Today’s lecture

• Recap of yesterday’s lecture
• Using Queries to retrieve information from database
• Using Reports to retrieve information from a database

Recap

• Databases can use the relational model, where relationships exist between entities
• Relationships require tables, primary key and foreign key. Referential integrity is an important concept
• Looked at how to create tables, insert fields and data and create a relationship

Aspects of a database

• Before we can create our database, we need to decide how to:
  1. Organize data in our database
     • Models, tables, relationships
  2. Enter data in our database
     • Datasheet view
  3. Retrieve data from our database
  4. Present the retrieved data to the user
Retrieving data - queries

- **Queries** allow you to retrieve certain records from your database
- Two kinds of queries in Access:
  - Query by example (QBE):
    - Visual way of designing queries
    - Access converts your QBE queries into SQL
  - SQL (Structured Query Language):
    - Uses commands to retrieve data from databases
    - Developed by IBM in the late 1970’s
- Access creates a table containing the results of the query

### QBE queries

<table>
<thead>
<tr>
<th>Country</th>
<th>Land Area</th>
<th>Water Area</th>
<th>Fossil</th>
<th>Pacific</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand</td>
<td>268,679</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Select Query Design from the Create Menu
2. Select tables to use in query

### ‘Run’ button

**Query results**

- New Zealand
- Arthurs Pass National Park: 268,679
- South Taupo Volcanic: 268,679
- New Zealand
- Mount Aspiring National Park: 268,679
- New Zealand
- South Taupo Volcanic: 268,679

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QBE queries - sorting

• Results from QBE queries can be sorted in ascending and descending order.

QBE queries - expressions

• Fields can be combined together to create an expression with the Expression Builder.

QBE queries

• A Totals QBE query allows us to group data using functions such as Min, Max, Avg, Sum etc.

We can use the Access Expression Builder to create derived fields that are calculated when queries are made.
QBE Exercise

• Complete this QBE grid so that it will return the first names, surname and grade (in that order) of all students who have received an A+. Sort the results by surname in alphabetical order.

SQL introduction

• **Structured Query Language** (SQL) was developed by IBM in the 1970s and is commonly used today.

• It uses text commands to perform operations on databases, such as inserting and removing records and running queries.
SQL queries

• Four clauses that can be part of a simple SQL query:
  – SELECT
  – FROM
  – WHERE
  – ORDER BY

• Construct a SQL query that will return the first names, surname, and grade (in that order) of all students who have received an A+. Sort the results by surname in alphabetical order

SQL queries - SELECT

• Selects fields from the tables that we want to display in our results table

• Syntax:
  SELECT [comma separated list]

• Example:
  SELECT First Names, Surname, Grade
  Note the square brackets around 'First Names' needed because of the space

SQL queries - FROM

• Specifies the table which holds the field(s) listed in the SELECT clause

• Syntax
  FROM [comma separated list]

• Example:
  FROM Students

SQL queries - WHERE

• Optional; used to provide criteria that limit the records displayed in the results table

• Syntax
  WHERE [criteria]

• There are a range of criteria we can use:
  – Comparisons (=, >, <, <=, >=, <>)
    – e.g., WHERE [Land Area] < 50000
  – BETWEEN ... AND ...
    – e.g., WHERE Price BETWEEN 10 AND 20
  – LIKE (some pattern)
    – e.g., WHERE [City] LIKE 'San *'
  – AND, NOT, OR (combined with any of above)
    – e.g., WHERE Country = 'New Zealand' AND City = 'Auckland'
  – IS NULL, IS NOT NULL
    – e.g., WHERE [Postal Code] IS NOT NULL
SQL queries - WHERE

• SELECT [First Names], Surname, Grade
  FROM Students
  WHERE Grade = ‘A+’

SQL queries – ORDER BY

• Optional; allows us to sort our data in ascending or descending order
• Syntax:
  ORDER BY [name of field] [ASC/DESC]
• SELECT [First Names], Surname, Grade
  FROM Students
  WHERE Grade = ‘A+’
  ORDER BY Surname ASC

SQL queries

• You need to ensure that you put a semi-colon on the last clause of your SQL query:
• SELECT [First Names], Surname, Grade
  FROM Students
  WHERE Grade = ‘A+’
  ORDER BY Surname ASC;

SQL queries

• We run a SQL query in the same way that we run a QBE query
SQL exercise

• Write an SQL command that will only display the first name, surname and grade of students whose Total mark was greater than 70. Order the results table by ID number in ascending order.

```sql
SELECT [First Names], Surname, Grade
FROM Students
WHERE Total > 70
ORDER BY ID ASC;
```

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     • QBE and SQL queries
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Reports

• Reports allow you to present the contents of a table, query etc. in a nicely formatted table

• There are two ways of creating Reports:
  – Report Tool (show entire table, some formatting control)
The Report Wizard

- Select the tables and fields you want to display in your report

![Image of Report Wizard selecting tables and fields]

The Report Wizard

- You can group records in the report using particular fields

![Image of Report Wizard grouping records]

The Report Wizard

- You can sort records in the report by one or more fields

![Image of Report Wizard sorting records]

The Report Wizard

- You can set certain aspects of your report’s formatting in the Wizard

- The final step involves giving the report a name and clicking on ‘Finish’

![Image of Report Wizard final step]
The Report Wizard

• The finished report, ready for printing
• You can continue to modify the report’s formatting at this point

Summary

1. **Organize** data in our database
   – Models, tables, relationships
2. **Enter** data in our database
   – Datasheet view
3. **Retrieve** data from our database
   – QBE and SQL queries
4. **Present** the retrieved data to the user
   – Report Wizard