Information Processes and Technology

The Preliminary Course is based on the following with weightings and approximate timings:

**Introduction to Information Skills and Systems (20%)**
- 8 weeks
  - Information systems in context
  - Information processes
  - Digital representation of data
  - Classification of information systems
  - Social and ethical issues

**Tools for Information Processes (40%)**
- 13 weeks
  - Collecting
  - Organising
  - Analysing
  - Storing and retrieving
  - Processing
  - Transmitting and Receiving
  - Displaying

**Planning, Design and Implementation (20%)**
- 5 weeks
  - Understanding the problem to be solved
  - Making decisions
  - Designing solutions
  - Implementing
  - Testing, evaluating and maintaining
  - Social and ethical issues

**Yearly Examination - Personal and Group Systems and Projects (20%)**
- Personal information systems
- Group information systems

The preliminary section of this course will be taught over the first 3 terms, to be followed by the HSC section taught over the following 4 terms. The preliminary section will be assessed using a range of tasks, including - project work, tests, portfolios, presentations, practical work, assignments, demonstrations, etc.

The HSC section will be assessed using a similar range of tasks for the School assessment part, and via the HSC written examinations for the External part. The HSC exams are to be 3 hours in duration - with compulsory sections based on the core, and one option section where candidates must answer two questions.

### IPT Page Formatting

Unless otherwise instructed, students are to use the following format for all exercises, assignments, etc. they hand in for marking -

- margins - all 0.5 inch
- line spacing 1.5
- font - Palatino - 12 point
- style - plain text with bold and/or italics for highlighting
- footer included with full name correctly spelled and page number if multiple pages

Make sure to use the spell checker **before** printing your answers.
An information system has a purpose in that it addresses the need(s) of a group or an individual. It performs the information processes of -

- collecting
- storing/retrieving
- displaying
- analysing
- processing
- transmitting/receiving
- storing/retrieving

Information processes involve computer and non-computer activities. For the processes to occur, participants (people), data/information and information technologies (hardware and software) are required.

The purpose of an information system defines who it is for and what they need. Information systems give rise to ethical issues for people directly and indirectly involved with them. They have a social impact on the environment in which they operate.

An Information System

The following diagram tries to represent a typical information system in the context in which it operates -

- the environment - is everything that influences and is influenced by the information system and its purpose. For a system it is continually changing.

- the purpose - is the reason for the system’s existence, and is determined by who the information is for and the need they have.

- the Information System - a set of information processes requiring participants, data/information and information technology to take place. They are created for a purpose and operate in a particular environment.

Who the information system is for will include individuals and organisations involved with the common goal - such as business and maybe some government agency concerned with that business.

- participants are the people who carry out the information processes within the information system (sometimes called users - though direct users and not customers or indirect users))
- data/information is the raw material that information processes deals with
- information technology is the hardware and software used in information processes

These terms and ideas will hopefully become more meaningful in the following example of such an information system.

Example - Joe’s Video Rental Shop

Joe runs a local video store and rents out videos, mostly overnight but also weekly to the people of Fairfield West. He also sells some videos, drinks and snacks from the store.

He purchases videos from the distributors for around $80 each and rents them for $4 per night, with weeklies at $7. The store has over 4000 video titles (up to 20 copies of some titles) and around 800 regular customers. Each video has a barcode to identify it (individually and for the title) and each customer has a membership card which also contains a barcode.
In this example the terms defined on the previous page include -

- the environment - the income of the people
  - interest rates for home and other loans
  - rental prices for videos
  - purchase price of videos
  - government taxes (such as the GST)
  - other video store prices
  - video store promotions
  - type of weather

- the purpose - who - Joe and his workers
  - needs - identify customers
    - - identify videos
    - - track videos
    - - book videos
  - - customers
  - - day of video return
  - - cost of video rental
  - - book new releases

- the participants - workers
  - suppliers of videos, food and drinks

- the data/information -
  - customer information
  - video identification
  - dates in and out of videos
  - overdue videos
  - rental prices
  - purchase price of videos

- the information technology -
  - bar coding of customer cards and videos
  - computers, bar code scanners, printers, etc
  - database software for customers, videos, other stock
  - video tape cleaning

**Information to Process - Joe’s Video Store**

Ten years ago, when Joe first opened the store, he could not afford a computer and did not understand computerised information processing. So he developed a manual card file system to process the data/information.

