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Assessment Coursework 2

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# Report

## Introduction

Within this report you will find a detailed description on how a database has been designed based off illiterate spreadsheets that had irrelevant data, that wasn’t organised or properly labelled. The *Target Audience* for this report would be the police service of England, as they require a brand-new system so they can manage information collected during their ‘*Stop & Search’* operations. This operation includes a lot of data, that needs sorting accordingly and as soon as possible. The police are currently using 3 Microsoft excel sheets that are very unorganised, don’t hold correct data types and worst of all, everything is mixed up between the 3 sheets.

My task is to design and re-evaluate the data types used within the excel sheets and create new entities to ensure efficiency within the new system. I will be analysing how the police take in their data and have it organised into appropriate entities.

## Assumptions

After analysing the spreadsheets, I can agree that the following entities(tables) will be created:

1. ***Location***

Wherever a crime or search etc may occur, all location data would be stored within this entity and keep irrelevant data out of other areas.

1. ***Suspect***

Having all details of a suspect within one table is essential as you don’t want suspect details to get mixed up with location details etc. This makes it much easier for the police to find all relating data to a suspect, whether they search for the suspect via name, ID or ethnicity, this table will have it stored.

1. ***Search***

A Search operation can happen for many reasons whether it’s related to a previous crime or operation. However, it is essential all search information is kept within its independent table, so all details gained from a search are recorded, that’s if there is any data to collect.

1. ***Outcome***

After a search, at a location or of a suspect, all data from those tables must have an outcome, even if the outcome is ‘No action taken’ etc. This also helps investigations for a potential crime, think of it as a follow up after an incident/operation takes place.

1. ***Crime***

If the previous outcome develops into a more serious matter for the individual(s) then it would be categorized as a crime. This would help prevent repetitive data and since a crime is a legal issue, it would need to be documented completely within its own heading.

1. ***Officer***

When a search, police operation or an arrest is made, it *will* be done by an officer. Therefore, the officer’s details must be stored so the police know who made what decision. This would include the officers badge number, other general information like gender and date of birth.

I do expect some changes to occur throughout development for the above entities. However, it shouldn’t be anything major, everything is planned out thoroughly within *Normalisation* and an *Entity Relationship Diagram* overleaf.

## Database Design

### Entity Relationship Diagram (ERD)

An entity relation diagram is a visual modelling tool for database design, in other words, it’s best to describe an ERD as “*Blueprints for your database” [1].* Where you can see how each entity/table with their attributes relate to each other, this would be in terms of a ´*relationship’* . These relationship formats can be *‘many-to-many’ or ‘1-to-1’* and so forth. Verbs are included to give a better elaborate understanding of the processes happening within the ERD.

Within the ERD below you can see a brief detail of the current entities, you will see all included *attributes* overleaf. You can also see the use of verbs to help describe what each table have in relation to one another. The use of *Cardinality* and *Optionality* helps ensure the database doesn’t have any redundant data and ensures efficiently inputted data to begin with.

**Outcome**

**Officer**

**Location**

**Search**

**Suspect**

**Crime**

**Attends**

**Occurs at**

**Performs**

**Results In**

**Determines**

**Commits?**

## Normalisation

The Normalization process includes “*organizing the columns(attributes) and tables(entities)” [2],* where all data entered is administered by database *integrity constraints* set by the development team. Data constraints ensure appropriate data is entered and managed via pre-coded functions within these constraints.

These Data types are like;

* CHAR – Strings, numbers, special characters
* INT – Integers only
* BOOLEAN/BIT – True OR False answers only.

The normalisation process comes with many benefits for database design, these benefits include;

* Reduction of redundant data
* More data consistency within the database
* Better database security
* Greater database organisation
* Groups data logically

There are some downsides to having normalisation as it slows database performance due to the need of more processing. However, it shouldn’t matter when its more efficient for the storage of data. See the complete normalisation table below. (split into 2 dues to size.)

