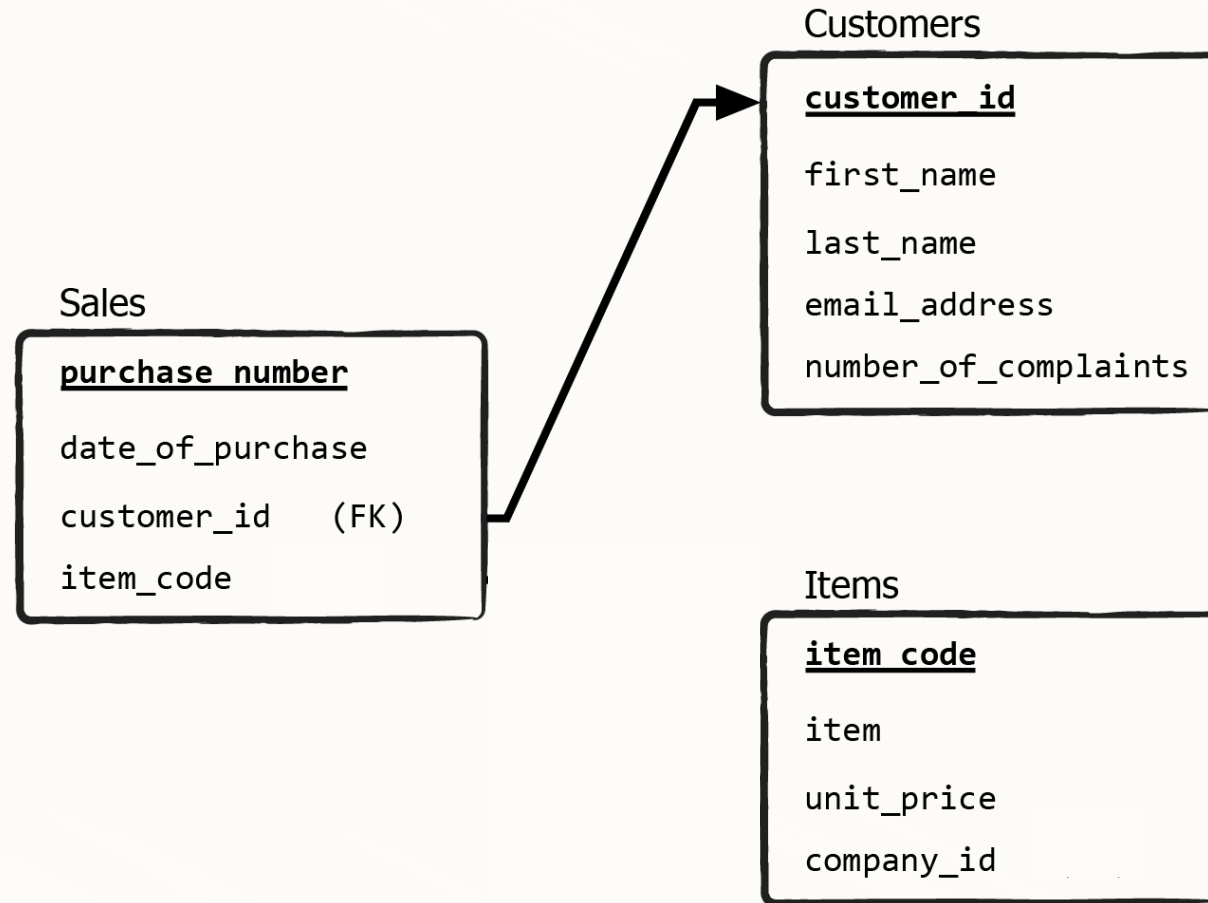
Sales				
purchase_number	date_of_purchase	customer_id	item_code	
1	9/3/2016	1	A_1	
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8	6/13/2017	3	C_1	
9	7/20/2017	1	A_1	
10	8/11/2017	2	B_1	

Items						
item_code	item	unit_price_usd	company_id	company	headquarters_phone_number	
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A_2	Desk	250	1	Company A	+1 (202) 555-0196	
B_1	Lamp	30	2	Company B	+1 (202) 555-0152	
B_2	Desk	350	2	Company B	+1 (202) 555-0152	
C_1	Chair	150	3	Company C	+1 (229) 853-9913	
D_1	Loudspeakers	400	4	Company D	+1 (618) 369-7392	

