

DATA 225

Database Systems for Analytics

Assignment #4.b Solutions

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Normalization exercise #1.a

AIRPORT KLX TABLE

<u>Date</u>	<u>AirlineID</u>	AirlineName	TerminalID	NumberOfGates	NumberOfDepartingFlights
11-Dec	UA	United	A	20	34
11-Dec	NW	Northwest	A	20	17
11-Dec	AA	American	A	20	11
11-Dec	DL	Delta	B	15	20
11-Dec	JB	Jet Blue	B	15	6
12-Dec	UA	United	A	20	29
12-Dec	DL	Delta	B	15	20
12-Dec	SWA	Southwest	C	15	17

- Insertion anomaly
 - You cannot add a new add a new Terminal D with 10 gates without adding an airline associated with it.

Normalization exercise #1.b

AIRPORT KLX TABLE

<u>Date</u>	<u>AirlineID</u>	AirlineName	TerminalID	NumberOfGates	NumberOfDepartingFlights
11-Dec	UA	United	A	20	34
11-Dec	NW	Northwest	A	20	17
11-Dec	AA	American	A	20	11
11-Dec	DL	Delta	B	15	20
11-Dec	JB	Jet Blue	B	15	6
12-Dec	UA	United	A	20	29
12-Dec	DL	Delta	B	15	20
12-Dec	SWA	Southwest	C	15	17

- Deletion anomaly
 - You cannot delete airline Southwest without also removing the information about Terminal C.

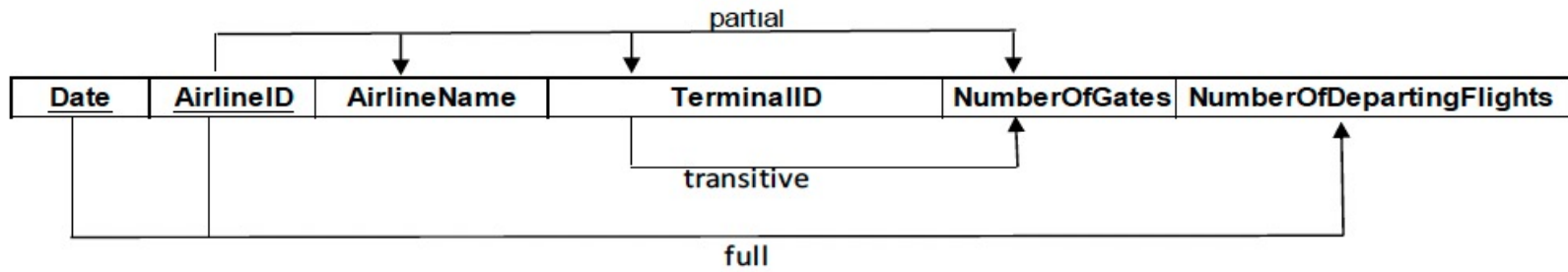
Normalization exercise #1.c

AIRPORT KLX TABLE

<u>Date</u>	<u>AirlineID</u>	AirlineName	TerminalID	NumberOfGates	NumberOfDepartingFlights
11-Dec	UA	United	A	20	34
11-Dec	NW	Northwest	A	20	17
11-Dec	AA	American	A	20	11
11-Dec	DL	Delta	B	15	20
11-Dec	JB	Jet Blue	B	15	6
12-Dec	UA	United	A	20	29
12-Dec	DL	Delta	B	15	20
12-Dec	SWA	Southwest	C	15	17