|  |  |  |  |
| --- | --- | --- | --- |
| UNF | 1NF | 2NF | 3NF |
| Crime ID | **Crime** | **Crime** | **Suspect** |
| ~~Month~~ | Crime ID | pkCrime ID | pkSuspectID |
| ReportedBy | Crime Type | Crime Type | Firstname |
| FallsWithin | Location | Location | Lastname |
| Longitude | ReportedBy | ReportedBy | Gender |
| Latitude | Context | Context | DOB |
| Location | Date | Date | Self-Defined Ethnicity |
| LSOA Code | FallsWithin | FallsWithin | Officer Defined Ethnicity |
| LSOA Name | PoliceOperation | Police Operation | PreviousConviction |
| CrimeType | Outcome type |  |  |
| Last Outcome Category | Last outcome category | **Suspect** | **Officer** |
| Context | Outcome linked to object of search | pkSuspect ID | pkOfficerID |
| Outcome Type |  | Gender | BadgeID |
| Type |  | DOB | Firstname |
| Date | **Suspect** | Self-Defined Ethnicity | Lastname |
| Part of a Policing Operation? | Gender |  | Gender |
| Policing Operation? | Age-Range | **Officer** | DOB |
| Gender | Officer Defined Ethnicity | pkOfficer ID |  |
| Age Range | Self-Defined Ethnicity | Gender |  |
| Self-Defined Ethnicity |  | DOB |  |
| Officer-Defined Ethnicity |  | Officer Defined Ethnicity |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| Legislation | **Officer** | **Location** | **Location** |
| Object of search | Gender | pkLocation | pkLocationID |
| Outcome |  | LSOA Code | LocationInfo |
| Outcome linked to Object of search? | **Search** | LSOA Name | LSOA Code |
| Removal of more | Object Of Search | Longitude | LSOA Name |
| than just outer clothing? | Object linked to outcome of search? | Latitude | Longitude |
|  | Removal of more than outer clothing? |  | Latitude |
|  | Outcome? | **Search** |  |
|  | Legislation | pkSearch ID | **Outcome** |
|  | Type | Object Of Search | pkOutcomeID |
|  | Date | Object linked to outcome of search? | OutcomeResult |
|  |  | Removal of more than outer clothing? | Last outcome category |
|  | **Location** | Outcome? | Outcome linked to object of search |
|  | LSOA Code | Legislation | Context |
|  | LSOA Name | Type |  |
|  | Longitude | Date | **Crime** |
|  | Latitude |  | pkCrimeID |
|  |  | **Outcome** | Crime Type |
|  |  | pkOutcome Type | ReportedBy |
|  |  | OutcomeResult | Context |
|  |  | Last outcome category | Date |
|  |  | Outcome linked to object of search | FallsWithin |
|  |  | Context | Police Operation |
|  |  |  | fkSuspectID |
|  |  |  | fkOutcomeID |
|  |  |  |  |
|  |  |  | **Search** |
|  |  |  | pkSearch ID |
|  |  |  | Object Of Search |
|  |  |  | Object linked to outcome of search? |
|  |  |  | Removal of more than outer clothing? |
|  |  |  | Legislation |
|  |  |  | Type |
|  |  |  | Date |
|  |  |  | fkOfficerID |
|  |  |  | fkSuspectID |
|  |  |  | fkLocationInfo |
|  |  |  | fkOutcomeID |
|  |  |  |  |
|  |  |  |  |

## Data Dictionary

A data dictionary is self-explanatory. People have dictionaries for their languages, a data dictionary is used to explain the values and meanings behind each attribute that’s used within tables, In other words its “*a collection of names, definitions and attributes about data elements that are being used or captured in a database.”[3],* as I mentioned above, basically a dictionary for databases that make it much easier to understand its data values.

Data dictionaries are very useful with the following benefits;

* Makes data much easier to analyse
* Enforces the use of data standards
* Basically, a dictionary for Database Designs
* Helps to avoid data inconsistencies

See below the various tables including information about the data types used, their description, field size, if they’re required or not and any *constraints* that are used within each attribute.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Crime | | | | | |
| Attribute | Description | Data Type | Field Size | Constraints | Required field? |
| CrimeID | Crimes Unique ID # | INT | 10 | IDENTITY,  PRIMARY KEY (Crime Table) | Y |
| Crime Type | Crime Type brief description | CHAR | 30 | NOT NULL,  CHECK LEN >= 2 | Y |
| ReportedBy | Branch that reported the crime. | CHAR | 30 | NOT NULL,  CHECK LEN >= 2 | Y |
| Context | Context of the crime | CHAR | 30 | NOT NULL,  CHECK LEN >= 2 | Y |
| Date | Date Crime occurred | DATE | 8 | NOT NULL,  CHECK LEN == 8 | Y |
| FallsWithin | Falls under specified Branch. | CHAR | 30 | NOT NULL,  CHECK LEN >= 5 | Y |
| Police Operation | Is it a police operation? | BOOLEAN | 5 | NOT NULL,  CHECK LEN >= 5 | N |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Suspect | | | | | |
| Attribute | Description | Data Type | Field Size | Constraints | Required field? |
| SuspectID | Suspects Unique Identification # | INT | 10 | IDENTITY,  PRIMARY KEY (Suspect Table),  FOREIGN KEY (Crime Table),  FOREIGN KEY (Search Table) | Y |
| Gender | Suspects Gender | CHAR | 7 | NOT NULL,  CHECK LEN >= 4 | Y |
| DOB | Suspects Date of Birth | DATE | 8 | NOT NULL,  CHECK LEN == 8 | Y |
| Self-Defined Ethnicity | Suspects ethnicity | CHAR | 50 | NOT NULL,  CHECK LEN >= 5 | Y |
| Officer-Defined Ethnicity | Officers definition of the suspects ethnicity | CHAR | 50 | NOT NULL,  CHECK LEN >= 5 | Y |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Officer | | | | | |
| Attribute | Description | Data Type | Field Size | Constraints | Required field? |
| OfficerID | Officers Unique Identification # | INT | 10 | IDENTITY,  PRIMARY KEY (Suspect Table),  FOREIGN KEY (Search Table) | Y |
| Gender | Officers Gender | CHAR | 7 | NOT NULL,  CHECK LEN >= 4 | Y |
| DOB | Officers Date of Birth | DATE | 8 | NOT NULL,  CHECK LEN == 8 | Y |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Location | | | | | |
| Attribute | Description | Data Type | Field Size | Constraints | Required field? |
| LocationInfo | Location Description | CHAR | 50 | IDENTITY,  PRIMARY KEY (Location Table),  FOREIGN KEY (Search Table),  FOREIGN KEY (Crime Table) | Y |
| LSOA Code | Lower-Layer Super Output Area Code | CHAR | 10 | NOT NULL,  CHECK LEN == 10 | Y |
| LSOA Name | Lower-Layer Super Output Area Name | CHAR | 50 | NOT NULL,  CHECK LEN >= 10 | Y |
| Longitude | Longitude Co-Ordinates | DECIMAL | 9,6 | NOT NULL | Y |
| Latitude | Latitude Co-Ordinates | DECIMAL | 8,6 | NOT NULL | Y |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Search | | | | | |
| Attribute | Description | Data Type | Field Size | Constraints | Required field? |
| SearchID | Search occurrence unique ID # | INT | 10 | IDENTITY,  PRIMARY KEY (Search Table) | Y |
| ObjectOfSearch | Searched objective. | CHAR | 30 | NOT NULL,  CHECK LEN >= 2 | Y |
| ObjectLinkedToOutcomeOfSearch | Are search findings linked to the outcome? | BOOLEAN | 5 | NOT NULL,  CHECK LEN >= 2 | Y |
| RemovalOfMoreThanOuterClothing? | Was outer clothing removed during search? | BOOLEAN | 5 | NOT NULL,  CHECK LEN >= 5 | Y |
| Legislation | Under what Act/Legislation did the search occur. | CHAR | 50 | NOT NULL,  CHECK LEN == 10 | Y |
| Type | What type of search occurred? | CHAR | 30 | NOT NULL,  CHECK LEN >= 5 | Y |
| Date | Date of search | DATE | 8 | NOT NULL,  CHECK LEN >= 5 | Y |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Outcome | | | | | |
| Attribute | Description | Data Type | Field Size | Constraints | Required field? |
| OutcomeResult | Outcome Results | CHAR | 35 | IDENTITY,  PRIMARY KEY (Outcome Table),  FOREIGN KEY (Search Table),  FOREIGN KEY (Crime Table) | N |
| LastOutcomeCategory | The last outcome category | CHAR | 50 | NOT NULL,  CHECK LEN >= 10 | N |
| OutcomeLinkedToObjectOfSearch? | Is the outcome related to the reason for search | BOOLEAN | 5 | NOT NULL,  CHECK LEN >= 4 | N |
| Context | Context of the outcome | CHAR | 30 | NOT NULL,  CHECK LEN >= 2 | N |