What he did in those first few years was -

1. have people fill in a form with their details and show some form of written identification
2. he then typed out a card showing some of the store details, an ID number and customer name - see example below.
3. for the videos, he attached a sticker with title and number when each was first purchased
4. he then made a card for each video with title and number and put it in a pocket on the video case, it had spaces for customer number and return date to be written in - see below.
5. when someone rented the video, the card was removed from the pocket, the renter’s number and return date put in, and the card was put in a file box.
6. he added the number of the video and the rental date to the customers card.
7. when the video was returned the card was put back into the pocket and returned the video to the shelves. The return date was checked off the customer card.
The renting of a video is shown in the following diagram using Joe's manual information system -

If a customer rang Joe to see about the availability of a particular video, he looked up the number and checked through the box of cards for videos out to see whether the video(s) is already out or not.

Joe kept a tally of the number of videos rented in a day to check the balance of the till. Any customers more than 2 days overdue in returning a video received a short letter requesting the return of the video and indicating that a fine has been imposed of $4 per day.

Joe spent hours per day putting the cards back in order, checking the card boxes and checking the videos on the shelves to see the more and less popular ones. At busy times he had to employ extra casual workers to assist the renting process, and often lost track of the the number of videos being rented due to the number of customers.

The Data

Joe's card system was critical to the success or failure of the store in those early years, so that he could run the business efficiently and profitably. The cards stored all of the required data and the system of storage provided Joe with a means to retrieve the necessary data when required.

However, the large number of videos and customers on the card system actually prevented Joe from accessing vital information for the best running of his business. Details like the most borrowed videos, the time that they are so popular, etc. would all aid Joe in making important and profitable decisions. Obviously all of this pushed Joe into establishing a computerised information system.
Exercise 1 - complete each of the following -

1. (a) Why did Joe need so much paperwork in his early card system?
(b) What are the 3 types of cards used in his system?
(c) List at least 6 things that a computerised information system would improve on, compared to the card system, and describe how for each one?

2. What steps would Joe have taken to find answers to the following in his non-computer system -
(a) the names of videos starring Pierce Brosnan?
(b) the most popular type of video? (Action, horror, western, etc.)
(c) the name of the customer who has rented the most videos?
(d) the names of videos hardly ever rented?
(e) how many copies to buy of a newly released video?
(f) the names of customers who return videos late most often?

3. Research your local video store (using a designed and printed out survey sheet) to find all the information to complete -
(i) a one page information system diagram - as seen in general form on page 2. All parts need to be filled in, in detail, for Joe's video store. Blank form attached to this booklet.
(ii) a list of hardware and software used by the video store information system(s)
(iii) a summary of how issues are handled - accuracy of data, copyright, privacy and ethical issues (see pages 17 - 20 of these notes for details)

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

Information Processes

As previously listed, the seven processes involved with information are -

1. collecting is the process that
   - defines the required data
   - identifies the source of the data
   - determines how the data will be gathered
   - gathers the data

2. organising is the process that
   - determines the format in which data will be represented in the information system

3. analysing is the process that
   - interprets the data, transforming it into information

4. storing and retrieving is the process that
   - saves data and information for later use
   - obtains data and information previously saved

5. processing is the process that
   - manipulates data and information

6. transmitting and receiving is the process that
   - sends and receives data and information, within and beyond information systems

7. displaying is the process that
   - decides the form in which the information will be displayed
   - displays the information

Data versus Information

Raw information gathered from whatever source(s) is normally called data, since on its own it is often quite worthless and may well be useless by itself or in its current format.

For example, if we collect a million addresses, the house numbers may be stored in one column, the street names in another and the suburb in a third. A section of the list of house numbers might look like - 34, 567, 27A, 67, 11, 3546. - this is raw data and is obviously of no use to anyone as it is.

