Databases

A database is a collection of data from which information is available.

Databases are used for hundreds of purposes by millions of people - some for the collection of the data, others for creating and filling it with data, and still others for obtaining useful information from the completed database.

Examples include -

• recipe cards
• encyclopaedias
• telephone books
• family histories

These are all useful collections of data which people use to research or investigate things and sometimes to produce things.

e.g.

Obviously, all of the databases of the past were non-computer ones. Today some are still non-computer, while the majority are computer databases. We have all used non-computer databases for many years, including -

• telephone books
• street directories
• address books

Exercise 1  Computer and Non-computer Databases

1. Give 3 reasons why we still use non-computer databases - giving examples to illustrate your ideas.

2. Give 3 reasons why we use computer databases - giving examples to illustrate your experiences.

To be printed out and handed in by -

........................................................................
The following two situations illustrate why both computer and non-computer databases are still in use today -

**Situation 1**
You want to find the phone number and address of one person - Joe Bloggs, you use the white pages phone book. This would work quickly and well - so long as you knew the correct spelling of the person’s last name and their initials.

**Situation 2**
You want to find the phone number and address of all people named Bloggs who live in the northern suburbs of Sydney - so you can ring or send them advertising about a new store you are opening. This process would take a long time to sort through the white pages phone book, with some mistakes likely. However, a computer database of phone numbers (white pages on CD) would perform this task quickly and accurately.

Both the White and Yellow pages are available on CD and searches and sorts are done every day for particular details on the databases. It would amaze some people to find out how much can be found out about them from all of the different databases they are on.

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**Exercise 2 Databases I Am On**

Almost all people are entered into many databases during their lives, from official government ones, to stores they buy food and products from, to clubs and teams they belong to, etc.

To Do - type in the following into your word processor -

1. Make a list of at least 10 different databases you are on, using as much variety as you can for the types of databases.

2. For 3 of these, list the data they would have about you

To be completed by - .................................................................

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**Case Study - Database use at Amazon.com** -

- Go to the Amazon site at  www.amazon.com
- Have a look at the parts of the site
- Answer the following questions by researching the site and discussing with class members.

**Questions - type out answers to** -

1. What does Amazon sell? (include all products)
2. Who do they sell to?
3. How do they manage to keep track of their
   - Products
   - Customers
   - Payments

Present these answers as part of a **Report** on Database Use at Amazon.com

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Creating a Database

A database is organised with a set of terms which you need to become familiar with, including - to be completed - (Complete these)

- **File** - ................................................................................................................................................................
  
  e.g. ........................................................................................................................................................................

- **Record** - ..........................................................................................................................................................
  
  e.g. ...........................................................................................................................................................

- **Field** - .............................................................................................................................................................
  
  e.g. ..........................................................................................................................................................

- **Character** - ........................................................................................................................................................
  
  e.g. ...........................................................................................................................................................

Example -

Correctly label the example, using the 4 terms listed above (file -> character).

Setting up a Database

The first step in setting up a database is to create what is called a **Data Dictionary**, which is a table for how the database is designed, and the format and form of the data.

Example - **Data Dictionaries** should have these headings -

<table>
<thead>
<tr>
<th>Field name</th>
<th>Field type</th>
<th>Field length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last name</td>
<td>text</td>
<td>25</td>
<td>Family name e.g. Smith</td>
</tr>
<tr>
<td>Postcode</td>
<td>number</td>
<td>4</td>
<td>4 digit postcode</td>
</tr>
<tr>
<td>D.O.B.</td>
<td>date</td>
<td>10</td>
<td>Date of birth e.g. 10/10/1992</td>
</tr>
</tbody>
</table>

Once the data dictionary is complete, then the database is created from scratch using the program of choice e.g. AppleWorks.
Exercise 3 First Fleet Database

1. Go to - cedir.uow.edu.au/programs/FirstFleet/ and have a quick look at the site. Click the ‘Database’ button.
2. Click on the ‘Download the data’ link and download the text file format to your documents folder.
3. Import the data into your own First Fleet database - Save as First Fleet DB.