## Database Security Protocols Discussion

### What is Database Security?

When a business is designing and developing a database, there are both physical and legal requirements that must be adhered to ensure a secure database management system. As a “*database security system encompasses a range of security controls to protect the database management system (DBMS)” [4].*

These security controls start off with the law.In today’s world the key laws are;

* Computer Misuse Act 1990 – Introduced to initially protect computer users from malicious attacks, viruses, malware and theft of data via hacking or unauthorised access.
* Data Protection Act 1998 – Defines how the processing of data takes place and is currently the main legislation governing act today.
* General Data Protection Regulations – An EU Law on data protection and privacy that helps prevent unauthorised users viewing data they’re not permitted to see. Very similar to the Data Protection Act.

When creating a database these laws must be followed, because in todays world *“Cyber-Security is much more than a matter of IT” [5],* as cyber crime is on the rise, even with laws in place its still a high risk to not consider it seriously.

### Why is it Important? - *Safeguarding*

Enough database security prevents valuable data from becoming lost or comprised via data breach or malicious attacks from unauthorised users. These can be prevented via *safeguarding*. Safeguarding is in other words *“The human policeman of the computer-based information database system or system administrator” [6],* where the system administrator is mainly responsible for the security protocols and safeguarding measures in place. If this isn’t taken seriously it could be a financial loss to any company, not only that, a high risk of personal data being lost also.

### Database Security Controls

This includes many security controls that ensure the prevention of lost data or from any malicious attacks. These security controls range from the following;

|  |  |
| --- | --- |
| 1. Authentication | 1. Backups |
| 1. Access | 1. System Hardening and monitoring |
| 1. DBMS Configuration | 1. Encryption |
| 1. Database auditing | 1. Application Security |

1. Authentication is the process of verifying if a staff member/users credentials match those stored in the database.
2. Access (DBA) decides what *attributes, roles and privileges* that users can use.
3. Database Management System configuration encompasses previously mentioned security measures to take full advantage of the systems overall security.
4. Database Auditing helps to detect, deter and reduce the impact of unauthorized access to your DBMS. (Auditing logs)
5. Backups create a copy of your data and saves it on a separate system which can be recovered when needed.
6. System Hardening and monitoring reduces vulnerability and security risk of the DBMS.
7. Encryption via encrypted keys can guarantee secure management within the DBMS.
8. Application Security framework measures can protect against common exploits, SQL injection for example.

The above controls are essential within a database system today, if not this could jeopardize an entire business, during development its key to ensure all controls are considered as “*it takes 20 years to build a reputation – and a few minutes of cyber-incident to ruin it.”[7]* Once the incident occurs with data being lost, there isn’t a chance of the business gaining it back.