Only if this is combined with the rest of the address data does this become meaningful and useful and is then referred to as information.
Therefore the seven processes described above contribute to -

<table>
<thead>
<tr>
<th>Collect</th>
<th>Organise</th>
<th>Process</th>
<th>Store and Retrieve</th>
<th>Transmit and Receive</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA</td>
<td></td>
<td></td>
<td>INFORMATION</td>
<td></td>
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</tbody>
</table>

Exercise 2 - complete each of the following -

1. For Joes Video Store, type out a list down the page, of each of the activities needed to be performed in the running of the business - from new customers, to daily totals, video popularity, profits, number of employees, etc. (your answers to the questions of exercise one should provide most of the activities). This list should contain at least 20 entries. Save file as Ex 2.

2. Group each of these activities under one of the seven information processes headings - as listed on the top of page 2. See pages 21 and 22 of the Powers textbook for ideas.

3. Investigate the following diagrammatic methods of representing the flow of data - Gantt chart and Flowchart. Draw an example of each diagram type to represent the flow of data and information through the video store - flowchart for borrowing a video, Gantt chart for computerising the store.

The Telephone Book is another information system, and you should be experienced with the use of the simple White Pages phone book, and most will have used the Yellow pages. This traditional system is generally the easiest to meet the need of locating the telephone number of a person. Consider one or both phone books to answer the following -

4. What are the information processes involved with the phone book - from all seven heading areas?

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

The Nature of Data and Information
Data is viewed as the input to an information system. Therefore data may be input to the system in a number of formats or in the form of media involved, namely -

Data Types - • image  • audio  • video  • text  • numbers

An example of these Data Types - may be a Hypercard stack produced by a student on a particular topic. The student designs a background (an image), types in directions for the user (text), adds pages numbers (numbers), adds a range of sounds (audio) and a number of graphics (images).

When this stack is completed and running smoothly we would no longer consider it just data, but would say it contained Information on the set topic.

View the HyperCard stack entitled Bird Stack to see such an example.
Exercise 3 - Data and Information

1. For each of the following first letters of the alphabet, complete each one to produce a word for a type of data and the actual data which applies to you (e.g. AGE as shown below) and 17 if that is true - and make it accurate please. Type them into a spreadsheet and save the file as Ex 3.

<table>
<thead>
<tr>
<th>TYPE</th>
<th>YOUR DATA</th>
<th>TYPE</th>
<th>YOUR DATA</th>
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</thead>
<tbody>
<tr>
<td>AGE</td>
<td>.................................</td>
<td>L.</td>
<td>.................................</td>
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<tr>
<td>A.</td>
<td>.................................</td>
<td>L.</td>
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<td>M.</td>
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<td>B.</td>
<td>.................................</td>
<td>M.</td>
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<tr>
<td>B.</td>
<td>.................................</td>
<td>N.</td>
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<tr>
<td>C.</td>
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<td>O.</td>
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<tr>
<td>C.</td>
<td>.................................</td>
<td>P.</td>
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<tr>
<td>D.</td>
<td>.................................</td>
<td>Q.</td>
<td>.................................</td>
</tr>
<tr>
<td>D.</td>
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<td>R.</td>
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<tr>
<td>E.</td>
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<td>R.</td>
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<tr>
<td>E.</td>
<td>.................................</td>
<td>S.</td>
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<tr>
<td>F.</td>
<td>.................................</td>
<td>S.</td>
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<tr>
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<td>U.</td>
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<td>V.</td>
<td>.................................</td>
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<td>J.</td>
<td>.................................</td>
<td>W.</td>
<td>.................................</td>
</tr>
<tr>
<td>K.</td>
<td>.................................</td>
<td>Y.</td>
<td>.................................</td>
</tr>
</tbody>
</table>

2. From your answers to part 1, organise MOST of these Types into 3 groups (of at least 6 types per group) and SORT them out on the spreadsheet. Add a meaningful title to each grouping.

Questions - type in and answer the following -
1. How many other data types can you think up for the letters A and S? List as many as possible.

2. This data (if collected for all of year 11) would be most easily be manipulated using some type of computer software. What type of program would this be? Why?

