Lab 4 - Postgre SQL Assignment

--- Importing the data of “BoatsPG” onto the postgre sql query tool

```
CREATE TABLE BOATS (
REG_NUM VARCHAR(7),
YEAR NUMERIC(4),
MAKE VARCHAR(10),
LENGTH NUMERIC(4,1),
BEAM NUMERIC(3),
CONSTRAINT BOATS_PK PRIMARY KEY (REG_NUM),
CONSTRAINT BOATS_YR_CC CHECK (YEAR > 1900),
CONSTRAINT BOATS_LENGTH_CC CHECK (LENGTH > 0),
CONSTRAINT BOATS_BEAM_CC CHECK (BEAM > 0)
);
INSERT INTO BOATS VALUES ('WN123AB',1977,'Hunter',25,96);
INSERT INTO BOATS VALUES ('WN234CD',1999,'Calabria',23,103);
INSERT INTO BOATS VALUES ('WN234EF',1962,'Del Mar',16,72);
INSERT INTO BOATS VALUES ('WN456GH',1957,'Harvey',13.5,70);
INSERT INTO BOATS VALUES ('WN567IJ',1997,'Seadoo',9,46);
INSERT INTO BOATS VALUES ('WN678JL',1996,'Bayliner',47,179);



CREATE TABLE ENGINE_TYPES(
MAKE VARCHAR(12),
MODEL VARCHAR(12),
HP NUMERIC(4,1),
FUEL VARCHAR(6),
CONSTRAINT ENGINE_TYPES_PK PRIMARY KEY (MAKE, MODEL),
CONSTRAINT ENGINE_TYPES_HP_CC CHECK (HP >= 0),
CONSTRAINT ENGINE_TYPES_FUEL_CC CHECK (FUEL IN ('Gas', 'Petrol','Diesel'))
);
INSERT INTO ENGINE_TYPES VALUES ('Clinton','K990',9.9,'Gas');
INSERT INTO ENGINE_TYPES VALUES ('Mercruiser','350MagMPI',300,'Gas');
INSERT INTO ENGINE_TYPES VALUES ('Mercury','Mark30',30,'Gas');
INSERT INTO ENGINE_TYPES VALUES ('Tohatsu','M50CEPTS',50,'Gas');
INSERT INTO ENGINE_TYPES VALUES ('Rotax','720CC',85,'Gas');
INSERT INTO ENGINE_TYPES VALUES ('Hino','W06DTA',310,'Diesel');



CREATE TABLE ENGINES(
SERIAL_NUM VARCHAR(7),
YEAR NUMERIC(4),
```

```
MAKE VARCHAR(12),
MODEL VARCHAR(12),
CONSTRAINT ENGINES_PK PRIMARY KEY (SERIAL_NUM),
CONSTRAINT ENGINES_YR_CC CHECK (YEAR > 1900),
CONSTRAINT ENGINES_FK FOREIGN KEY (MAKE, MODEL) REFERENCES
ENGINE_TYPES (MAKE,MODEL) ON DELETE SET NULL
);
INSERT INTO ENGINES VALUES ('C1075',1975,'Clinton','K990');
INSERT INTO ENGINES VALUES ('M30099',1999,'Mercruiser','350MagMPI');
INSERT INTO ENGINES VALUES ('M3060',1962,'Mercury','Mark30');
INSERT INTO ENGINES VALUES ('T5090',1990,'Tohatsu','M50CEPTS');
INSERT INTO ENGINES VALUES ('R8596',1997,'Rotax','720CC');
INSERT INTO ENGINES VALUES ('H31096A',1996,'Hino','W06DTA');
INSERT INTO ENGINES VALUES ('H31096B',1996,'Hino','W06DTA');
```

```
CREATE TABLE BOAT_ENGINES(
ENGINE_SERIAL_NUM VARCHAR(7),
BOAT_ID VARCHAR(7),
CONSTRAINT BOAT_ENGINES_SERIALNUM_FK FOREIGN KEY
(ENGINE_SERIAL_NUM) REFERENCES ENGINES (SERIAL_NUM) ON DELETE SET
NULL,
CONSTRAINT BOAT_ENGINES_BOATID_FK FOREIGN KEY (BOAT_ID) REFERENCES
BOATS (REG_NUM) ON DELETE SET NULL
);
INSERT INTO BOAT_ENGINES VALUES ('C1075','WN123AB');
INSERT INTO BOAT_ENGINES VALUES ('M30099','WN234CD');
INSERT INTO BOAT_ENGINES VALUES ('M3060','WN234EF');
INSERT INTO BOAT_ENGINES VALUES ('T5090','WN456GH');
INSERT INTO BOAT_ENGINES VALUES ('R8596','WN567IJ');
INSERT INTO BOAT_ENGINES VALUES ('H31096A','WN678JL');
INSERT INTO BOAT_ENGINES VALUES ('H31096B','WN678JL');
```

Part I: SQL DDL

- Create the following table (BOAT_REGISTRY) with an appropriate primary key (CUST_ID) and foreign key (BOAT_ID) – for a company that winterizes and stores boats for clients. Include a check constraint preventing BALANCE from becoming negative. Also, provide INSERT statements for the following two records. Save and turn in your scripts.