### Database Threats

Databases face everyday threats, some big and small, these can be along the lines of:

1. Unauthorized access from a potential hacker
2. Theft of personal data or software/programs
3. Unmanaged sensitive data – Data exposure
4. Weak authentication
5. Database injection attacks
6. Excessive/abuse of privileges
7. Unauthorized physical access to the facility

With the necessary database security controls in place, most of the list above can be avoided, however, there’s always a risk of a potential attack.

## References

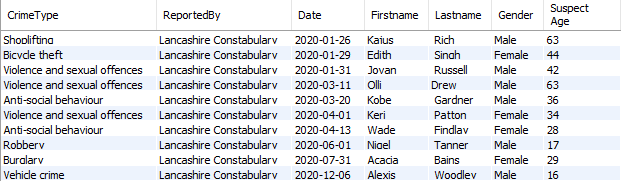
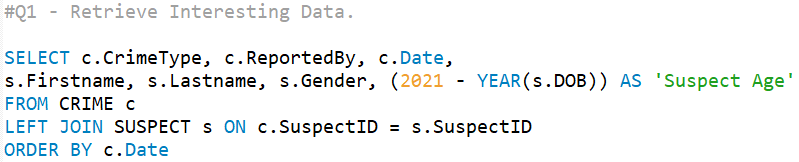
|  |  |
| --- | --- |
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|  | Sisense (2020) *What is an Entity relationship Diagram?,*Available at: *https://www.sisense.com/glossary/entity-relationship-diagram/#:~:text=Explore%20Dashboard%20An%20entity%20relationship,sets%20of%20data%20(entities).* (Accessed: 06/01/2021). |
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|  | Blue-Pencil (2020) *it takes 20 years to build a reputation – and a few minutes of cyber-incident to ruin it,*Available at: *https://www.blue-pencil.ca/8-tweetable-cybersecurity-quotes-to-help-you-and-your-business-stay-safer/* (Accessed: 09/01/2021). |

# Database SQL Queries

## Q1 – Retrieve Interesting Data

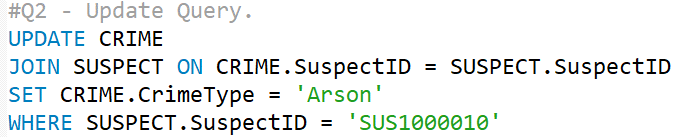
‘Interesting Data’ – With this query I wanted to show the users Crimes that have been committed with the relating suspect convicted. That said data shows the type of crime committed, what branch it was reported by and the basic details of the suspect.

To keep things simple, I set the data returned to order by date. I also made things simpler by calculating the suspects age by using their date of birth, see highlight.

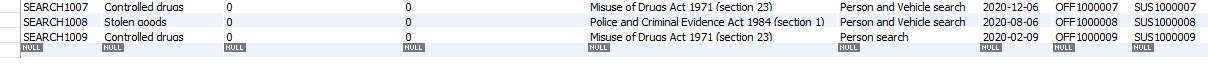
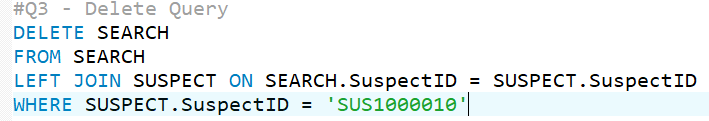


## Q2 – Update Query

For update to work, I had to join the suspect table on to the crime table so I could pull the suspect ID from Crime and update the Crime Type that had the matching suspectID. You can see highlighted in the diagram below the process of the update procedure.



## Q3 – Delete Query

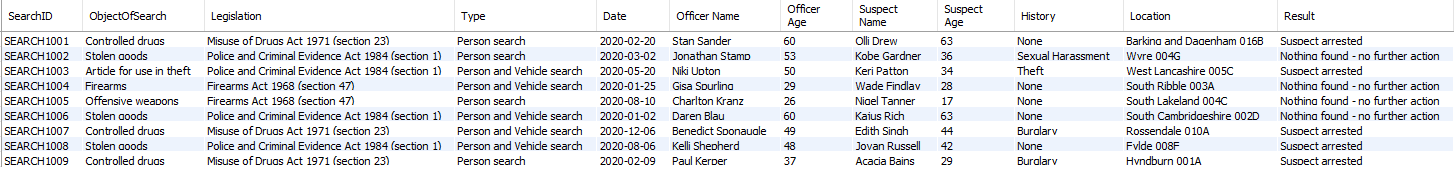
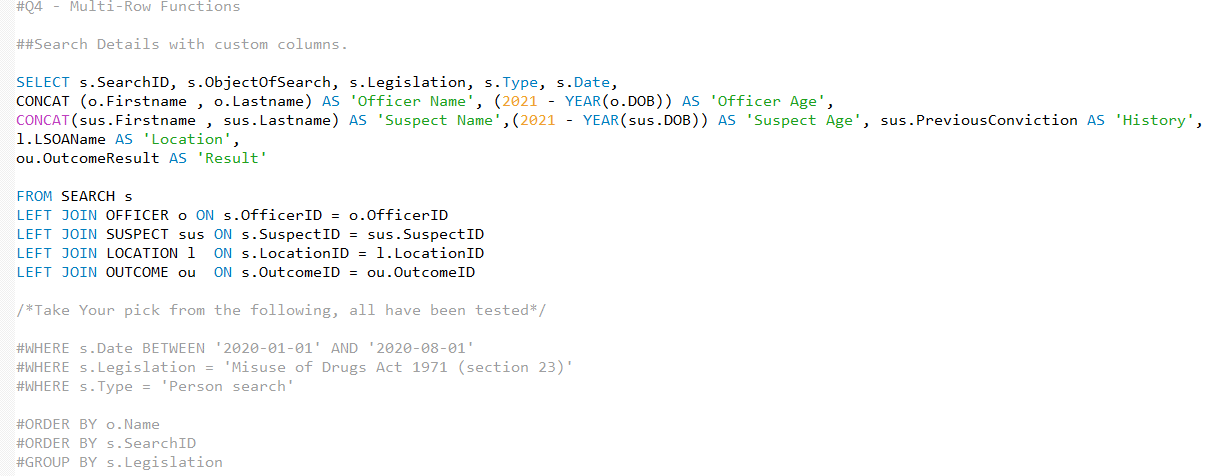


