Jon Kaplan
IST659 Project Deliverable
March 2019

Project Deliverable

Part 1: Design

Project Narrative

I am creating a database that will make it easier to track the relationship between weather and its impact on Tom Brady's performance with the New England Patriots. I will use QB Rating as the leading indicator of performance for Tom Brady. I will use win/loss and points scored as leading indicators for the New England Patriots. This database will ideally aid in better statistical analysis and coaching decisions in future games.

Data Dictionary

After reviewing Tom Brady and Patriots stats, I have identified the following list of entities and their attributes.

Entity	**Attribute**	**Properties**
Tom Brady	QB Rating	Decimal number (example 100.5 or 85.2)
	Passing Yards	
	TD	
	INT	
New England Patriots	Game Points	
	Running Yards	
Game	Win Or Loss	W or L
	Home Or Away	H or A
	Week	Which week in NFL Season
	SeasonYear	Year
	SeasonType	Regular (Reg) or Postseason (Post)
	GameDay	Day of week

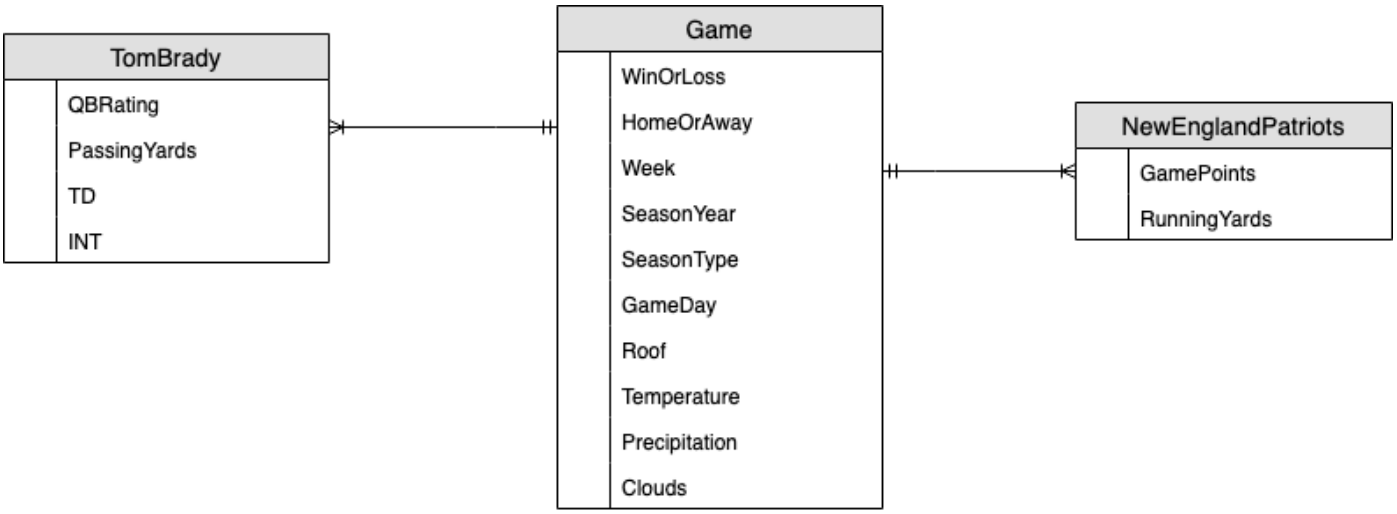
	Roof	Yes(Y) or No(N)
	Weather	Temperature
	Precipitation	No (N), Rain (R), Snow (S)
	Clouds	Yes (Y) or No (N)

