

# ICT Database Essentials

## Lesson 1: What is a Database?

### LESSON SKILLS

After completing this lesson, you will be able to:

- Describe the functions of a relational database.
- Distinguish between databases and spreadsheets.
- Identify advantages of using a database instead of alternatives (e.g., spreadsheets, electronic documents, paper).
- Describe real-world uses for databases, including search engines, schools, hospitals, retail.
- Identify and compare various database applications, including Microsoft Access, MySQL, Oracle.
- Describe Structured Query Language (SQL) and discuss its use with databases.
- Define "big data" and describe how it is used in advertising.

### KEY TERMS

big data	Open Database Connectivity (ODBC)
common field	query
flat-file database	relational database
database	spreadsheet
database management system (DBMS)	Structured Query Language (SQL)
Microsoft Access	table

## Points to Ponder

These Points to Ponder are designed to help you focus on key elements in this lesson. They are also suitable for use to spark discussions or individual research.

- Name a real-world use for a database.
- What is the difference between a database and a spreadsheet?
- What are some advantages of using a database?
- What does "relational" mean in a relational database?
- What is "big data"?
- Describe how big data is used in advertising.

SAMPLE

## Overview

People use information in a multitude of ways on a daily basis. Storing, retrieving and reporting on that information are the strengths of a database. They are extremely useful software tools that power everything from your music playlist to being the basis of important business decisions. In this lesson, you will learn what a database is and how it can be used.

# Introduction to Databases

## Objectives

9.1.1: Describe the functions of a relational database.

9.1.2: Distinguish between databases and spreadsheets.

9.1.3: Identify advantages of using a database instead of alternatives (e.g., spreadsheets, electronic documents, paper).

9.1.4: Describe real-world uses for databases, including search engines, schools, hospitals, retail.

## Suggested video

- [What is a Database?](#) (YouTube video, 5 mins)

## Introduction to tables

You may not realize it, but you use **databases** all the time. In its simplest definition, a database is a file that stores data in an organized fashion so that information can be retrieved from it. Your iPod uses a database to create your playlist. Netflix uses a database to create your movie list. The contacts in your phone are stored in a database.

In fact, the ability to use a database is what makes many of our electronic devices so efficient. You can program your air conditioning thermostat to keep your house at different temperatures, at different times, on different days. This allows us to control how cool we keep our house at different times of the day and allows us to reduce our use of energy and lower our electric bill.

Time	Mon.	Tue.	Wed.	Thur.	Fri.	Sat.	Sun.
12:00 – 6:00 am	78	78	78	78	78	78	78
6:00 – 10:00 am	76	76	76	76	76	76	76
10:00 – 5:00 pm	80	80	80	80	80	76	76
5:00 – 10:00 pm	76	76	76	76	76	76	76
10:00 – 12:00 am	78	78	78	78	78	78	78

Table 1-1: Thermostat settings

Setting a thermostat like in Table 1-1, allows us to keep our houses warmer during week days when we're at school or work, and cooler in the morning and evening when we're up and around our house and a

little more comfortable at night while we're asleep. Notice how it also allows us to modify the schedule for the weekends when someone is more likely to be home during the day.

Something you might notice about Table 1-1 is that it's organized in columns and rows with the columns labeled as days of the week and the rows labeled as segments of time. It's the ability to store data in an organized manner that makes databases so useful.

Let's take a look at something you might be a little more familiar with. Figure 1-1 shows a playlist from iTunes.



Figure 1-1: iTunes playlist

The difference between the playlist database and the thermostat settings is that as a song gets played, the "Times Played" field gets updated by 1. This is also a useful trait of databases; they can be updated to stay current with ongoing activities.

Let's take a step back and look at refining the definition of a database. What we have been working with is a **flat-file database**, or a single **table** which is a collection of data organized in rows and columns that can be used to store and manage information. Flat-file databases work great with small lists of data (information) that is all related as shown in Figure 1-2.

