

Московский Авиационный Институт
(Национальный Исследовательский Университет)
Факультет “Компьютерные науки и прикладная математика”

Лабораторная работа
По курсу «Базы данных»
Тема:
«Жилфонд микрорайона»

Выполнили студенты:

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Преподаватель:

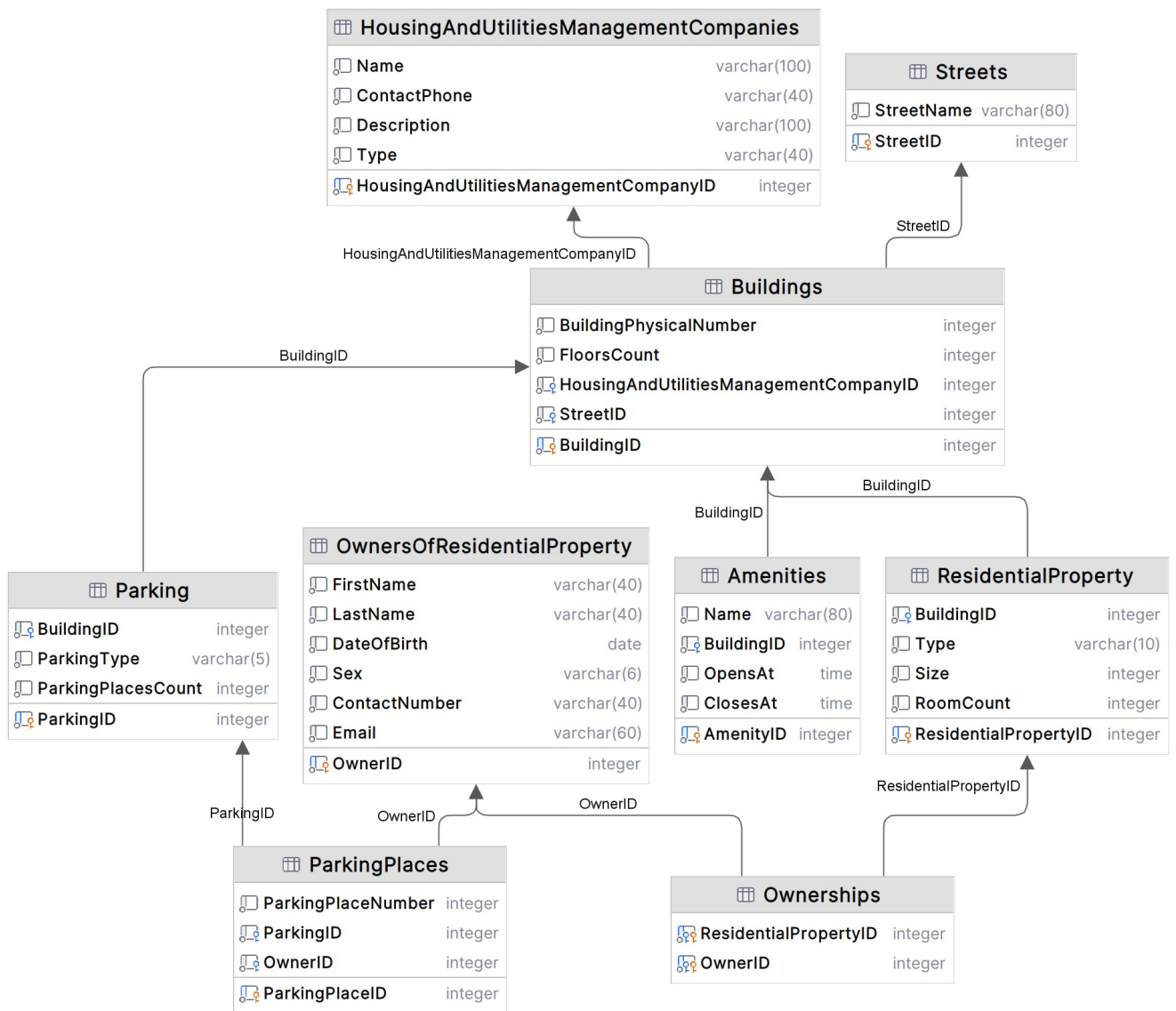
Киндинова В.В.

