More complex databases

Simple databases with only one table are called **flat-file databases**

id	name	species	age	gender	height
001	Marg	Giraffe	12	F	4.7
002	Molly	Giraffe	6	F	4.4
003	Molly	Giraffe	5	F	4.2
004	Mike	Giraffe	14	M	5.1
005	Sammy	Giraffe	1	M	2.4
006	Rex	Lion	4	M	1.8

More complex databases

Flat-file databases are simple to create and to maintain. You can use simple spreadsheet software to make them.

They have a single table of data.

But...

Data gets really powerful when we start to combine **multiple tables** of data together.

More complex databases

id	name	species	age	gender	height	keeper	phone	e-mail
001	Marg	Giraffe	12	F	4.7	Ford	321	iford@thezoo.com
002	Molly	Giraffe	6	F	4.4	Wright	521	nwright@thezoo.com
003	Molly	Giraffe	5	F	4.2	Bufford	894	wbufford@thezoo.com
004	Mike	Giraffe	14	M	5.1	Ford	321	iford@thezoo.com
005	Sammy	Giraffe	1	M	2.4	Ford	400	cford@thezoo.com
006	Rex	Lion	4	M	1.8	Bufford	894	wbufford@thezoo.com

More complex databases

id	name	species	age	gender	height	keeper	phone	e-mail
001	Marg	Giraffe	12	F	4.7	Ford	321	iford@thezoo.com
002	Molly	Giraffe	6	F	4.4	Wright	521	nwright@thezoo.com
003	Molly	Giraffe	5	F	4.2	Bufford	894	wbufford@thezoo.com
004	Mike	Giraffe	14	M	5.1	Ford	321	iford@thezoo.com
005	Sammy	Giraffe	1	M	2.4	Ford	400	cford@thezoo.com
006	Rex	Lion	4	M	1.8	Bufford	894	wbufford@thezoo.com

I've added data about the zookeeper responsible for each animal

More complex databases

This creates data that's repeated more than once - some of the phone numbers and e-mail addresses have to be written out more than once

This ends up being a waste of data in a large database

It also means that each data item has to be entered more than once. If a phone number changes, it has to be changed every time. This isn't efficient and can lead to errors

			ht	keeper	phone	e-mail
0				Ford	321	iford@thezoo.com
0				Wright	521	nwright@thezoo.com
0				Bufford	894	wbufford@thezoo.com
0				Ford	321	iford@thezoo.com
0				Ford	400	cford@thezoo.com
0				Bufford	894	wbufford@thezoo.com

When you have repeated data we'd say you have **redundancy** in the database

More complex databases

To solve these problems I can split my data into **two tables** - one about animals and the other about zookeepers

id	name	species	age	ge
001	Marg	Giraffe	12	
002	Molly	Giraffe	6	
003	Molly	Giraffe	5	
004	Mike	Giraffe	14	
005	Sammy	Giraffe	1	
006	Rex	Lion	4	

keeper	phone	e-mail
Ford	321	iford@thezoo.com
Wright	521	nwright@thezoo.com
Bufford	894	wbufford@thezoo.com
Ford	321	iford@thezoo.com
Ford	400	cford@thezoo.com
Bufford	894	wbufford@thezoo.com

More complex databases

I can delete some **redundant** rows where data is simply repeated

id	name	species	age	ge	
001	Marg	Giraffe	12	F	4.7
002	Molly	Giraffe	6	F	4.4
003	Molly	Giraffe	5		
004	Mike	Giraffe	14		
005	Sammy	Giraffe	1		
006	Rex	Lion	4		

keeper	phone	e-mail
Ford	321	iford@thezoo.com
Wright	521	nwright@thezoo.com
Bufford	894	wbufford@thezoo.com
Ford	400	cford@thezoo.com

What needs to be added to the zookeeper table?

id	name	species	age	gender	height
001	Marg	Giraffe	12	F	4.7
002	Molly	Giraffe	6	F	4.4
003	Molly	Giraffe	5	F	4.2
004	Mike	Giraffe	14	M	5.1
005	Sammy	Giraffe	1	M	2.4
006	Rex	Lion	4	M	1.8

Now we need to link each keeper to their animal

Primary key added

keeperID	keeperName	phone	e-mail
001	Ford	321	iford@thezoo.com
002	Wright	521	nwright@thezoo.com
003	Bufford	894	wbufford@thezoo.com
004	Ford	400	cford@thezoo.com

id	name	species	age	gender	height	keeperID
001	Marg	Giraffe	12	F	4.7	001
002	Molly	Giraffe	6	F	4.4	002
003	Molly	Giraffe	5	F	4.2	003
004	Mike	Giraffe	14	M	5.1	001
005	Sammy	Giraffe	1	M	2.4	004
006	Rex	Lion	4	M	1.8	003

keeperID	keeperName	phone	e-mail
001	Ford	321	iford@thezoo.com
002	Wright	521	nwright@thezoo.com
003	Bufford	894	wbufford@thezoo.com
004	Ford	400	cford@thezoo.com

You do this by using the keeperID in both tables

More complex databases

Linking tables together is a really important idea.

First you tell the database that the two tables are linked. Then you tell it what field manages the linking.

The linking field should be the **primary** key in one table - so that it’s a unique identifier

This makes it the **foreign key** in the other table

More complex databases

Foreign key: a field in one table which is the primary key from another table.

This allows tables to be linked together.

Because the primary key is unique, the foreign key links to one (and only one) record in the other table. This means it can be used to avoid duplicating data in the first table.

id	name	species	age	gender	height	keeperID
001	Marg	Giraffe	12	F	4.7	001
002	Molly	Giraffe	6	F	4.4	002
003	Molly	Giraffe	5			003
004	Mike	Giraffe	14			001
005	Sammy	Giraffe	1	M	2.4	004
006	Rex	Lion	4	M	1.8	003

Foreign key here

Primary key there

keeperID	keeperName	phone	e-mail
001	Ford	321	iford@thezoo.com
002	Wright	521	nwright@thezoo.com
003	Bufford	894	wbufford@thezoo.com
004	Ford	400	cford@thezoo.com