SCREEN
CinemaName#
ScreenNumber
Phone_Ext
SeatNumber

CINEMA
CinemaName
Phone
Street

PROGRAM
CinemaName#
ScreenNumber
Week
Title#
NbOfTicketsSold

DISTRIBUTION
Title#
ActorName#
NbOfPlayedScenes

MOVIE
Title
Country
Director
Year

Use relational algebra in order to build queries answering the following

Q1. List of all French movies (title, year, director).

R1 = σ **MOVIE** (Country= 'France')

R11= π R1 (title, year, director)

MOVIE
Title
Country
Director
Year

Q2. Movies currently on show in the « Pathé-Masséna ».

R1 = σ **PROGRAM** (CinemaName='Pathé-Masséna' and Week='now')

R11= π R1 (title)

PROGRAM
CinemaName#
ScreenNumber
Week
Title#
NbOfTicketsSold

Q3. All the actors playing « Inception».

R1 = σ **DISTRIBUTION** (title='Inception')

R11= π R1 (ActorName)

DISTRIBUTION
Title#
ActorName#
NbOfPlayedScenes

Q4. Cinema names, screens number and seats number which play « Midnight in Paris ».

R1 = σ **PROGRAM** (title= 'Midnight in Paris' and Week='now')

R11= π R1 (CinemaName)

R12= π **Screen** (CinemaName, Screen Number, SeatNumber)

R13 = R11 ⋈ R12

R14 = π R13 (CinemaName, Screen Number, SeatNumber)

SCREEN
CinemaName#
ScreenNumber
Phone_Ext
SeatNumber

PROGRAM
CinemaName#
ScreenNumber
Week
Title#
NbOfTicketsSold

Q5. Cinemas addresses showing a movie directed by Scorsese.

R1 = σ **MOVIE** (Director='Scorsese')

R11 = π R1 (title)

R12 = σ **PROGRAM** (Week='Week - now')

R13 = π R12 (title, CinemaName)

R14 = π **Cinema** (CinemaName, Street)

R15 = R11 ⋈ R13

R16 = π R15 (CinemaName)

R17 = R14 ⋈ R16

R18 = π R17 (CinemaName)

CINEMA
CinemaName
Phone
Street

PROGRAM
CinemaName#
ScreenNumber
Week
Title#
NbOfTicketsSold

MOVIE
Title
Country
Director
Year
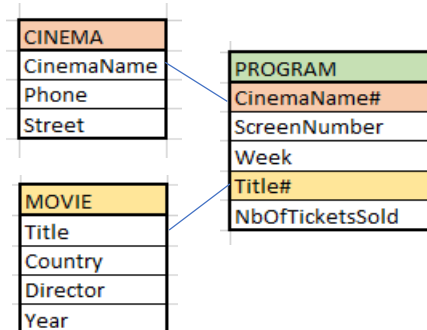
Q6. Cinemas addresses showing a movie where either Angelina Jolie or Matt Damon play

R1 = σ **DISTRIBUTION** (ActorName=' Angelina Jolie' or ActorName=' Matt Damon')

R11 = π R1 (title)

R12 = π **PROGRAM** (title, CinemaName)

R13 = R11 ⋈ R12

R14 = π R13 (CinemaName)

R15 = π **CINEMA** (CinemaName, Street)

R16 = R14 ⋈ R15

R17 = π R16 (street)

CINEMA		PROGRAM
CinemaName		CinemaName#
Phone		ScreenNumber
Street		Week
DISTRIBUTION		Title#
Title#		NbOfTicketsSold
ActorName#		
NbOfPlayedScenes		
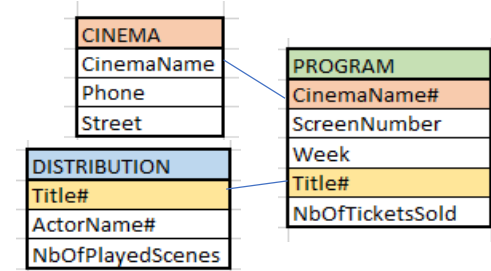
Q7. Cinemas addresses showing a movie where Angelina Jolie and Johnny Depp play.