Оценка: _____

Дата: _____






Подпись: _____

База данных в DataGrip



Таблицы

Amenities (удобства):

	 AmenityID ▾	 Name ▾	 BuildingID ▾	 OpensAt ▾	 ClosesAt ▾
1	1	School	10	08:30:00	20:00:00
2	2	Gym	7	06:00:00	23:00:00
3	3	Coffee Shop	5	07:00:00	20:00:00
4	4	Library	5	10:00:00	23:00:00
5	5	Restaurant	8	16:00:00	23:00:00
6	6	Movie Theater	6	13:00:00	23:30:00
7	7	Swimming Pool	9	07:30:00	19:30:00
8	8	Shopping Mall	6	10:00:00	23:30:00

Типы данных:

Первичный ключ удобства (ID)	AmenityID	integer
Название удобства	Name	varchar(80)
ID здания, в котором находится удобство	BuildingID	integer
Время открытия	OpensAt	time
Время закрытия	ClosesAt	time

Buildings (здания):

	BuildingID	BuildingPhysicalNumber	FloorsCount	HousingAndUtilitiesManagementCompanyID	StreetID
1	9	102	6	5	4
2	5	10	5	5	2
3	1	2	4	1	3
4	3	15	3	3	1
5	6	13	3	4	5
6	8	42	2	4	1
7	4	7	7	2	3
8	2	3	2	4	1
9	10	1	4	1	5
10	7	85	7	2	4

Типы данных:

Первичный ключ здания (ID)	BuildingID	integer
Физический номер здания	BuildingPhysicalNumber	integer
Количество этажей	FloorsCount	integer
ID ЖКХ	HousingAndUtilitiesManagementCompanyID	integer
ID улицы	StreetID	integer

HousingAndUtilitiesManagementCompanies (ЖКХ):

	HousingAndUtilitiesManagementCompanyID	Name	ContactPhone	Description	Type
1	3	Harmony Homes Management	+1-555-345-6789	Striving to create a harmoniou...	Homeowners Association
2	4	Prime Property Partners	+1-555-456-7890	Dedicated to providing top-not...	Homeowners Association
3	2	Elite Estate Solutions	+1-555-987-6543	Expert management services for...	Housing Company
4	1	Premier Property Management	+1-555-123-4567	Providing comprehensive house ...	Housing Company
5	5	Urban Living Solutions	+1-555-876-6790	Transforming urban living with...	Housing Company

Типы данных:

Первичный ключ ЖКХ (ID)	HousingAndUtilitiesManagementCompanyID	integer
Название	Name	varchar(100)
Контактный телефон	ContactPhone	varchar(40)
Описание	Description	varchar(100)
Тип (Ассоциация домовладельцев или обслуживающая компания)	Type	varchar(40)

Ownerships (факт владения):

	ResidentialPropertyID	OwnerID
1	1	6
2	2	18
3	4	10
4	5	7
5	6	8
6	7	4
7	8	13
8	9	15
9	11	11
10	12	16
11	15	3
12	17	17
13	18	1
14	20	14
15	16	9
16	13	13
17	14	3
18	3	3
19	19	9
20	10	8

Типы данных:

ID жилфонда	ResidentialPropertyID	integer
ID владельца	OwnerID	integer


OwnersOfResidentialProperty (владельцы):

	OwnerID	FirstName	LastName	DateOfBirth	Sex	ContactNumber	Email
1	9	David	Johnson	1988-10-08	Male	654-321-9870	davidmiller@example.com
2	1	John	Doe	1990-05-20	Male	123-456-7890	johndoe@example.com
3	3	Michael	Johnson	1978-03-04	Male	555-123-4567	michaeljohnson@example.com
4	4	Sarah	Williams	1992-11-30	Female	123-789-4562	sarahwilliams@example.com
5	6	Emily	Davis	1995-01-25	Female	456-789-1235	emilydavis@example.com
6	7	James	Anderson	1979-06-11	Male	321-654-9870	jamesanderson@example.com
7	10	Megan	Wilson	1994-04-01	Female	456-123-7890	meganwilson@example.com
8	11	Christopher	Moore	1980-08-22	Male	123-789-4560	christophermoore@example.com
9	14	Jessica	Lee	1989-06-27	Female	654-321-9874	jessicalee@example.com
10	15	Steven	Harris	1990-01-30	Male	456-123-7895	stevenharris@example.com
11	16	Laura	Clark	1984-05-11	Female	321-654-9870	lauraclark@example.com
12	17	Matthew	Walker	1992-09-24	Male	789-456-1236	matthewwalker@example.com
13	18	Samantha	Allen	1978-03-15	Female	654-321-9875	samanthaallen@example.com
14	8	Amanda	Thomas	1991-02-18	Female	789-456-1234	amandathomas@example.com
15	13	Andrew	Thompson	1977-02-14	Male	789-456-1235	andrewthompson@example.com