Data Questions

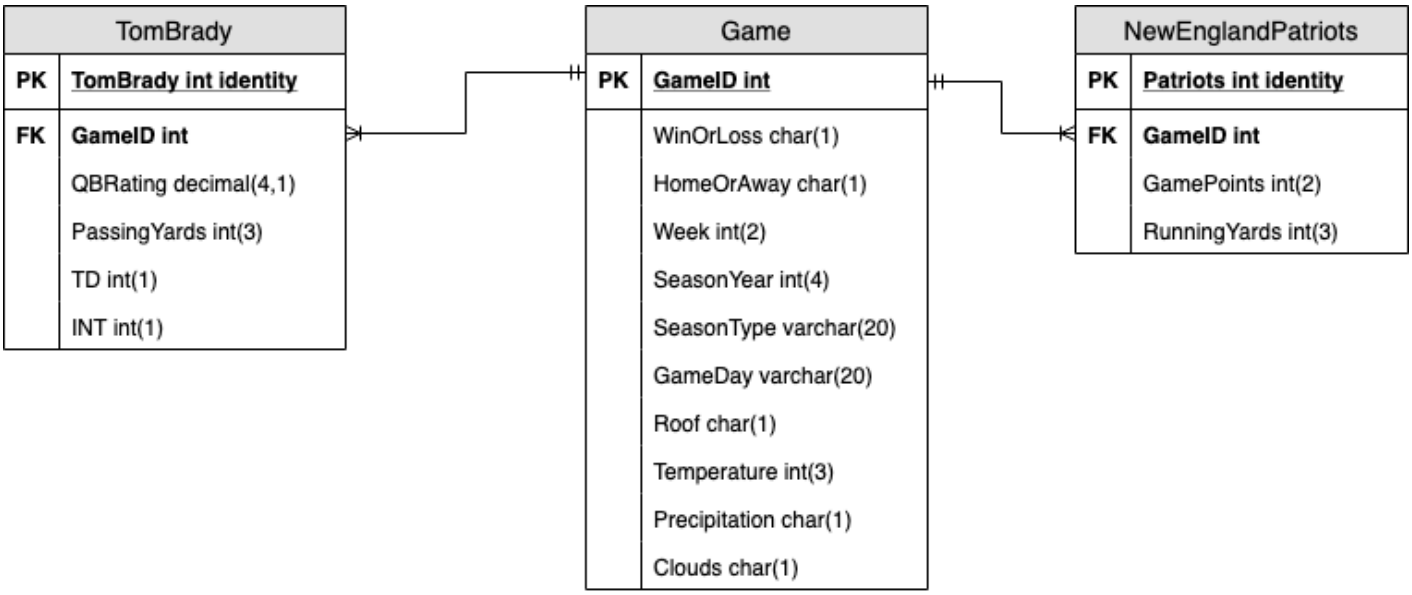
Some questions I hope to answer using this data are:

1. Does Tom Brady's QB Rating increase or decrease when the weather is below 40 degrees?
2. What is Tom Brady's win percentage when his QB Rating is above 100?
3. What is the average rushing yards for the Patriots when the weather was freezing (below 32 degrees)? How about cloudy and above 75 degrees?
4. Is there a specific day of the week where Tom Brady performs better (QB Rating)?
5. Does Tom Brady tend to have more interceptions when the weather is cloudy?
6. When there is precipitation, do the Patriots lose more?
7. What is the win percentage for cloudy games for the Patriots?
8. If Tom Brady has a bad performance in a game (below 85 QB Rating and more than 0 INT), what's the Patriot's average running yards and points for those games?
9. How many games did Tom Brady have with more than 2 TD *and* over 300 yards?
10. How did Tom Brady's postseason passing yard average and average TD, INT, compare in 2016 to 2017?

Entity Relationship Diagram



Logical Model Diagram



Part 2: Implementation

SQL DDL

SQL DDL Statements for Tom Brady Database

Author: Jon Kaplan
March 2019
IST659 Project

```
-DROP tables

-- foreign keys
ALTER TABLE TomBrady DROP CONSTRAINT Game_TomBrady;

ALTER TABLE NewEnglandPatriots DROP CONSTRAINT NewEnglandPatriots_Game;

-- tables


DROP TABLE NewEnglandPatriots;

DROP TABLE TomBrady;

DROP TABLE Game;
```

```
---CREATE tables

-- Table: Game
CREATE TABLE Game (
    GameID int  NOT NULL,
    WinOrLoss char(1)  NOT NULL,
    HomeOrAway char(1)  NOT NULL,
    Week int  NOT NULL,
    SeasonYear int  NOT NULL,
    SeasonType varchar(20)  NOT NULL,
    GameDay varchar(20)  NOT NULL,
    Roof char(1)  NOT NULL,
    Temperature int  NOT NULL,
    Precipitation char(1)  NOT NULL,
    Clouds char(1)  NOT NULL,
    CONSTRAINT Game_pk PRIMARY KEY  (GameID)
);
-- Table: NewEnglandPatriots
CREATE TABLE NewEnglandPatriots (
    PatriotsID int  identity,
    GameID int  NOT NULL,
    GamePoints int  NOT NULL,
    RunningYards int  NOT NULL,
    CONSTRAINT NewEnglandPatriots_pk PRIMARY KEY  (PatriotsID)
);

-- Table: TomBrady
CREATE TABLE TomBrady (
    TomBradyID int  identity,
    GameID int  NOT NULL,
    QBRating decimal(4,1)  NOT NULL,
    PassingYards int  NOT NULL,
    TD int  NOT NULL,
    INT int  NOT NULL,
    CONSTRAINT TomBrady_pk PRIMARY KEY  (TomBradyID)
);

-- foreign keys
-- Reference: Game_TomBrady (table: TomBrady)
ALTER TABLE TomBrady ADD CONSTRAINT Game_TomBrady
    FOREIGN KEY (GameID)
    REFERENCES Game (GameID);

-- Reference: NewEnglandPatriots_Game (table: NewEnglandPatriots)
ALTER TABLE NewEnglandPatriots ADD CONSTRAINT NewEnglandPatriots_Game
    FOREIGN KEY (GameID)
    REFERENCES Game (GameID);
```