BOAT_REGISTRY

CUST_ID	L_NAME	F_NAME	ADDRESS	ZIP	EMAIL	BALANCE	BOAT_ID
0	Ferrari	Jessica	4790 96th St.	10008	jessica@jessicaferrari.com	1450.00	WN123AB
1	Mandela	Bebeto	4321 Main St.	87919	bebeto@bebetomandela.com	99.99	WN234CD
…	…	…	…	…	…	…	…

Query:

--- SQL DDL (Boat_Registry Table)

```
CREATE TABLE BOAT_REGISTRY (
   CUST_ID SERIAL PRIMARY KEY,
   L_NAME VARCHAR(50),
   F_NAME VARCHAR(50),
   ADDRESS VARCHAR(255),
   ZIP VARCHAR(10),
   EMAIL VARCHAR(255),
   BALANCE NUMERIC(10, 2) CHECK (BALANCE >= 0),
   BOAT_ID VARCHAR(7),
   CONSTRAINT BOAT_REGISTRY_FK FOREIGN KEY (BOAT_ID) REFERENCES BOATS (REG_NUM) ON DELETE SET NULL
);
```

--- Inserting the following two records hierarchically

```
INSERT INTO BOAT_REGISTRY (L_NAME, F_NAME, ADDRESS, ZIP, EMAIL, BALANCE, BOAT_ID)
VALUES ('Ferrari', 'Jessica', '4790 96th St.', '10008', 'jessica@jessicaferrari.com', 1450.00, 'WN123AB');
```

INSERT INTO BOAT_REGISTRY (L_NAME, F_NAME, ADDRESS, ZIP, EMAIL, BALANCE, BOAT_ID)

VALUES ('Mandela', 'Bebeto', '4321 Main St.', '87919', 'bebeto@bebetomandela.com', 99.99, 'WN234CD');

--- Viewing the table

SELECT * FROM BOAT_REGISTRY

Query Output:

	cust_id [PK] integer	l_name character varying (50)	f_name character varying (50)	address character varying (255)	zip character varying (10)	email character varying (255)	balance numeric (10,2)
1	1	Ferrari	Jessica	4790 96th St.	10008	jessica@jessicaferrari.com	1450.00
2	2	Mandela	Bebeto	4321 Main St.	87919	bebeto@bebetomandela....	99.99
3	3	Ferrari	Jessica	4790 96th St.	10008	jessica@jessicaferrari.com	1450.00
4	4	Mandela	Bebeto	4321 Main St.	87919	bebeto@bebetomandela....	99.99

Part II : DML and DDL Query Command

DML - Querying the database:

1. Select all the unique/distinct years within the BOATS table.

Query:

SELECT DISTINCT YEAR FROM BOATS;

Query Output:

Data Output | Messages | Notifications

	year numeric (4)
1	1996
2	1957
3	1997
4	1977
5	1962
6	1999

2. Select all data for the boat ‘WN123AB’ from the BOATS table.

Query:

```
SELECT * FROM BOATS
WHERE REG_NUM = 'WN123AB';
```

Query Output:

Data Output | Messages | Notifications

	reg_num [PK] character varying (7)	year numeric (4)	make character varying (10)	length numeric (4,1)	beam numeric (3)
1	WN123AB	1977	Hunter	25.0	96

3. Select all data for the BOATS with a ‘23’ somewhere in the REG_NUM from the BOATS table.

Query:

```
SELECT * FROM BOATS
WHERE REG_NUM LIKE '%23%';
```

Query Output:

Data Output | Messages | Notifications

	reg_num [PK] character varying (7)	year numeric (4)	make character varying (10)	length numeric (4,1)	beam numeric (3)
1	WN123AB	1977	Hunter	25.0	96
2	WN234CD	1999	Calabria	23.0	103
3	WN234EF	1962	Del Mar	16.0	72

4. Select the BOATS that are classics (made before 1978) or large (length over 20 feet) from the BOATS table.

Query:

```
SELECT * FROM BOATS
WHERE YEAR < 1978 OR LENGTH > 20;
```

Query Output:

Data Output | Messages | Notifications

	reg_num [PK] character varying (7)	year numeric (4)	make character varying (10)	length numeric (4,1)	beam numeric (3)
1	WN123AB	1977	Hunter	25.0	96
2	WN234CD	1999	Calabria	23.0	103
3	WN234EF	1962	Del Mar	16.0	72
4	WN456GH	1957	Harvey	13.5	70
5	WN678JL	1996	Bayliner	47.0	179

Total rows: 5 of 5 | Query complete 00:00:00.065 | Ln 116, Col 34

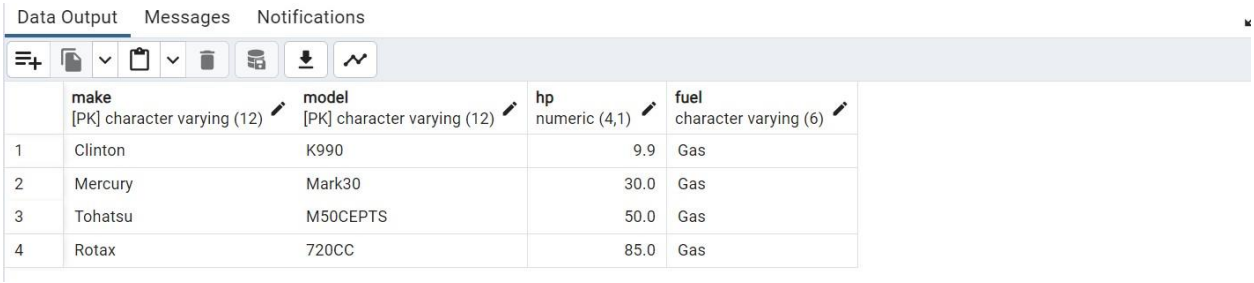
5. Select all data for low power engines (ENGINE_TYPES with less than 100 HP) from the ENGINE_TYPES table.