Типы данных:

Первичный ключ владельца (ID)	OwnerID	integer
Имя	FirstName	varchar(40)
Фамилия	LastName	varchar(40)
Дата рождения	DateOfBirth	date
Пол	Sex	varchar(6)
Контактный телефон	ContactNumber	varchar(40)
Адрес электронной почты	Email	varchar(60)





Parking (парковки):

	 ParkingID ↕	 BuildingID ↕	 ParkingType ↕	 ParkingPlacesCount ↕
1	1	1	open	16
2	2	2	open	2
3	3	4	close	100
4	4	5	open	52
5	5	3	open	1

Типы данных:

Первичный ключ парковки (ID)	ParkingID	integer
ID здания, которому принадлежит парковка	BuildingID	integer
Тип парковки (открытый/крытый)	ParkingType	varchar(5)
Количество паркомест	ParkingPlacesCount	






ParkingPlaces (паркоместа):

	 ParkingPlaceID ^	 ParkingPlaceNumber ↕	 ParkingID ↕	 OwnerID ↕
1	1	10	1	11
2	2	8	3	9
3	3	15	4	13
4	4	13	1	6
5	5	5	3	14
6	6	1	1	9
7	7	2	1	13
8	8	3	1	9
9	9	1	2	7
10	10	1	5	4
11	11	2	2	7

Типы данных:

Первичный ключ паркоместа (ID)	ParkingPlaceID	integer
Реальный номер паркоместа	ParkingPlaceNumber	integer
ID парковки	ParkingID	integer
ID владельца	OwnerID	integer

ResidentialProperty (жилфонд):

	 ResidentialPropertyID ↕	 BuildingID ↕	 Type ↕	 Size ↕	 RoomCount ↕
1	18	5	a	55	2
2	11	1	a	90	2
3	14	4	a	70	2
4	1	1	a	100	3
5	3	4	a	150	4
6	13	4	a	130	3
7	6	1	a	40	1
8	12	5	a	45	1
9	9	5	a	120	4
10	8	5	a	60	2
11	4	4	a	75	1
12	15	4	a	170	5
13	19	5	a	110	3
14	16	1	a	35	1
15	10	4	a	80	3
16	20	4	a	85	2
17	5	2	h	200	5
18	7	3	h	180	4
19	17	5	a	160	3
20	2	5	a	50	2

Типы данных:

Первичный ключ жилфонда (ID)	ResidentialPropertyID	integer
ID здания	BuildingID	integer
Тип жилфонда (дом/квартира)	Type	varchar(10)
Размер в м ²	Size	integer
Количество жилых комнат	RoomCount	integer

Streets (улицы):

