Version 2/last updated: 03/29/24

GLOBAL GUIDANCE:

- Use one font, Arial, for all storyboard text
- For learner navigation guidance, use the term “CLICK” instead of “SELECT”
- Ensure that there is feedback for both correct and incorrect answers in review activities. Incorrect feedback **should provide a hint** to the right answer.
- Ensure to indicate both correct and incorrect answers in activities
- Dev notes are in *italicized, blue font*

SB REVISIONS

- When making revisions to content in the storyboard, please use red font to indicate content which has been changed/added

Client Handover Prep:

Grading

1. LMS reporting: 100% Course progress and min passing score
2. *X*% on scale
3. Assignment type: Quiz
4. Threshold:
5. Total attempts#: Unlimited
6. Weight of total grade: 100
7. Randomize question order (highlight one): Y/N
8. Shuffle answer choices (highlight one): Y/N
9. Enable Time Exam (highlight one) : Y/N
10. Assessment result visibility (highlight one):
    a. Always show
    b. Never show
    c. Show when subsection is past due
11. Are there any prerequisites?

Final Packing

Version 2/last updated: 03/29/24

- SCORM version: 1.2
- Final platform (highlight one): Client LMS/Other
- Final asset inventory: [***LINK***]
- Storyline WORD export
- VTT files used for CC

Course Name	SQLite Database Structures
Instructional Designer:	Val Groce
Learning Objective:	Explain the role of primary keys, and foreign keys, and how they link related data across tables.

WELCOME/INTRODUCTION

Slide Name: Welcome	
Micro Course Title	SQLite Database Structures
Slide Type	Title

Additional Details	*Delve into the fundamentals of SQLite database structures. Mastering these concepts is essential for effectively analyzing and interpreting data within SQLite databases.*
Click START to begin. ***Button:*** START	

Slide Name: Navigation Help	
Image	Default image from template
Interactives	***User action:*** User selects Hotspots to reveal text 1. *[Notes]* - Click to add a transcript to each slide. 2. *[Glossary]* - Click to quickly discover the meaning of **terms** and **concepts** in the course content. 3. *[Filter symbol]* - Click to search for text within the slide content or the slide notes. 4. *[Navigation menu]* - Use the **menu** to navigate to specific slides within the course quickly. 5. *[Hamburger menu button]* - Toggle the **menu** button to show or hide the menu sidebar. 6. *[Resources]* - Click **Resources** to access reference materials, job aids, and other helpful information. 7. *[Play button]* - Use the **Play/Pause** button to view slide content at your own pace. 8. *[Seek Bar]* - Use the **seek bar** to fast-forward or go back to the content on a slide. 9. *[Restart]* - Use the **Restart** button to view a slide from the beginning. 10. *[Speaker]* - Hover over the **speaker** icon and slide the volume up or down as needed.

	11. *[CC]* - Toggle the **closed captioning** button to turn on/off captions. 12. *[Playback Speed]* - Hover over the **playback speed** icon to choose any speed between 0.25 and 2x. 13. *[Gear]* - Click on the **gear** to view and adjust the various accessibility options. 14. *[Full screen]* - Click the **full-screen** button to scale the video to **fill** the **screen**. Click it again to return to **normal** viewing mode. 15. *[<Prev Next>]* - Use the **Back** and **Next** buttons to move backward and forward, respectively. ***Arrow button:*** Back ***Arrow button:*** Next

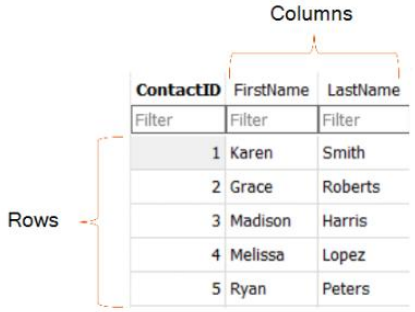
Slide Name	Learning Objective
Output	SL Template slide w/text
Slide Content:	• Explain the role of primary keys, and foreign keys, and how they link related data across tables.
Interactives:	***Arrow button:*** Back ***Arrow button:*** Next