3. When does data become information? What actually causes this change?

Data -> Information -> Data
You would probably consider that once data had become information that it would remain so forever. This is true within the information system that you are dealing with (e.g. Year 11 Student Information system) however, if we then include the Year 11 Student Information into the Westfields Student Information system (i.e. Years 7 to 12) then the Year 11 information actually reverts to being data for the whole school information system.

Other such examples may include -
• bus pass information -> student transport data
• credit card information -> financial planning data
Data Overload
In our daily lives, each of us absorbs so much data from television, radio, newspapers and magazines, billboards, conversations, etc. that we cannot possibly pay attention to all of it. Therefore a useful definition might be -

INFORMATION IS DATA WHOSE FORM AND CONTENT ARE APPROPRIATE FOR A PARTICULAR USE.

Thus with our continual deluge of data every day, each person will only consciously process those parts which are appropriate at that time. So, in fact, the information you receive from this lesson may be slightly (or not so slightly!) different for each person - despite the fact that the data was all identical.

Example: Ford lover versus Classic car lover versus Truck lover

![Diagram](data_overload_diagram.png)

This diagram shows both how data may become converted into information and how the information may add to the user's overall knowledge which will effect the converting as the situation may change.

**Exercise 4 - Personal information systems**

[A] 1. Use database software to enter -
   - your data types (these will be the field names)
   - your data (field entries) from Exercise 3.

2. Save the database file as MY DATA

3. Use the columnar format to display and print out the 3 groups you listed in Exercise 3.

**Questions** - type in and answer the following -

1. How does the use of a database make the manipulating of the data easier? List the benefits. Are there any things made harder rather than easier? If so what?

2. If we take your groups from Q3, and examine it, is it data or information? Why?

3. If we take the same group from Q3 and combine it with everyone else’s in the school, is it data or information? Why?

4. Describe, in some detail, TWO examples of other information systems (not ones given as examples) that use information from another information system as data.

To be completed and handed in by - ..................................................
1. Using spreadsheet software, design an information system to use to invoice students for the Year 12 Farewell tickets. A $10 deposit must be paid (by end of Term 1) and the remaining $60 paid (by the end of Term 3).

2. Produce a report to demonstrate the following phases of your planning - understanding the problem, making decisions, designing solutions and implementing. You will need to illustrate that you have gone through these phases in a half to one page report on the use of the information system.

To be completed and handed in by - ............................................................

Digital Representation of Data

Data is accessed in a variety of ways, some from surveys or other hand written text forms, others from computer sources (programs, files, Internet, etc.), while still others are from photographs, videos, recorded sounds, etc. Therefore the raw data begins in a variety of formats which, if left as is, would be very difficult to combine in order to gain any real use from them.

A user might cut out photographs or pictures and paste them onto word processed pages and then photocopy them to combine several of these, but this would still leave out sounds, videos, etc. Therefore all of these different forms of data need to be digitised.

Digitisation involves coding the data as an equivalent (or approximately equivalent) set of numbers, that the computer can use.

The coding technique could follow any given set of rules - for example the word “bad” could be coded as 22 - 21 - 24 - if the coding rule was to add 20 to the position of each letter in the alphabet. Similarly, a picture could be digitised by dividing it into tiny dots on a grid and and assigning a number to represent the colour and intensity of the dot.

Digital and Analog

A digital value is one that can only be ON or OFF - like the electricity flowing through a light globe. The On is given the value 1 and the OFF the value 0, and a series of ON/OFF pulses can be used to count using binary numbers.

Example - the pulses ON OFF ON OFF would represent the binary number 1010

A digital wave

1 0 1 0

An analog signal is not restricted to just ON or OFF, but can have any number of values. For example, on a normal car speedometer, any number may be indicated as a vehicle accelerates and slows down in traffic.

Example - 3.142 might represent the value of \( \pi \), or the number of volts going through a wire.

An analog wave

Note - since people have great difficulty working in only 0’s and 1’s, the binary is generally converted for coding
- usually into either ASCII (pronounced ass-kee) a 7 bit code for symbols, letters and numbers, or EBCDIC an 8 bit code for the symbols, letters and numbers.