Data Dictionary Task
This is a sample of “raw data” extracted from the First Fleet Database. The original database contains 777 records (only the first 15 records are shown). Data in this form is called a CSV file or Comma Separated Value file, and is treated by the computer as a text file and is commonly used for reasons of file portability for the transfer of data from computer to computer or between differing software packages.

| 2. Abel, Robert, M, 9/15/1784, Old Bailey, Assault Robbery, 5, D, 7, No Trade, |
| 3. Abrahams, Esther, F, 8/30/1786, Old Bailey, Larceny, 50, T, 7, Millener, 20 |
| 5. Acres, Thomas, M, 3/14/1785, Devon, Assault Highway Robbery, 10, D, 7, No Trade, |
| 6. Adams, John, M, 5/26/1784, Old Bailey, Larceny, 30, T, 7, No Trade, |
| 7. Adams, Mary, F, 12/13/1786, Old Bailey, Theft Apparel, 44, T, 7, Service, 29 |
| 8. Agley, Richard, M, 3/2/1784, Hampshire, Assault Robbery, 2, D, 7, No Trade, |
| 9. Allen, Charles, M, 7/7/1784, Old Bailey, Larceny, 30, T, 7, No Trade, |
| 10. Allen, John, M, 3/2/1786 Hertford, Larceny, 200, T, 7, Labourer Miller, 45 |
| 11. Allen, Mary, F, 1/10/1787, Old Bailey, Highway Robbery, 72, T, 7, Service Prostitute, 22 |
| 12. Allen, Mary, F, 1/10/1787, Old Bailey, Theft Apparel, 12, T, 7, Hawker, 28 |
| Please note - |
| • returns have been entered at the end of each record for the purpose of making the data easier to read |
| • age fields data is not available in some cases, these records end with a comma. |

Task - examine this data and complete the 3 activities -

1. Create a Data Dictionary for the data shown in the above in the following table-
2. Using your data dictionary as a guide, complete these practical activities -

• Create this database using a database package such as AppleWorks, save the database as ‘First Fleet’
• Populate the database by manually entering the first 3 records in the sample above
• Save this as Sample DB 1
• Create a new version of the database and import the first fleet database into this version
• Save this as Sample DB 2

3. Answer the questions in the spaces provided -

(a) Identify each of these data structures using specific examples from your database -
(i) File - ........................................................................................................................................................
(ii) Record - ..................................................................................................................................................
(iii) Field - .......................................................................................................................................................
(iv) Character - .............................................................................................................................................

(b) Describe how the data dictionary is used when creating a new database - ............................... 
.....................................................................................................................................................................
.....................................................................................................................................................................

(c) State the differences between the process of manual entry of data with that of importing data in terms of data validation - ............................................................................................................
.....................................................................................................................................................................
.....................................................................................................................................................................
.....................................................................................................................................................................

(d) Identify 3 factors that could lead to inaccuracies in the data in this database -
1.....................................................................................................................................................................
2.....................................................................................................................................................................
3.....................................................................................................................................................................
First Fleet Questions -
Now that you have a working database, we need to see what useful information you can find from it, including the answers to -

Q1. How many ships were in the First Fleet? .............................................

Q2. For the First fleet, what were -
(a) the total number of convicts leaving England - ..............................................
(b) the total number of convicts to reach Australia - ...........................................

Q3. What was the number of female convicts - ..........................................................

Q4. How many murderers were on the First Fleet - .............................................

Q5. What was the safest of the First Fleet ships to travel to Australia?
........................................................................................................................................

This was because - ................................................................................................................................

Q6. How many male convicts died before 1790 (in 2 years) - .........................

Q7. How many military people were on the First fleet - ..............................

This was because - ................................................................................................................................

Q8. Complete the following table -

<table>
<thead>
<tr>
<th>Age</th>
<th>Number</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 - 17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 - 22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 - 30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 - 40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 - 70</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

You now need to write 2 more questions, of interest to you, in the spaces below (and add the answers to your questions).

Q9. ...............................................................................................................................
........................................................................................................................................

This was because - ............................................................................................................

Q10. .............................................................................................................................
........................................................................................................................................

This was because - ............................................................................................................

To be completed by - ..........................................................................................
Exercise 4 - Design, Produce and Evaluate a Database

From scratch, create a database for a new health club - Club West, being set up in Wetherill Park adjacent to the swimming pool complex. It is expected that construction will start in 3 months and be completed for opening 6 months later. It is planned to cost up to $1 million, have a staff of 6 (2 full time, 4 part time) and a client base of around 400 per week. A database solution is needed to run all aspects of this new business.