LEARN IT

Slide Name:	Database Tables
Output:	Video
Video and Slide Title:	**Database Tables**
File Name:	CASAM2.2_SQLDBTbl_031824
Resources:	**Please use the following MURF avatars:** • Marcus or Terrell *(whichever sounds better with the content)*

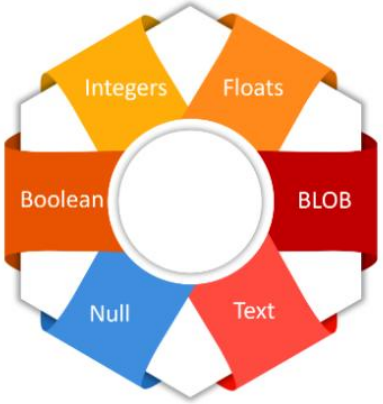
Overview:	This video touches on the different parts of an SQLite database, providing a foundation for learners exploring the different components. *Devs Notes:* ***Accessibility:*** • *Please include closed captions (CC) for this video.* • *Please use a diverse set of characters in photos, illustrations, video, and audio to include and represent the different learners.*

SCRIPT/CAPTIONS	ONSCREEN TEXT	IMAGERY (Description/Links)
At its most basic concept, an SQLite database file is generally a single file stored on flash memory.		*Show a file folder with "Database" printed on the front.*
Now, let's unpack that folder to see what's contained inside.		*The folder opens to reveal the contents.*
The first thing we see is that our database contains several tables used to categorize the different types of data. While examiners have yet to discover a phone with anywhere near the maximum of 2 billion tables, some databases may contain several tables to be reviewed and interpreted.	An SQLite database file can contain up to 2 billion tables.	*Inside of the folder are several grids (columns/rows)*
Let's start small as we gain an understanding of the structure. A contacts database may have only two tables, names, and numbers.		*Show a folder named "Contacts" open up and reveal 2 tables (grids), called "Names" and "Numbers."*

Each table contains columns and rows. At the top of each column, there is a name for what the data in that column represents. Each row contains the data, or a record, that corresponds to the column name. Each record has a unique ID indicated in the first column. This value is usually an integer, and never reused, even after a record is deleted.		*Make an enhanced version of the table below., first without the column headings, then another that has them all.*  *Show the grid, and enhance a column, then a row, as they are mentioned.* *Enhance the ContactID column as it is mentioned.*
When two tables share data, they are connected by a join to establish a relationship. The primary key of the first table is joined to the foreign key that connects to the data to be shared.	Primary Key Foreign Key	*Show 2 tables with a bulleted list below the table name:* *1. Contacts* *a. ContactID* *b. FirstName* *c. LastName* *2. Phone* *a. PhoneNumber* *b. FirstName* *c. LastName* *Draw a line on the screen from the ContactID field (label “Primary Key”)*

		in the first table to the LastName in the second table (label "Foreign Key")
Discovering these relationships between tables helps examiners follow the trail of information as they identify key evidence.		Show a magnifying glass starting with a table, then following the joins to other tables.

Activity Name	Data Types
Output	Interactive Screenshot slide - aka Labeled Graphic
Interactives:	***Arrow button:*** Back ***Arrow button:*** Next

Interactive Screenshot (labeled graphic w/hotspot)	
Image	*Let's have the graphic designers create an updated labeled graphic with these details:*  *Link to Data Types image for reference*
Introduction	Of all the different types of data a database contains, there are only a handful that an examiner needs to be familiar with for digital forensics. Click each data type to reveal more information and the subsets of data that fit into each type.