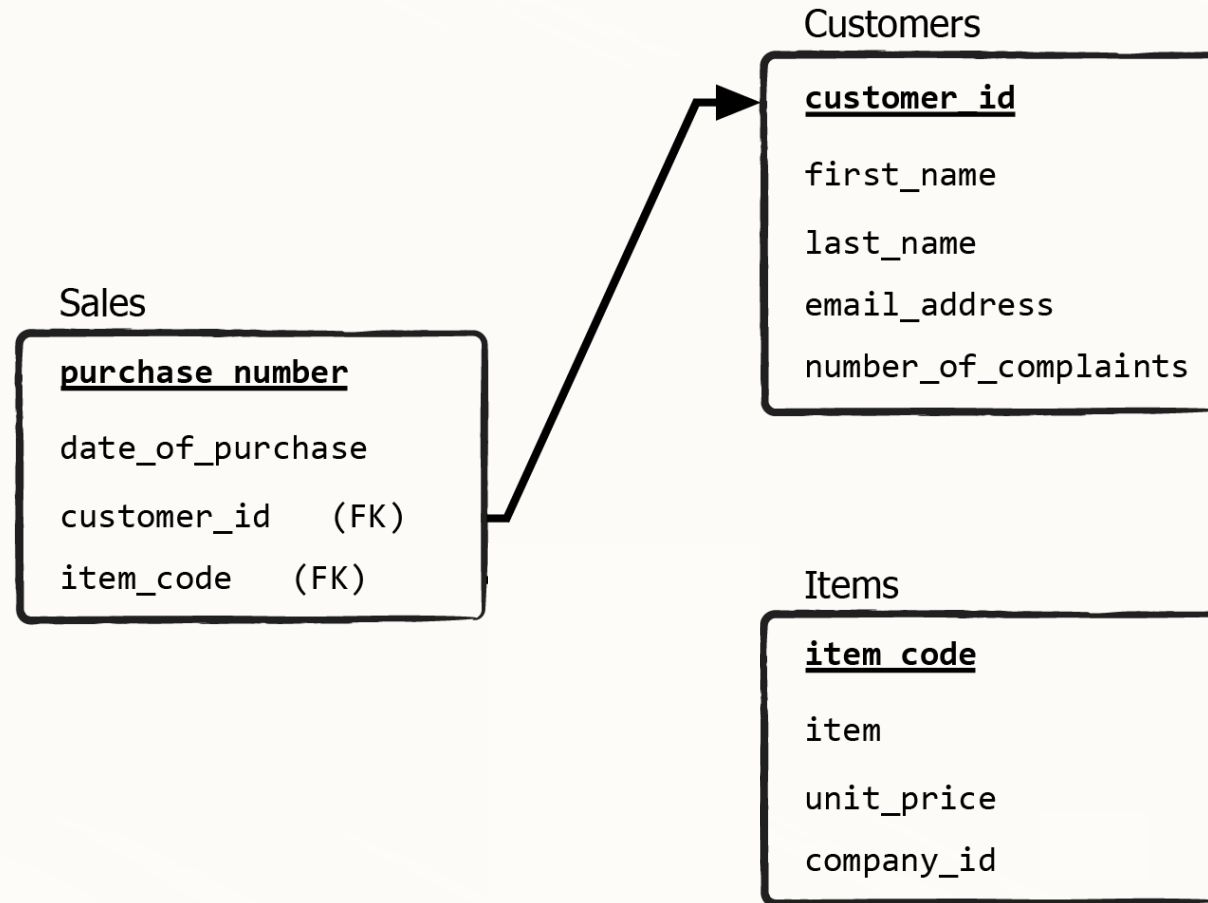
no repeating and missing values

repeating and missing values

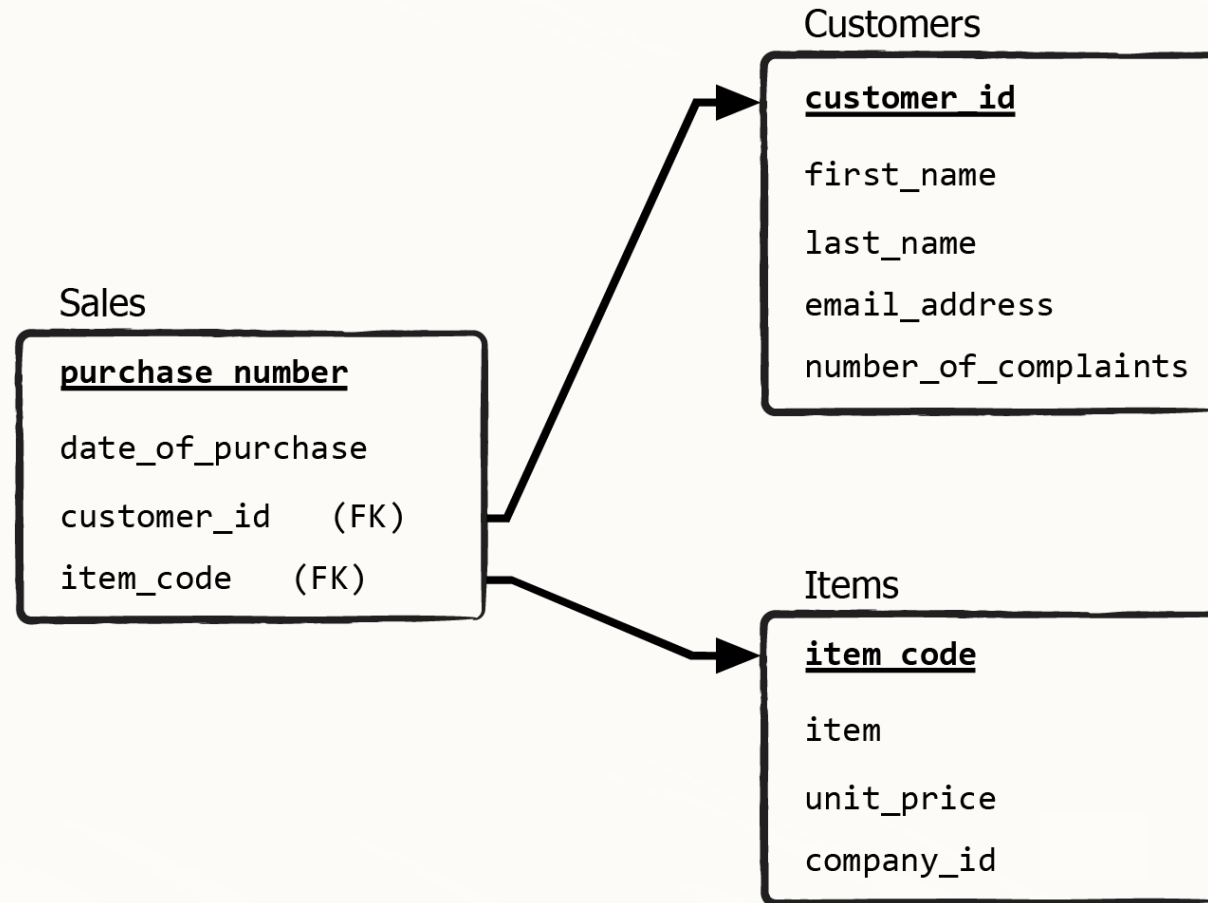
# Relational Schemas: Foreign Key



# Relational Schemas: Foreign Key



# Relational Schemas: Foreign Key



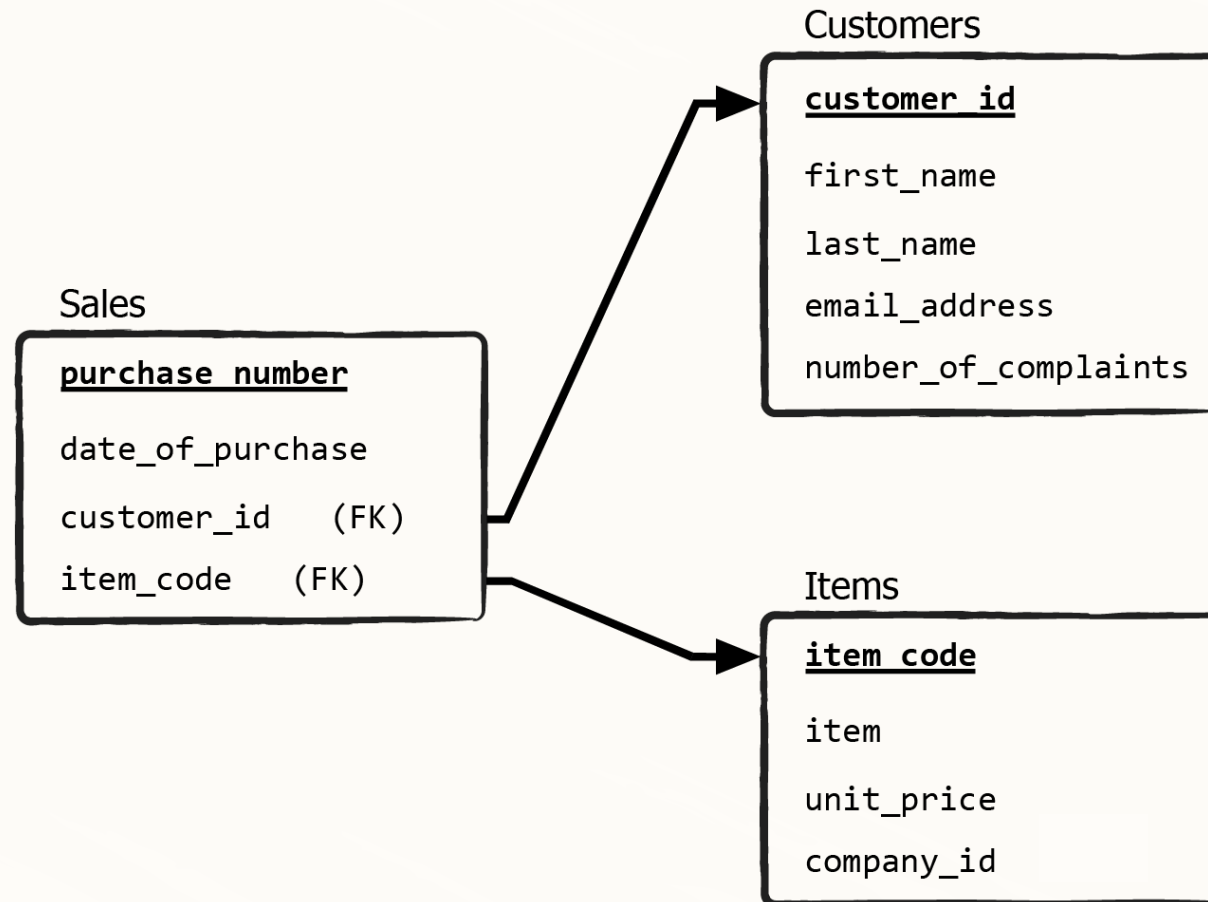


# Relational Schemas: Foreign Key

**foreign key**

identifies the relationships between tables, not the tables themselves

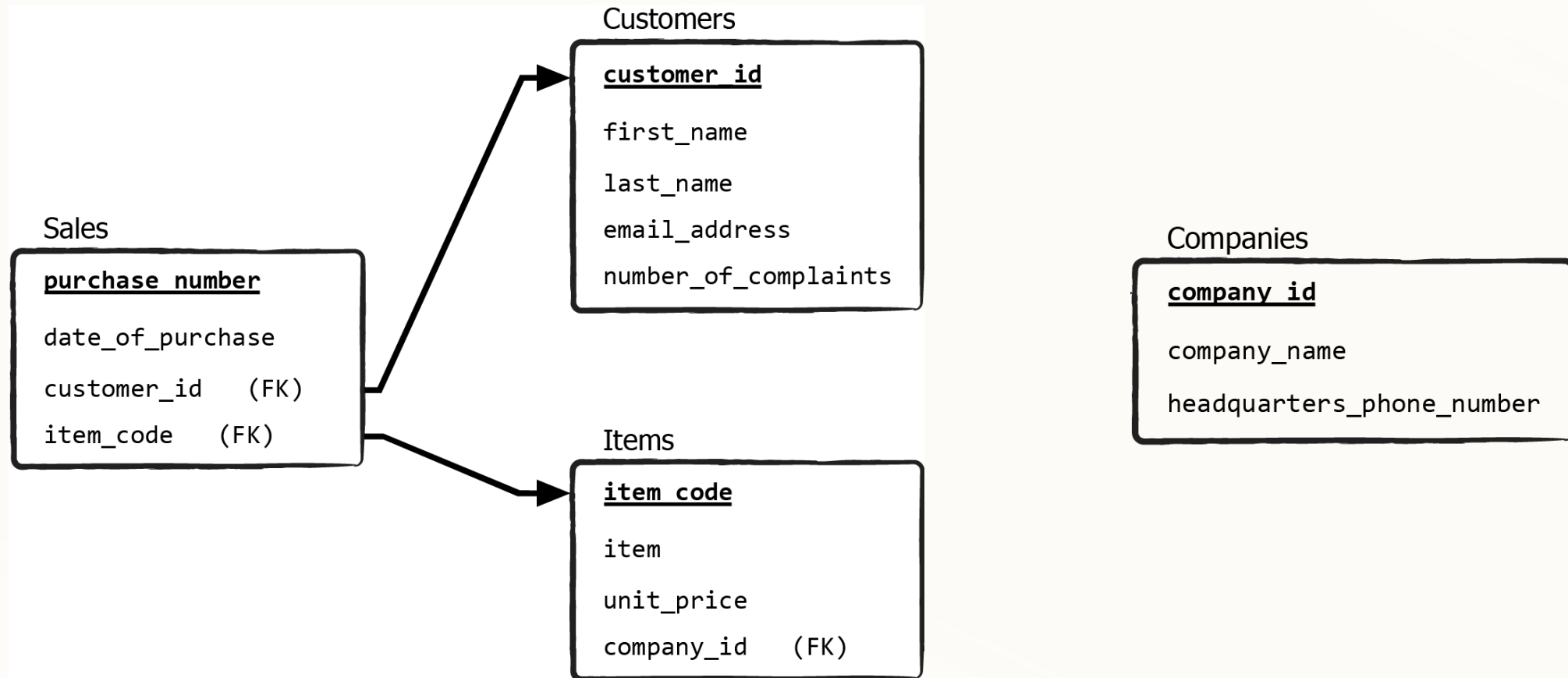
# Relational Schemas: Foreign Key



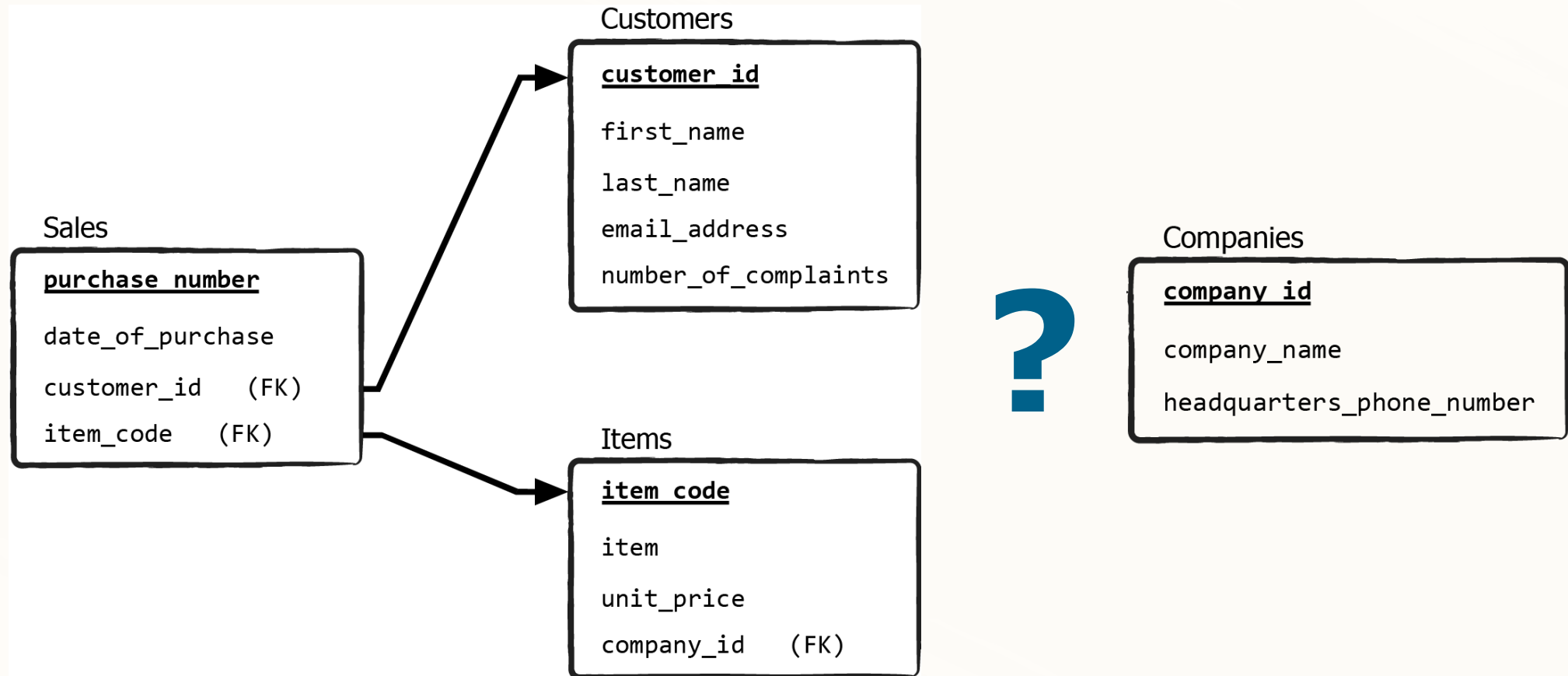
A modern conference room with large windows and a long table. The room is empty, with several chairs arranged around the table. The windows offer a view of a city skyline. The image has a blue tint and a stylized, torn-paper-like border.

# Relational Schemas: Unique Key & Null Values

# Relational Schemas: Unique Key & Null Values



# Relational Schemas: Unique Key & Null Values



# Relational Schemas: Unique Key & Null Values

Companies		
company_id	headquarters_phone_number	company
1	+1 (202) 555-0196	Company A
2	+1 (202) 555-0152	Company B
3	+1 (229) 853-9913	Company C
4	+1 (618) 369-7392	Company D

# Relational Schemas: Unique Key & Null Values

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company_id	headquarters_phone_number	company
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3	+1 (229) 853-9913	Company C
4	+1 (618) 369-7392	Company D

You can have two or more companies with the same name

# Relational Schemas: Unique Key & Null Values

Companies		
company_id	headquarters_phone_number	company
1	+1 (202) 555-0196	Company A
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2	+1 (202) 555-0152	Company B
3	+1 (229) 853-9913	Company C
4	+1 (618) 369-7392	Company D

You *cannot* have two US numbers that are completely identical

# Relational Schemas: Unique Key & Null Values

Companies		
company_id	headquarters_phone_number	company
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4	+1 (618) 369-7392	Company D



# Relational Schemas: Unique Key & Null Values

## unique key

used whenever you would like to specify that you don't want to see duplicate data in a given field

# Relational Schemas: Unique Key & Null Values

	primary key	unique key
NULL VALUES	no	yes

# Relational Schemas: Unique Key & Null Values

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company_id	headquarters_phone_number	company
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# Relational Schemas: Unique Key & Null Values

**ERROR**

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4	+1 (618) 369-7392	Company D

# Relational Schemas: Unique Key & Null Values

	primary key	unique key
NULL VALUES	no	yes
NUMBER OF KEYS	1	0, 1, 2...



# Relational Schemas: Unique Key & Null Values

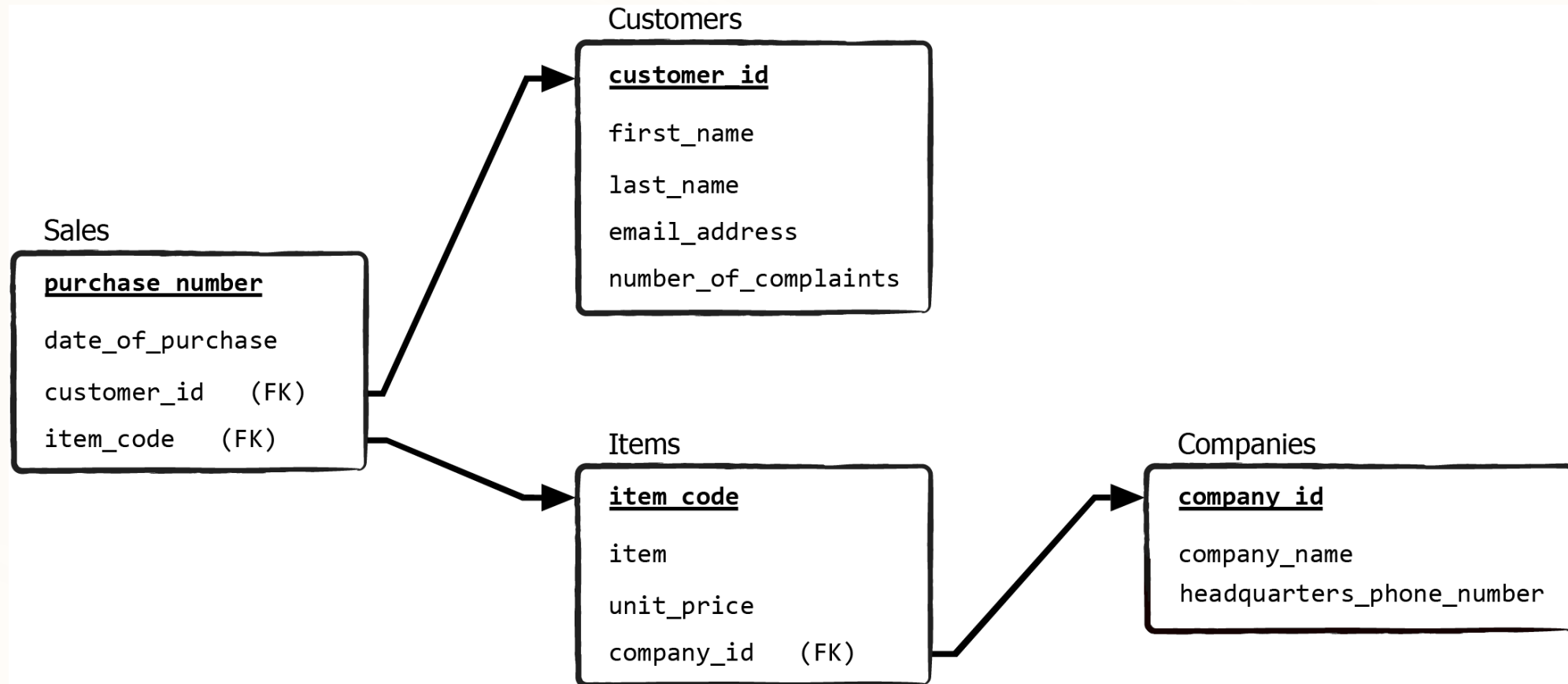
	primary key	unique key
NULL VALUES	no	yes
NUMBER OF KEYS	1	0, 1, 2...
APPLICATION TO MULTIPLE COLUMNS	yes	yes

# Relational Schemas: Unique Key & Null Values

Companies		
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# Relational Schemas: Unique Key & Null Values

# Relational Schemas: Unique Key & Null Values



# Relationships

# Relationships

- Relationships

# Relationships

- Relationships

relationships tell you how much of the data from a foreign key field can be seen in the primary key column of the table the data is related to and vice versa

# Relationships

Sales				
purchase_number	date_of_purchase	customer_id	item_code	
1	9/3/2016	1	A_1	
2	12/2/2016	2	C_1	
3	4/15/2017	3	D_1	
4	5/24/2017	1	B_2	
5	5/25/2017	4	B_2	
6	6/6/2017	2	B_1	
7	6/10/2017	4	A_2	
8	6/13/2017	3	C_1	
9	7/20/2017	1	A_1	
10	8/11/2017	2	B_1	

Customers					
customer_id	first_name	last_name	email_address	number_of_complaints	
1	John	McKinley	<a href="mailto:john.mackinley@365careers.com">john.mackinley@365careers.com</a>	0	
2	Elizabeth	McFarlane	<a href="mailto:e.mcfarlane@365careers.com">e.mcfarlane@365careers.com</a>	2	
3	Kevin	Lawrence	<a href="mailto:kevin.lawrence@365careers.com">kevin.lawrence@365careers.com</a>	1	
4	Catherine	Winnfield	<a href="mailto:c.winnfield@365careers.com">c.winnfield@365careers.com</a>	0	



# Relationships

Sales				
purchase_number	date_of_purchase	customer_id	item_code	
1	9/3/2016	1	A_1	
2	12/2/2016	2	C_1	
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4	5/24/2017	1	B_2	
5	5/25/2017	4	B_2	
6	6/6/2017	2	B_1	
7	6/10/2017	4	A_2	
8	6/13/2017	3	C_1	
9	7/20/2017	1	A_1	
10	8/11/2017	2	B_1	

Customers					
customer_id	first_name	last_name	email_address	number_of_complaints	
1	John	McKinley	<a href="mailto:john.mackinley@365careers.com">john.mackinley@365careers.com</a>	0	
2	Elizabeth	McFarlane	<a href="mailto:e.mcfarlane@365careers.com">e.mcfarlane@365careers.com</a>	2	
3	Kevin	Lawrence	<a href="mailto:kevin.lawrence@365careers.com">kevin.lawrence@365careers.com</a>	1	
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purchase_number	date_of_purchase	customer_id	item_code
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2	12/2/2016	2	C_1
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4	5/24/2017	1	B_2
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6	6/6/2017	2	B_1
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customer_id	first_name	last_name	email_address	number_of_complaints
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2	Elizabeth	McFarlane	<a href="mailto:e.mcfarlane@365careers.com">e.mcfarlane@365careers.com</a>	2
3	Kevin	Lawrence	<a href="mailto:kevin.lawrence@365careers.com">kevin.lawrence@365careers.com</a>	1
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unique values