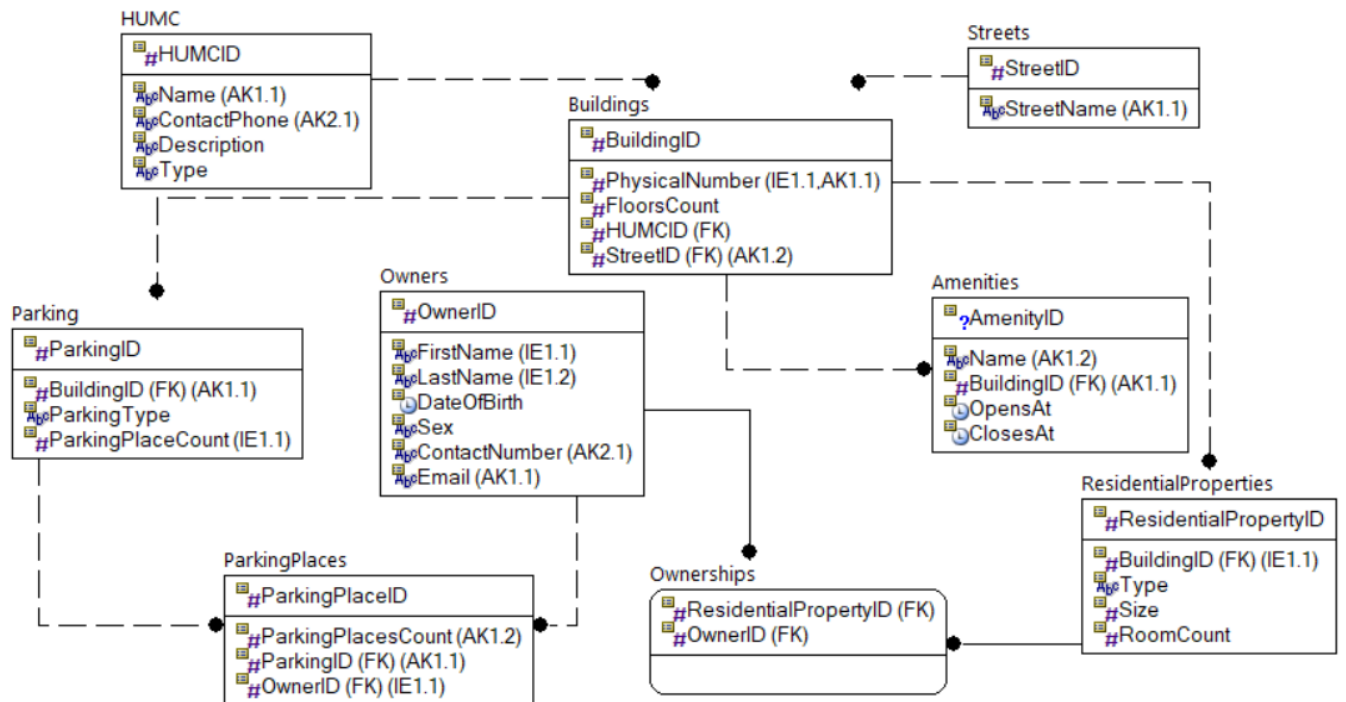
	 StreetID ▾	 StreetName ▾
1	1	Elm Street
2	2	Oakridge Lane
3	3	Cedar Avenue
4	4	Pinecrest Road
5	5	Maplewood Avenue

Типы данных:

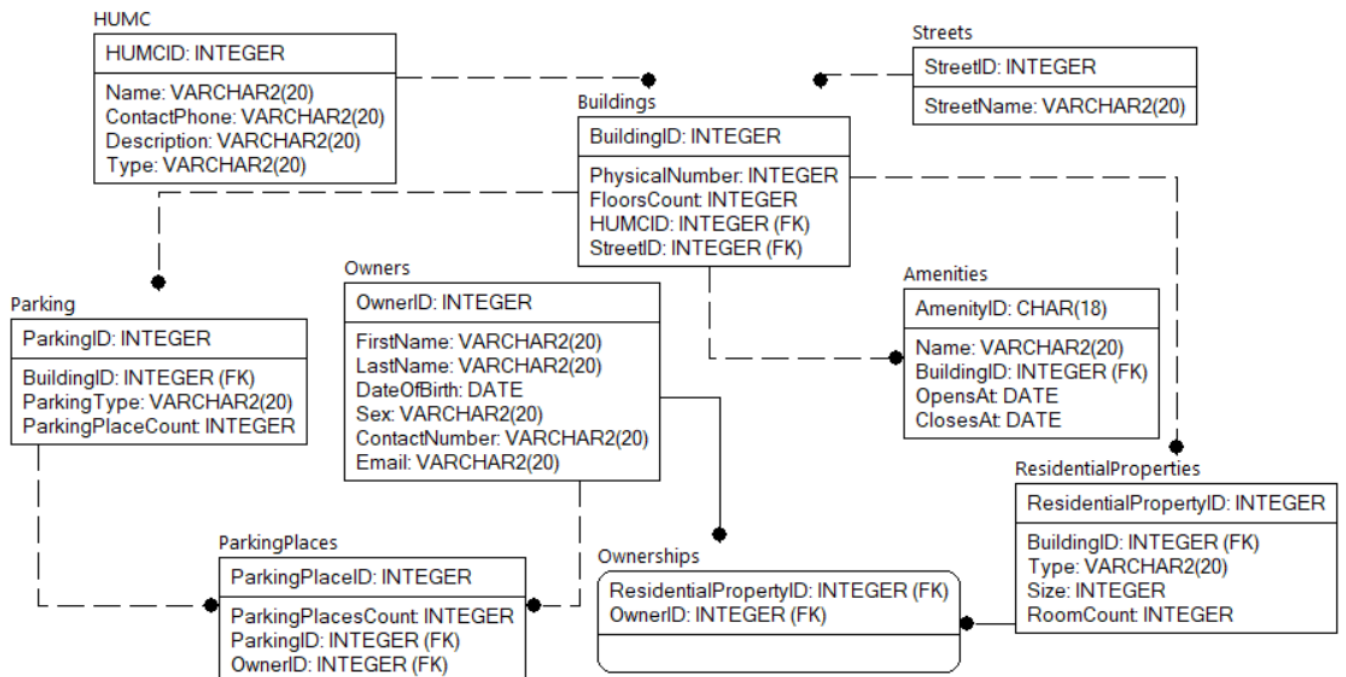
Первичный ключ улицы (ID)	StreetID	integer
Название улицы	StreetName	varchar(80)