Interactives	***User action:*** *User selects Hotspots to reveal text* *[Integers]* - This data only contains **whole numbers** (no decimals). *[Floats]* - This data is used to represent numbers with **fractional parts** or **floating decimal points**. *[BLOB]* - The BLOB value type can be a very interesting data type. It contains binary data, referring to something like a file. For instance, this field might contain a photograph in a contacts database. If the phone user sets a contact's photo, the phone will want to store that image within the database so that if the full image is deleted from the phone it will still be able to display the image. BLOB fields might contain photographs, plists, JSON, plain binary data, or any file that the developer decides they want to store in their database. BLOB fields are extremely important, and time should be spent looking at the data that they contain when trying to decode unsupported application data. An example of a database that uses them is the Instagram database on iOS devices. The actual user messages are stored in plists that are stored in BLOB fields. There is a large amount of other data that is also stored in these plists. *[Text]* - Text data is easy to recognize, as it only contains **plain text** values. *[Null]* - The null value data type means that there is **no data** in this field. *[Boolean]* - The Boolean data type indicates true or false values and is typically represented by a 0 or a 1. Computers store all data in 0s or 1s and those values are either on or off; true or false. a. 0 represents a **false** value b. 1 represents a **true** value An example of where a Boolean data type would be found is in a column that shows if a message was sent or received. The name of a column will generally provide an idea of what the column represents, so a column showing if a message was sent or received might be called "**isSent**." Looking at this name as a question, "*is sent?*," will help in understanding the values. If the value

	1 is present, that means true, or yes, the message is sent. If the value 0 is present, that means false, or no, the message is not sent. ***Arrow button:*** Back ***Arrow button:*** Next

Activity Name	GUIDs, Primary Keys, Deleted Records, Foreign Keys
Output	Accordion Interaction 1
Interactives:	***Arrow button:*** Back ***Arrow button:*** Next

Interactive – Accordion Activity

Contains 4 numbered bars that open vertically to reveal content.

- *Accordion Interaction 1*

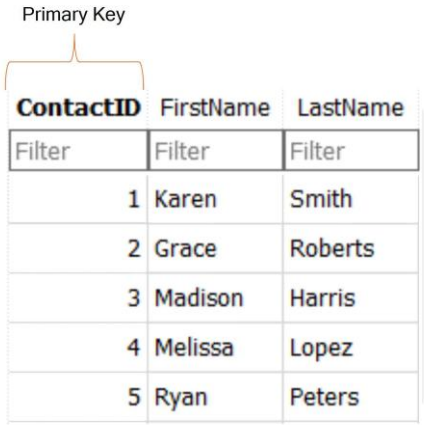
Accordions

Introduction GUIDs, Primary Keys, Deleted Records, Foreign Keys	
Body	Click the numbered tabs to explore additional data types that may be revealed during an examination and how their data is connected.

Image	*Please add Cellebrite branded imagery* *Alt text:* Decorative setting

Item 1	
Header	GUIDs (Globally Unique Identifiers)
Body	These identifiers, combining integers, text, and dashes, may resemble this image. These larger identifiers may be quite lengthy, minimizing the likelihood of being repeated.
Image	GUIDs  Alt Text: GUID example

Item 2	
Header	Primary Keys
Body	**Record identifiers** are also known as primary keys (PKs). In the table here, the **ContactID** column is an integer value that increments by 1 in a sequential order. It is very common for primary keys that use integer values to increment by 1.

Image	Primary Key - *graphic design enhancement, please add an orange box around the first column.*  Alt Text: Table example identifying the primary key

Item 3	
Header	Deleted Records
Body	When it comes to deleted records, it's crucial to know that the primary key of those deleted records will never be used again for a new record. As a result, an examiner may notice that one or more values will be missing from a table, indicating that there were records in the table that were deleted as seen in the example. **Note:** When it comes to the less common identifier, GUIDs, it is not as easy to notice deleted records since GUIDs are not sequential.
Image	Deleted Records

Names table

ContactID	FirstName	LastName
Filter	Filter	Filter
1	Karen	Smith
2	Grace	Roberts
3	Madison	Harris
4	Melissa	Lopez
5	Ryan	Peters

Names table

ContactID	FirstName	LastName
Filter	Filter	Filter
1	Karen	Smith
2	Grace	Roberts
3	Madison	Harris
5	Ryan	Peters
6	Nicole	Vera

Alt Text: Two tables with one deleted record

Item 4

Header	Foreign Keys
Body	Foreign keys are **links to primary keys** from another table, indicating a relationship between the tables. Foreign keys allow multiple tables to join together so the data can be joined and displayed as single records. In this example, the **Numbers** table within the contacts database contains the phone numbers of the individuals from the **Names** table. The first column, NumberID, is the primary key in the table to the right. The second column is ContactID. This column is a foreign key. Anywhere there is a number for Karen, the **ContactID** column will contain the integer value 1 because, in the **Names** table, the primary key for Karen is 1. When the phone user opens their contact application and goes to the contact for Karen, the database queries all the phone numbers from the **Numbers** table that have the **ContactID** of 1, as seen in the table.