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repeated values

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unique values

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purchase_number	date_of_purchase	customer_id	item_code
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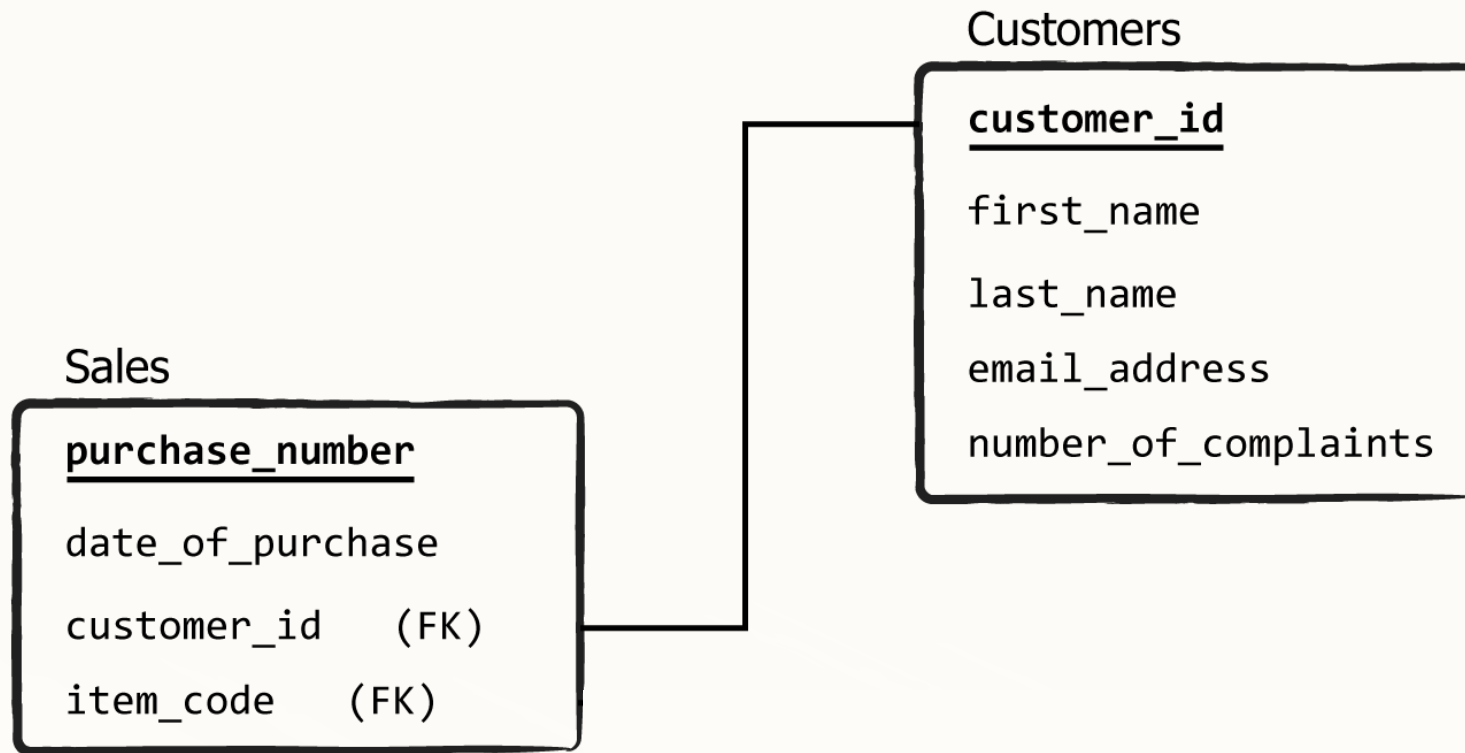
unique values

one-to-many type of relationship

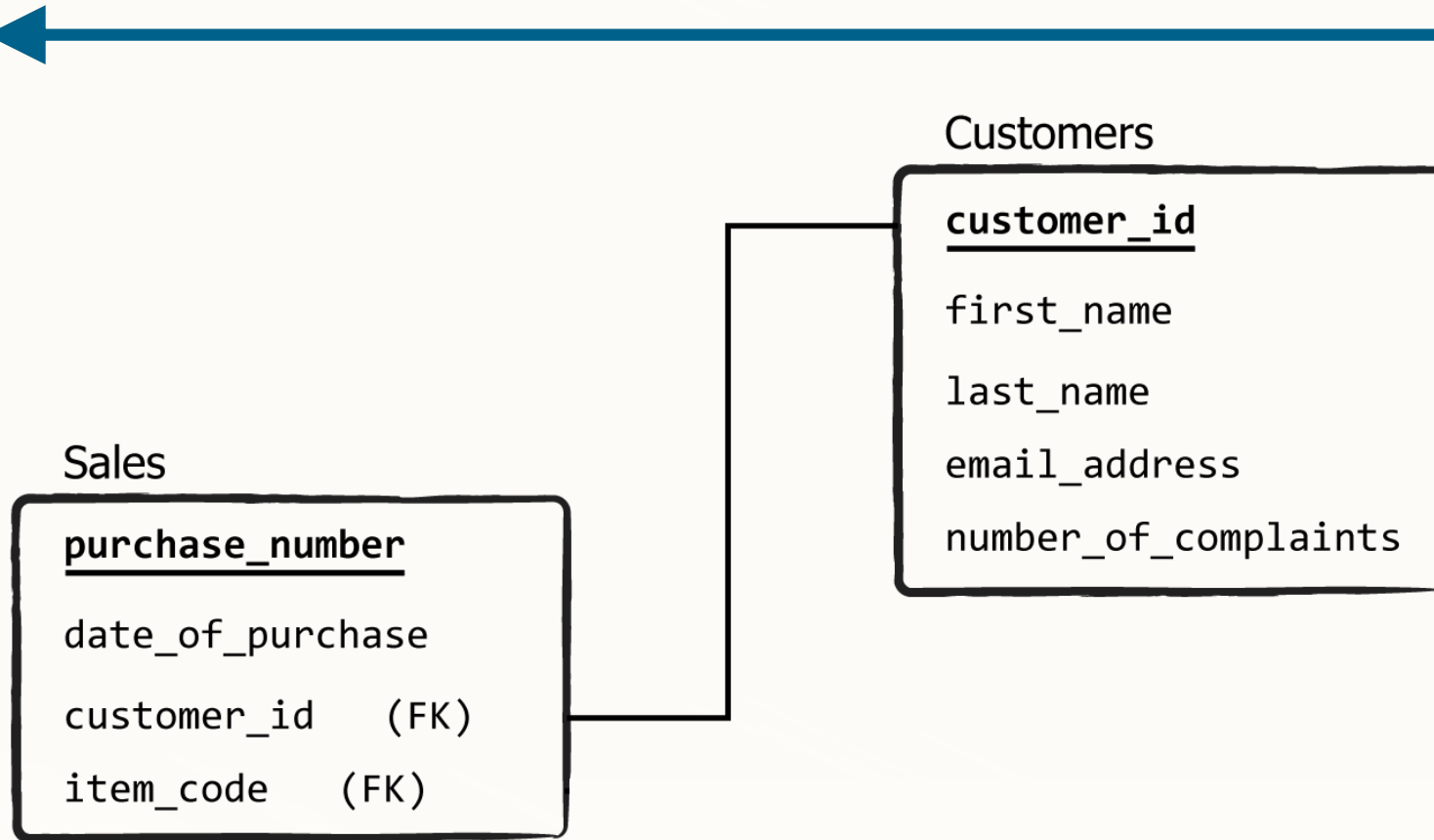
**one** value from the *customer\_id* column under the “Customers” table can be found **many** times in the *customer\_id* column in the “Sales” table.