Query:

SELECT * FROM ENGINE_TYPES

WHERE HP < 100;

Query Output:



Data Output | Messages | Notifications

	make [PK] character varying (12)	model [PK] character varying (12)	hp numeric (4,1)	fuel character varying (6)
1	Clinton	K990	9.9	Gas
2	Mercury	Mark30	30.0	Gas
3	Tohatsu	M50CEPTS	50.0	Gas
4	Rotax	720CC	85.0	Gas

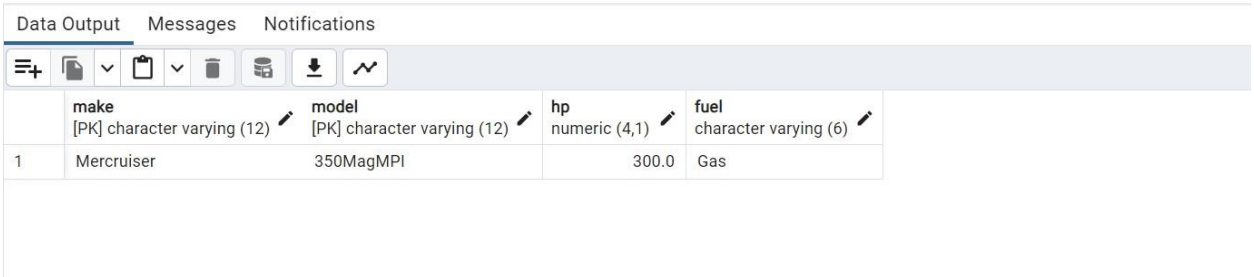
6. Select all data for Gas engines over 100 HP from the ENGINE_TYPES table.

Query:

SELECT * FROM ENGINE_TYPES

WHERE HP > 100 AND FUEL = 'Gas';

Query Output:



Data Output | Messages | Notifications

	make [PK] character varying (12)	model [PK] character varying (12)	hp numeric (4,1)	fuel character varying (6)
1	Mercruiser	350MagMPI	300.0	Gas

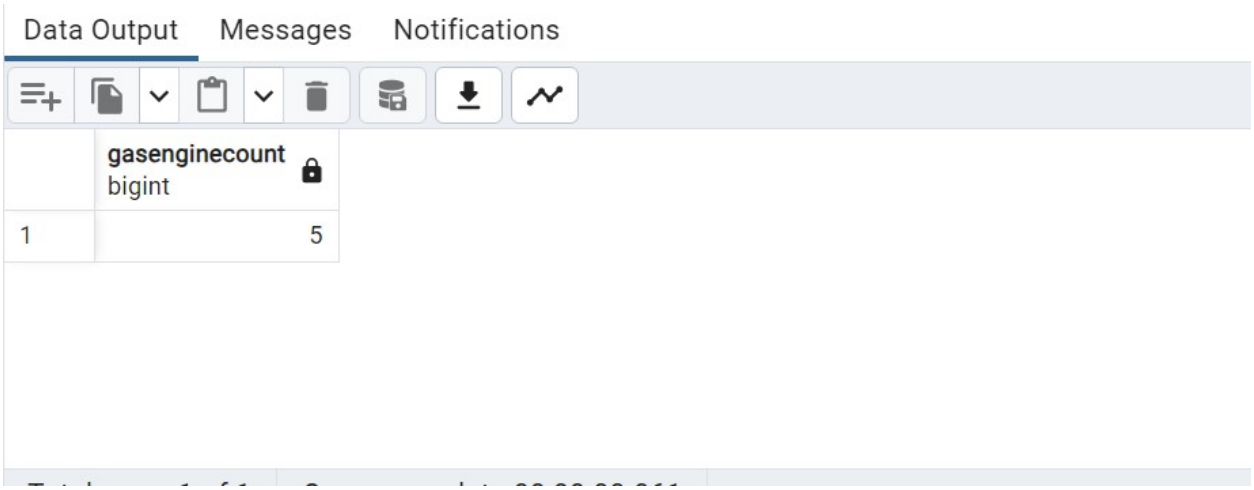
Aggregate Queries

7. Count the number of ‘Gas’ fueled engines from the ENGINE_TYPES table.

Query:

```
SELECT COUNT(*) AS GasEngineCount
FROM ENGINE_TYPES
WHERE FUEL = 'Gas';
```

Query Output:

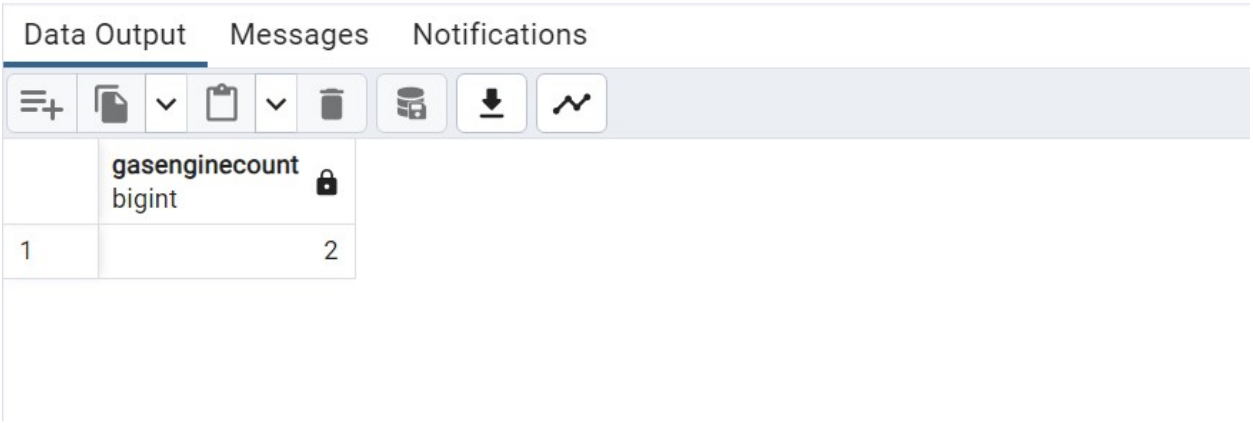


8. Count the number of ‘Gas’ fueled engines with more than 70 HP from the ENGINE_TYPES table.

Query:

```
SELECT COUNT(*) AS GasEngineCount
FROM ENGINE_TYPES
WHERE FUEL = 'Gas' AND HP > 70;
```

Query Output:

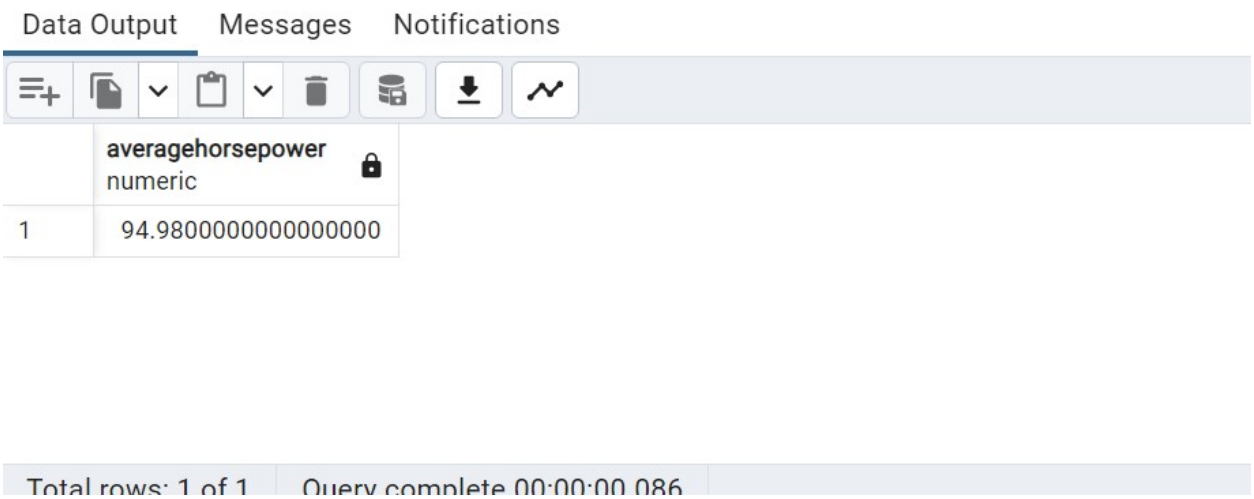


9. Provide the average HP of ‘Gas’ fueled engines from the ENGINE_TYPES table.

Query:

```
SELECT AVG(HP) AS AverageHorsepower
FROM ENGINE_TYPES
WHERE FUEL = 'Gas';
```

Query Output:

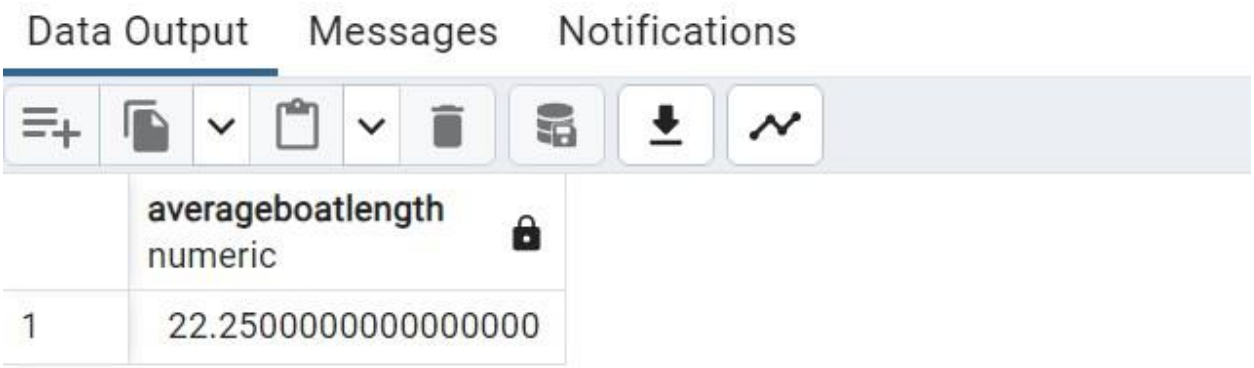


10. What is the average boat length?

Query:

```
SELECT AVG(LENGTH) AS AverageBoatLength
FROM BOATS;
```

Query Output:

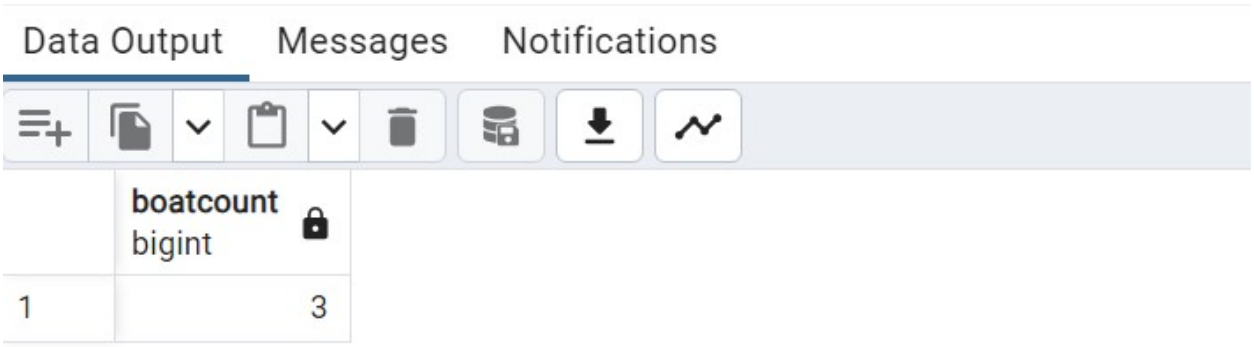


11. Count the boats made in the 1990s from the BOATS table.

Query:

```
SELECT COUNT(*) AS BoatCount
FROM BOATS
WHERE YEAR BETWEEN 1990 AND 1999
```

Query Output:



Multi-table Joins:

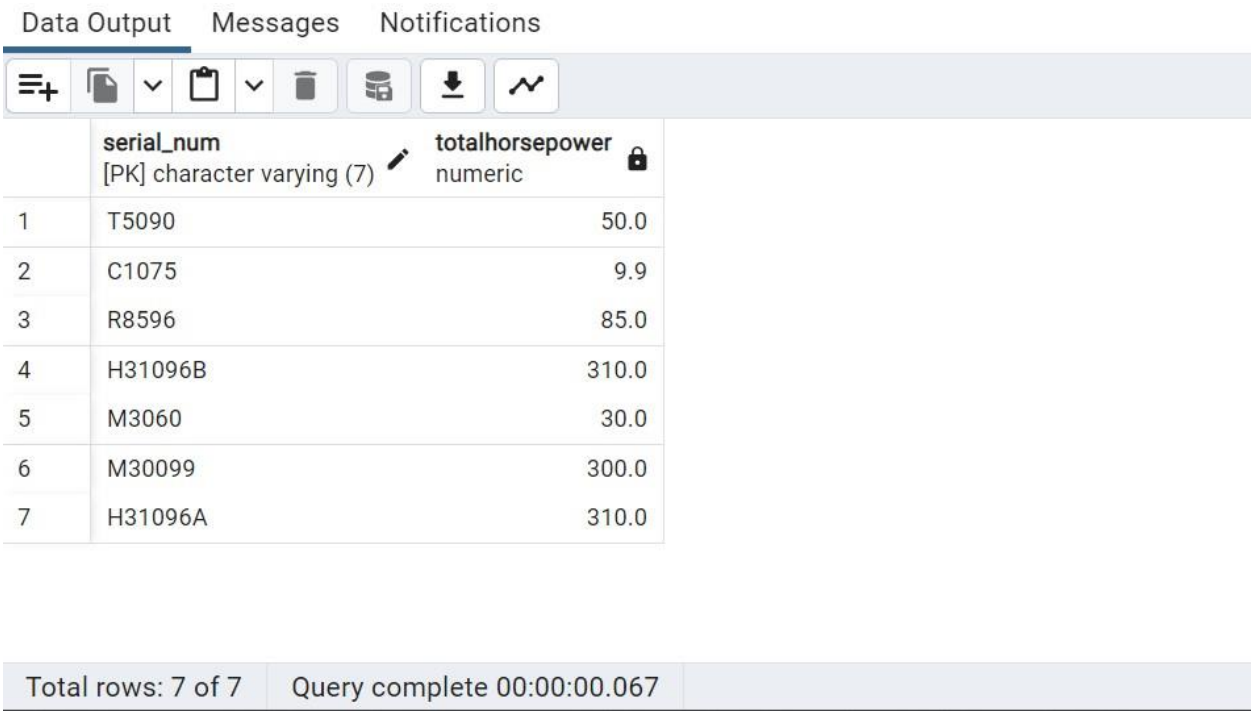
12. What is the total HP for every specific ENGINE (SERIAL_NUM)?