As part of the team, you need to pay attention to the technology aspects, including -
- identification of the need or problem to be solved
- constraints
  - technical (hardware and software)
  - operational (effects on the operation of the business)
  - financial (costs)
  - ethical (issues with data)

Design methods for possible solutions - in order to come up with an effective design plan for a database solution for the business, a number of methods may be used, including -
1. concept mapping
2. brainstorming
3. research

Having completed an examination of these methods in class, you should now be able to produce a 1-2 page Report, containing -
- a description of the purpose of the database(s)
- the components of the database (records, fields, etc.)
- the inputs and outputs of the database
- a data dictionary

To Do - Produce an Inventory Database for Club West

Inventory would include -

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Your database should have at least 6 fields and 6 records.
Include a suitable small graphic (picture or logo) in a section of your database.
Save as Club West Inventory DB.

Give any descriptions or explanations for how and why you have done things (as if you had to give these to the boss).

To be completed by - ...........................................

Evaluate

In order to evaluate how effectively a database works, we firstly need to establish a list of criteria for evaluation, such as -
- functionality (ease of use)
- accuracy
- aesthetics
- plus others decided by the class.
To Do -
Use the chosen criteria to evaluate the Club West Inventory Databases of 2 other class members. Write a 1 page evaluation of each of the 2 database solutions, pointing out both strengths and weaknesses.

Collecting, Organising and Storing Data

The data entered into the computer does not sit on the disk or in the memory as letters and diagrams, etc. as it appears on screen. These letters you are reading on the page are in an ANALOG form whereas the computer only works in DIGITAL, so they are stored as digits that is either 0 or 1.

Each digit is termed a bit - short for binary digit, and is the smallest unit for storing data.

This comes from the circuits of the computer being in one of two possible states - 0 for ‘off’ (no electric current) or 1 for ‘on’ (an electric current) represented by the binary number system.

Thus Binary code in the form of 1’s and 0’s is the only language that computers actually work in.

Bits and Bytes

Bits are grouped together to form bytes 8 bits = 1 byte

Each character of data e.g. a letter, punctuation or other symbol is represented by a byte, and the byte is also used as the unit of measurement for memory. Actually kilobytes (K) is generally used for memory - with a 1 page of word processing for example using around 3 to 4 K of disk space when saved. For the capacities of disks we often use the term megabytes (MB), so a hard disk might be 200 MB in size.

Note though -
- a kilobyte is actually 1024 bits (not 1000) - since it is $2^{10}$
- a megabyte is therefore not 1 000 000 bits - since it is $2^{20}$
  but is........................................................... bits.
How the Binary Number System Works -
• We normally use numbers in the decimal number system - with the numerals 0, 1, 2, 3, 4, 5, 6, 7, 8, & 9.
• We also have place values depending on the position of the number - based on 10’s
  e.g. 1823 is 1 x 1000’s + 8 x 100’s + 2 x 10’s + 3 x 1’s

<table>
<thead>
<tr>
<th>10³</th>
<th>10²</th>
<th>10¹</th>
<th>10⁰</th>
<th>powers</th>
<th>value</th>
<th>decimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>100</td>
<td>10</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• The binary system is in base 2, and therefore has numerals of only 0 and 1
• It also has place values - but based on 2’s -
  e.g. 1010

<table>
<thead>
<tr>
<th>2³</th>
<th>2²</th>
<th>2¹</th>
<th>2⁰</th>
<th>powers</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

So 1010 = 1 x 8 + 1 x 2
  = 8 + 2
  = 10 (base 10) or as a decimal number

Using this method we can change any number from binary to decimal or vice versa. For example changing 38 decimal to binary would involve -

<table>
<thead>
<tr>
<th>2⁶</th>
<th>2⁵</th>
<th>2⁴</th>
<th>2³</th>
<th>2²</th>
<th>2¹</th>
<th>2⁰</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>32</td>
<td>16</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>binary</td>
</tr>
</tbody>
</table>