# Relationships

# Relationships



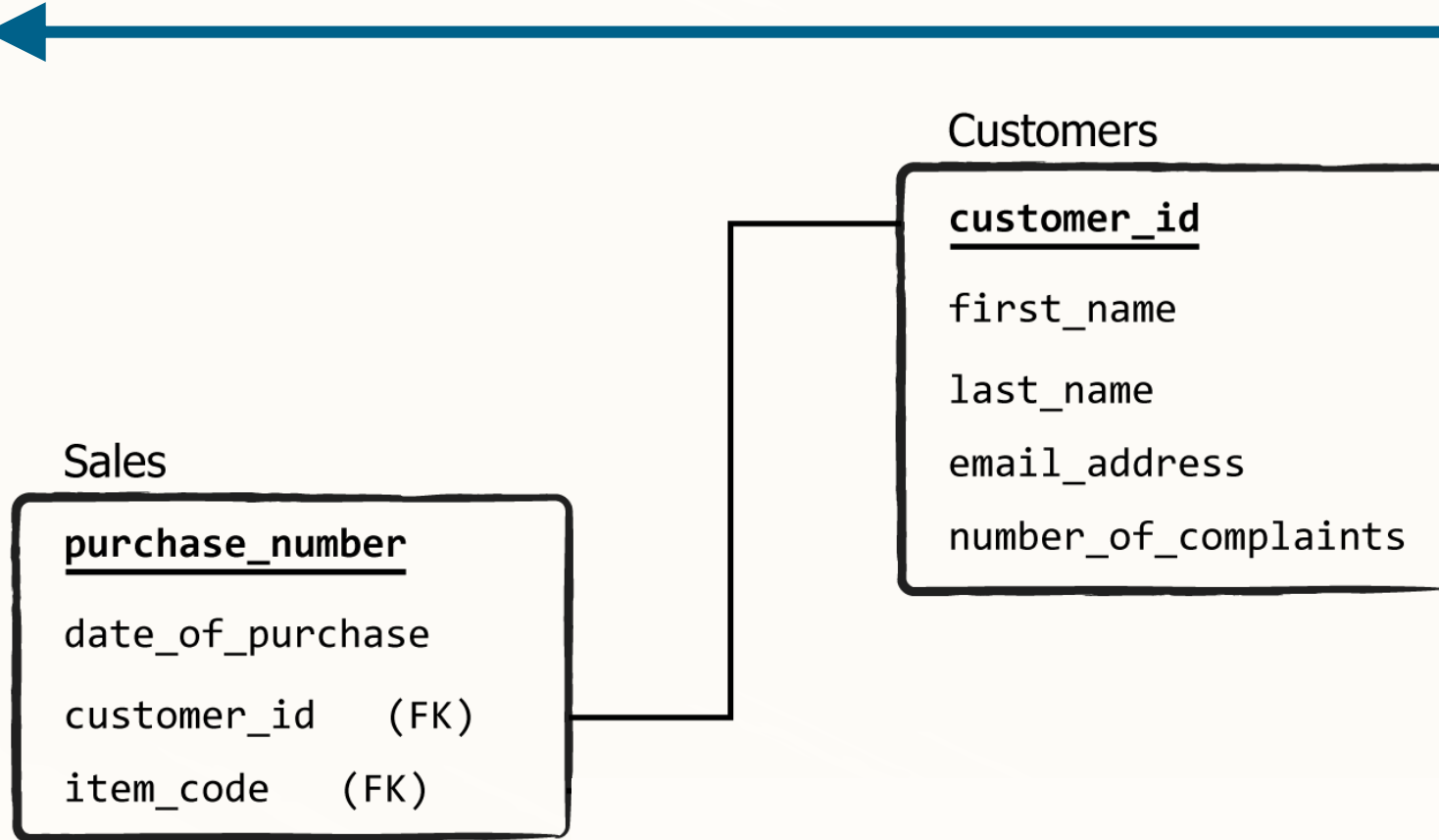
# Relationships



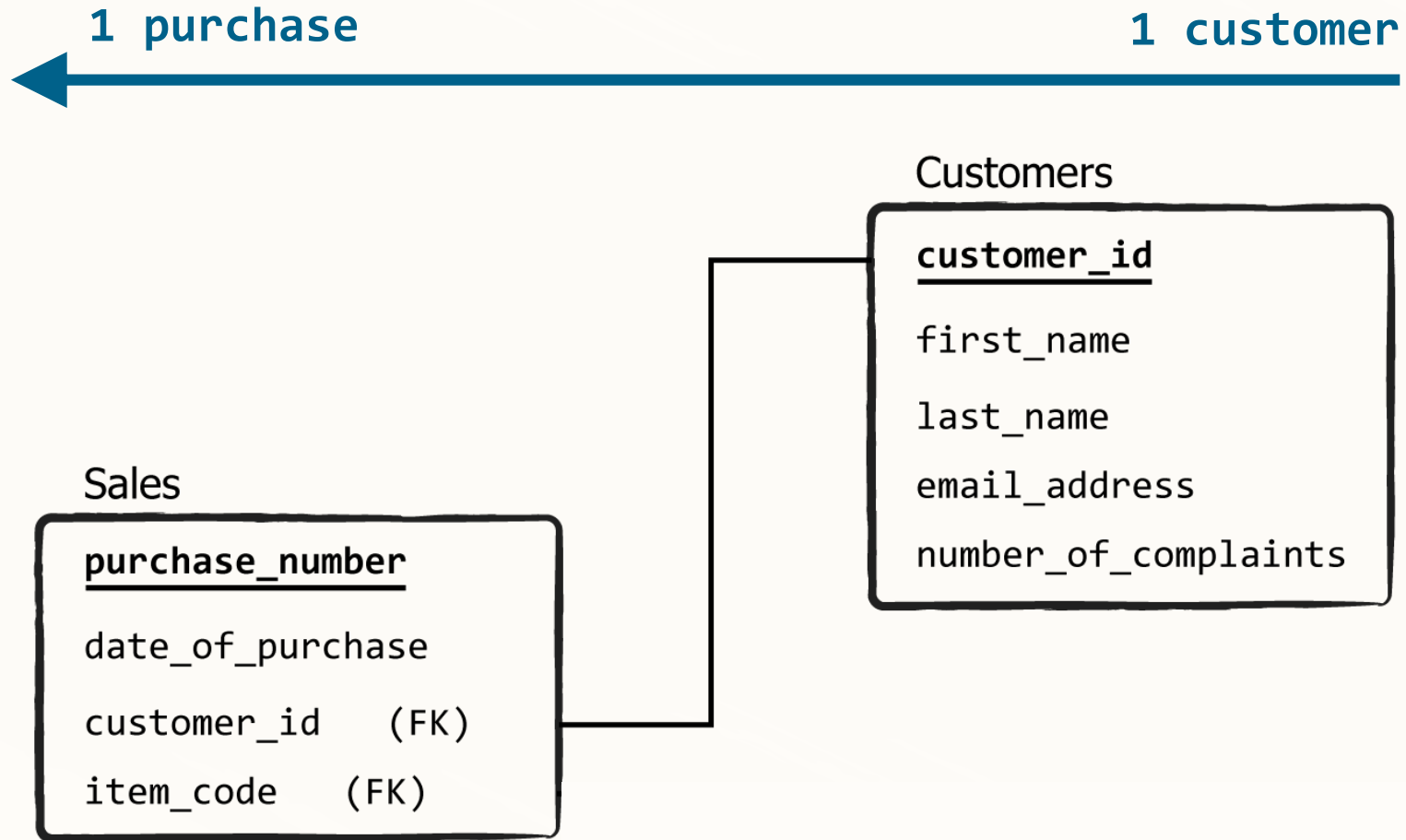


# Relationships

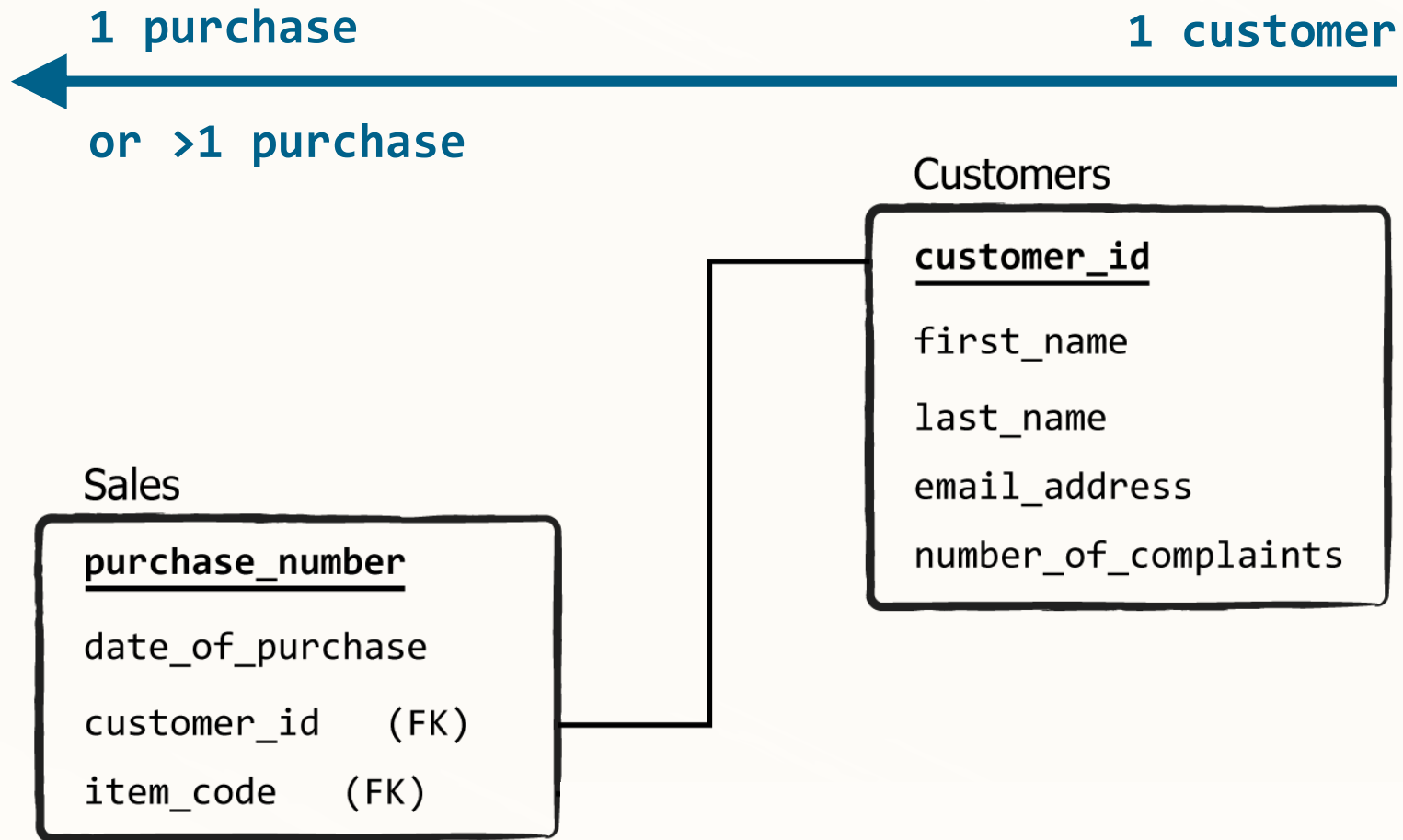
1 customer



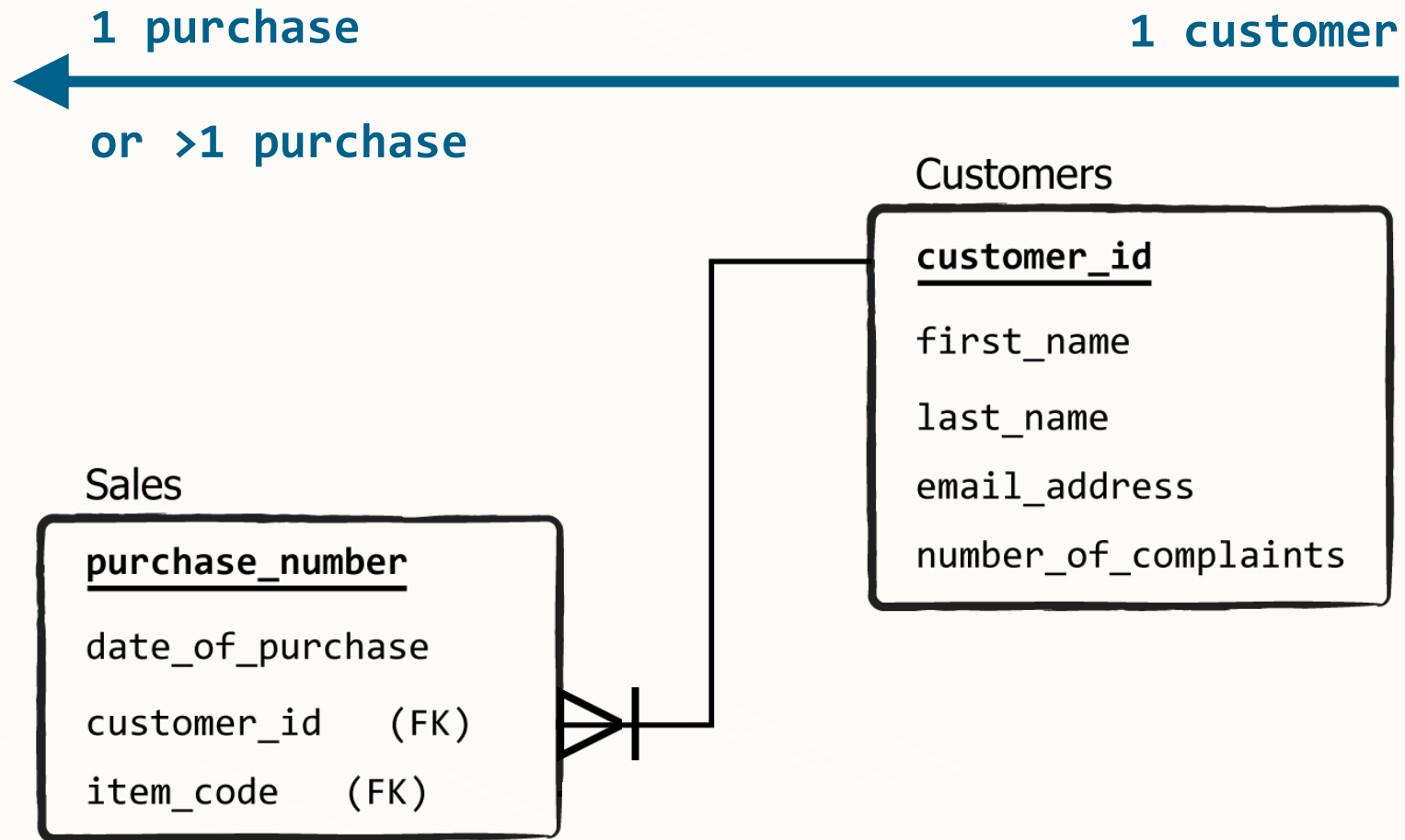
# Relationships



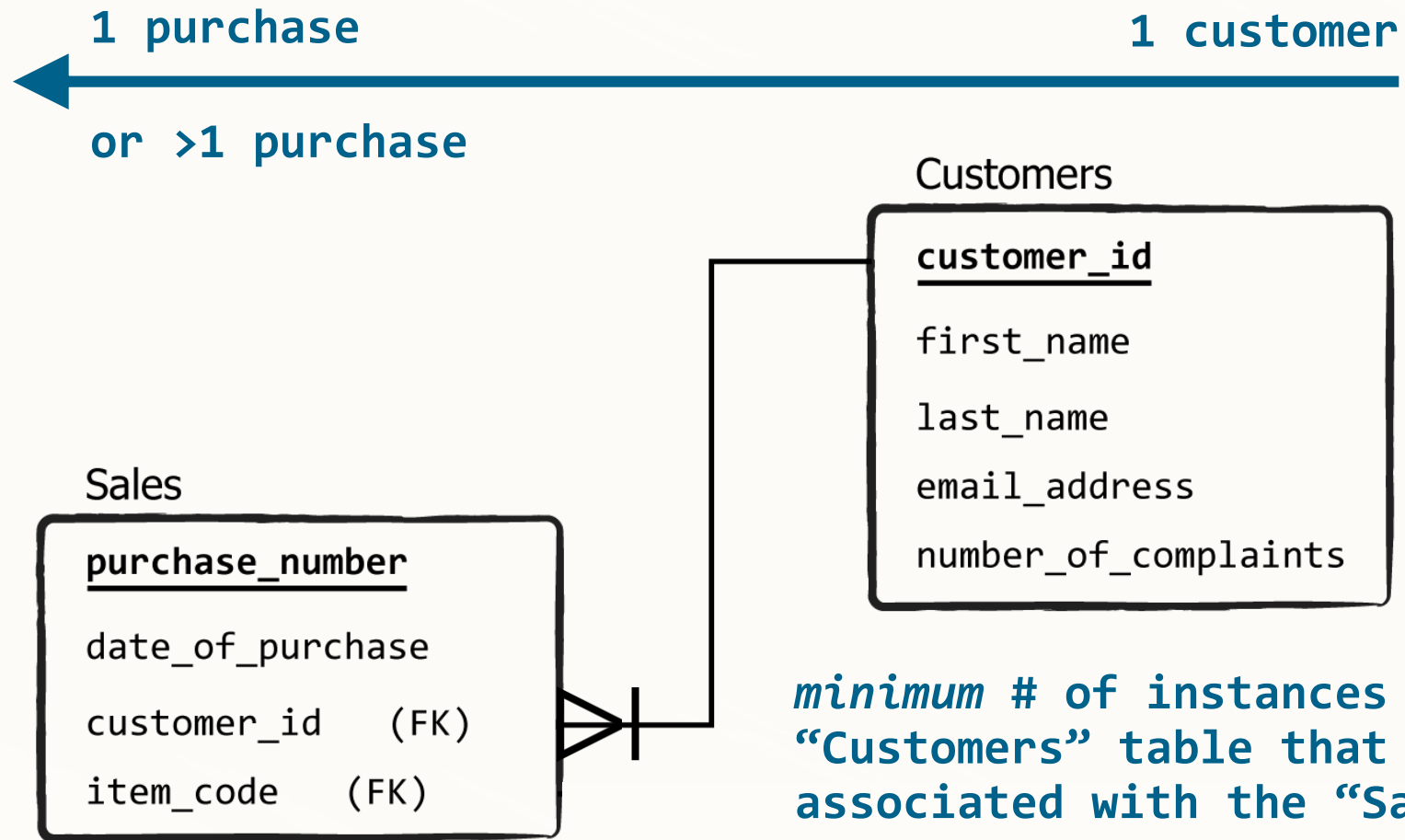
# Relationships



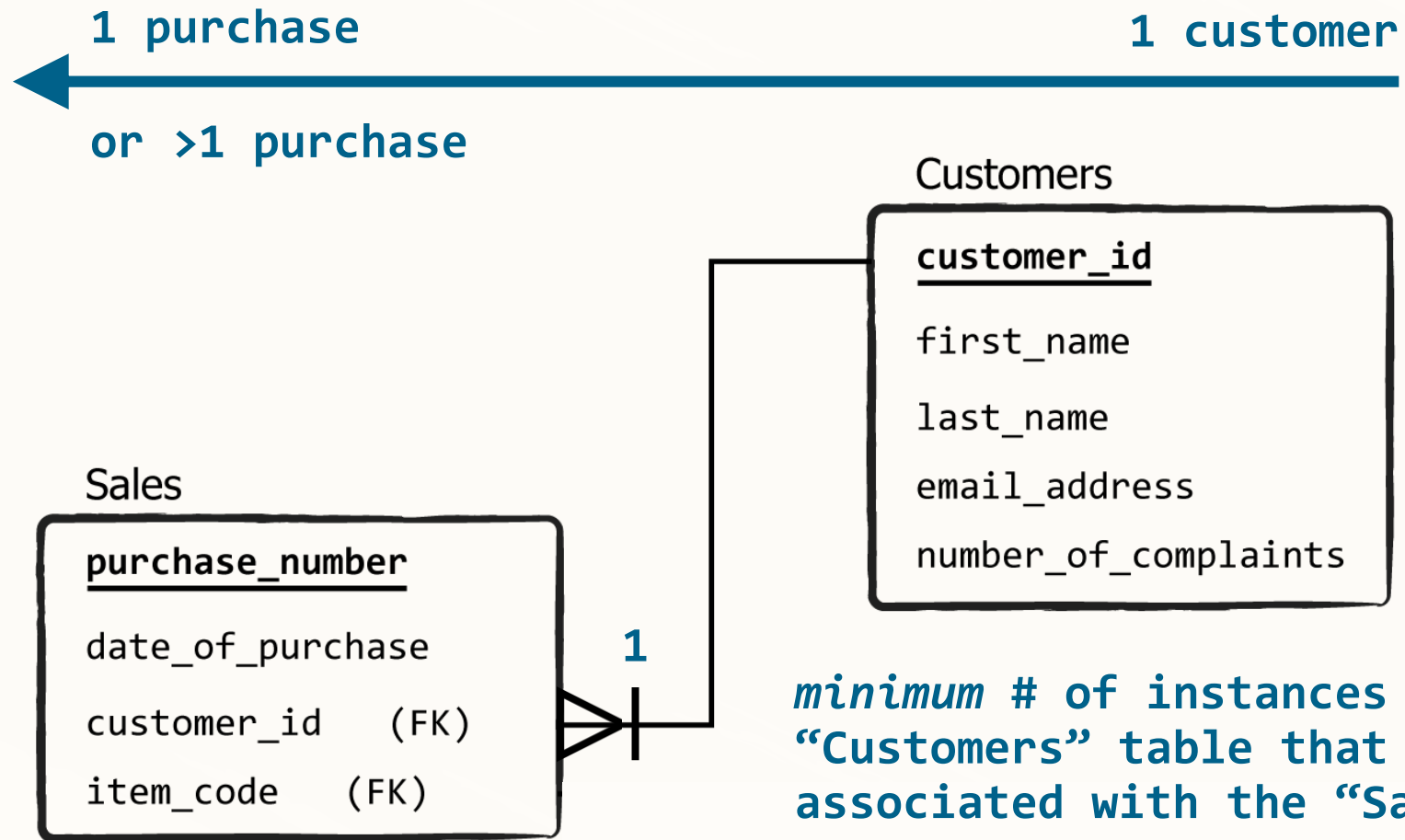
# Relationships



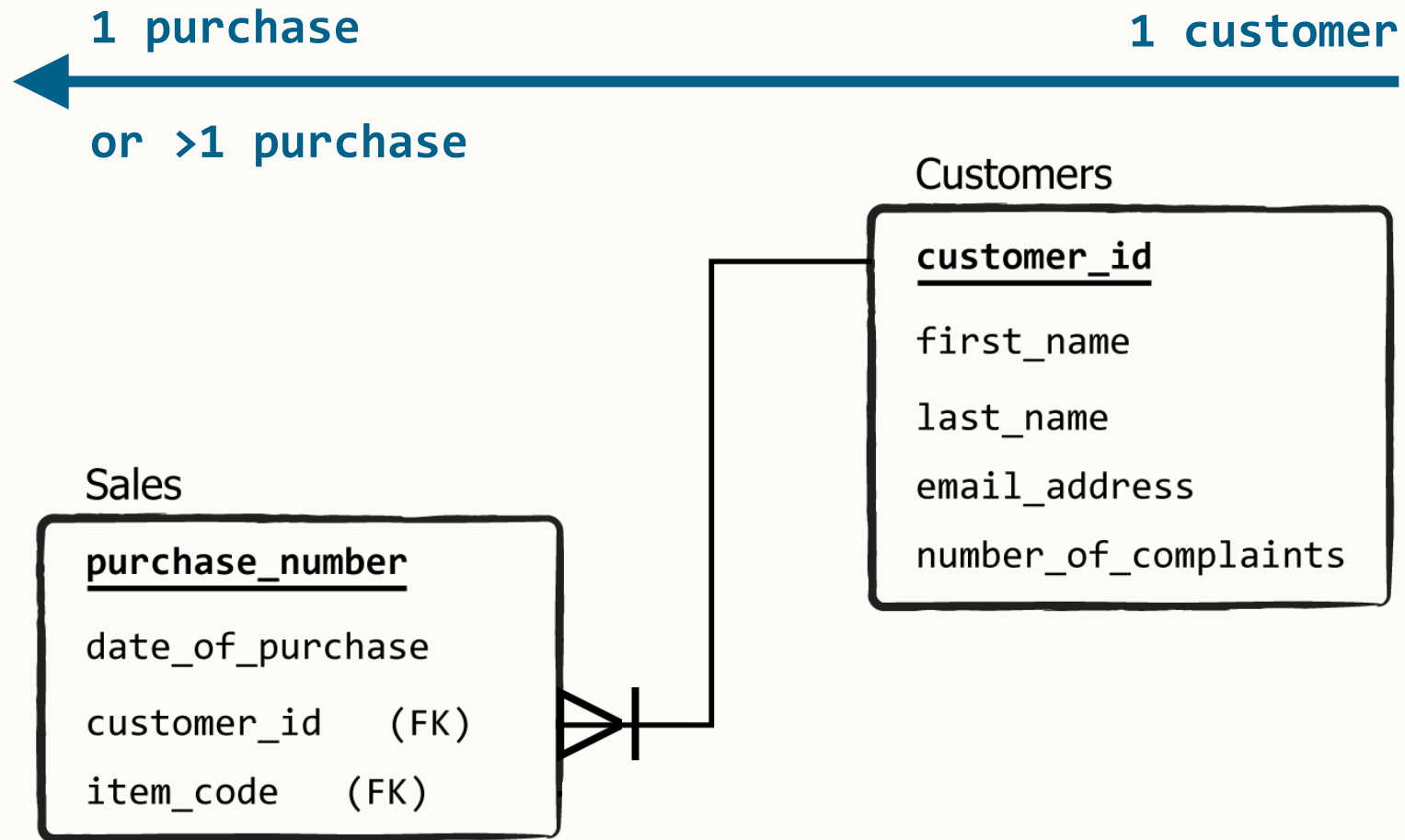
# Relationships



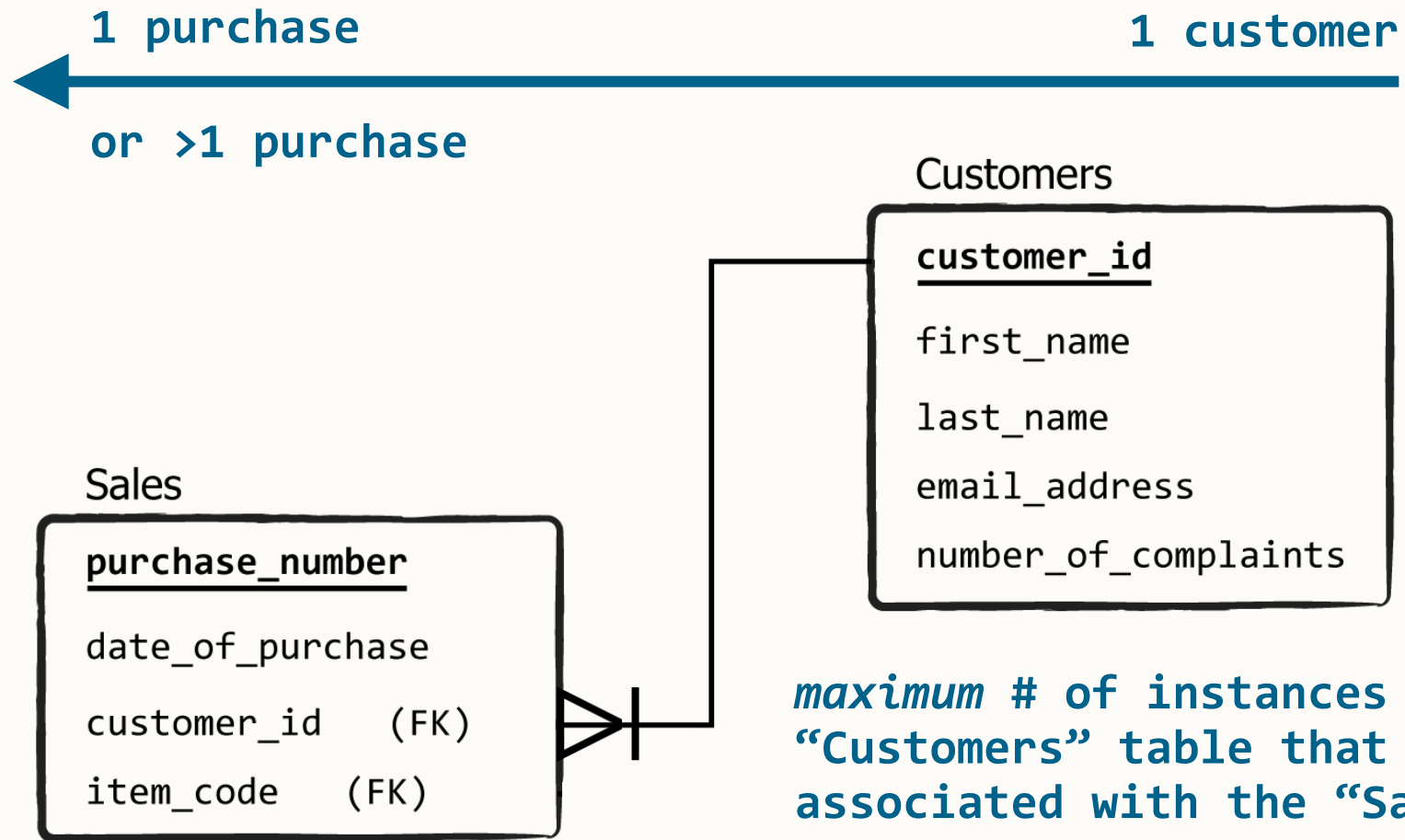
# Relationships



# Relationships

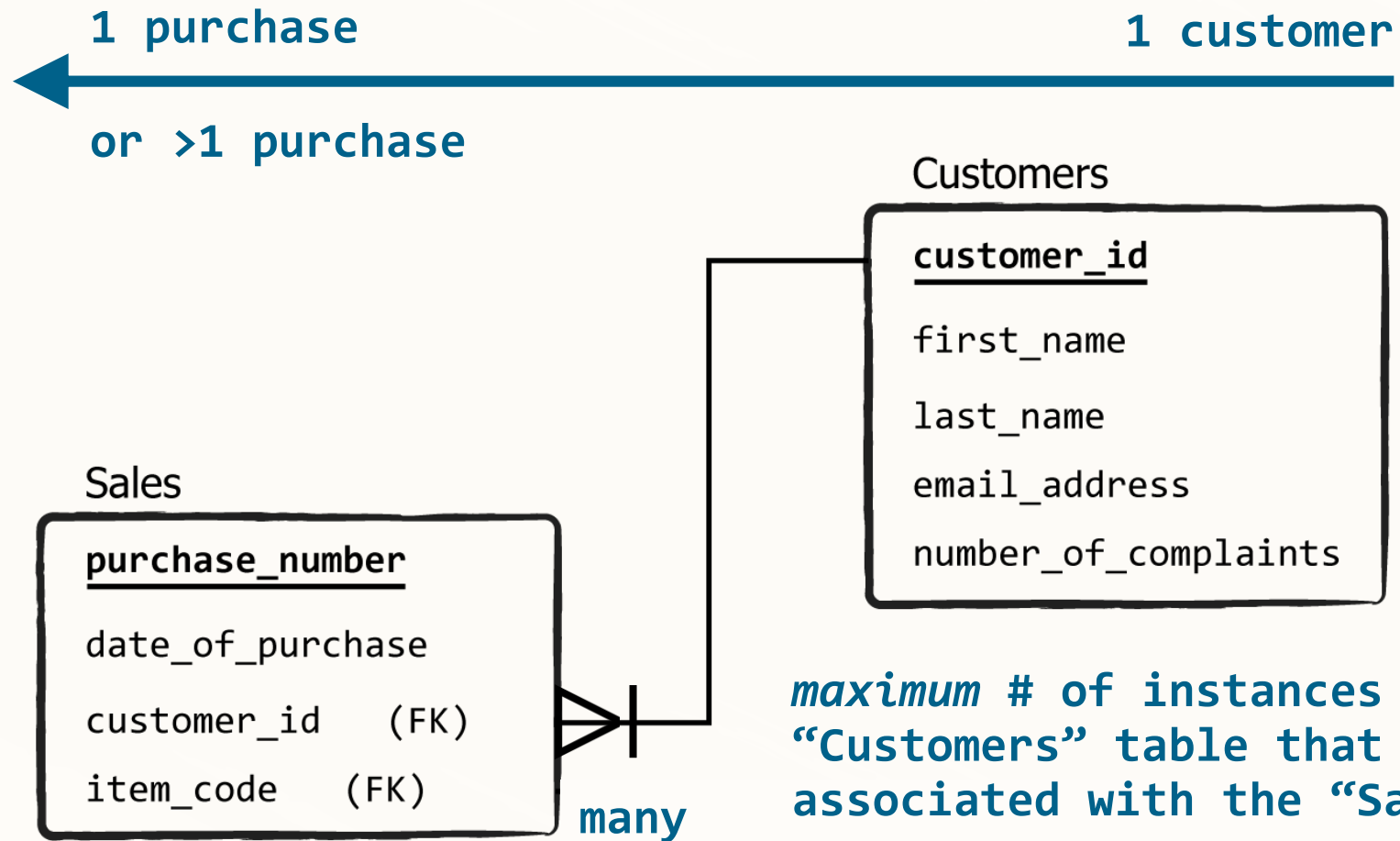


# Relationships

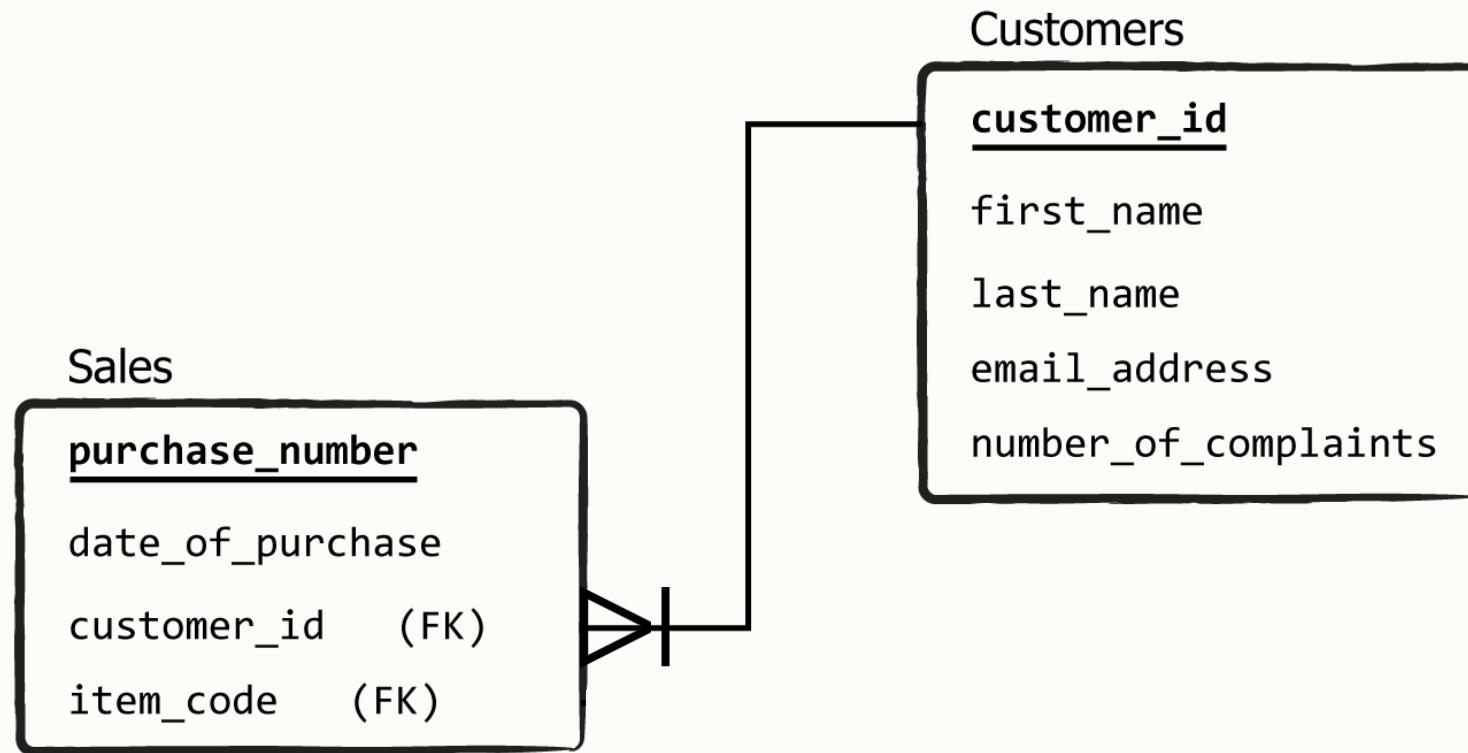