**Before**

**After**

## Q4 – Multi-Row Functions

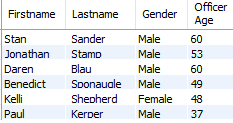
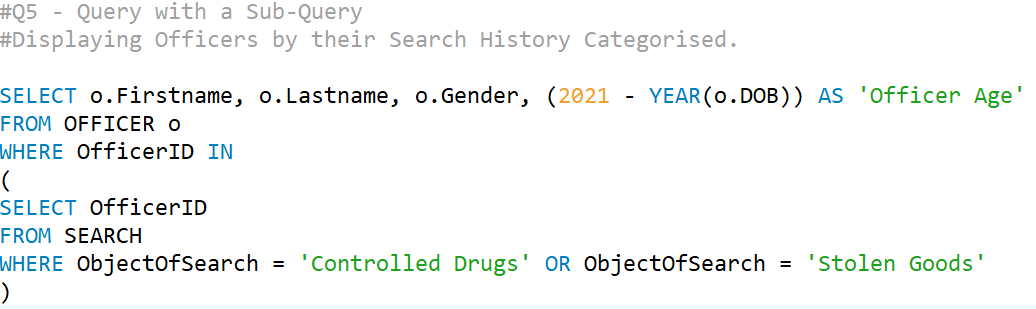
The point of this query was to show *Search Details* with the matching *Officer and Suspect. Y*ou can see I used a lot of functions, ***Concat*** being one of them, this allows me to merge two columns of data and rename them under one, I did this with Officer and Suspect, you can see highlighted the results. I also used the age method from date birth within this query also.



You can see highlighted in the yellow circle that I have included many options of **WHERE and ORDER BY/GROUP BY.** All Work. The results of only a couple of these methods are shown below.

## Q5 – Query & Sub-Query

My first time ever using Sub-Queries. Within this query I am pulling data from one table, and then doing the same again but in a *nested type form*(sub-Query). I wanted to keep this short and simple since I never used them before, so I pulled the first and last name, gender and then calculated the age of the officers where their object of search was either *Controlled Drugs or Stolen Goods.* I did have other data types being displayed but this had the most data linked.



## Reflection

### Approach

I approached this project with confidence as I do know SQL, however, I don’t know MySQL. I learned there are slight differences between the two like BIT and BOOLEAN (both the same) and it took me awhile to get used to it. Learning the SQL workbench software was also a challenge for a while.

### Achievements

Throughout this assignment I achieved the ability to develop a database using new techniques, especially with Sub-Queries, as I never used those before. I also learned how to calculate a user’s age via the user of their inputted date of birth, where I subtracted the year of their date of birth from the current year (2021). To finish off I then renamed the column to suit as ‘*Age’*.

### Any Problems?

There were minor problems throughout, these were silly syntax errors during the code. However, many errors were from confusing between SQL and MySQL, some of which I had errors with joining primary keys or non-primary keys from the same table to the other, error like this:



The only way I could fix this error was to only join the primary key to another primary key. It was frustrating at first, but I will know for next time.

### How would I approach it differently?

If I were to approach it differently, I would revise over my normalisation techniques, same with entity relationship diagrams as I struggled with those at the beginning of the assignment. Final thing I would reconsider is my time management, during the current times I did struggle to balance my workload evenly, but that seems to the normal nowadays. Apart from that I don’t see anything else I would need to approach differently.

## Appendices

### tblSUSPECT

CREATE TABLE cis24609650.SUSPECT

(

SuspectID CHAR(10) NOT NULL,

Firstname CHAR(30) NOT NULL,

Lastname CHAR(30) NOT NULL,

Gender CHAR(7) NOT NULL,

DOB DATE NOT NULL,

SelfDefinedEthnicity CHAR(75) NOT NULL,

OfficerDefinedEthnicity CHAR(75) NOT NULL,

PreviousConviction CHAR(75) NOT NULL,

PRIMARY KEY (SuspectID)

)

#DROP TABLE cis24609650.SUSPECT

INSERT INTO cis24609650.SUSPECT(SuspectID, Firstname, Lastname, Gender, DOB, SelfDefinedEthnicity, OfficerDefinedEthnicity, PreviousConviction) VALUES

('SUS1000001', 'Olli', ' Drew', 'Male','1958-03-29', 'White - English/Welsh/Scottish/Northern Irish/British', 'White - Irish','None'),