Разработка моделей в ERWIN

Логическая модель:



Физическая модель:



ERWIN schema generation

```
CREATE TABLE Amenities
(
    Name                VARCHAR2(20) NOT NULL ,
    BuildingID          INTEGER NOT NULL ,
    OpensAt             DATE NOT NULL ,
    ClosesAt            DATE NOT NULL ,
    AmenityID           CHAR(18) NOT NULL
);
```

```
CREATE TABLE Buildings
(
    PhysicalNumber      INTEGER NOT NULL ,
    FloorsCount         INTEGER NOT NULL ,
    HUMCID              INTEGER NOT NULL ,
    StreetID            INTEGER NOT NULL ,
    BuildingID          INTEGER NOT NULL
);
```

```
CREATE TABLE HUMC
(
    Name                VARCHAR2(20) NOT NULL ,
    ContactPhone        VARCHAR2(20) NOT NULL ,
    Description          VARCHAR2(20) NOT NULL ,
    Type                VARCHAR2(20) NOT NULL ,
    HUMCID              INTEGER NOT NULL
);
```

```
CREATE TABLE Owners
(
    FirstName           VARCHAR2(20) NOT NULL ,
    LastName            VARCHAR2(20) NOT NULL ,
    DateOfBirth         DATE NOT NULL ,
    Sex                 VARCHAR2(20) NOT NULL ,
    ContactNumber       VARCHAR2(20) NOT NULL ,
    Email               VARCHAR2(20) NOT NULL ,
    OwnerID             INTEGER NOT NULL
);
```

```
CREATE TABLE Ownerships
```

```

(
    ResidentialPropertyID INTEGER NOT NULL ,
    OwnerID                INTEGER NOT NULL
);

CREATE TABLE Parking
(
    BuildingID            INTEGER NOT NULL ,
    ParkingType            VARCHAR2(20) NOT NULL ,
    ParkingPlaceCount      INTEGER NOT NULL ,
    ParkingID              INTEGER NOT NULL
);

CREATE TABLE ParkingPlaces
(
    ParkingPlacesCount     INTEGER NOT NULL ,
    ParkingID              INTEGER NOT NULL ,
    OwnerID                INTEGER NOT NULL ,
    ParkingPlaceID         INTEGER NOT NULL
);

CREATE TABLE ResidentialProperties
(
    BuildingID            INTEGER NOT NULL ,
    Type                   VARCHAR2(20) NOT NULL ,
    Size                   INTEGER NOT NULL ,
    RoomCount              INTEGER NOT NULL ,
    ResidentialPropertyID INTEGER NOT NULL
);

CREATE TABLE Streets
(
    StreetName             VARCHAR2(20) NOT NULL ,
    StreetID               INTEGER NOT NULL
);