SQL DML

INSERT Statements

Game Table

```
INSERT INTO Game([GameID],[WinOrLoss],[HomeOrAway], [Week], [SeasonYear],
[SeasonType],[GameDay], [Roof],[Temperature], [Precipitation], [Clouds])
VALUES (399,'L','H',1,2017,'Reg','Thursday','N',63,'N','N')
, (87,'W','H',2,2016,'Reg','Sunday','N',79,'N','Y')
, (327,'W','H',2,2016,'Post','Saturday','N',28,'N','Y')
, (660,'W','H',2,2017,'Post','Saturday','N',24,'N','N')
, (98,'W','H',3,2016,'Reg','Thursday','N',68,'N','N')
, (331,'W','H',3,2016,'Post','Sunday','N',41,'N','Y')
, (439,'W','H',3,2017,'Reg','Sunday','N',84,'N','N')
, (663,'W','H',3,2017,'Post','Sunday','N',48,'N','N')
, (120,'L','H',4,2016,'Reg','Sunday','N',56,'N','Y')
, (455,'L','H',4,2017,'Reg','Sunday','N',61,'N','N')
, (665,'L','H',4,2017,'Post','Sunday','N',3,'N','Y')
, (148,'W','H',6,2016,'Reg','Sunday','N',66,'N','N')
, (504,'W','H',7,2017,'Reg','Sunday','N',56,'N','Y')
, (510,'W','H',8,2017,'Reg','Sunday','N',62,'R','Y')
, (211,'L','H',10,2016,'Reg','Sunday','N',43,'N','N')
, (566,'W','H',12,2017,'Reg','Sunday','N',47,'N','Y')
, (250,'W','H',13,2016,'Reg','Sunday','N',39,'N','N')
, (273,'W','H',14,2016,'Reg','Monday','N',31,'N','N')
, (297,'W','H',16,2016,'Reg','Saturday','N',40,'R','Y')
, (629,'W','H',16,2017,'Reg','Sunday','N',35,'N','Y')
, (645,'W','H',17,2017,'Reg','Sunday','N',13,'N','Y')
, (79,'W','A',1,2016,'Reg','Sunday','N',73,'N','N')
, (332,'W','A',4,2016,'Post','Sunday','Y',76,'N','Y')
, (176,'W','A',8,2016,'Reg','Sunday','N',49,'R','Y')
, (578,'W','A',13,2017,'Reg','Sunday','N',48,'N','Y')
, (131,'W','A',5,2016,'Reg','Sunday','N',58,'N','N')
, (286,'W','A',15,2016,'Reg','Sunday','N',18,'N','N')
, (544,'W','A',10,2017,'Reg','Sunday','N',48,'N','Y')
, (310,'W','A',17,2016,'Reg','Sunday','N',80,'N','Y')
, (606,'L','A',14,2017,'Reg','Monday','N',55,'N','N')
, (421,'W','A',2,2017,'Reg','Sunday','Y',85,'N','Y')
, (241,'W','A',12,2016,'Reg','Sunday','N',47,'N','Y')
, (483,'W','A',6,2017,'Reg','Sunday','N',73,'N','Y')
, (556,'W','A',11,2017,'Reg','Sunday','N',66,'N','N')
, (170,'W','A',7,2016,'Reg','Sunday','N',63,'N','N')
, (619,'W','A',15,2017,'Reg','Sunday','N',42,'N','Y')
, (223,'W','A',11,2016,'Reg','Sunday','N',64,'R','Y')
, (463,'W','A',5,2017,'Reg','Thursday','N',76,'N','N')
```