('SUS1000002','Kobe', ' Gardner','Male','1985-12-10', 'Asian/Asian British - Any other Asian background','Asian/Asian British - Bangladeshi','Sexual Harassment'),

('SUS1000003','Keri', ' Patton','Female','1987-07-19', 'Asian/Asian British - Pakistani','Asian/Asian British - Bangladeshi','Theft'),

('SUS1000004','Wade', ' Findlay', 'Female','1993-08-31', 'Other ethnic group - Not stated', 'White - Irish','None'),

('SUS1000005','Nigel', ' Tanner', 'Male','2004-02-01', 'Black/African/Caribbean/Black British','Other ethnic group - Not stated','None'),

('SUS1000006','Kajus', ' Rich','Male','1958-04-16', 'White - English/Welsh/Scottish/Northern Irish/British', 'White - Irish','None'),

('SUS1000007','Edith', ' Singh', 'Female','1977-01-12', 'White - English/Welsh/Scottish/Northern Irish/British', 'White - Irish','Burglary'),

('SUS1000008','Jovan', ' Russell', 'Male','1979-11-06', 'White - English/Welsh/Scottish/Northern Irish/British', 'White - Irish','None'),

('SUS1000009','Acacia', ' Bains', 'Female','1992-02-06', 'White - English/Welsh/Scottish/Northern Irish/British', 'White - Irish','Burglary'),

('SUS1000010','Alexis', ' Woodley','Male','2005-08-17', 'Asian/Asian British - Pakistani','Asian/Asian British - Bangladeshi','Anti-social behaviour');

### tblOFFICER

CREATE TABLE cis24609650.OFFICER

(

OfficerID CHAR(10) NOT NULL,

BadgeID INT NOT NULL,

Firstname CHAR(30) NOT NULL,

Lastname CHAR(30) NOT NULL,

Gender CHAR(7) NOT NULL,

DOB DATE NOT NULL,

PRIMARY KEY(OfficerID)

)

DROP TABLE cis24609650.OFFICER

INSERT INTO cis24609650.OFFICER(OfficerID,BadgeID, Firstname, Lastname, Gender, DOB) VALUES

('OFF1000001', 156898, 'Stan', ' Sander', 'Male','1961-01-14'),

('OFF1000002', 156953, 'Jonathan', ' Stamp', 'Male','1968-06-25'),

('OFF1000003', 158947, 'Niki', ' Upton','Female','1971-10-31'),

('OFF1000004', 158975, 'Gisa', ' Spurling','Female','1992-06-21'),

('OFF1000005', 159649, 'Charlton', ' Kranz','Male','1995-01-05'),

('OFF1000006', 156963, 'Daren', ' Blau','Male','1961-11-18'),

('OFF1000007', 153589, 'Benedict', ' Sponaugle','Male','1972-04-29'),

('OFF1000008', 156515, 'Kelli', ' Shepherd','Female','1973-06-10'),

('OFF1000009', 156894, 'Paul', ' Kerper','Male','1984-06-11'),

('OFF1000010', 156397, 'Mart', ' Eldridge','Male','1990-11-09');

### tblLOCATION

CREATE TABLE cis24609650.LOCATION

(

LocationID CHAR(10) NOT NULL,

LocationInfo CHAR(50) NOT NULL,

LSOACode CHAR(10) NOT NULL,

LSOAName CHAR(30) NOT NULL,

Longitude DECIMAL(9,6) NOT NULL,

Latitude DECIMAL(8,6) NOT NULL,

PRIMARY KEY(LocationID)

)

DROP TABLE cis24609650.LOCATION

INSERT INTO cis24609650.LOCATION(LocationID, LocationInfo, LSOACode, LSOAName, Longitude, Latitude) VALUES

('LOC1000001','On or near Longbridge Road', 'E01000009','Barking and Dagenham 016B', 0.084145, 51.541333),

('LOC1000002','On or near Stone Hill Drive','E01012608','Wyre 004G',-2.465978, 53.767257),

('LOC1000003','On or near Kelsall Avenue','E01012609','West Lancashire 005C',-2.464039, 53.766168),

('LOC1000004','On or near Fountains Avenue','E01012608','South Ribble 003A',-2.462042, 53.762509),

('LOC1000005','On or near Tintern Crescent','E01013807','South Lakeland 004C', -2.465978, 53.767257),

('LOC1000006','On or near Hazelwood Close','E01013805','South Cambridgeshire 002D', -2.461766, 53.762222),

('LOC1000007','On or near Sunny Bower Road','E01013601','Rossendale 010A',-2.465978, 53.767257),

('LOC1000008','On or near Philips Road', 'E01014903','Fylde 008F',-2.46275, 53.763441),

('LOC1000009','On or near Challenge Way','E01014502','Hyndburn 001A',-2.46309, 53.768149),

('LOC1000010','On or near Peridot Close','E01014206','Lancaster 011D', -2.46309,53.768149)

### tblOUTCOME

CREATE TABLE cis24609650.OUTCOME

(

OutcomeID CHAR(10) NOT NULL,

OutcomeResult CHAR(35) NOT NULL,

LastOutcomeCategory CHAR(50) NOT NULL,

OutcomeLinkedToObjectOfSearch BOOLEAN NOT NULL,

Context CHAR(50) NOT NULL,

PRIMARY KEY(OutcomeID)