```

Запросы

Запрос 1. Найти всех владельцев с двумя или больше объектами недвижимости.

```
select "OwnerID", "FirstName", "LastName"
from "OwnersOfResidentialProperty"
where "OwnerID" in (select "OwnerID"
                     from "Ownerships"
                     group by "Ownerships"."OwnerID"
                     having count("ResidentialPropertyID") > 1);
```

Результат:

	"OwnerID" ↕	"FirstName" ↕	"LastName" ↕
1	9	David	Johnson
2	3	Michael	Johnson
3	13	Andrew	Thompson
4	8	Amanda	Thomas

Запрос 2. Найти все объекты недвижимости определенного владельца.

```
select *
from "ResidentialProperty"
      inner join "Ownerships" on "Ownerships"."ResidentialPropertyID" =
      "ResidentialProperty"."ResidentialPropertyID"
where "OwnerID" = '3';
```

Результат:

	"ResidentialPropertyID" ↕	"BuildingID" ↕	"Type" ↕	"Size" ↕	"Rooms" ↕	"OwnerID" ^	"OwnerID" ↕
1	3	4	a	150	4	3	3
2	14	4	a	70	2	14	3
3	15	4	a	170	5	15	3

Запрос 3. Найти количество объектов недвижимости для каждого владельца.

```
select o."OwnerID", o."FirstName", o."LastName", count("ResidentialPropertyID") as
propertyCount
from "OwnersOfResidentialProperty" o
      left join "Ownerships" ow ON o."OwnerID" = ow."OwnerID"
group by o."OwnerID", o."FirstName", o."LastName"
order by propertyCount DESC;
```




Результат:

	"OwnerID" ↕	"FirstName" ↕	"LastName" ↕	propertycount ↕
1	3	Michael	Johnson	3
2	13	Andrew	Thompson	2
3	9	David	Johnson	2
4	8	Amanda	Thomas	2
5	4	Sarah	Williams	1
6	1	Nyanya	Morozov	1
7	18	Samantha	Allen	1
8	16	Laura	Clark	1

Запрос 4. Найти все удобства, расположенные в определенном здании.

```
select "Name", "ClosesAt", "OpensAt"
from "Amenities"
where "BuildingID" = '5';
```




Результат:

	 "Name" ⚙	 "ClosesAt" ⚙	 "OpensAt" ⚙
1	Coffee Shop	20:00:00	07:00:00
2	Library	23:00:00	10:00:00

Запрос 5. Найти все удобства, расположенные на определённой улице.

```
select "Name", "ClosesAt", "OpensAt"
from "Amenities"
where "BuildingID" in (select "BuildingID"
                        from "Buildings"
                        where "StreetID" in (select "StreetID"
                                                from "Streets"
                                                where "StreetName" = 'Oakridge Lane'));
```




Результат:

	 "Name" ⚙	 "ClosesAt" ⚙	 "OpensAt" ⚙
1	Coffee Shop	20:00:00	07:00:00
2	Library	23:00:00	10:00:00

Запрос 6. Найти количество объектов недвижимости на каждой улице.

```
select      "Streets"."StreetID",      "StreetName",      count("ResidentialPropertyID")      as
propertyCount
from "Streets"
      left join public."Buildings" B on "Streets"."StreetID" = B."StreetID"
      left join public."ResidentialProperty" RP on B."BuildingID" = RP."BuildingID"
group by "StreetName", "Streets"."StreetID"
order by propertyCount DESC;
```

Результат:

	 StreetID ⚙	 StreetName ⚙	 propertycount ⚙
1	3	Cedar Avenue	11
2	2	Oakridge Lane	7
3	1	Elm Street	2
4	5	Maplewood Avenue	0
5	4	Pinecrest Road	0

Запрос 7. Найти всех владельцев, имеющих объекты недвижимости, обслуживаемые определенным ЖКХ.

```
select "FirstName", "LastName"
from "OwnersOfResidentialProperty"
      inner join "Ownerships"
```

```

on "OwnersOfResidentialProperty"."OwnerID" = "Ownerships"."OwnerID"
inner join "ResidentialProperty"
on "Ownerships"."ResidentialPropertyID" =
"ResidentialProperty"."ResidentialPropertyID"
inner join "Buildings"
on "ResidentialProperty"."BuildingID" = "Buildings"."BuildingID"
inner join public."HousingAndUtilitiesManagementCompanies" HAUMC
on "Buildings"."HousingAndUtilitiesManagementCompanyID" =
HAUMC."HousingAndUtilitiesManagementCompanyID"
where "Name" = 'Harmony Homes Management';