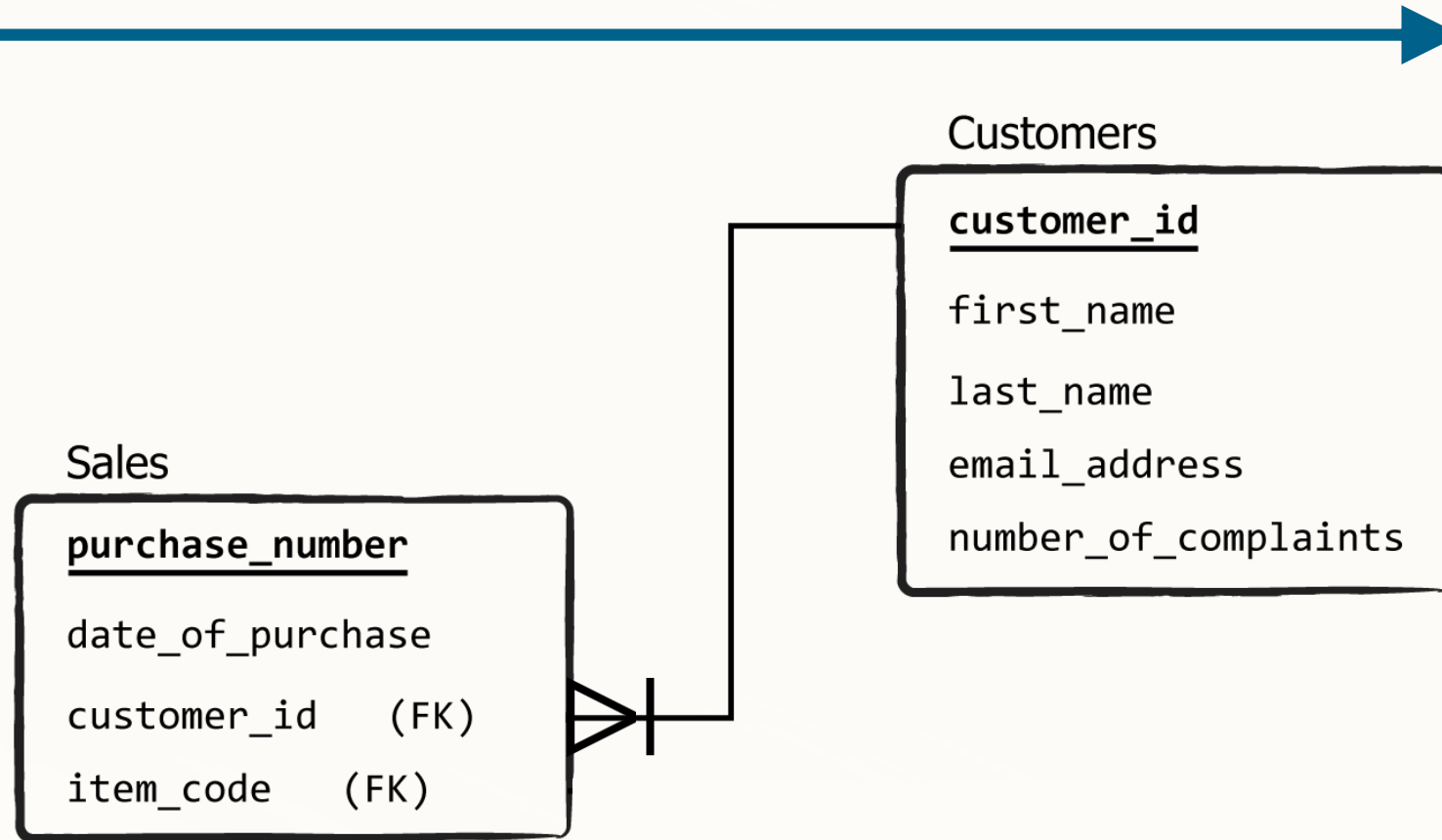
# Relationships



# Relationships

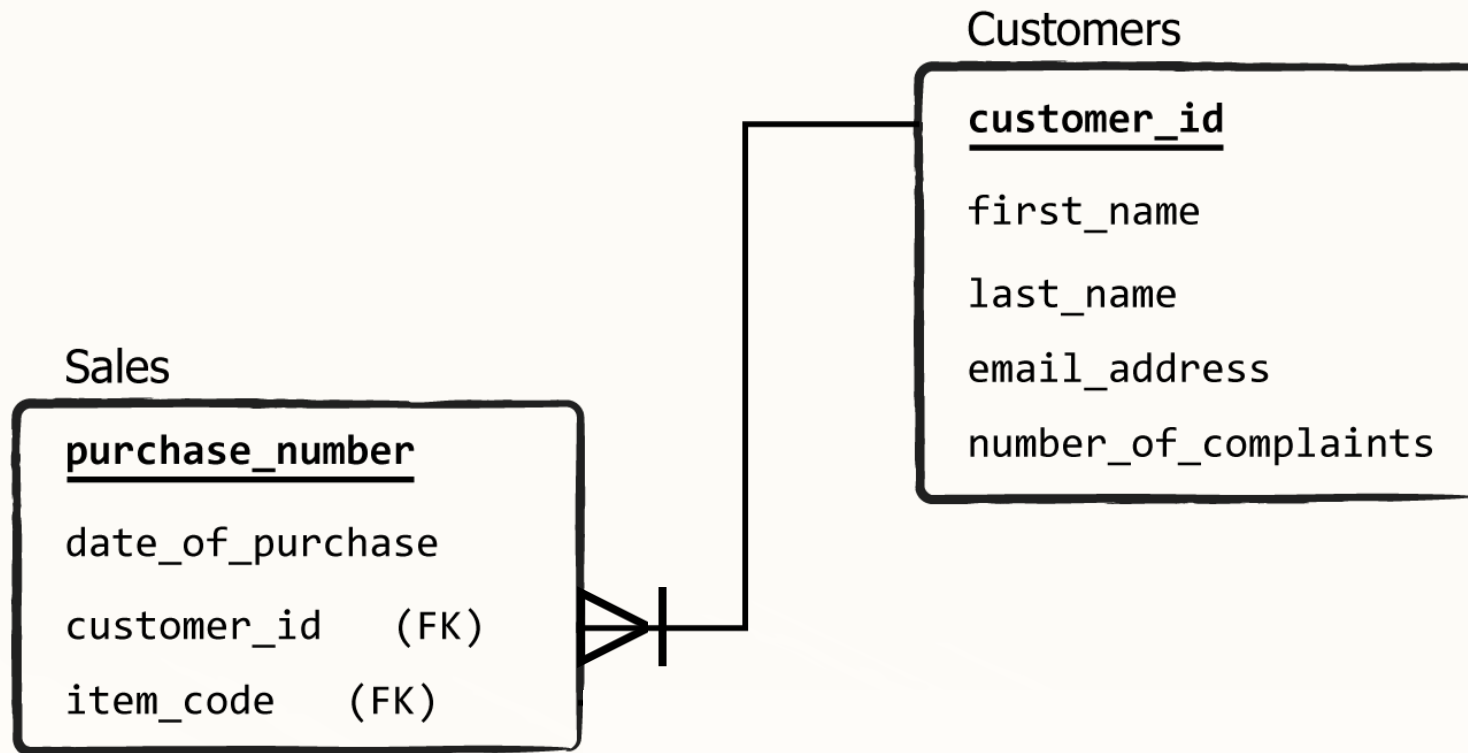


# Relationships



# Relationships

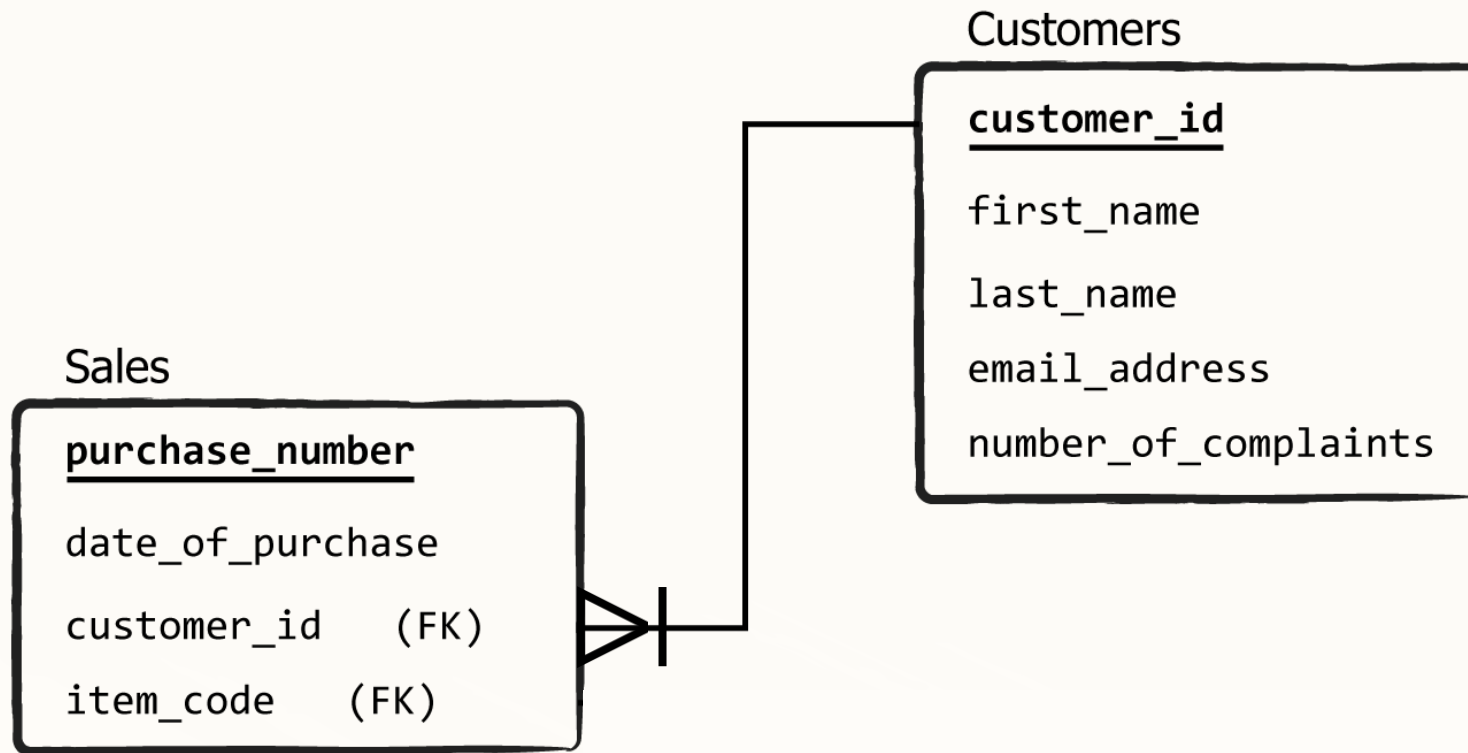
## 1 purchase



# Relationships

1 purchase

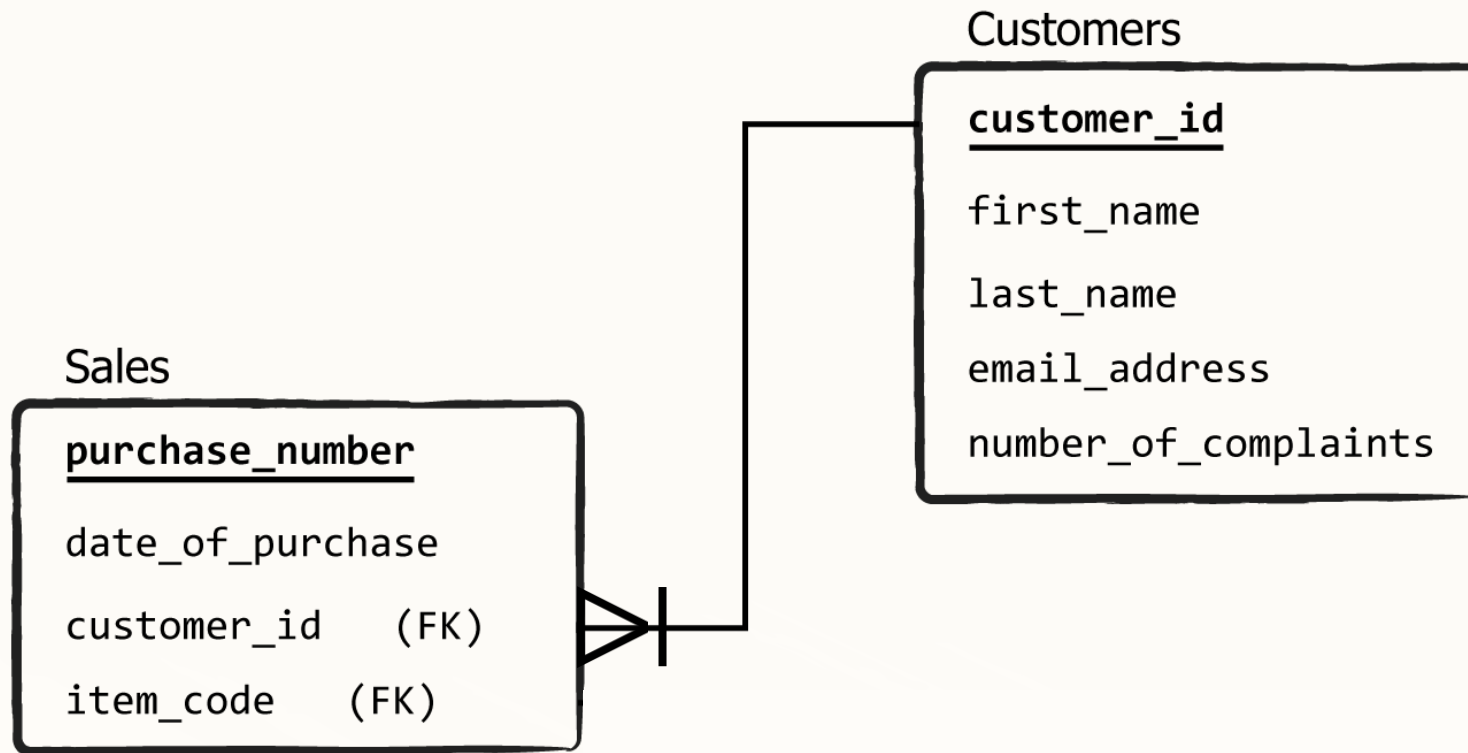
1 customer



# Relationships

1 purchase

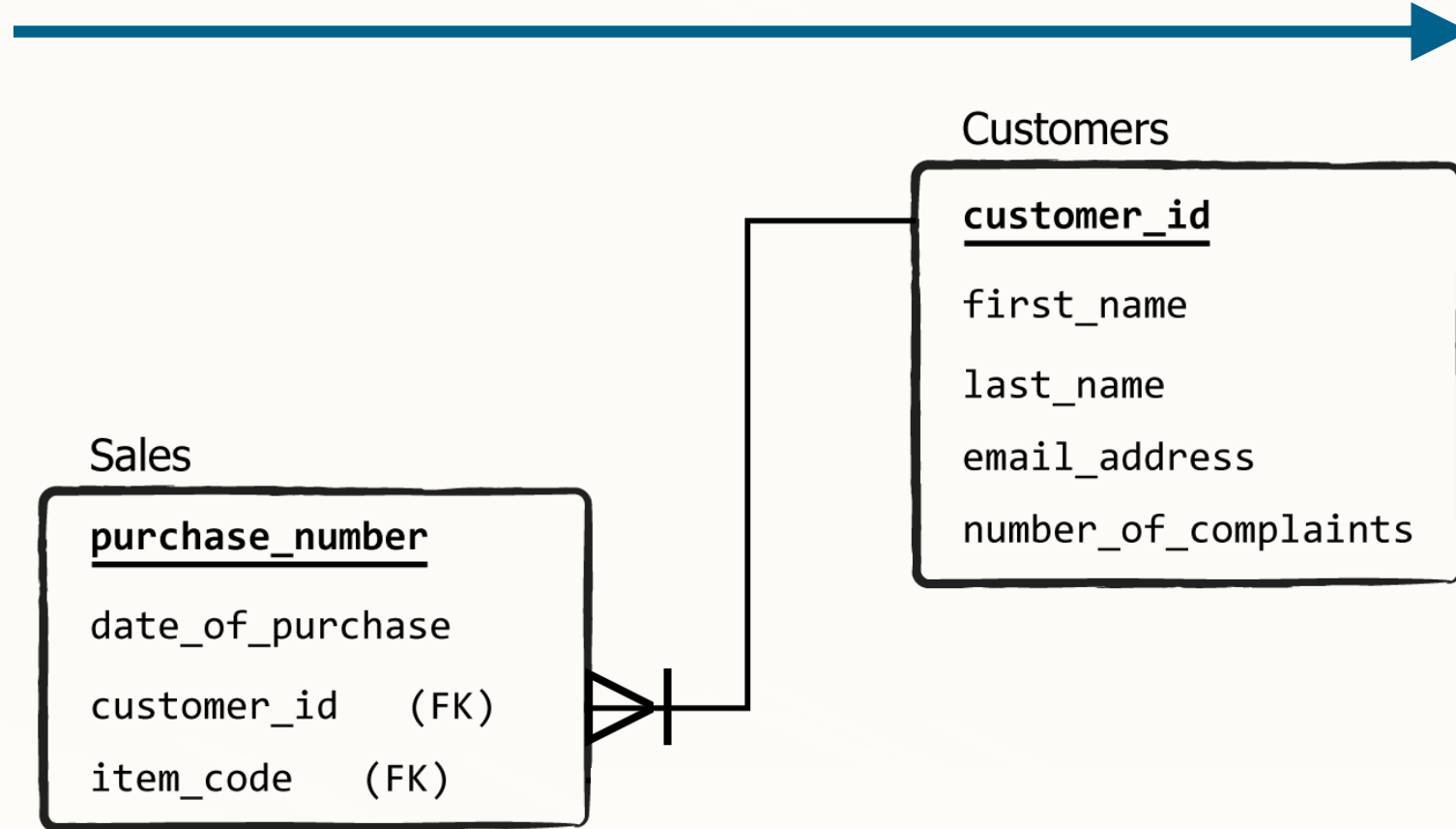
*minimum = 1* customer



# Relationships

1 purchase

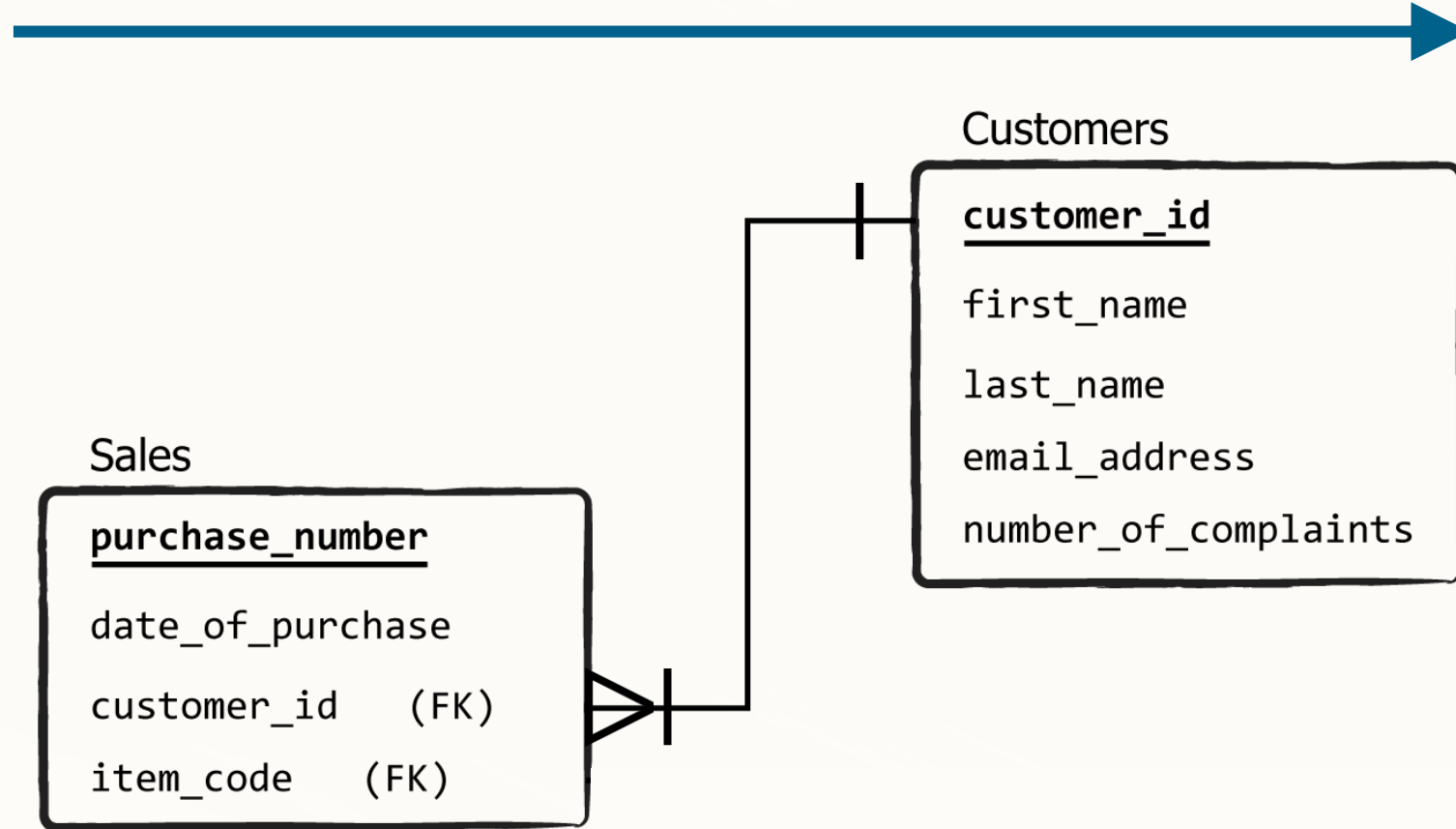
*minimum = 1 customer = maximum*



# Relationships

1 purchase

*minimum = 1 customer = maximum*