This is 1 x 32 + 0 x 16 + 0 x 8 + 1 x 4 + 1 x 2 + 0 x 1 = 38

So 38 decimal = 100110 binary

And 49 decimal = 110001 binary
Exercise 5

1. Complete the table by filling in all of the missing digits -

<table>
<thead>
<tr>
<th>Binary</th>
<th>64</th>
<th>32</th>
<th>16</th>
<th>8</th>
<th>4</th>
<th>2</th>
<th>1</th>
<th>Decimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) 1010</td>
<td></td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>(b) 1101</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>63</td>
</tr>
<tr>
<td>(d) 10101</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>93</td>
</tr>
<tr>
<td>(f) 11011</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g) 1000111</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(h)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>115</td>
</tr>
</tbody>
</table>

2. The table below contains the first 10 numbers in binary code, complete the second column for 11 to 20 in Binary - using 5 bits.

3. How many bits would be needed to represent the numbers -
   (a) 198 ........................................
   (b) 284 ........................................

4. Complete the table -

<table>
<thead>
<tr>
<th>The Decimal System</th>
<th>The Binary System</th>
<th>Decimal</th>
<th>Binary</th>
</tr>
</thead>
<tbody>
<tr>
<td>zero 0</td>
<td>0</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>one 1</td>
<td>1</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>two 2</td>
<td>10</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>three 3</td>
<td>11</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>four 4</td>
<td>100</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>five 5</td>
<td>101</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>six 6</td>
<td>110</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>seven 7</td>
<td>111</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>eight 8</td>
<td>1000</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>nine 9</td>
<td>1001</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>ten 10</td>
<td>1010</td>
<td>21</td>
<td></td>
</tr>
</tbody>
</table>

To be handed in by - ..........................................................
The ASCII System

Of the many codes created to represent data within the computer, the most widely used has been the American Standard Code for Information Interchange (ASCII - pronounced ass-key). It is a seven-bit code and is therefore able to contain $2^7$ or 128 possibilities (0 to 127), with a table to show all 128 codes.

Examples -

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Binary</th>
<th>ASCII</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>00000000</td>
<td>NUL</td>
</tr>
<tr>
<td>32</td>
<td>00100000</td>
<td>space</td>
</tr>
<tr>
<td>55</td>
<td>00110111</td>
<td>7</td>
</tr>
<tr>
<td>75</td>
<td>01001011</td>
<td>K</td>
</tr>
<tr>
<td>119</td>
<td>01110111</td>
<td>w</td>
</tr>
</tbody>
</table>

Database File Types

Just as a graphic may be a jpeg, gif or bmp for example, so too a database file can be of a number of types.

Exercise 6 - Comparison of Database File Types

Create a table with the following headings -

<table>
<thead>
<tr>
<th>Use</th>
<th>Data Format</th>
<th>Extension</th>
</tr>
</thead>
</table>

and complete it for at least 3 file types for databases.

To be printed out and handed in by - ...............................................

Data Storage and Function

When we -

- are working on any computer file - it is being stored in RAM or Primary memory.
- save a computer file - it is stored on a hard disk or similar device called Secondary memory.

Assignment

Complete each of the following -

1. Define the terms RAM and ROM - giving examples to illustrate the difference.
2. Define Primary memory and describe what happens to the information when the computer is turned off.
3. Define secondary memory or storage and describe what happens to the information stored in secondary memory when the computer is turned off?
4. Make a list of different types of secondary storage devices or media.

To be handed in by - ..........................................................
Exercise 7 - Database of Storage Devices

Each student (or pair normally sharing a computer) is to design and create a database with the following field names -

• Name of device
• Picture
• Description
• Category (Primary or Secondary)
• Media type
• Storage Size/Capacity (MB)
• Access Time
• Typical Application/Use
• Source/Reference

Populate this database with data researched from the Internet, books, class discussions and notes - complete for 10 devices.

Save as Storage Devices.

Questions -
1. Why is there such a range of storage devices? Give reasons to justify your answer.
2. What effects can the area of use of the database (e.g. school, doctors surgery, Microsoft head office, etc.) have on the storage device and media?

To be completed by - .................................................................