Query:

```
SELECT SERIAL_NUM, SUM(et.HP) AS TotalHorsepower
```

```
FROM ENGINES e
JOIN ENGINE_TYPES et ON e.MAKE = et.MAKE AND e.MODEL = et.MODEL
GROUP BY SERIAL_NUM;
```

Query Output:



Data Output | Messages | Notifications

	serial_num [PK] character varying (7)	totalhorsepower numeric
1	T5090	50.0
2	C1075	9.9
3	R8596	85.0
4	H31096B	310.0
5	M3060	30.0
6	M30099	300.0
7	H31096A	310.0

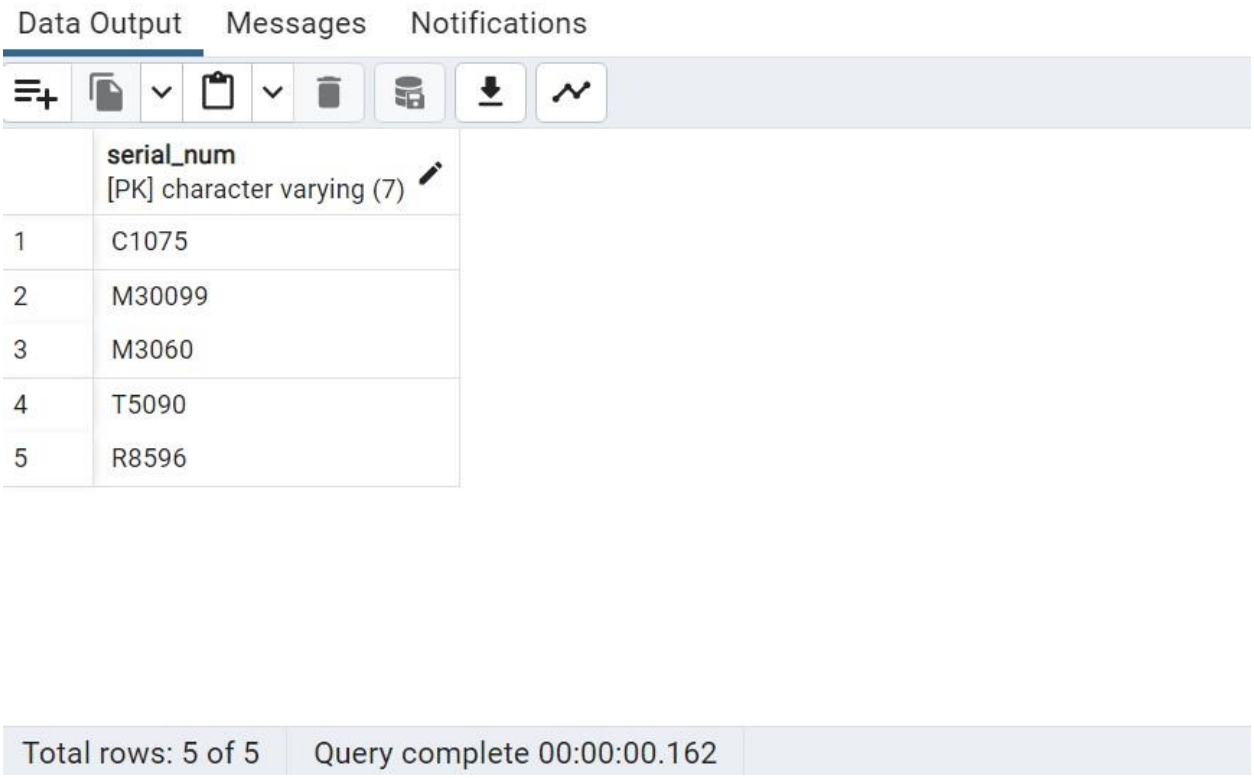
Total rows: 7 of 7 | Query complete 00:00:00.067

13. What are the serial numbers for only the ‘Gas’ fueled engines?

Query:

```
SELECT e.SERIAL_NUM
FROM ENGINES e
JOIN ENGINE_TYPES et ON e.MAKE = et.MAKE AND e.MODEL = et.MODEL
WHERE et.FUEL = 'Gas';
```

Query Output:

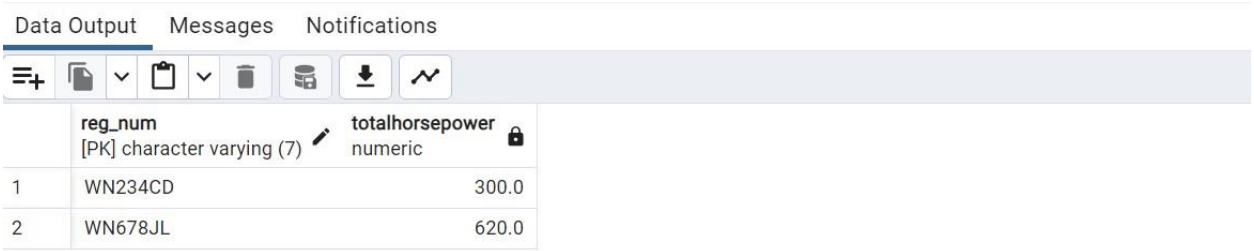


14. Which BOATS have over 100 total HP? Hint: for a boat with multiple engines, you will need to aggregate.

Query:

```
SELECT b.REG_NUM, SUM(et.HP) AS TotalHorsepower
FROM BOATS b
JOIN BOAT_ENGINES be ON b.REG_NUM = be.BOAT_ID
JOIN ENGINES e ON be.ENGINE_SERIAL_NUM = e.SERIAL_NUM
JOIN ENGINE_TYPES et ON e.MAKE = et.MAKE AND e.MODEL = et.MODEL
GROUP BY b.REG_NUM
HAVING SUM(et.HP) > 100;
```