NewEnglandPatriots Table

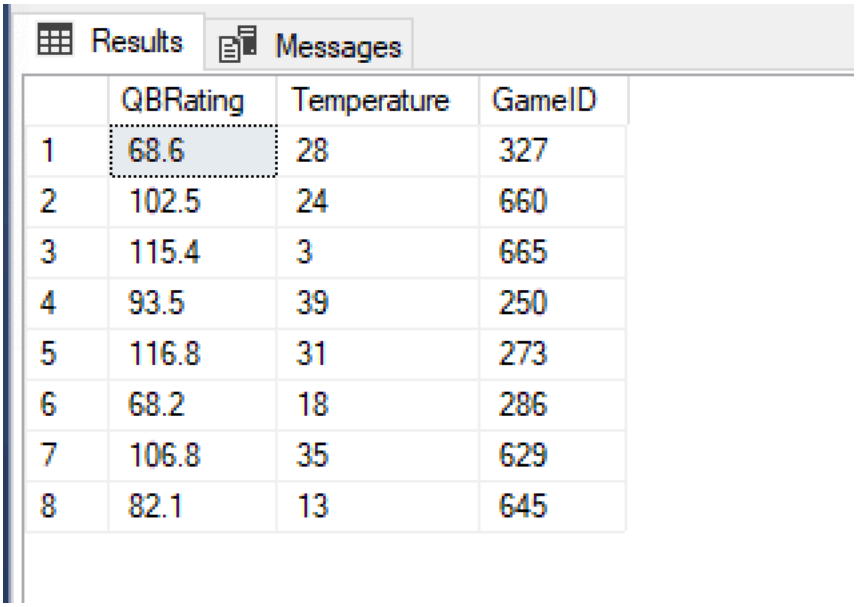
```
INSERT INTO NewEnglandPatriots([GameID], [GamePoints], [RunningYards])
VALUES (399,27,124)
, (79,23,106)
, (87,31,161)
, (660,35,101)
, (327,34,98)
, (98,27,185)
, (421,36,119)
, (439,36,59)
, (331,36,57)
, (663,24,46)
, (455,30,80)
, (120,0,90)
, (665,33,113)
, (463,19,113)
, (332,34,104)
, (483,24,118)
, (131,33,98)
, (148,35,79)
, (170,27,140)
, (504,23,162)
, (510,21,97)
, (176,41,72)
, (211,24,81)
, (223,30,171)
, (544,41,99)
, (241,22,91)
, (250,26,133)
, (556,33,89)
, (273,30,95)
, (566,35,196)
, (578,23,191)
, (286,16,136)
, (606,20,25)
, (619,27,77)
, (297,41,114)
, (629,37,193)
, (310,35,120)
, (645,26,147)
```

TomBrady Table

```
INSERT INTO TomBrady ([GameID], [QBRating], [PassingYards], [TD], [INT])
VALUES (399,70.1,267,0,0)
, (327,68.6,287,2,2)
, (660,102.5,337,3,0)
, (331,127.5,384,3,0)
, (421,139.6,447,3,0)
, (663,108.4,290,2,0)
, (439,146.2,378,5,0)
, (665,115.4,505,3,0)
, (455,104.6,307,2,0)
, (463,94.1,303,1,1)
, (131,127.7,406,3,0)
, (483,80.7,257,2,1)
, (148,140,376,3,0)
, (170,124.2,222,2,0)
, (176,137,315,4,0)
, (504,121.2,249,2,0)
, (510,95.4,333,1,0)
, (211,90.1,316,0,1)
, (332,95.2,466,2,1)
, (223,114.6,280,4,0)
, (544,125.4,266,3,0)
, (241,89.2,286,2,0)
, (250,93.5,269,1,0)
, (556,132,340,3,0)
, (273,116.8,406,3,1)
, (566,114.1,227,4,1)
, (578,82.4,258,0,1)
, (286,68.2,188,0,0)
, (606,59.5,233,1,2)
, (619,87.6,290,1,1)
, (297,124.6,214,3,0)
, (629,106.8,224,2,1)
, (310,130.4,276,3,0)
, (645,82.1,190,2,0)
```

Answers to Data Questions (SQL SELECT Statements)

1. **Does Tom Brady's QB Rating increase or decrease when the weather is below 40 degrees?**



Results | Messages

	QBRating	Temperature	GameID
1	68.6	28	327
2	102.5	24	660
3	115.4	3	665
4	93.5	39	250
5	116.8	31	273
6	68.2	18	286
7	106.8	35	629
8	82.1	13	645

```
SELECT QBRating, Temperature, Game.GameID
FROM TomBrady
INNER JOIN Game ON
TomBrady.GameID=Game.GameID
WHERE Temperature<40

SELECT AVG(QBRating)
FROM TomBrady
INNER JOIN Game ON
TomBrady.GameID=Game.GameID
WHERE Temperature<40
--94.24 average QB rating when temperature below 40 degrees

SELECT AVG(QBRating)
FROM TomBrady
INNER JOIN Game ON
TomBrady.GameID=Game.GameID
WHERE Temperature>40
--109.49 average QB Rating when temperature above 40 degrees

--Tom Brady's average QB Rating decreases from 109.49 to 94.24 when the temperature is
below 40 degrees.
```

2. What is Tom Brady's win percentage when his QB Rating is above 100?

	WinOrLoss	QBRating
1	W	102.5
2	W	127.5
3	W	139.6
4	W	108.4
5	W	146.2
6	L	115.4
7	L	104.6
8	W	127.7
9	W	140.0
10	W	124.2
11	W	137.0

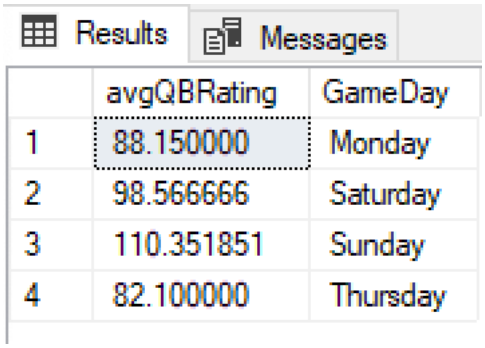
```
SELECT Game.WinOrLoss,
TomBrady.QBRating
FROM Game
INNER JOIN TomBrady ON
Game.GameID=TomBrady.GameID
WHERE QBRating>100
--18/20 or 90% win percentage when QB rating above 100
```