Investigation
As a class we are now going to research the variety of jobs or careers that currently exist in the IT area for people skilled in the use of databases. Each person or pair will need to come up with several entries to go into the table - with the details coming under the headings -

<table>
<thead>
<tr>
<th>Job Title and Description</th>
<th>Salary</th>
<th>Experience and Qualifications</th>
</tr>
</thead>
</table>

Sources of information include - the classified adds and the Internet (e.g. www.seek.com.au)

To be completed by - .................................................................

Methods of Processing and Analysing Data
In order to process and analyse data - and thereby gain meaning from otherwise possibly meaningless data, the user of the database must perform one or more functions on the database. These functions include -

• Editing
• Sorting
• Querying
• Using Calculations
• Using Macros
• Reporting
• Using forms
Editing a Database
To edit or alter a database, the user may do such things as - add, change or delete fields, records or even files.

Exercise 8 - Editing a Database
To Do -
• Add a ‘Price’ field to the Storage Devices database. Find (in a magazine or brochure) and enter a typical price for each device.
• Locate and open and add your name(s) and details to the Crims 2004 Database and Save to your folder.

To be completed by - ..............................................................

Sorting a Database
Simply putting a series of records into a different order will give a different appearance to the data and it is the field and the order on which the database is sorted that is critical. For example, sorting from A-Z or Z-A will make a big difference, as will sorting on Price, compared to say Access Time.

Exercise 9 - Sorting a Database
To Do -
• Describe how each of the following are -
  1. normally sorted
  2. could be sorted to suit different data or another purpose
     Telephone book
     Recipe book
     Encyclopaedia

• Describe how sorting can be used to help in the analysing of data, with specific examples from the Crims 2004 DB.

• Question - what might a teacher use ‘sort’ for in her computerised class markbook?

To be completed by - ..............................................................

Searching a Database
The main ways of extracting information from a database include -
Searching - locating the first occurrence of a selected item in a database - used again to find subsequent occurrences of the item.
Querying - shows a view of only the records that satisfy the details or criteria of the query.
Reporting - a report provides a summary of the records that satisfy the criteria.

Searches
These are often done using Find from the Menu, and generally locates the nominated data in the field selected - but only where selected. In some databases, the records with matching data are highlighted for the user to look through and sometimes a total of the records with matching data will be given.
Exercise 10

You are a police person using the COPS database to help locate likely suspects for crimes in the area. Use the Crims 2004 database to find a list of suspects for each of the following -

1. A break in has been reported in Wakeley, a male of at least 170 cm, with short brown hair was seen leaving the scene. Shoe print found outside a broken window is at least size 9.

2. A drug bust has occurred in Fairfield and one of the culprits has escaped. A tall (at least 170 cm) girl wearing a cap, red jacket and blue jeans ran away and long dark hair was seen fall out under the cap.

3. A 12 year old boy has been bashed and given the following description of the person. Female aged 14 to 16, short brown hair, brown eyes and really loud voice.

4. A car has been stolen from Fairfield West Primary School at 1.30 pm. The suspect is a male, at least 14 years of age, with blue eyes and a shoe print size 8.

5. A school hall has been burned down, and from a Fairfield West surveillance video, the suspects are -
   (i) a male over 170 cm with brown hair
   (ii) a girl described as short with medium length brown hair
   (iii) a short person with blonde hair

6. A break in reported in Smithfield, with a medium height male seen with a large screen TV, weight at least 70 kg

Questions -

1. Why can you only give a list of suspects and not name the criminals?

2. How have some people limited their range of suspects by their selection of relevant fields?

To be completed by -
Queries
A query is a question or enquiry, and we can use this technique to find or match up with data in a database. As opposed to a simple find, a query normally nominates a number of criteria in several fields to be located - and Match is often used from the Menu.

Queries may be used as ‘filters’ to gradually refine the search, for example, in the Storage Device DB, ‘Secondary’ may be selected in the storage type field first, then ‘Magnetic’ on the storage medium field - thus filtering out the unnecessary records in stages.

Operators need to be used to connect the parts of the query and to allow variations in what is actually sought. The two types of operators used are -

- Logical operators - like AND, OR and NOT.
- Comparative operators - like >, <, >=, <=, LIKE.

Examples -
(i) From - Class database
    Where - Age > 15 years AND Hair = ‘Red’

Would find from the class database all of the students 16 years or over (greater than 15) who also (the AND means both criteria) have red hair.