R1 = σ **DISTRIBUTION** (ActorName=' Angelina Jolie')

R11 = π R1 (title)

R12 = σ **DISTRIBUTION** (ActorName=' Johnny Depp')

R13 = π R2 (title)

R14 = R11 ∧ R13

R15 = π **PROGRAM** (title, CinemaName)

R16 = R14 ⋈ R15

R17 = π R16 (CinemaName)

R18 = π **CINEMA** (CinemaName, Street)

R19 = R17 ⋈ R18

R20 = π R19 (street)

CINEMA		PROGRAM
CinemaName		CinemaName#
Phone		ScreenNumber
Street		Week
DISTRIBUTION		Title#
Title#		NbOfTicketsSold
ActorName#		
NbOfPlayedScenes		
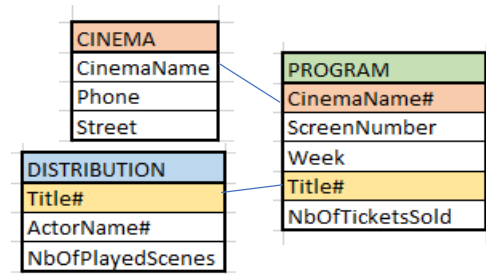
Q8. Years when movies played Leonardo Di Caprio where in cinemas.

R1 = σ **DISTRIBUTION** (ActorName=' Angelina Jolie')

R11 = π R1 (title)

R12 = π MOVIE (Title, Year)

R13 = R11 ⋈ R12

R14 = π R13 (Title, Year)

R15 = π PROGRAM (Title)

R16 = R14 ⋈ R15

R17 = π R16 (Year)

SCREEN		CINEMA		PROGRAM
CinemaName#		CinemaName		CinemaName#
ScreenNumber		Phone		ScreenNumber
Phone_Ext		Street		Week
SeatNumber				Title#
DISTRIBUTION		MOVIE		NbOfTicketsSold
Title#		Title		
ActorName#		Country		
NbOfPlayedScenes		Director		
		Year		
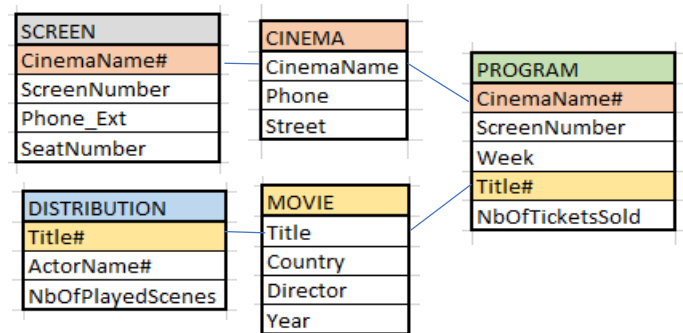
Q9. Actors who played under the direction of James Cameron.

R1 = σ MOVIE (Director='James Cameron')
R12 = π R1 (Title)
R13 = π DISTRIBUTION (Title, ActorName)

R14 = R12 ⋈ R13
R15 = π R14 (ActorName)

Q10. Actors who co-starred in movies with Daniel Radcliffe.

R1 = σ DISTRIBUTION (ActorName='Daniel Radcliffe')
R12 = π R1 (title)
R13 = σ DISTRIBUTION(ActorName<>'Daniel Radcliffe)
R14 = π R13 (title, ActorName)

R15 = R12 ⋈ R14
R16 = π R15 (ActorName)

Q12. Street and screen number, with number of seats, of cinemas where a movie made in 2010 and starred by Brad Pitt..

R1 = σ MOVIE (year=2010)
R11= π R1(title)
R12 = σ DISTRIBUTION(ActorName='Brad Pitt')
R13= π R12(title)

R14 = R11 ⋈ R13
R15= π R14(title)
R16= π PROGRAM(title, CinemaName, ScreenNumber)

R17 = R15 ⋈ R16
R18= π R17(CinemaName, ScreenNumber)
R19= π SCREEN(CinemaName, ScreenNumber, SeatNumber)

R20 = R18 ⋈ R19
R21= π R20 (CinemaName, ScreenNumber, SeatNumber)
R22= π CINEMA (CinemaName, street)

R23 = R21 ⋈ R22
R24= π R23(Street, ScreenNumber, SeatNumber)