Query Output:



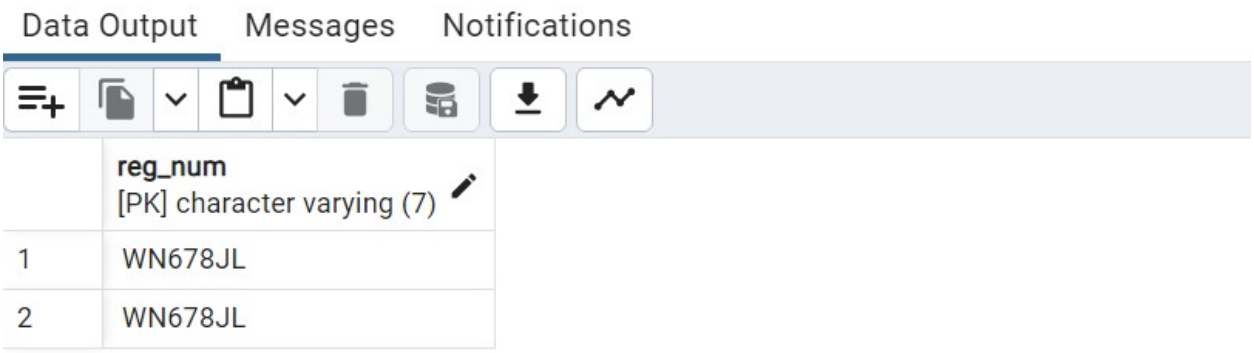
Sub-Queries:

15. Which:
    - newer full-sized BOATS (LENGTH>20 and YEAR >1990)
    - also have an ENGINE with over 300 HP?

Query:

```
SELECT b.REG_NUM
FROM BOATS b
JOIN BOAT_ENGINES be ON b.REG_NUM = be.BOAT_ID
JOIN ENGINES e ON be.ENGINE_SERIAL_NUM = e.SERIAL_NUM
JOIN ENGINE_TYPES et ON e.MAKE = et.MAKE AND e.MODEL = et.MODEL
WHERE b.LENGTH > 20 AND b.YEAR > 1990 AND et.HP > 300;
```

Query Output:



	reg_num [PK] character varying (7)
1	WN678JL
2	WN678JL

16. Which BOATS:
    - have a LENGTH that is longer than the average boat (see the correlated subquery slides)
    - that are also a classic boat built before 1978.

Query:

```
SELECT *
FROM BOATS b1
WHERE b1.LENGTH > (SELECT AVG(LENGTH) FROM BOATS)
  AND b1.YEAR < 1978;
```

Query Output:

	reg_num [PK] character varying (7)	year numeric (4)	make character varying (10)	length numeric (4,1)	beam numeric (3)
1	WN123AB	1977	Hunter	25.0	96

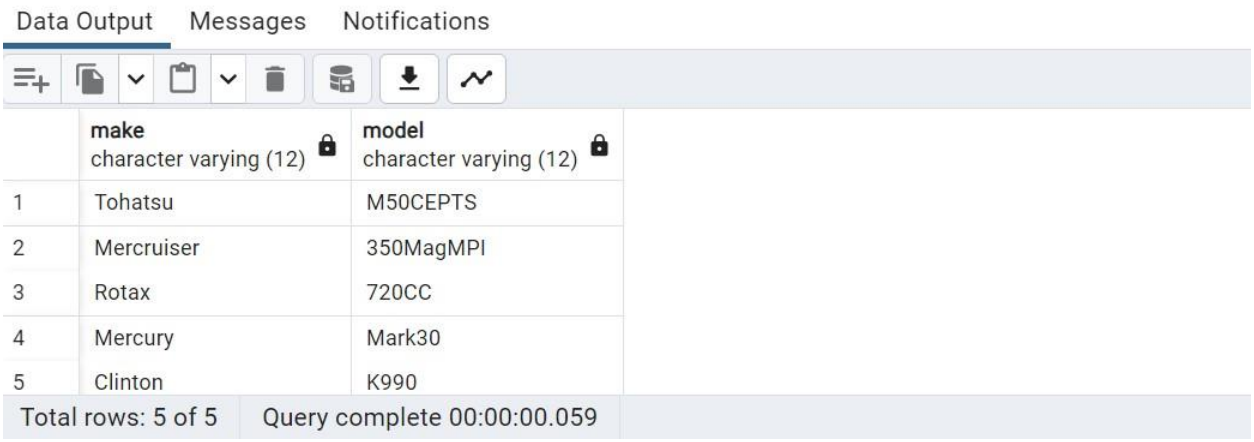
Set Operations:

17. Use a set operation (UNION, INTERSECT, or MINUS) statement to find the ENGINES (e.g., MAKE, MODEL) that use 'Gas' FUEL and were produced before 1989.