3. **What is the average rushing yards for the Patriots when the weather was freezing (below 32 degrees)? How about cloudy and above 75 degrees?**

	RunningYards	Temperature	GameID
1	101	24	660
2	98	28	327
3	113	3	665
4	95	31	273
5	136	18	286
6	147	13	645

```
SELECT RunningYards, Temperature, Game.GameID
FROM Game
INNER JOIN NewEnglandPatriots ON
NewEnglandPatriots.GameID=Game.GameID
WHERE Temperature<32


SELECT AVG(RunningYards)
FROM Game
INNER JOIN NewEnglandPatriots ON
NewEnglandPatriots.GameID=Game.GameID
WHERE Temperature<32
--115 average running yards when freezing


How about cloudy and above 75 degrees?

SELECT RunningYards, Temperature, Game.GameID
FROM Game
INNER JOIN NewEnglandPatriots ON
NewEnglandPatriots.GameID=Game.GameID
WHERE Temperature>75
AND Clouds='Y'

SELECT AVG(RunningYards)
FROM Game
INNER JOIN NewEnglandPatriots ON
NewEnglandPatriots.GameID=Game.GameID
WHERE Temperature>75
AND Clouds='Y'
--126 average running yards when cloudy and above 75 degrees
```

4. Is there a specific day of the week where Tom Brady performs better (QB Rating)?

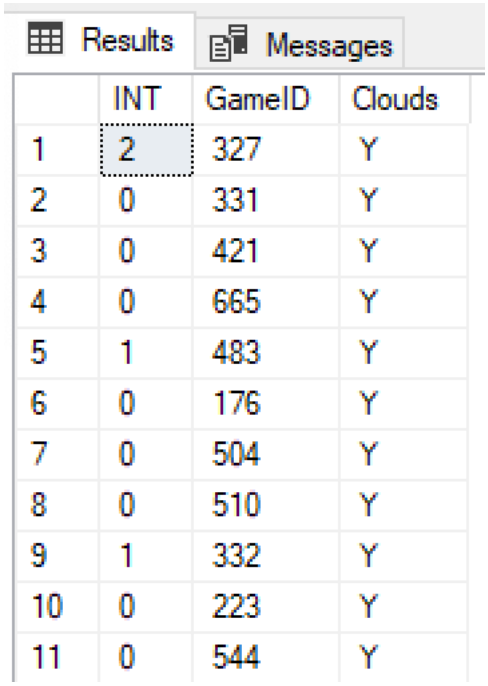


Results | Messages

	avgQBRating	GameDay
1	88.150000	Monday
2	98.566666	Saturday
3	110.351851	Sunday
4	82.100000	Thursday

```
SELECT AVG(QBRating) AS avgQBRating,GameDay
FROM TomBrady
INNER JOIN Game ON
TomBrady.GameID=Game.GameID
GROUP BY GameDay


--Brady's best performing day for games is Sunday with an average QB Rating of 110.35best
performing day for games is Sunday with an average QB Rating of 110.35
```

5. Does Tom Brady tend to have more interceptions when the weather is cloudy?

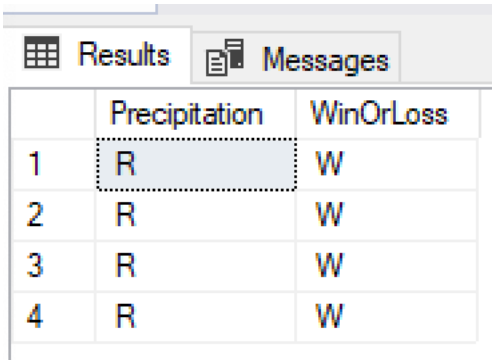


Results | Messages

	INT	GameID	Clouds
1	2	327	Y
2	0	331	Y
3	0	421	Y
4	0	665	Y
5	1	483	Y
6	0	176	Y
7	0	504	Y
8	0	510	Y
9	1	332	Y
10	0	223	Y
11	0	544	Y

```
SELECT INT, Game.GameID, Clouds
FROM TomBrady
INNER JOIN Game ON
TomBrady.GameID=Game.GameID
WHERE Clouds='Y'

SELECT SUM(INT)
FROM TomBrady
INNER JOIN Game ON
TomBrady.GameID=Game.GameID
WHERE Clouds='Y'
--8 INT in 19 games when cloudy... 42% chance of interception in cloudy game

SELECT SUM(INT)
FROM TomBrady
INNER JOIN Game ON
TomBrady.GameID=Game.GameID
WHERE Clouds='N'
--5 INT in 15 games when not cloudy... 33% chance of interception in non cloudy game
```