**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 \( 1 \times 1000’s + 8 \times 100’s + 2 \times 10’s + 3 \times 1’s \)

<table>
<thead>
<tr>
<th>(10^4)</th>
<th>(10^3)</th>
<th>(10^2)</th>
<th>(10^1)</th>
<th>(10^0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>1000</td>
<td>100</td>
<td>10</td>
<td>1</td>
</tr>
</tbody>
</table>

  place value

<table>
<thead>
<tr>
<th>(10^0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

  decimal

- 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>(2^4)</th>
<th>(2^3)</th>
<th>(2^2)</th>
<th>(2^1)</th>
<th>(2^0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

  place value

<table>
<thead>
<tr>
<th>(2^0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

  binary

So \(1010 = 1 \times 8 + 1 \times 2\)

= \(8 + 2\)

= 10 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>(2^6)</th>
<th>(2^5)</th>
<th>(2^4)</th>
<th>(2^3)</th>
<th>(2^2)</th>
<th>(2^1)</th>
<th>(2^0)</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>
</tbody>
</table>

  place value

<table>
<thead>
<tr>
<th>(2^0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

  binary

This is \(1 \times 32 + 0 \times 16 + 0 \times 8 + 1 \times 4 + 1 \times 2 + 0 \times 1 = 38\)

So 38 decimal = 100110 binary

And 49 decimal = 110001 binary

**Exercise 5**

Complete each of the following -

1. 11101 as a decimal would be = ............... 2. 11010 as a decimal would be = ............... 3. 101101 as a decimal would be = ............... 4. 110101 as a decimal would be = ............... 5. 1101011 as a decimal would be = ............... 6. 52 in binary would be = ............... 7. 71 in binary would be = ............... 8. 123 in binary would be = ............... 9. 199 in binary would be = ............... 10. 317 in binary would be = ...............
has presented a number of problems (for this booklet, all of the text occupies less than 100k of disk space, while the black and white pictures take up 10 times that storage space, and one high resolution photograph would not fit on a disk at all).

Since the technology has allowed digitising (to be done, stored and transmitted) many uses have been found, from old movie films that were deteriorating so fast that they would have been lost forever within a few more years, to multiple telephone books being stored on just a few CD’s for the whole of Australia.

Multimedia presentations can now be produced by students using normal computers and programs which cost only one or two hundred dollars.

NOTE - see examples of student presentations on HyperStudio.

Current Digitising Trends
Some industries or groups have made extensive use of digitised data, while others have yet to adopt the use of the technology. You will be finding out about -

1. Newspapers on the Internet
   Rather than rely on the various printings of a number of editions of the daily newspaper (from say midnight through to 6 a.m.) an Internet version of the newspaper can be continually updated. Due to the text, diagrams and photographs being digitised, the Internet format (called HTML) is easily achieved.

Exercise 6(i) Complete each of the following -

1. How many newspapers publish on the Internet? Name several of them and their country of origin.
2. Do any Australian newspapers publish on the Internet? If so which one(s)?
3. Would Internet newspapers have any disadvantages for production or use?

2. Telephone System
   Telstra has installed and tested fibre optic cabling for digital digital phone calls in several suburbs (near Centennial Park in Sydney and another in Melbourne) in the last few years. At last report, they plan to install such cabling only in new areas rather than replace any more established areas.
   ISDN phone lines (Integrated Services Digital Network) are available to any user prepared to pay the installation and higher usage costs. All government schools have been given an ISDN line for Internet access - so Westfields SHS will have multiple use over the network.

Exercise 6(ii) Complete each of the following -

1. Why would Telstra not be replacing the old phone network with fibre optic cabling for digital telephone calls right now?
2. Why would people want digital phones?
3. Why would ISDN phone lines cost so much money?
4. In what ways would a digital telephone system have disadvantages?

3. Video on DVD
   Just as movies have been sold on video disks, and video clips are included on CD’s, so full feature movies are now available on DVD (Digital Versatile Disk).
   For example South Park ($40), Austin Powers ($35) and Titanic ($45) are on sale on DVD from department stores now, as well as rentals of some movies.
4. Facsimiles
FAX (for short) machines scan a page (text and/or pictures), digitises its image and then transmits this image to another location over the phone lines to another machine where it is printed or stored on a computer for later use.