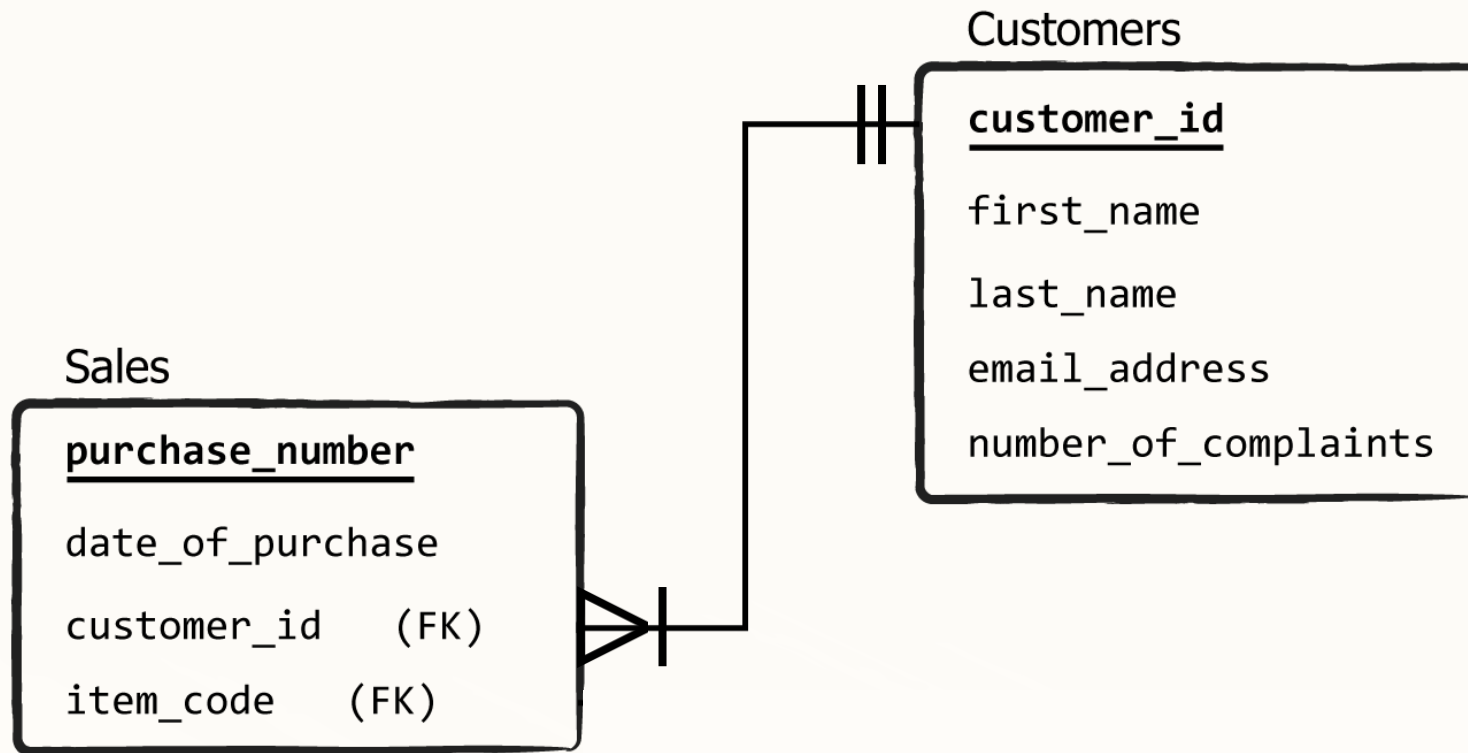




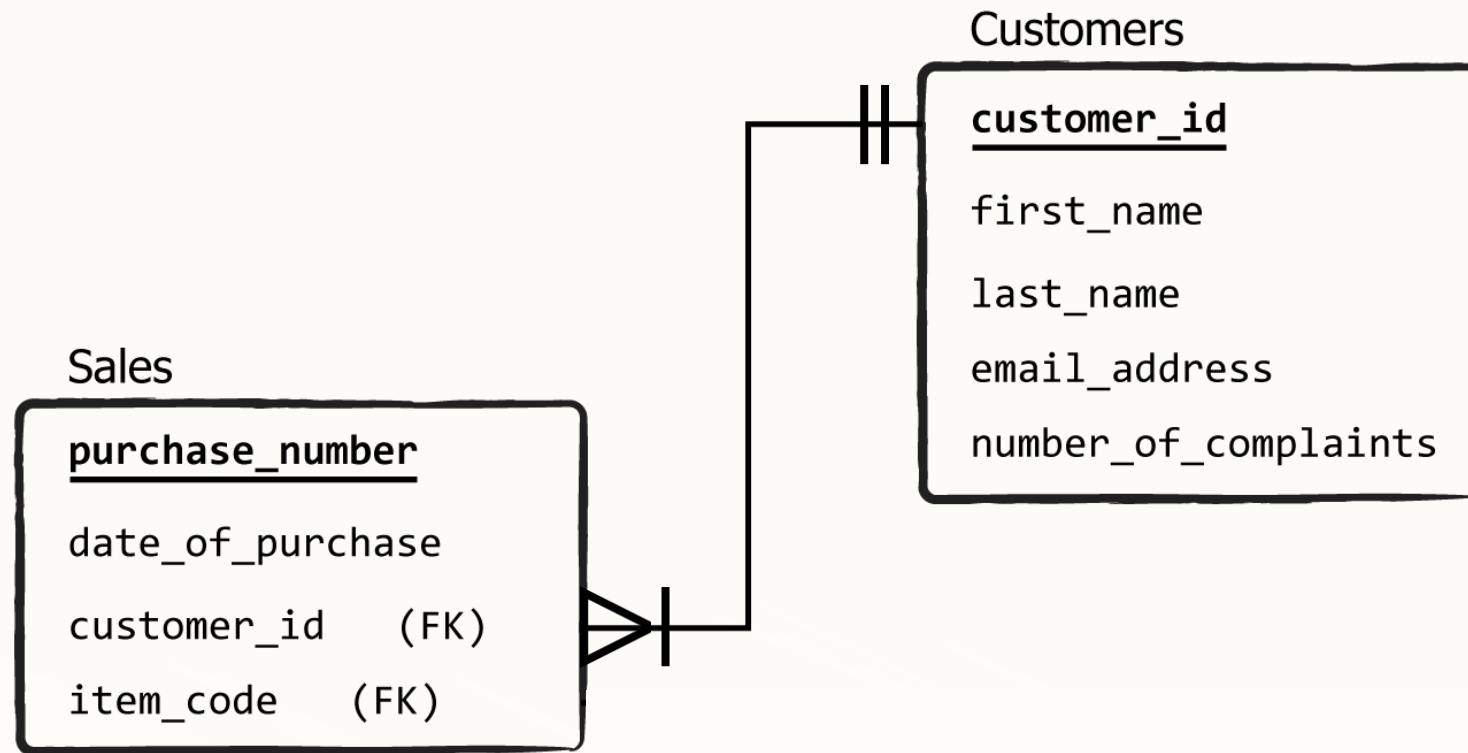
# Relationships

1 purchase

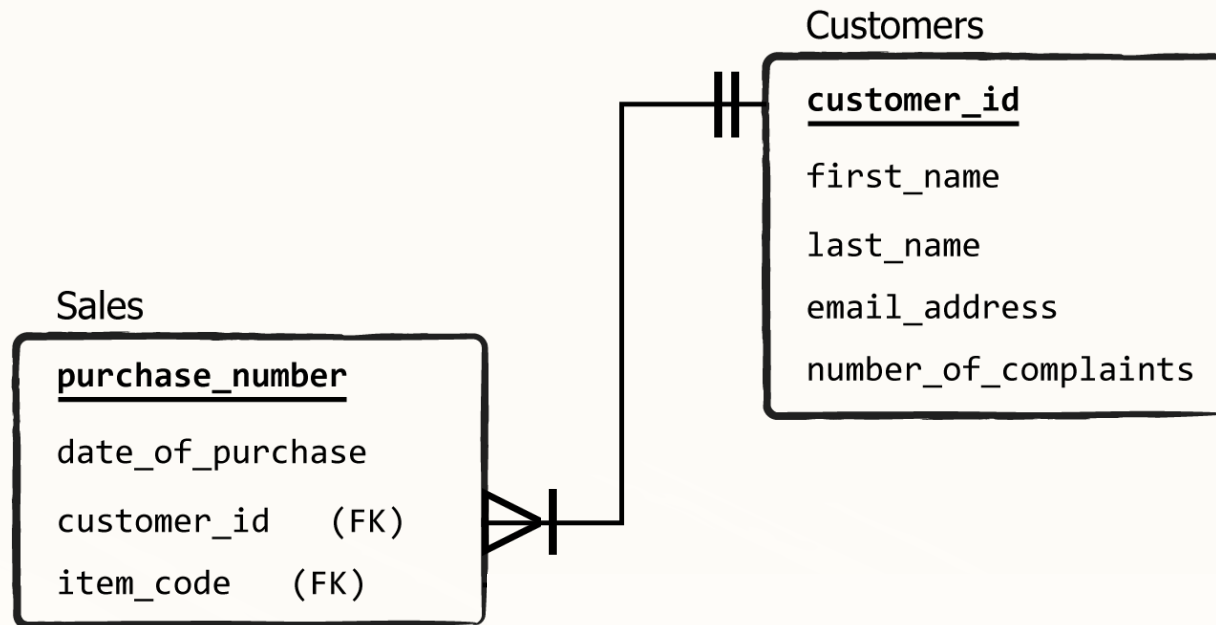
*minimum = 1 customer = maximum*



# Relationships

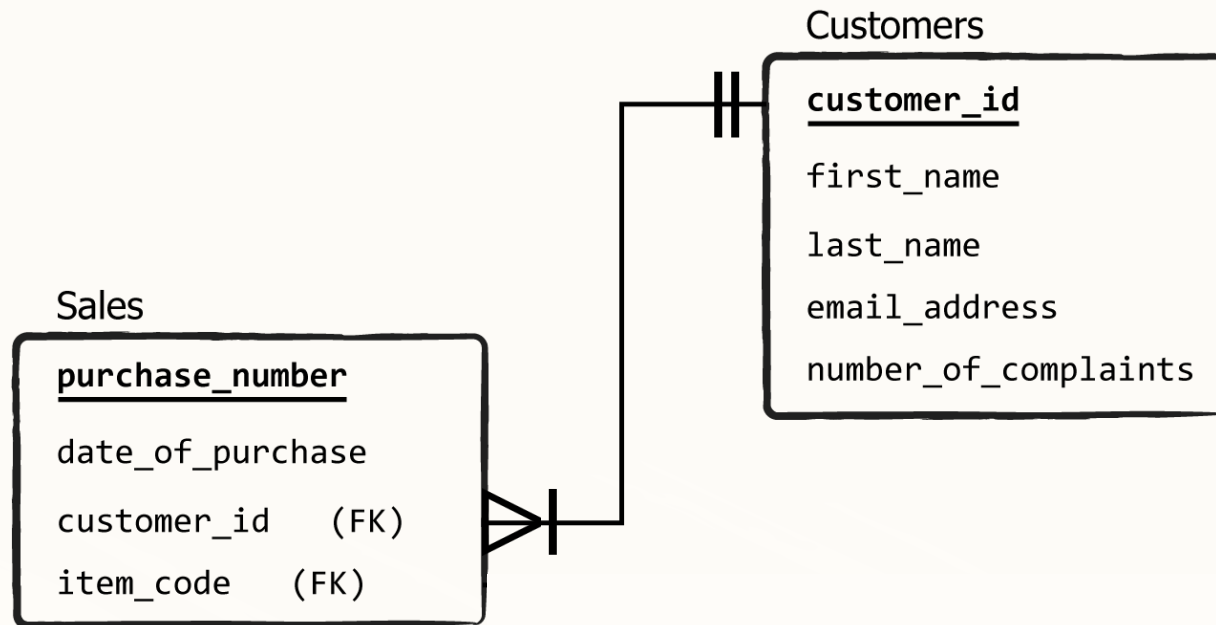


# Relationships



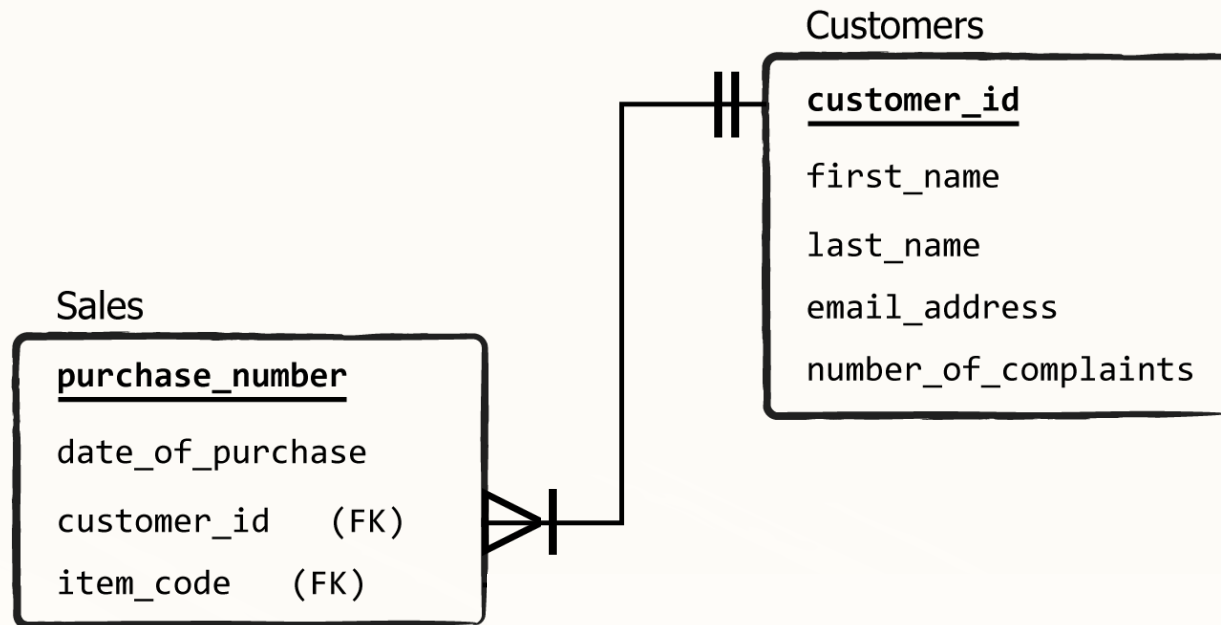
# Relationships

Customers to Sales: *one-to-many*



# Relationships

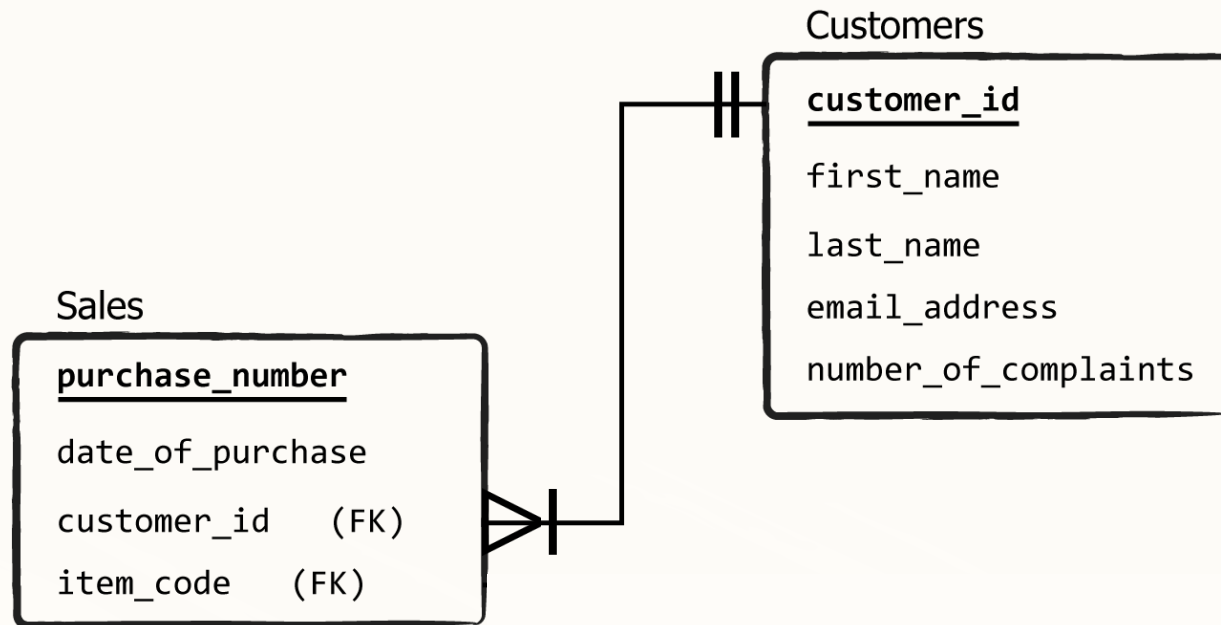
Customers to Sales: *one-to-many*



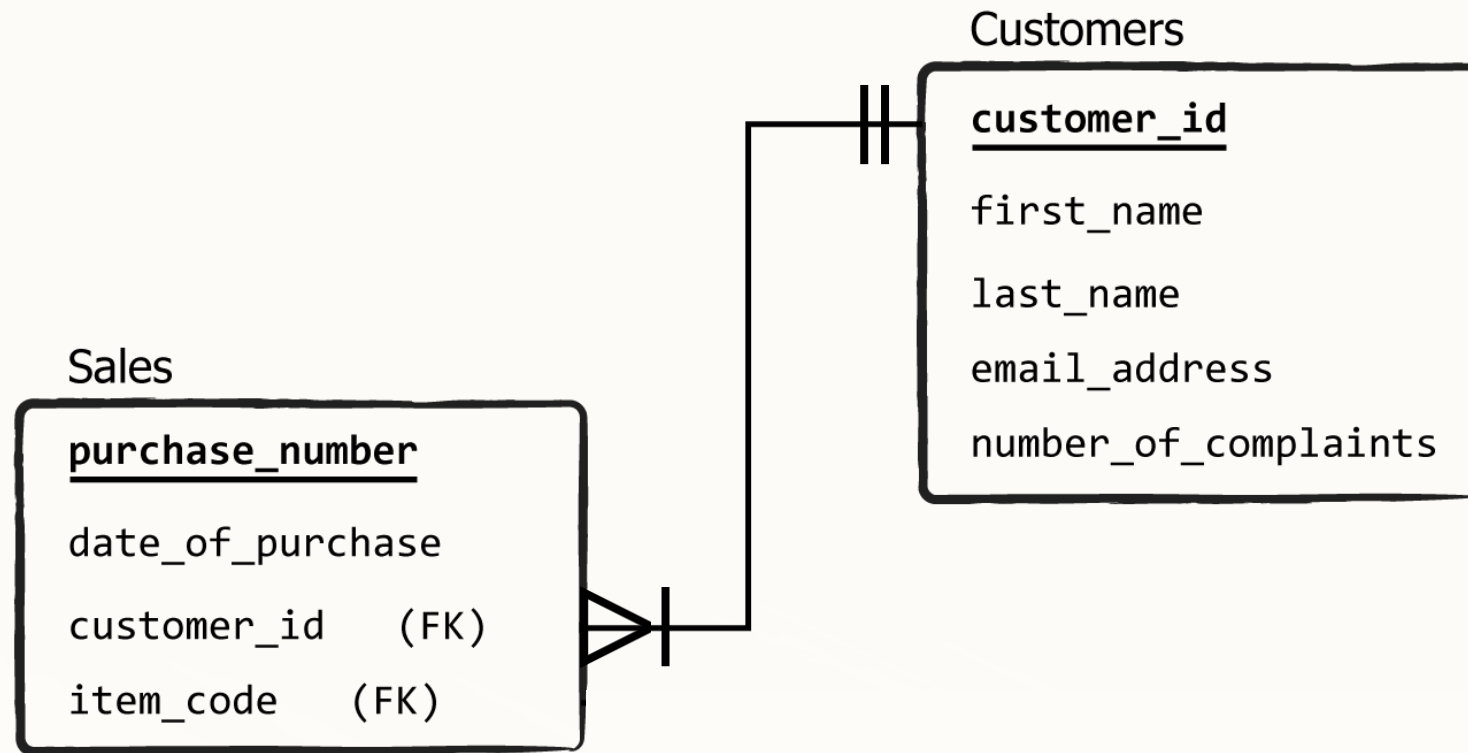
# Relationships

Customers to Sales: *one-to-many*

Sales to Customers: *many-to-one*

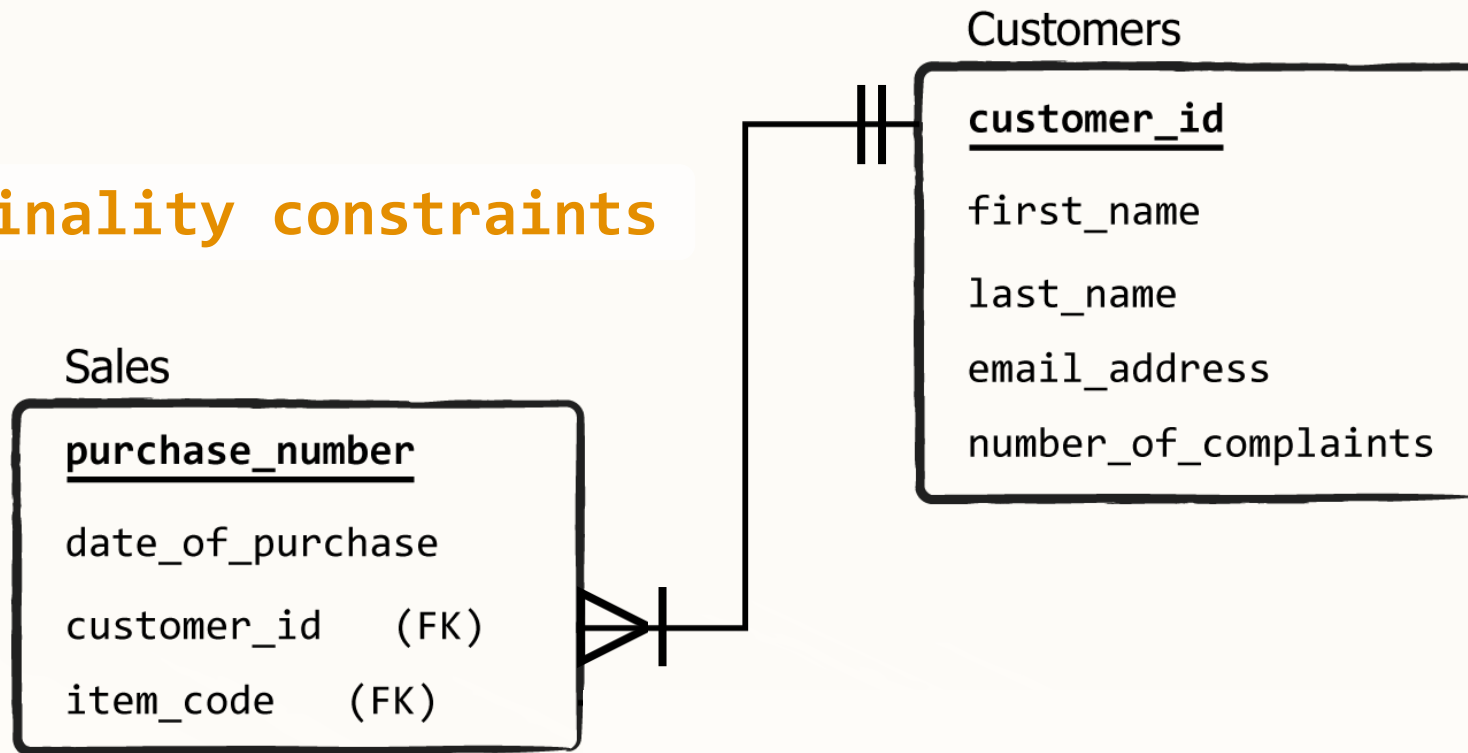