```

Результат:

	"FirstName"	"LastName"
1	Sarah	Williams

Запрос 8. Найти ЖКХ с наибольшим количеством обслуживаемых домов.

```

select "Name", count(B."HousingAndUtilitiesManagementCompanyID") as CountServed
from "HousingAndUtilitiesManagementCompanies" as HAUMC
inner join public."Buildings" as B
on HAUMC."HousingAndUtilitiesManagementCompanyID" =
B."HousingAndUtilitiesManagementCompanyID"
group by "Name"
having count(B."HousingAndUtilitiesManagementCompanyID") >= all (
select count(B."BuildingID")
from "Buildings" as B
inner join public."HousingAndUtilitiesManagementCompanies" HAUMC
on HAUMC."HousingAndUtilitiesManagementCompanyID" =
B."HousingAndUtilitiesManagementCompanyID"
group by B."HousingAndUtilitiesManagementCompanyID");

```

Результат:

	Name	countServed
1	Prime Property Partners	3

Запрос 9. Найти все парковки, где парковочных мест больше, чем на определенной парковке.

```

select "BuildingID", "ParkingType", "ParkingPlacesCount"
from "Parking"
where "ParkingPlacesCount" >
all (select "ParkingPlacesCount" from "Parking" where "BuildingID" = '1');

```




Результат:

	"BuildingID"	"ParkingType"	"ParkingPlacesCount"
1	4	close	100
2	5	open	52

Запрос 10. Найти всех владельцев, чьи парковочные места находятся на разных парковках.

```
select "OwnerID", "FirstName", "LastName"
from "OwnersOfResidentialProperty" as ORP
where "OwnerID" in (select "OwnerID"
                     from "ParkingPlaces" as PP
                     group by PP."OwnerID"
                     having count("ParkingID") > 1);
```


Результат:

	 "OwnerID" ▾	 "FirstName" ▾	 "LastName" ▾
1	9	David	Johnson
2	13	Andrew	Thompson

Запрос 11. Найти все улицы, в зданиях которых расположены удобства.

```
select "StreetName"
from "Streets"
where "StreetID" in (select "StreetID"
                      from "Buildings"
                      where "BuildingID" = any (select "BuildingID"
                                                    from "Amenities"
                                                    group by "Amenities"."BuildingID"));
```



Результат:

	 "StreetName" ▾
1	Elm Street
2	Oakridge Lane
3	Pinecrest Road
4	Maplewood Avenue

Запрос 12. Найти всех людей с фамилией 'Johnson'.

```
select "FirstName", "LastName"
from "OwnersOfResidentialProperty"
where "LastName" = 'Johnson';
```

Результат:

	 "FirstName" ▾	 "LastName" ▾
1	David	Johnson
2	Michael	Johnson

Запрос 13. Найти всех людей, которые владеют домом или паркоместом.

```
select "OwnerID" as ID, "FirstName", "LastName"
from "OwnersOfResidentialProperty"
where "OwnerID" in (select "OwnerID"
                      from "Ownerships"
                      where "ResidentialPropertyID" in
```

```

(select "ResidentialPropertyID" from "ResidentialProperty" where
    "Type" = 'h'))
union
select "OwnerID" as ID, "FirstName", "LastName"
from "OwnersOfResidentialProperty"
where "OwnerID" in (select "OwnerID"
                    from "ParkingPlaces")

order by ID;

```

Результат:

	id	FirstName	LastName
1	4	Sarah	Williams
2	6	Emily	Davis
3	7	James	Anderson
4	9	David	Johnson
5	11	Christopher	Moore
6	13	Andrew	Thompson
7	14	Jessica	Lee

Запрос 13. Найти всех людей, которые владеют домом и паркоместом.

```

select "OwnerID" as ID, "FirstName", "LastName"
from "OwnersOfResidentialProperty"
where "OwnerID" in
    (select "OwnerID"
     from "Ownerships"
      where "ResidentialPropertyID" in (select "ResidentialPropertyID" from
"ResidentialProperty" where "Type" = 'h')
     intersect
     select "OwnerID"
     from "ParkingPlaces"
    group by "ParkingPlaces"."OwnerID");