)

DROP TABLE cis24609650.OUTCOME

INSERT INTO cis24609650.OUTCOME(OutcomeID, OutcomeResult, LastOutcomeCategory, OutcomeLinkedToObjectOfSearch, Context) VALUES

('OUTID10001','Suspect arrested','Unable to prosecute suspect', FALSE, ''),

('OUTID10002','Nothing found - no further action','Investigation complete; no suspect identified', FALSE, ''),

('OUTID10003','Suspect arrested','Suspect charged', FALSE, ''),

('OUTID10004','Nothing found - no further action','Investigation complete; no suspect identified', FALSE, ''),

('OUTID10005','Nothing found - no further action','Investigation complete; no suspect identified', FALSE, ''),

('OUTID10006','Nothing found - no further action','Investigation complete; no suspect identified', FALSE, ''),

('OUTID10007','Suspect arrested','Under investigation', FALSE, ''),

('OUTID10008','Suspect arrested','Suspect charged', FALSE, ''),

('OUTID10009','Suspect arrested','Under investigation', FALSE, ''),

('OUTID10010','Suspect arrested','Local resolution', FALSE, '')

### tblCRIME

CREATE TABLE cis24609650.CRIME

(

CrimeID CHAR(10) NOT NULL,

CrimeType CHAR(30) NOT NULL,

ReportedBy CHAR(30) NOT NULL,

Context CHAR(30) NOT NULL,

Date DATE NOT NULL,

FallsWithin CHAR(30) NOT NULL,

PoliceOperation BOOLEAN NOT NULL,

SuspectID CHAR(10) NOT NULL,

OutcomeID CHAR(10) NOT NULL,

PRIMARY KEY(CrimeID),

FOREIGN KEY (SuspectID) REFERENCES SUSPECT(SuspectID),

FOREIGN KEY (OutcomeID) REFERENCES OUTCOME(OutcomeID)

)

DROP TABLE cis24609650.CRIME

INSERT INTO cis24609650.CRIME(CrimeID, CrimeType, ReportedBy, Context, Date, FallsWithin, PoliceOperation, SuspectID, OutcomeID) VALUES

('CRIME10001','Violence and sexual offences', 'Lancashire Constabulary','','2020-03-11','Lancashire Constabulary', TRUE, 'SUS1000001','OUTID10001'),

('CRIME10002','Anti-social behaviour', 'Lancashire Constabulary','','2020-03-20','Lancashire Constabulary', TRUE, 'SUS1000002','OUTID10002'),

('CRIME10003','Violence and sexual offences', 'Lancashire Constabulary','','2020-04-01','Lancashire Constabulary', TRUE, 'SUS1000003','OUTID10003'),

('CRIME10004','Anti-social behaviour', 'Lancashire Constabulary','','2020-04-13','Lancashire Constabulary', TRUE, 'SUS1000004','OUTID10002'),

('CRIME10005','Robbery', 'Lancashire Constabulary','','2020-06-01','Lancashire Constabulary', TRUE, 'SUS1000005','OUTID10005'),

('CRIME10006','Shoplifting', 'Lancashire Constabulary','','2020-01-26','Lancashire Constabulary', TRUE, 'SUS1000006','OUTID10006'),

('CRIME10007','Bicycle theft', 'Lancashire Constabulary','','2020-01-29','Lancashire Constabulary', TRUE, 'SUS1000007','OUTID10007'),

('CRIME10008','Violence and sexual offences', 'Lancashire Constabulary','','2020-01-31','Lancashire Constabulary', TRUE, 'SUS1000008','OUTID10008'),

('CRIME10009','Burglary', 'Lancashire Constabulary','','2020-07-31','Lancashire Constabulary', TRUE, 'SUS1000009','OUTID10009'),

('CRIME10010','Vehicle crime', 'Lancashire Constabulary','','2020-12-06','Lancashire Constabulary', TRUE, 'SUS1000010','OUTID10010')

### tblSEARCH

CREATE TABLE cis24609650.SEARCH

(

SearchID CHAR(10) NOT NULL,

ObjectOfSearch CHAR(30) NOT NULL,

ObjectLinkedToOutcomeOfSearch BOOLEAN NOT NULL,

RemovelOfMoreThanOuterClothing BOOLEAN NOT NULL,

Legislation CHAR(50) NOT NULL,

Type CHAR(30) NOT NULL,

Date DATE NOT NULL,

OfficerID CHAR(10) NOT NULL,

SuspectID CHAR(10) NOT NULL,

LocationID CHAR(10) NOT NULL,

OutcomeID CHAR(10) NOT NULL,

PRIMARY KEY(SearchID),

FOREIGN KEY(OfficerID) REFERENCES OFFICER(OfficerID),

FOREIGN KEY(SuspectID) REFERENCES SUSPECT(SuspectID),

FOREIGN KEY(LocationID) REFERENCES LOCATION(LocationID),

FOREIGN KEY(OutcomeID) REFERENCES OUTCOME(OutcomeID)

)

DROP TABLE cis24609650.SEARCH

INSERT INTO cis24609650.SEARCH(SearchID, ObjectOfSearch, ObjectLinkedToOutcomeOfSearch,