# Relationships



# Relationships

cardinality constraints

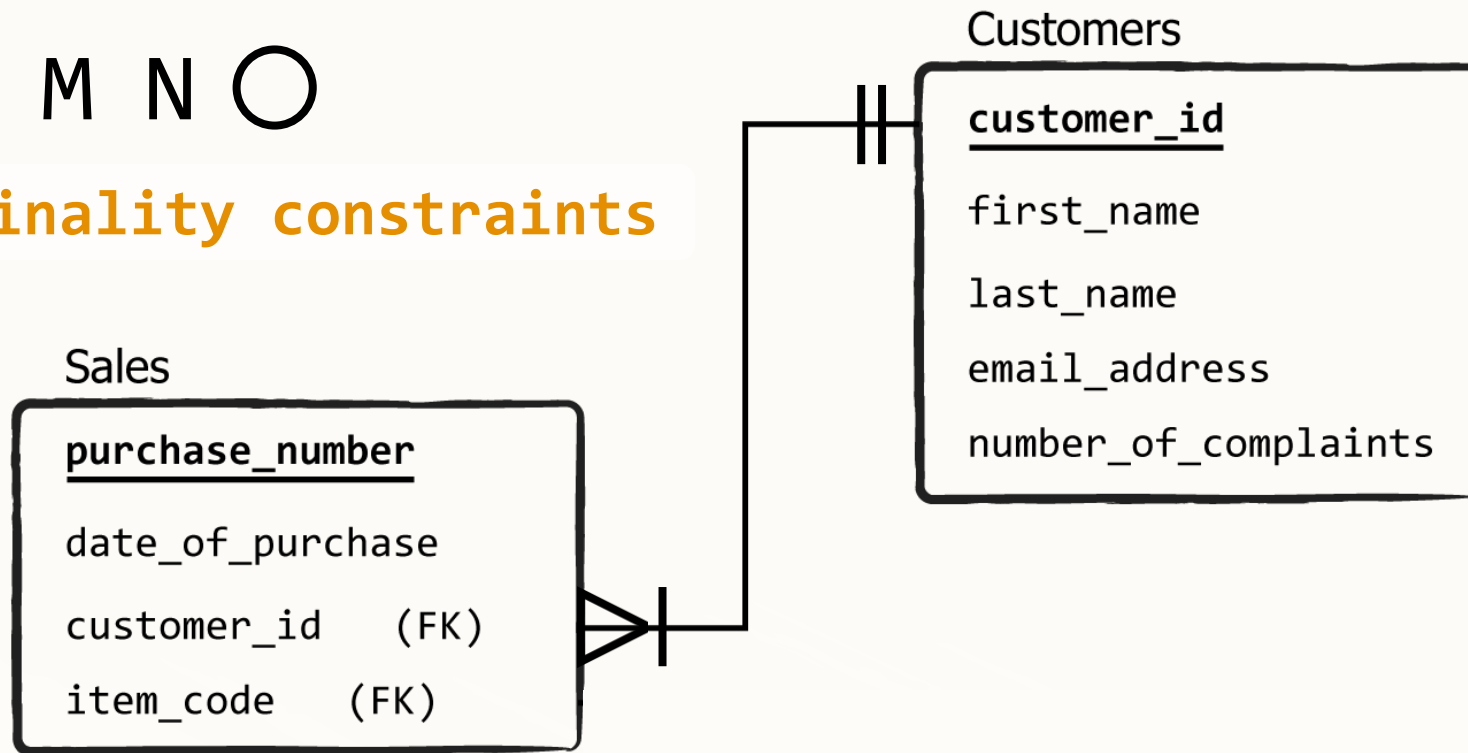




# Relationships

I > M N O

cardinality constraints



# Relationships

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relationships tell you how much of the data from a foreign key field can be seen in the primary key column of the table the data is related to and vice versa

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- types of relationships

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## ● types of relationships

- one-to-many (many-to-one)

# Relationships

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- one-to-one

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## ● types of relationships

- one-to-many (many-to-one)
- one-to-one
- many-to-many

# Relationships

- Relational schemas

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  - represent the concept database administrators must implement



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- represent the concept database administrators must implement
  - depict how a database is organized
- = blueprints, or a plan for a database
- *will help you immensely while writing your queries!*