	A	B	C	D	E	F	G
1	Company Name	Price Level	Product ID	Name	Size	Color	Price
2	Hawaiian Pools	2	BN-0609-TGOLD	Gold Tumbled BN	6"x9"	Gold	\$ 3.49
3	Hawaiian Pools	2	TK-1616-TGOLD	Gold Tumbled Paver	16"x16"	Gold	\$ 4.29
4	Sahara Pools	1	BN-0609-TPERL	Pearl Tumbled BN	6"x9"	Pearl	\$ 3.75
5	Sahara Pools	1	TK-1212-TPERL	Pearl Tumbled Paver	12"x12"	Pearl	\$ 3.59
6	Alure Pools	1	BN-0609-TGOLD	Gold Tumbled BN	6"x9"	Gold	\$ 3.49
7	Alure Pools	1	TK-1616-TGOLD	Gold Tumbled Paver	16"x16"	Gold	\$ 4.29
8	Pete's Pools	3	BN-0609-TGOLD	Gold Tumbled BN	6"x9"	Gold	\$ 3.49
9	Pete's Pools	3	TK-1616-TGOLD	Gold Tumbled Paver	16"x16"	Gold	\$ 4.29
10	Clear Pools	2	BN-0609-TPERL	Pearl Tumbled Paver	6"x9"	Pearl	\$ 3.59
11	Clear Pools	2	TK-1616-TGOLD	Gold Tumbled Paver	16"x16"	Gold	\$ 4.29

Figure 1-2: Airlines table – flat-file database

A simple way to create a flat-file database is to use a **spreadsheet**. Spreadsheets, like Microsoft Excel, store information in cells organized in columns and rows of data. Spreadsheets are great for analyzing and sorting related data. Spreadsheets are easy to learn and use and are suitable for storing and calculating relatively small volumes of numerical data. Spreadsheets also have the ability to present



# Spreadsheets vs. Databases



In this activity, you will compare the uses and functionalities of a Microsoft Excel Spreadsheet to a Microsoft Access Database, while getting to know your classmates a little more. Many times, information can be simplified in its organization and interpretation depending on the tool that you use to analyze the data.

## Getting to know your classmates using spreadsheets

You and classmates will assist in building a spreadsheet (or flat-file database).

1. Open **Getting to Know Your Classmates.xlsx** and add the information for each of your classmates onto the spreadsheet.
2. Once the entire team has entered in their information, find any similarities or relationships with the data. Go ahead and explore before answering the questions below.

How many of your classmates are born in the same month as you?

Do you have the same middle name as someone else in class? If so, how many?

How many groups of students have the same favorite holiday?

Are there any other similarities or relationships you see with other classmates?

## Getting to know your classmates via databases

Now, it's time to have a little fun with this activity! Relational databases are designed to connect information through related fields in order to find a unique relationship.

1. As a class, form smaller groups of specific fields to create multiple clusters of information. (For instance, divide yourselves into groups by age.)
2. Next, raise your hand based on a specific request. (For instance, raise your hand if you were born in the month of March.)
3. Depending on the number of students who raised their hand, you're able to see the connection between the different groups of age and the birth month. This is what's called a relational database.

Which method did you think was easier and faster at analyzing and organizing the data (flat-file database or relational database)? Why?

What were some of the advantages of creating a relational database?

In your own words, describe some of the functions of relational databases.

In this section, you experienced creating a flat-file database and got a glimpse at how relational databases work.



# Developing Database Queries



In this activity, you will develop ideas for queries that will extract information from database data. You can describe your virtual database scenarios by writing with pen and paper or typing on a word processor.

*For this activity, use the virtual relational database scenarios that you created in the Lesson 1 activity titled "It's Easier If They're Related!"*

1. Suitable for an individual or in teams of two to four people each.
2. Using the virtual relational database scenarios that you created in an earlier activity, add new fields and records to your database tables.

For example, using the states scenario, suppose you want to add information such as the population and area of each state; the population of the capital and largest cities; how each state ranks in various categories, such as education, employment, and so forth.

3. Discuss and write down some queries you could create to extract specific pieces of data from your database. Remember that queries are simply questions asking for specific information. For example:
  - Which cities across multiple states have the same name?
  - Which state ranks first (or last) in education?
  - Which state ranks first (or last) in employment?
  - For which state is the largest city and the capital city the same city?