```

Результат:

	id	FirstName	LastName
1	7	James	Anderson
2	4	Sarah	Williams

Запрос 14. Найти всех людей, у которых есть дом и найти физические номера этих домов.

```

select      OORP."OwnerID"      as      ID,      OORP."FirstName",      OORP."LastName",
      B."BuildingPhysicalNumber"
from "OwnersOfResidentialProperty" as OORP
      join public."Ownerships" O on OORP."OwnerID" = O."OwnerID"
      join public."ResidentialProperty" RP on O."ResidentialPropertyID" =
RP."ResidentialPropertyID"
      join public."Buildings" B on B."BuildingID" = RP."BuildingID"

```



```

where OORP."OwnerID" in (select "OwnerID"
                           from "Ownerships"
                           where "ResidentialPropertyID" in
                               (select "ResidentialPropertyID" from "ResidentialProperty"
                                    where "Type" = 'h'))
group by OORP."OwnerID", "FirstName", "LastName", "BuildingPhysicalNumber";

```

Результат:

	id	FirstName	LastName	BuildingPhysicalNumber
1	4	Sarah	Williams	15
2	7	James	Anderson	3

Запрос 15. Найти средний размер объектов недвижимости на определенной улице.

```

select avg("Size") as AverageSize
from "ResidentialProperty"
where "BuildingID" in (select "BuildingID"
                        from "Buildings"
                        where "StreetID" = '1');

```

Результат:

	averagesize
1	190

Запрос 16. Найти средний размер объектов недвижимости на каждой улице.

```

select B."StreetID", cast(avg("Size") as int) as AverageSize
from "ResidentialProperty" as RP
    inner join public."Buildings" B on B."BuildingID" = RP."BuildingID"
    inner join public."Streets" S on S."StreetID" = B."StreetID"
group by B."StreetID";

```

Результат:

	StreetID	averagesize
1	3	93
2	1	190
3	2	86

Запрос 17. Найти самого молодого владельца.

```

select "FirstName", "LastName", "DateOfBirth"
from "OwnersOfResidentialProperty"
where "DateOfBirth" >= all (select "DateOfBirth" from "OwnersOfResidentialProperty");

```

Результат:

	"FirstName"	"LastName"	"DateOfBirth"
1	Emily	Davis	1995-01-25

Запрос 18. Найти все улицы, на которых нет объектов недвижимости.

```

select "StreetID", "StreetName"

```

```

from "Streets"
except
select "StreetID", "StreetName"
from "Streets"
where "StreetID" in (select "StreetID"
                      from "Buildings"
                      where "BuildingID" in (select "BuildingID"
                                              from "ResidentialProperty"
                                              group by "BuildingID"));

```

Результат:

	"StreetID"	"StreetName"
1		4 Pinecrest Road
2		5 Maplewood Avenue

Запрос 19. Обновить имя, фамилию и электронный адрес владельца.

```

update "OwnersOfResidentialProperty"
set "FirstName" = 'Nyanya',
    "LastName"   = 'Morozov',
    "Email"      = 'nyanyamorozov@example.com'
where "OwnerID" = 1;

```

Запрос 20. Удаление и вставка записи в таблицу “Здания”.

```

delete
from "Buildings"
where "BuildingID" = 13;
insert into "Buildings"
values (13, 114, 5, 1, 3);

```

Запрос 21. Найти всех владельцев парковочных мест.

```

select "OwnerID", "FirstName", "LastName", "ContactNumber"
from "OwnersOfResidentialProperty"
where exists (select *
              from "ParkingPlaces"
              where "ParkingPlaces"."OwnerID" = "OwnersOfResidentialProperty"."OwnerID");

```

Результат:

	"OwnerID"	"FirstName"	"LastName"	"ContactNumber"
1	9	David	Johnson	654-321-9870
2	6	Emily	Davis	456-789-1235
3	11	Christopher	Moore	123-789-4560
4	14	Jessica	Lee	654-321-9874
5	13	Andrew	Thompson	789-456-1235