5. Media Retrieval Management
As the volume of data in any organisation increases, so the locating and using of that data becomes more and more of a problem. No matter how the data is stored - hard drive, CD, tape, DVD, etc. being able to locate and retrieve that data at any given time can become quite difficult.

How to record the type of data involved, is a problem in itself, as for example a TV station might need 10 seconds of video on some personality saying they will do something, and then some facts and figures on what actually happened - and this might be from 5 years ago. Just being able to store video footage so you could later find parts would be a problem with categorising and labelling for a start (is it filed under name or topic or date - or all of them?). Digitised data at least makes searching for particular facts more likely than in the old days of dragging out old dusty boxes of records in basements, but being quicker to try and less dirty does not necessarily locate the required item(s) of data.

Exercise 6(v)
Complete each of the following -

1. Why would the retrieval of digital data be quicker than for paper files?
2. What other advantages would computer searches have over manual ones?
3. What potential disadvantages would digital retrieval have?

To be completed and handed in by - ..................................................
Classification of Information Systems

Information systems are basically divided into two types -

- personal - where the user is an individual
- group - where a number of people use the same information system

If you put you stamp or coin collection data onto a set of cards or a computer database for example, and you were the only person to use this, then this would be a personal information system. You would not need to go to any trouble over securing it, or limiting access, etc. since there would be no other users. If Joe ran a one man store for his video shop, then it would be a personal information system.

However, if a group information system has twenty or maybe twenty thousand users, then other considerations must be allowed for. Here the participants in the information system work as a group and access and security for the system become important. Since Joe has employees who also use the same information system, it is a group system.

Exercise 8 Complete each of the following -

1. For each of the following examples, state which of the information systems -
   - individual or
   - group each one is, and then describe why you think this.

[a] At the end of each day Mr Lambe has the pink slips that the teachers complete for unexplained absences from classes each period of the school day, collected. He uses the file for absences from roll call and the list of sick or injured and after comparing these, ends up with a list of students to interview to find out why they failed to attend certain classes. He uses a computer to compare the files and generate the list of students to be interviewed.

   Type - ..................................................
   Reasons - ......................................................................................................................................................
   ........................................................................................................................................................................
   ........................................................................................................................................................................

[b] The Local Telephone book contains phone numbers for residents and businesses in the local suburbs, both as white and yellow pages. This means that it is less bulky to store and requires less time to locate people and businesses both for their telephone numbers and for their addresses, compared to the whole Sydney versions.

   Type - ..................................................
   Reasons - ......................................................................................................................................................
   ........................................................................................................................................................................
   ........................................................................................................................................................................

2. Find a small newspaper article about Computing or Information Technology to scan in (text scanning), then a picture which matches the article to scan in (graphic scanning). Word Process these into a one page document (two column, 12 point size) and laser print it. It is planned that the best of these may be added to the school intranet.

   Question - Which laws (if any) may be broken in producing these documents?

   To be completed and handed in by - ..................................................
Group Project

You need to organise into groups of 4 (at neighbouring computers) to complete this task -

Westfields (as a Sports high school) has been given the task of organising the paperwork for 6 of the events for the Olympics, and these are -
(i) Discus (mens) (ii) Volleyball (womens)
(iii) Platform dive (womens) (iv) 1500 metres swimming (mens)
(v) Double sculls rowing (womens) (vi) Middleweight (76Kg) weight lifting (mens)

Your group needs to -
1. research the type of event entry and/or recording form(s) needed for the event you are given, and then design and print it/them out on the laser printer.
2. produce an advertising sheet A4 size to be pasted up both around and outside the arenas to assist spectators with times, location, etc. for your event.

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

Social and Ethical Issues

Philosophers have put forward theories of ethical behaviour for thousands of years, and these could be summarised down to -

• people should act in ways that maximise the overall good of society
• people should make choices to maximise their own personal outcomes
• treat other people well

Due to employment and work practice, a range of social considerations also needs to be kept in mind, both for the work being done and the information being created and used.