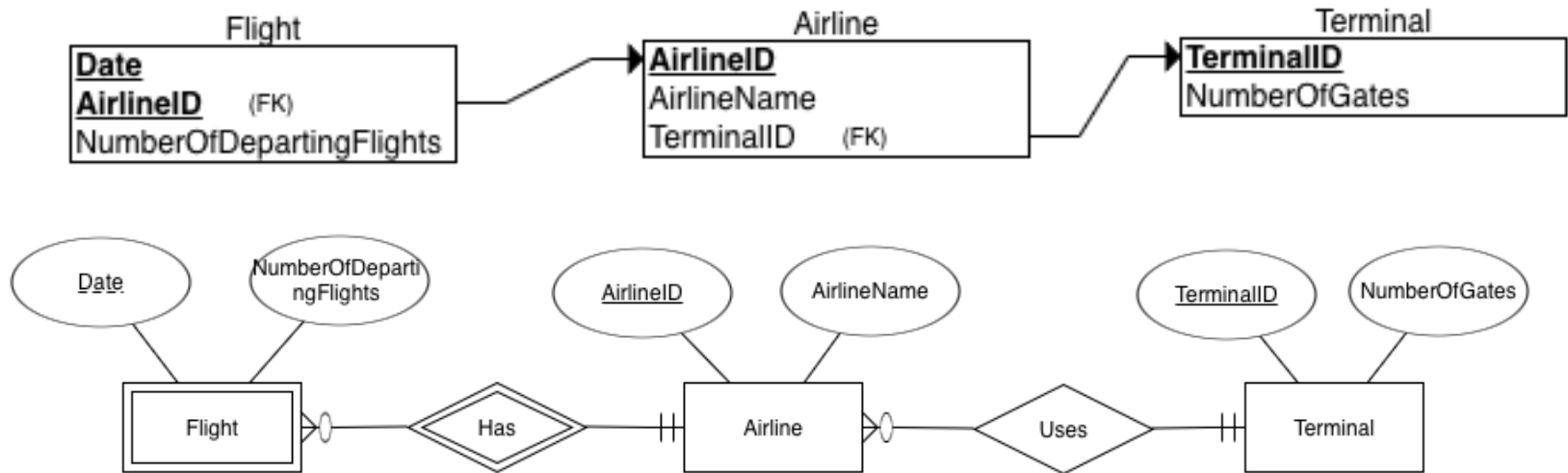
- Modification anomaly
 - Changing the number of gates value for Terminal A requires making a change in multiple records.

Normalization exercise #1.d



- The table has composite primary key (Date + AirlineID)
 - Partial FD
 - AirlineID → AirlineName, TerminalID, NumberOfGates
 - Transitive FD
 - TerminalID → NumberOfGates
 - Full key FD
 - Date + AirlineID → NumberOfDepartingFlights

Normalization exercise #1.e and #1.f

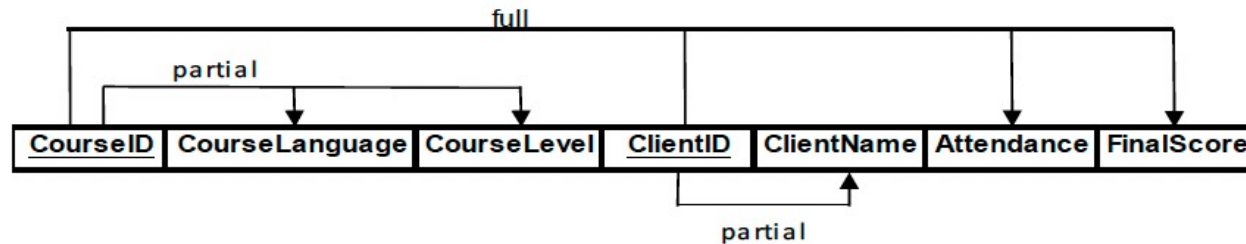


- **Flight** is a weak entity whose owner entity is the **Airline** entity.
 - This ER diagram will map to the relational schema.