RemovelOfMoreThanOuterClothing, Legislation,Type, Date, OfficerID, SuspectID, LocationID, OutcomeID) VALUES

('SEARCH1001','Controlled drugs',FALSE, FALSE, 'Misuse of Drugs Act 1971 (section 23)','Person search','2020-02-20','OFF1000001','SUS1000001','LOC1000001','OUTID10001'),

('SEARCH1002','Stolen goods',FALSE, FALSE, 'Police and Criminal Evidence Act 1984 (section 1)','Person search','2020-03-02', ‘OFF1000002','SUS1000002','LOC1000002','OUTID10002'),

('SEARCH1003','Article for use in theft',FALSE, FALSE, 'Police and Criminal Evidence Act 1984 (section 1)','Person and Vehicle search','2020-05-20', 'OFF1000003','SUS1000003','LOC1000003','OUTID10003'),

('SEARCH1004','Firearms',FALSE, FALSE, 'Firearms Act 1968 (section 47)','Person and Vehicle search','2020-01-25','OFF1000004','SUS1000004','LOC1000004','OUTID10004'),

('SEARCH1005','Offensive weapons',FALSE, FALSE, 'Firearms Act 1968 (section 47)','Person search','2020-08-10','OFF1000005','SUS1000005','LOC1000005','OUTID10005'),

('SEARCH1006','Stolen goods',FALSE, FALSE, 'Police and Criminal Evidence Act 1984 (section 1)','Person and Vehicle search','2020-01-02', 'OFF1000006','SUS1000006','LOC1000006','OUTID10006'),

('SEARCH1007','Controlled drugs',FALSE, FALSE,'Misuse of Drugs Act 1971 (section 23)','Person and Vehicle search','2020-12-06','OFF1000007','SUS1000007','LOC1000007','OUTID10007'),

('SEARCH1008','Stolen goods',FALSE, FALSE,'Police and Criminal Evidence Act 1984 (section 1)','Person and Vehicle search','2020-08-06','OFF1000008','SUS1000008','LOC1000008','OUTID10008'),

('SEARCH1009','Controlled drugs',FALSE, FALSE, 'Misuse of Drugs Act 1971 (section 23)','Person search','2020-02-09','OFF1000009','SUS1000009','LOC1000009','OUTID10009'),

('SEARCH1010','Firearms',FALSE, FALSE, 'Firearms Act 1968 (section 47)','Person and Vehicle search','2020-05-20','OFF1000010','SUS1000010','LOC1000010','OUTID10010')

### Q1 – RETRIEVE INTERESTING DATA

#Q1 - Retrieve Interesting Data.

SELECT c.CrimeType, c.ReportedBy, c.Date,

s.Firstname, s.Lastname, s.Gender, (2021 - YEAR(s.DOB)) AS 'Suspect Age'

FROM CRIME c

LEFT JOIN SUSPECT s ON c.SuspectID = s.SuspectID

ORDER BY c.Date

### Q2 – MULTIPLE JOIN UPDATE

UPDATE CRIME

JOIN SUSPECT ON CRIME.SuspectID = SUSPECT.SuspectID

SET CRIME.CrimeType = 'Arson'

WHERE SUSPECT.SuspectID = 'SUS1000010'

select \* from CRIME

### Q3 – DELETE QUERY

DELETE SEARCH

FROM SEARCH

LEFT JOIN SUSPECT ON SEARCH.SuspectID = SUSPECT.SuspectID

WHERE SUSPECT.SuspectID = 'SUS1000010'

select \* from SEARCH

### Q4 – MULTI-ROW FUNCTIONS

##Search Details with custom columns.

SELECT s.SearchID, s.ObjectOfSearch, s.Legislation, s.Type, s.Date,

CONCAT (o.Firstname , o.Lastname) AS 'Officer Name', (2021 - YEAR(o.DOB)) AS 'Officer Age',

CONCAT(sus.Firstname , sus.Lastname) AS 'Suspect Name',(2021 - YEAR(sus.DOB)) AS 'Suspect Age', sus.PreviousConviction AS 'History',

l.LSOAName AS 'Location',

ou.OutcomeResult AS 'Result'

FROM SEARCH s

LEFT JOIN OFFICER o ON s.OfficerID = o.OfficerID

LEFT JOIN SUSPECT sus ON s.SuspectID = sus.SuspectID

LEFT JOIN LOCATION l ON s.LocationID = l.LocationID

LEFT JOIN OUTCOME ou ON s.OutcomeID = ou.OutcomeID

/\*Take Your pick from the following, all have been tested\*/

#WHERE s.Date BETWEEN '2020-01-01' AND '2020-08-01'

#WHERE s.Legislation = 'Misuse of Drugs Act 1971 (section 23)'

#WHERE s.Type = 'Person search'

#ORDER BY o.Name

#ORDER BY s.SearchID

#GROUP BY s.Legislation

### Q5 QUERY & SUB-QUERY

SELECT o.Firstname, o.Lastname, o.Gender, (2021 - YEAR(o.DOB)) AS 'Officer Age'

FROM OFFICER o

WHERE OfficerID IN

(

SELECT OfficerID

FROM SEARCH

WHERE ObjectOfSearch = 'Controlled Drugs' OR ObjectOfSearch = 'Stolen Goods'

)