Image	Foreign Keys

Numbers table

NumberID	ContactID	Number
Filter	Filter	Filter
1	1	Karen Cell
2	1	Karen Home
3	2	Grace Cell
4	5	Ryan Cell
5	1	Karen Work
6	4	Melissa Cell
7	6	Nicole Cell
8	5	Ryan Work

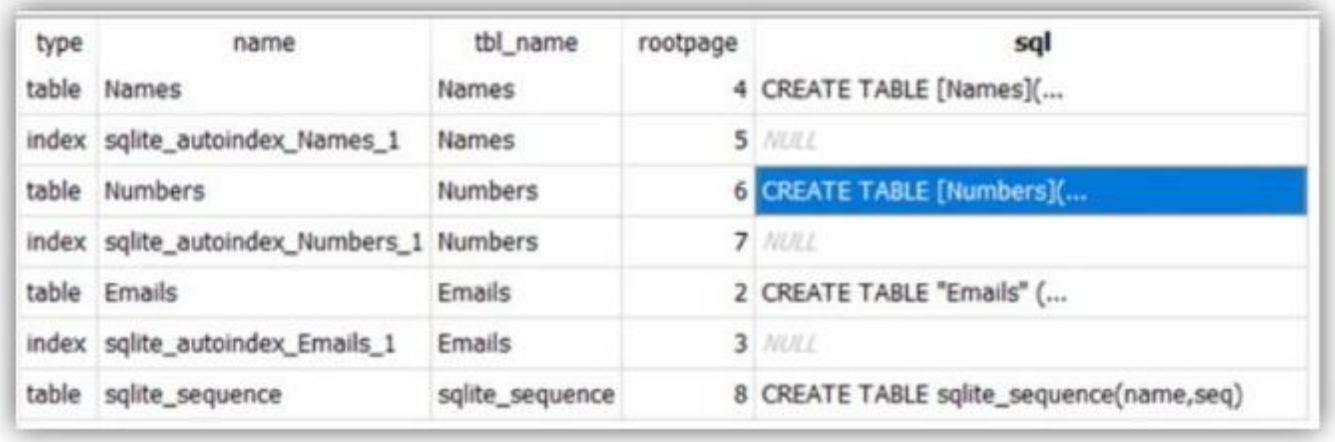
ContactID is the foreign key in the **Numbers** table, and the primary key in the **Names** table.

Filtering for **ContactID** of 1 shows only number for Karen:

NumberID	ContactID	Number
1	1	Karen Cell
2	1	Karen Home
5	1	Karen Work

Alt Text: Two tables illustrating primary and foreign keys

Activity Name	SQLite Master Table
Output	50/50 with no H2
Interactives:	***Arrow button:*** Back ***Arrow button:*** Next

50/50 Layout Think half text and an image taking half the screen. *Identify to the developers which 50/50 slide template to use.* • *50/50 Layout (no H2)*	
Image	Master Table - *will need to be redone by GD for higher quality*  Alt Text: Master table image

type	name	tbl_name	rootpage	sql
table	Names	Names	4	CREATE TABLE [Names](...
index	sqlite_autoindex_Names_1	Names	5	NULL
table	Numbers	Numbers	6	CREATE TABLE [Numbers](...
index	sqlite_autoindex_Numbers_1	Numbers	7	NULL
table	Emails	Emails	2	CREATE TABLE "Emails" (...
index	sqlite_autoindex_Emails_1	Emails	3	NULL
table	sqlite_sequence	sqlite_sequence	8	CREATE TABLE sqlite_sequence(name,seq)

Header/Title	SQLite_Master Table
Body Text	Finally, you can view the structure of a database by querying the data contained within the **SQLite Master** table. This table holds the SQLite commands that created the database and defines the different types of columns. ● Provides insight into the database structure and tables ● Identifies the primary key field for each table ● Provides the overall high-level schema design of the database A SELECT statement will display the data from within this table. **SELECT* FROM sqlite_master**

MASTER IT

Activity Name	Review Activity

Output	Review Activity slides
Interactives:	***Arrow button:*** Back ***Arrow button:*** Next

Review Activity Introduction	
SQLite Database Structures **REVIEW ACTIVITY** Use the navigation bar to revisit any topic and find your answers as you complete the review exercises.	
Interactives:	***Arrow button:*** Back ***Arrow button:*** Next

True or False?	
Slide Title	Question 1
Question True or False?	True or False? Tables may reuse primary key values from deleted records.