6. When there is precipitation, do the Patriots lose more?

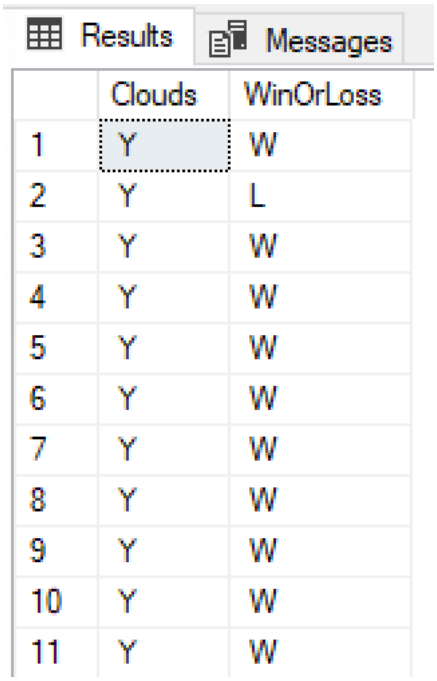


Results | Messages

	Precipitation	WinOrLoss
1	R	W
2	R	W
3	R	W
4	R	W

```
SELECT Precipitation, WinOrLoss
FROM Game
WHERE Precipitation='R'
--win every time, 100% win percentage
```

7. What is the win percentage for cloudy games for the Patriots?

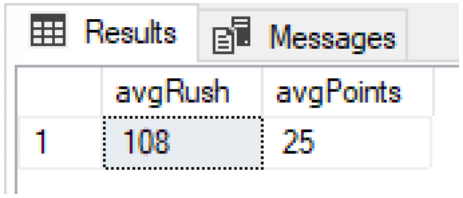


Results | Messages

	Clouds	WinOrLoss
1	Y	W
2	Y	L
3	Y	W
4	Y	W
5	Y	W
6	Y	W
7	Y	W
8	Y	W
9	Y	W
10	Y	W
11	Y	W

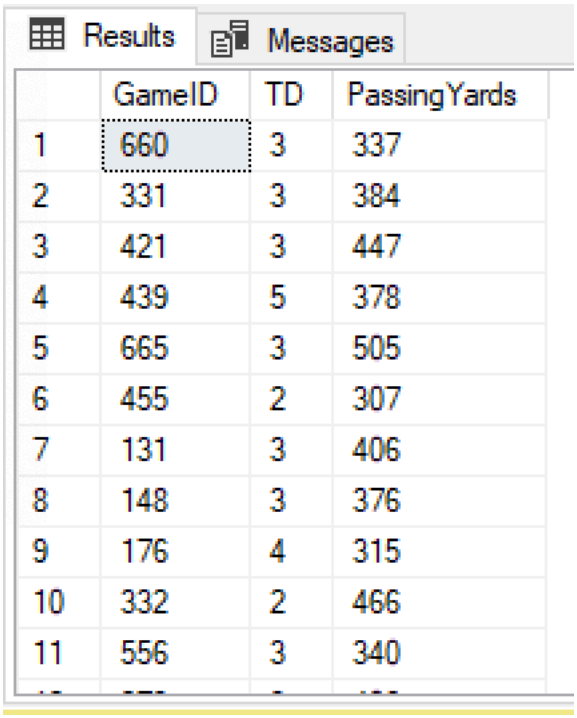
```
SELECT Clouds, WinOrLoss
FROM Game
WHERE Clouds='Y'
--21/38 or 55% win percentage for Patriots in cloudy games
```

8. **If Tom Brady has a bad performance in a game (below 85 QB Rating and more than 0 INT), what's the Patriot's average running yards and points for those games?**




```
SELECT AVG(RunningYards) AS avgRush, AVG(GamePoints) AS avgPoints
FROM TomBrady
INNER JOIN NewEnglandPatriots ON
NewEnglandPatriots.GameID=TomBrady.GameID
WHERE QBRating<85
AND
INT>0
--108 yards and 25 average points when Tom Brady has a bad game
```

9. How many games did Tom Brady have with more than 2 TD *and* over 300 yards?



Results | Messages

	GameID	TD	PassingYards
1	660	3	337
2	331	3	384
3	421	3	447
4	439	5	378
5	665	3	505
6	455	2	307
7	131	3	406
8	148	3	376
9	176	4	315
10	332	2	466
11	556	3	340