(ii) From - Class database
    Where - Eye colour = ‘Blue’ OR ‘Green’ AND Hair = ‘Blonde’

Would find from the class database all of the students with blonde hair and either blue or green eyes.

Wild Cards are symbols (such as * or ?) which are entered into fields to query, when all of the characters may not be known. The ‘?’ is normally used to represent a single missing character, while the ‘*’ is used to replace 0 or multiple characters in the search.

For example, ‘ h?t ’ would find - hot, hit hat and hut.
While ‘collect*’ would find - collect, collection, collectable, collecting, etc.

Exercise 11 - Querying a Database
To Do -
Answer the following questions - for the Dangerous Australians database -

[a] 1. The number of animals found on the coast is - .............................................
2. The animal with the longest Scientific name is - .......................................................
3. Names of all animals over 2000 mm are - ..............................................................
4. Which animals live entirely in the water? .................................................................

[b] Write a series of requests for the Storage Devices DB -
1. .......................................................................................................................................,
2. .......................................................................................................................................,
3. .......................................................................................................................................,

To be completed by - ...........................................................
Calculations
We would normally consider using a spreadsheet if the calculation of numbers was an important part of what we were planning to do, however, modern database software generally allows us to make some calculations within the database. This means we are free to choose the software best suited to what we want to achieve.

The calculations most databases allow us to perform include - sum, average and count within queries.

Exercise 12 - Calculations in a Database
1. Write a query that would find the range of values in the -
   (i) “Price” field
   (ii) average “Storage Capacity”
   (iii) total count of records in the database

2. In your database, create a new query field that calculates the price per MB for each storage device in the database. (Price per MB = Price / Storage Capacity)
   Sort by this field to determine the most cost-effective method of storage.
   To be completed by - ............................................

Macros
These are a set of instructions written to perform a series of frequently used keyboard strokes. They may be used in a range of program types, from word processing to database and spreadsheet, to quickly perform often repeated tasks.

Macros are created by recording the sequence of keystrokes to perform a particular function, then playing them back on demand by using a specified key or keys e.g. F7. Thus they are a quick and accurate method of performing some function e.g. totaling a column each day and putting this number into a certain location.

Methods of Presenting Information
A number of methods may be used to present the information extracted from a database, both electronic and hardcopy.
These include -

Outputs from a database -  reports
                           forms
                           data/information

Example (for class discussion) - a list of possible items that someone may want from a school databases of - students, teachers and classes/courses.
For each item - is a hard copy or on-screen display better?

Reports
We are able to produce a range of reports, so, what is the purpose of reports?
Report parts - header, footer, body and text, and what is put in each part and why.
Report design considerations -
- typeface (what difference does it make?)
- sequence and structure of the information (does this matter?)
- use of white space (what is this?)
- balanced text and styles
- layout and page number, etc.
- need for date stamping hard copies

13 - Producing Reports

1. For the First Fleet database, produce 3 different styled reports - that is, making changes in the arrangement of reports and/or design aspects. Then print one page of each of these out.

2. Homework - Find one or two examples of good report design and at one example of poor report design from magazines, newspapers, etc.

To be completed by - ........................................

Forms

The purpose of database forms is to provide the user with an interface to view, enter and if necessary edit selected database data. Differing views of a database are given by designing the form. Examples include -
- page - shows the details of just one record to the page
- column - shows many records in a table arrangement
- label - shows some details (like name and address for example) to make a sticky label

The layout of the form may be set out by the user and altered at some later date - depending on the needs. The user can position fields, headings, instructions and graphics on the form. The instructions will explain the requirements for the data and any rules that may apply to particular fields.

Databases are sometimes used as either a “front-end” or maybe as a “back-end” with other applications.
Assignment
To Do - research these two terms - ‘front-end’ and ‘back-end’ and produce a paragraph on each to explain their meanings and the reasons and places they may be used.

To be word processed and printed out to hand in by - ..............................

Forms may contain a range of elements (as set up by the user) and depending on the particular database software, include such features as - header, footer, body, labels, textboxes, buttons, icons and pictures.

User Interfaces for Forms
Different types of user interfaces may be used for forms for databases, the Graphical User Interface (GUI) is one of these types.