The important social and ethical issues for information systems therefore include -

- Privacy of the individual
- Security of data and information
- Accuracy of data and information
- Changing nature of work
- Appropriate information use
- Health and safety
- Copyright laws

Individual Privacy

This is the ability of an individual to avoid unwanted intrusions into personal time, space and property. Information technologies provide numerous opportunities to intrude on others from computer-generated phone calls from charities while you are eating dinner, to unwanted advertising faxes and electronic junk mail that use up paper or disk storage space.

The optional caller ID function in current telephone systems raises some questions about individual privacy - who should be favoured the caller or the person called? The person called would like to eliminate some calls, while the person who anonymously calls a business to get price information does not want to automatically become part of that business's mailing list. Thus ID blocking has had to be added to get over such problems - but you have to remember to activate this first. Answer phones have of course been used to screen incoming calls for some years, with the user only 'picking up' if they want to speak to the caller.

The concept of privacy differs from culture to culture though, from the group-oriented Japanese who really had...
no term for privacy, to the Americans who have laws such as one which states - “Rights to honor, personal and family privacy and one’s own image are guaranteed ... The law shall limit the use of known information for the sake of guaranteeing honor and personal and family privacy of citizens and the full exercise of their rights.”

Security of Data and Information

Most people seem to feel that they should not be monitored without consent, and that personal information they provide should be treated confidentially. However widespread use of computerised databases for example makes privacy a much broader issue than in the past. Each of us leaves a trail of computerised data every time use a credit card, write a cheque, use medical insurance or subscribe to a magazine. Data from a number of sources can be combined to give a very detailed picture of how you live, whom you associate with, what your interests are, and how you handle money. For example, for $5 New York state sells a driver’s personal data including height and weight, driving record, license revocations, vehicle ownership and accident and police reports.

NOTE - See excerpts from the video - You Have No Secrets

It is hard to know what personal information exists in these databases, whether it is correct, or who is actually using that information. It is not clear what information is held on government databases or whether that information is more of less threatening than information on private databases. No matter the purpose of an information system, there is no way to guarantee that the information in the system will be protected from someone intending to use it for an illegal or simply inappropriate purpose.

Scenario -

(i) you are in Joe’s video store and see a person steal a blank video tape
(ii) the same person rents a video from Joe’s store and copies it

Both situations involve theft, but the nature of the theft seems different to many people. In (i) the person stole a physical object (the tape) while in (ii) the person stole the information. Although the information is more valuable than the the blank tape, many people act as though copying the information is not theft.

It has been estimated that 97% of computer software used in Thailand has been copied illegally, compared to 40% in the USA, 80% in Spain and 25% in the United Kingdom. Pirated CD’s may make up 50% of total sales according to some music industry figures. Legal issues concerning property rights to information arise in many areas, such as the departure of employees to join the competition, employees who are sacked, etc. Should knowledge from one company travel to another with an employee? Can some ‘forget’ secret business plans, formulas, etc. from say Coke when they join Pepsi?

Computer crime is still a reasonably new area for the legal system, and so called ‘white collar’ crimes involve theft, sabotage and vandalism. Physical and software security measures are common these days, but the challenge still seems to attract “hackers” and the penalties are generally much less severe than for other types of crimes.

Exercise 9(i)

- think about the following before typing answers to them -

1. To what extent should your medical records be available to your employer?
2. To what extent should any government or private agency be able to get lists of -
   (a) what videos you hire
   (b) what items you purchase from any store
   (c) your financial records from the bank
3. Should there be a limit to the types of information others can collect about you without telling you they are doing so? Why and how?
4. What is the NSW Freedom of Information Act about?
5. What does the term intellectual property mean? What consequences does it have for computerised
information?

6. What steps can be taken to secure information on a computer system (which is connected to the Internet), to prevent theft, alteration, sabotage and vandalism, etc. from -
   (i) unauthorised intrusion from outside the organisation
   (ii) unauthorised intrusion from inside the organisation

To be completed and handed in by - ..........................................................
Changing Nature of Work
The technological revolution of the last 20 years has had quite definite effects on the type of jobs many people perform these days. Some jobs and job levels have virtually disappeared, even in the information technology industry. Clerical and secretarial staff numbers have reduced, as have some middle-level management positions, with both computer programs and faster computers reducing the need for as many people to perform the tasks. Thus information systems can affect the meaningfulness of work, firstly in that they can be set up to either expand or limit the scope, variety and significance in the user’s job, and also that the work being done on a computer may affect the way people experience their work.