Normalization exercise #2.a

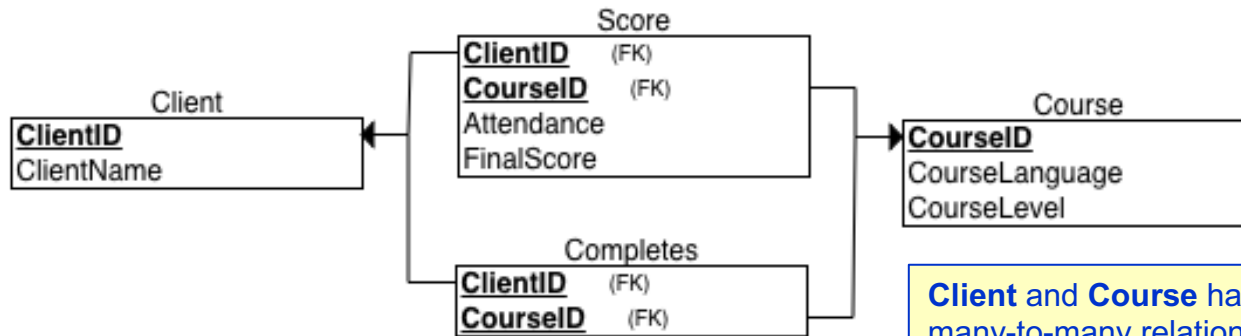
LANGUAGE SCHOOL TABLE

CourseID	CourseLanguage	CourseLevel	ClientID	ClientName	Attendance	FinalScore
10	German	Basic	C111	Mr. Smith	100%	80%
11	German	Intermediate	C222	Ms. Jones	90%	90%
12	German	Advanced	C333	Mr. Vance	95%	100%
10	German	Basic	C444	Ms. Clark	100%	100%
11	German	Intermediate	C555	Ms. Wong	90%	95%
12	German	Advanced	C666	Ms. Hess	95%	98%
20	Japanese	Basic	C111	Mr. Smith	100%	100%
21	Japanese	Intermediate	C222	Ms. Jones	95%	100%

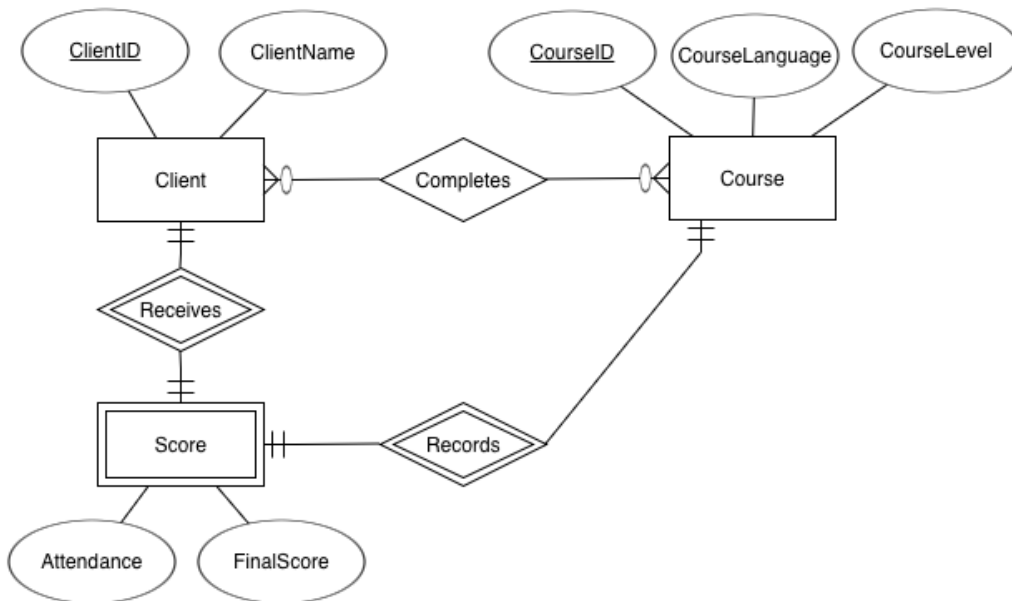


- Partial FD
 - CourseID → CourseLanguage, CourseLevel
- Partial FD
 - ClientID → ClientName
- Full key FD
 - CourseID + ClientID → Attendance, FinalScore

Normalization exercise #2.b and #2.c



Client and Course have a many-to-many relationship. Completes is their linking table.



- Score is a weak entity with two owner entities, Client and Course.
- This ER diagram will map to the relational schema.