	True	**Feedback** **Correct** That's right! When a record is deleted, the primary key is **permanently deleted from the table**, not to be used for any new record. **Incorrect** That's not correct. When a record is deleted, the primary key is **permanently deleted from the table**, not to be used for any new record.
Correct Answer	False	

True or False?		
Slide Title	Question 2	
Question True or False?	True or False? A single row can have multiple primary keys.	
	True	**Feedback** **Correct** That's right! A single row (record) has **only one** primary key. **Incorrect**
Correct Answer	False	

		That's not correct. A single row (record) has **only one** primary key.

Multiple Choice Question Only one correct answer. Add an image with alt-text if applicable. Specify which MC template to use. • Multiple Choice Layout 2		
Developer - please randomize answers.		
Slide Title	Question 3	
Question Multiple Choice Layout 2 *Please randomize answers below. Make appropriate changes/labels for multiple correct answers.*	Why is it crucial to understand that the primary key of deleted records is not recycled? [Add link to image if applicable] Alt Text: [Type Text]	
	The missing primary key may be found on a different SQLite database.	**Feedback** **Correct** That's right! Missing records can be used to recognize records that have been deleted. **Incorrect** Not quite. Consider the value of the gaps you might notice while examining an SQLite database.
Correct Answer	Missing records can be used to recognize records that have been deleted.	
	The missing record may be found on a different table.	

	A trace of the primary key may remain on another table.	

Matching Activity	
Slide Title	Question 4
Graphic	*No graphic related to the question, but if there's room for any Cellebrite branded graphics, that's cool.*
Matching Columns	Drag and drop each table component to connect to its description.

Choices (random)	**Matches (static)**
Primary key	Unique identifier for each record
Foreign key	Links data between tables
Row	Holds a single record
Column	Categorizes data

Feedback	**Feedback** **Correct** Great job matching each table component to its description! **Incorrect** That's not quite right. You may review the lessons again after reviewing which table components you matched correctly. Let's try again!

Multiple Choice Question Only one correct answer. Add an image with alt-text if applicable. Specify which MC template to use. • Multiple Choice Layout 1		
Developer - please randomize answers.		
Slide Title	Question 5	
Question Multiple Choice Layout 1 *Please randomize answers below. Make appropriate changes/labels for multiple correct answers.*	What is the default data type for the PRIMARY KEY column in SQLite?	
Correct Answer	Integer	**Feedback** **Correct** That's right! The default data type for primary keys is **integer**. **Incorrect** Not quite. Remember that primary keys are commonly sequential.
	BLOB	
	GUID	
	Null	

Multiple Choice Question Only one correct answer. Add an image with alt-text if applicable. Specify which MC template to use. • Multiple Choice Layout 1		
Developer - please randomize answers.		
Slide Title	Question 6	
Question Multiple Choice Layout 1 *Please randomize answers below. Make appropriate changes/labels for multiple correct answers.*	Which of the following data types represents **true** and **false** values?	
	Floats	**Feedback** **Correct** That's right! **Boolean** data types are used to represent true and false values. **Incorrect** Not quite. Remember that the true/false values are represented as 0 and 1**.**
	Text	
	Null	
Correct Answer	Boolean	

Slide Name:	Summary
Output:	SL Template slide w/animated text and images
Headline:	SQLite Database Structure Summary
Paragraph 1 Text:	In this lesson, we reviewed SQLite database structures along with the role of primary keys, and foreign keys, and how they link related data across tables.
Learning Objectives Met:	• Explain the role of primary keys, and foreign keys, and how they link related data across tables.
Paragraph 2 Text:	Click RESTART to review again.
Interactives:	**Button:** Restart