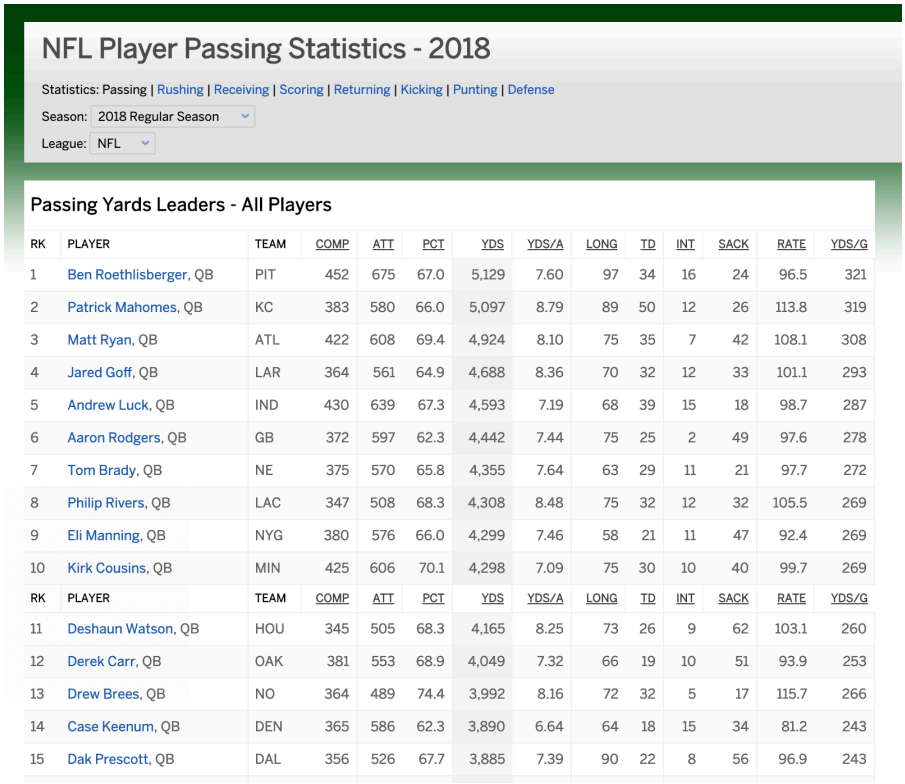
```
SELECT Game.GameID, TD, PassingYards
FROM Game
INNER JOIN TomBrady ON
TomBrady.GameID=Game.GameID
WHERE TD>1 AND PassingYards>300
--12 games with more than 2 TD and over 300 yards
```

10. How did Tom Brady's postseason passing yard average and average TD, INT, compare in 2016 to 2017?

```
SELECT AVG(PassingYards), AVG(TD)
FROM TomBrady
INNER JOIN Game ON
TomBrady.GameID=Game.GameID
WHERE SeasonType='Post' AND SeasonYear=2016
--379 average passing yards, 2.33 TD in 2016

SELECT AVG(PassingYards), AVG(TD)
FROM TomBrady
INNER JOIN Game ON
TomBrady.GameID=Game.GameID
WHERE SeasonType='Post' AND SeasonYear=2017
--377 average passing yards, 2.66 TD in 2017

--Brady had a slightly better 2016 post season in regards to average passing yards but
average TD was higher in 2017. They are both fairly similar.
```

GUI Prototype

ESPN Stat GUI



NFL Player Passing Statistics - 2018

Statistics: Passing | Rushing | Receiving | Scoring | Returning | Kicking | Punting | Defense

Season: 2018 Regular Season

League: NFL

Passing Yards Leaders - All Players

RK	PLAYER	TEAM	COMP	ATT	PCT	YDS	YDS/A	LONG	TD	INT	SACK	RATE	YDS/G
1	Ben Roethlisberger, QB	PIT	452	675	67.0	5,129	7.60	97	34	16	24	96.5	321
2	Patrick Mahomes, QB	KC	383	580	66.0	5,097	8.79	89	50	12	26	113.8	319
3	Matt Ryan, QB	ATL	422	608	69.4	4,924	8.10	75	35	7	42	108.1	308
4	Jared Goff, QB	LAR	364	561	64.9	4,688	8.36	70	32	12	33	101.1	293
5	Andrew Luck, QB	IND	430	639	67.3	4,593	7.19	68	39	15	18	98.7	287
6	Aaron Rodgers, QB	GB	372	597	62.3	4,442	7.44	75	25	2	49	97.6	278
7	Tom Brady, QB	NE	375	570	65.8	4,355	7.64	63	29	11	21	97.7	272
8	Philip Rivers, QB	LAC	347	508	68.3	4,308	8.48	75	32	12	32	105.5	269
9	Eli Manning, QB	NYG	380	576	66.0	4,299	7.46	58	21	11	47	92.4	269
10	Kirk Cousins, QB	MIN	425	606	70.1	4,298	7.09	75	30	10	40	99.7	269
RK	PLAYER	TEAM	COMP	ATT	PCT	YDS	YDS/A	LONG	TD	INT	SACK	RATE	YDS/G
11	Deshaun Watson, QB	HOU	345	505	68.3	4,165	8.25	73	26	9	62	103.1	260
12	Derek Carr, QB	OAK	381	553	68.9	4,049	7.32	66	19	10	51	93.9	253
13	Drew Brees, QB	NO	364	489	74.4	3,992	8.16	72	32	5	17	115.7	266
14	Case Keenum, QB	DEN	365	586	62.3	3,890	6.64	64	18	15	34	81.2	243
15	Dak Prescott, QB	DAL	356	526	67.7	3,885	7.39	90	22	8	56	96.9	243