Exercise 14 - Creating Database Forms

1. Create a simple set of design principles for Form elements and Form design - things to do (and not to do maybe). See the design considerations on the previous page.

2. Produce a one page form including and labelling all of the good points of your design, on the page.

3. Discuss the design of the First Fleet website you used and comment on at least 3 aspects of the interface design.

To be completed by - ..............................

Integration
Data is often integrated into a range of programs these days, sometimes being exported into another database, or into some other type of program. Another type of integration is involved with mail merging, which is the combining of data from a database into some type of form letter. Therefore the details about a person (name, address, etc.) may be added to a letter about selling books for example - and this is done for thousands of people, so each person appears to have a letter especially printed out just to them.
The places for the data from the database to be added to the form letter are indicated by some kind of indicator (like ! or << >>) depending on the database software.

**Exercise 15 - Creating a Mail Merge**

Freddy Rich is having a birthday party and he will be deciding which members of your class will be invited. He will use a class database to do this and then mail merge the lucky names into a specially designed invitation letter.

You are to produce -
- a class database (fields shown below)
- a query to display just those chosen to get an invitation
- a specially design party invitation (including graphic)
- two mail merged invitations (from the invited group)

All of these are to placed in order in a **display folder**.  
Save the files as **Class DB** and **Party Invitation**.

**Fields for class database** - Surname, Given name, Title, Gender, Address, Invite (Yes/No)

The names are to be at least 20 of the members of this class, along with appropriate title, but with a ‘made up’ address.

Folder to be handed in by - ........................................

**Database Software**

Database programs allow the user to perform a number functions that other types of software generally will not, including - searching, sorting, macros, etc. Since you have been using databases for some time now you should be aware of a good range of these features and be able to complete a table to illustrate these features and how they work.

**Exercise 16**

Use the outline below to produce your table -

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>Comparison to other types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Searching</td>
<td>To retrieve specific pieces of ....</td>
<td>Most other programs can only ...</td>
</tr>
</tbody>
</table>

To be printed out and handed in by - ........................................

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Designing, Producing and Evaluating Databases

For someone to go to the trouble of creating a database, some problem or challenge must be present - or they would not put in the effort. Sometimes the actual problem may be difficult to state clearly, and sometimes the database fails to do what the users want for exactly that reason - it does not solve the real problem.

To allow you to go through this process, you are to - Design a database solution for monitoring the stock of a DVD hire shop - called Design DVD's. Work in groups of up to 4 students.

**Assessment Task 1 (10%)**

**Step 1**

(i) identify the need or problem to be solved - write down the things that need to be done to keep track of the DVD stock.

(ii) analyse the possible range of solutions - come up with a list of possibilities.

(iii) identify a range of possible constraints (like costs, skills, etc) and discuss how they impact on the solution.

Produce a Report (1-2 pages) on the range of solutions and your recommendations on the best one(s).

**Step 2**

Assuming that the owner of the DVD store has decided on a database solution, in groups of up to 4 students, design a Stock Management database for use in the shop.

This design stage will have to supply descriptions of -

• the purpose of the database
• the components of the database
• the inputs and outputs to and from the database
• a data dictionary for planning all of the field details

**Step 3**

Create a prototype of the Stock Management database and enter the details of 5 records.

Check to see if the database solution meets all of the specifications of the original design from your report.

Create a page of documentation for potential users of the database - User Documentation.

**Step 4**

Devise a set of criteria for evaluating the Stock Management database (or indeed any piece of software). This should include aspects such as - functionality, accuracy and aesthetics.

• Produce a written evaluation of - TWO other database solutions (from 2 other groups), print these out (1 to a page) and give them to the groups.

• Collect the ones done on your database and make any changes needed to ensure the full functioning of the solution.

To be completed by - ..........................................................
Assessment Task 2 (10%)

1. Examine the Internet site for Amazon.com

2. Analyse the structure of the business - all of the various parts.

3. Research and write a report that describes the main features of the Amazon database and how it functions at the centre of the on-line service (the basic structure and function of the database need to be examined and described).

4. Describe why database software was selected when starting up this business - under the following headings -
   - Defining the problem (why did Amazon create a web site?)
   - Designing the solution (why use a database?)
   - Evaluating the solution (has it justified the choice?)

To be completed and handed in (in your display folder) by - ............................................