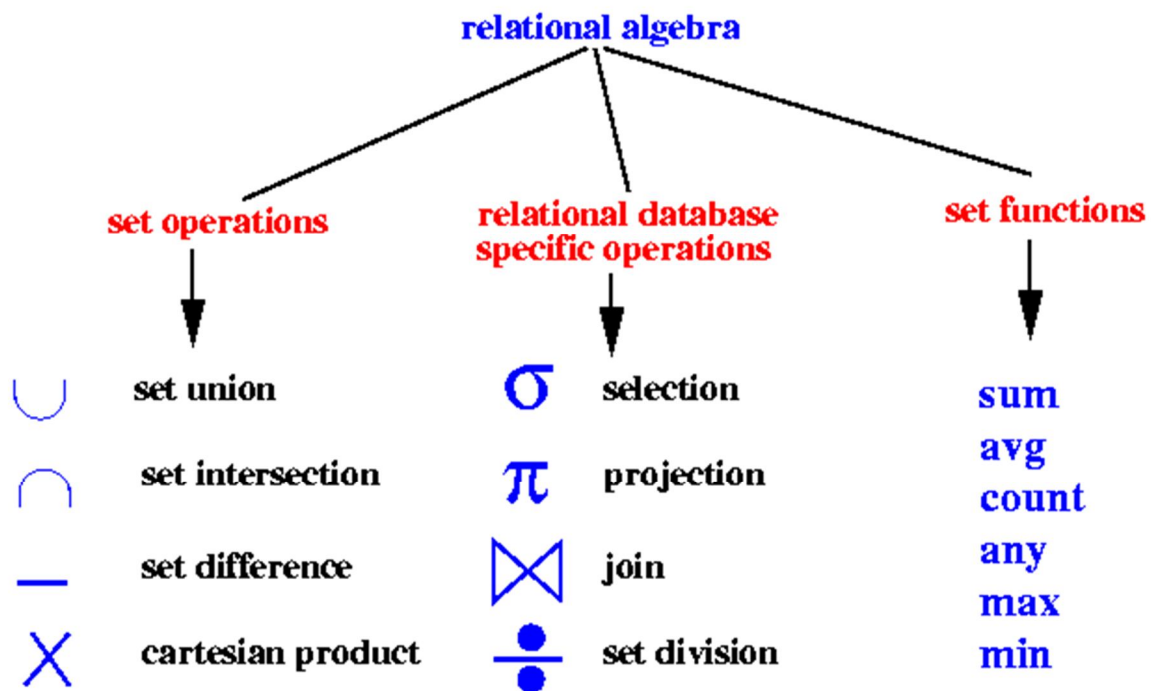## Q13. All movies' names for which the director is also an actor.

R1= π MOVIE(title, Director)
R11 = π DISTRIBUTION(title, ActorName)

R12 = R1 ⋈ R11
    Director = ActorName

R13 = π R12 (title)

relational algebra

set operations	relational database specific operations	set functions
∪ set union	σ selection	sum
∩ set intersection	π projection	avg
— set difference	⋈ join	count
✕ cartesian product	÷ set division	any
		max
		min

Selection	σ
Projection	π
Renaming	ρ
Union	∪
Intersection	∩
Difference	—
Cartesian product	×
Join	⋈
Logical AND	∧
Logical OR	∨
Logical NOT	∼

Relational Algebra special characters

Unary operators

selection: $\sigma_{cname<cname2 \wedge enr>10000}$

projection: $\Pi_{cname}E$

Aggregate function: **G**

Binary operators

union: $E_1 \cup E_2$
intersection: $E_1 \cap E_2$
difference: $E_1 - E_2$
Cartesian product: $E_1 \times E_2$
division: $E_1 \div E_2$

rename: $\rho_{isStudent}$ or $\rho_{S2(isStudent)}$

Natural join: $\bowtie$
Theta join: $\bowtie_{condition}$

Left semijoin: $\ltimes$
Right semijoin: $\rtimes$
left outer join: $\bowtie$

right outer join: $\bowtie$
full outer join: $\bowtie$
antijoin: $\triangleright$

Logic symbols

Logical AND: $\wedge$
Logical OR: $\vee$
Logical NOT: $\neg$

Other

null: ω