Example from ESPN of how I would probably want to display my stats, using drop down menu at top and rows of data below

Excel Tables Example GUI

V	W	X	Y	Z
GAMEKEY	QBR	PassingYards	TD	INT
399	70.1	267	0	0
327	68.6	287	2	2
660	102.5	337	3	0
331	127.5	384	3	0
421	139.6	447	3	0
663	108.4	290	2	0
439	146.2	378	5	0
665	115.4	505	3	0
455	104.6	307	2	0
463	94.1	303	1	1
131	127.7	406	3	0
483	80.7	257	2	1
148	140	376	3	0
170	124.2	222	2	0
176	137	315	4	0
504	121.2	249	2	0
510	95.4	333	1	0
332	95.2	466	2	1
223	114.6	280	4	0
544	125.4	266	3	0
241	89.2	286	2	0
250	93.5	269	1	0
556	132	340	3	0
273	116.8	406	3	1
566	114.1	227	4	1
578	82.4	258	0	1
286	68.2	188	0	0
606	59.5	233	1	2
619	87.6	290	1	1

UI with Access

Game Data | Game Data_NEW | Table2 | Table3

ID	GameKey	Lookup to Table5	Field2	Field3	Lookup to Table4	Field4	Field5	Field6	Field7
221	426	2017, Reg, Sunday	2017	Reg	2, Denver, Denver Broncos	2		Sunday	Denver
222	460	2017, Reg, Sunday	2017	Reg	4, Denver, Denver Broncos	4		Sunday	Denver
223	489	2017, Reg, Sunday	2017	Reg	6, Denver, Denver Broncos	6		Sunday	Denver
224	544	2017, Reg, Sunday	2017	Reg	10, Denver, Denver Broncos	10		Sunday	Denver
225	559	2017, Reg, Thursday	2017	Reg	12, Detroit, Detroit Lions	12		Thursday	Detroit
226	608	2017, Reg, Sunday	2017	Reg	15, Detroit, Detroit Lions	15		Sunday	Detroit
227	641	2017, Reg, Sunday	2017	Reg	17, Detroit, Detroit Lions	17		Sunday	Detroit
228	4	2016, Pre, Friday	2016	Pre	2, Green Bay, Green Bay Packers	2		Friday	Green E
229	30	2016, Pre, Thursday	2016	Pre	3, Green Bay, Green Bay Packers	3		Thursday	Green E
230	102	2016, Pre, Sunday	2016	Pre	4, Minneapolis, Minnesota Vikings	4		Sunday	Minnea
231	141	2016, Reg, Sunday	2016	Reg	5, Green Bay, Green Bay Packers	5		Sunday	Green E
232	154	2016, Reg, Sunday	2016	Reg	6, Chicago, Chicago Bears	6		Sunday	Chicago
233	158	2016, Reg, Thursday	2016	Reg	7, Green Bay, Green Bay Packers	7		Thursday	Green E
234	195	2016, Reg, Sunday	2016	Reg	7, Kansas City, Kansas City Chiefs	7		Sunday	Kansas
235	248	2016, Reg, Sunday	2016	Reg	13, Green Bay, Green Bay Packers	13		Sunday	Green E
236	270	2016, Reg, Sunday	2016	Reg	14, Green Bay, Green Bay Packers	14		Sunday	Green E
237	295	2016, Reg, Sunday	2016	Reg	16, Chicago, Chicago Bears	16		Sunday	Chicago
238	325	2016, Post, Sunday	2016	Post	1, Green Bay, Green Bay Packers	1		Sunday	Green E

Experimenting in Access trying to figure out ways to display my data

Reflection

I underestimated how hard this project was going to be after deliverable part 1. Figuring out how to insert massive amounts of data from excel into SQL Server Management Studio was extremely difficult. I eventually decided on concatenating to make it easier to copy and paste the values. I also realized during part 2 that I didn't include enough info on individual games, therefore, I had to add a few more attributes to the Game table. I also decided on consolidating weather into the game table to make it easier.

I also realized that the way in which I set up my naming conventions in my database was somewhat limiting. It is ok for this project, but if I wanted my database to be more general, I could have named the TomBrady field as "PlayerStats" and NewEnglandPatriots as "TeamStats". This could have made my database have a broader context for the future. Misspelling was also a huge area of frustration as I had to be very careful when I typed in SQL since I ran into a lot of errors based on typos. I also struggled a bit with the GUI section and feel I could use more practice with that.

Overall, this project was challenging but ultimately very rewarding. Once I got the database working, it was very fun to do the querying and find out ways to answer my data questions. Seeing returned results is very gratifying. I also learned that doing a project based on a topic you are interested in makes it so much more fun and interesting. I look forward to continuing to develop my SQL and database design skills in the future.