Query:

```
SELECT MAKE, MODEL
FROM ENGINE_TYPES
WHERE FUEL = 'Gas'
UNION
SELECT et.MAKE, et.MODEL
FROM ENGINES e
JOIN ENGINE_TYPES et ON e.MAKE = et.MAKE AND e.MODEL = et.MODEL
WHERE et.FUEL = 'Gas' AND e.YEAR < 1989;
```

Query Output:



Data Output | Messages | Notifications

	make character varying (12)	model character varying (12)
1	Tohatsu	M50CEPTS
2	Mercruiser	350MagMPI
3	Rotax	720CC
4	Mercury	Mark30
5	Clinton	K990

Total rows: 5 of 5 | Query complete 00:00:00.059

Additional DML Statements:

18. Update each ‘Gas’ fuel type to ‘Petrol’ in the ENGINE_TYPES table.

Query:

```
UPDATE ENGINE_TYPES
SET FUEL = 'Petrol'
WHERE FUEL = 'Gas';

SELECT * FROM ENGINE_TYPES
```

Query Output:

Data Output | Messages | Notifications

	make [PK] character varying (12)	model [PK] character varying (12)	hp numeric (4,1)	fuel character varying (6)
1	Hino	W06DTA	310.0	Diesel
2	Clinton	K990	9.9	Petrol
3	Mercruiser	350MagMPI	300.0	Petrol
4	Mercury	Mark30	30.0	Petrol
5	Tohatsu	M50CEPTS	50.0	Petrol
6	Rotax	720CC	85.0	Petrol

Total rows: 6 of 6 | Query complete 00:00:00.070 | Ln 21

19. Delete boat ‘WN123AB’ from the BOATS table.

Query:

```
DELETE FROM BOATS
WHERE REG_NUM = 'WN123AB';

SELECT * FROM BOATS
```

Query Output:

Data Output | Messages | Notifications

	reg_num [PK] character varying (7)	year numeric (4)	make character varying (10)	length numeric (4,1)	beam numeric (3)
1	WN234CD	1999	Calabria	23.0	103
2	WN234EF	1962	Del Mar	16.0	72
3	WN456GH	1957	Harvey	13.5	70
4	WN567IJ	1997	Seadoo	9.0	46
5	WN678JL	1996	Bayliner	47.0	179

DDL – View Statements:

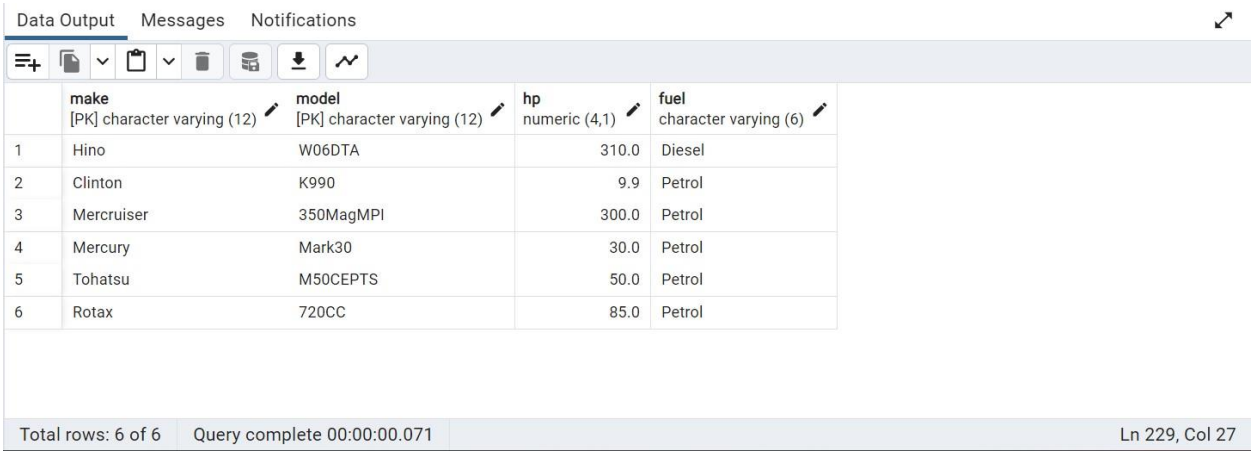
20. Create a view that contains only the ENGINE_TYPES records (i.e., rows) that run on ‘Petrol’.

Query:

```
CREATE VIEW PetrolEnginesView AS
SELECT *
FROM ENGINE_TYPES
WHERE FUEL = 'Petrol';

SELECT * FROM ENGINE_TYPES
```

Query Output:



Data Output | Messages | Notifications

	make [PK] character varying (12)	model [PK] character varying (12)	hp numeric (4,1)	fuel character varying (6)
1	Hino	W06DTA	310.0	Diesel
2	Clinton	K990	9.9	Petrol
3	Mercruiser	350MagMPI	300.0	Petrol
4	Mercury	Mark30	30.0	Petrol
5	Tohatsu	M50CEPTS	50.0	Petrol
6	Rotax	720CC	85.0	Petrol

Total rows: 6 of 6 | Query complete 00:00:00.071 | Ln 229, Col 27