Variety and Scope of work - the range of different things people do at work is termed task variety and most people desire variety rather than getting bored with limited repetitive tasks.
Task scope is the size of the task compared to the overall purpose of the organisation, and again most people prefer to do a wider range of tasks than a very narrow one.
Information systems reduce variety if they force the worker to focus on a small aspect of work.

Example - an insurance claims analyst used to get information about each account from the paper filing system, checked contract limitations, discussed some cases with colleagues, completed the necessary paperwork and returned the files to the filing cabinets.
With the computerised system, most of the information is already on the computer, which runs programs that assured claims are processed in a standard way. The analyst now spends more time entering data into the computers and less time using their knowledge and judgment. Within the first year, the new system had increased productivity by 30 to 40 %, but at the cost of job satisfaction for the analyst - the work is limited, repetitive and abstract since the worker only deals with the computer not the people involved.

Appropriate Information Use
Just because someone knows something (whether it be about a person or a place or event), that does not mean they have to share that information with everyone else. This could include the directions for making a bomb appearing on the Internet for school children to find easily or private photographs taken over the fence into someone’s back yard. Ethics rule this side of information systems, with the good of society having to be weighed against the gain for the individual - generally with a range of results.

Exercise 10 - read through the following ethical dilemmas and having considered them, type in and print out your solutions -

1. The supervisor of twenty telephone attendants has received numerous complaints lately and is considering secretly listening in on the attendant’s phone conversations to monitor their service. Is this right or wrong? Why?

2. A software engineer working for a city government prints a file while debugging a computer program and notices that a large number of unpaid traffic tickets have been cancelled for several individuals, one of whom is an elected official. Is it right or wrong to publicise this? Why?

3. A manager under severe competitive pressure is thinking about installing a new computerised system that will eliminate the jobs of five people who will probably be unable to get equally good jobs anywhere else. Is this right or wrong? Why?

4. A programmer for Microsoft is unhappy with the way the latest system software has been tested and despite discussions with management about not offering it for sale is overruled. He is thinking of going to the newspapers with his complaints. Is this right or wrong? Why?

5. John Laws and Alan Jones both received substantial amounts of money to publicly endorse certain companies, and not to criticise them over the radio. Is this right or wrong? Why?

To be completed and handed in by - ..........................................................
**Health and Safety**

Researchers have found relationships between psychological well-being at work and physical health. People with active jobs involving initiative, discretion, and advancement have the lowest heart attack rates - even though these jobs often involve stress. People in high strain jobs at the bottom of the job ladder have the highest heart attack rates.

Information systems, as part of the job environment, therefore have an impact on health - a positive one if the system contributes to a person’s feelings of initiative, discretion, advancement and control. **Information overload** is a contributor to stress levels, with e-mail, faxes, and personal computers bringing the work faster and people expect faster and faster responses.

<table>
<thead>
<tr>
<th>Characteristics of a Healthy Job</th>
<th>Meaning to the Employee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skills</td>
<td>You can use and increase your skills</td>
</tr>
<tr>
<td>Meaningfulness</td>
<td>You understand and respect the importance of your work and understand how it fits into the organisation’s work</td>
</tr>
<tr>
<td>Autonomy</td>
<td>You can control your work and are not made to feel childish by the methods of supervision</td>
</tr>
<tr>
<td>Social relations</td>
<td>Your job includes collaboration and communication with others</td>
</tr>
<tr>
<td>Psychological demands</td>
<td>Your job includes both routine and new demands and you have some control over what demands to accept</td>
</tr>
<tr>
<td>Personal rights</td>
<td>You feel that you appropriate personal rights and reasonable ways to settle grievances</td>
</tr>
<tr>
<td>Life outside</td>
<td>The job does not not interfere excessively with your ability to participate in family and community life</td>
</tr>
</tbody>
</table>

**Copyright Laws**

Some people say that there have been no real new ideas for centuries, just the recombining of old ideas. Information systems in all of their forms allow people access to millions of pieces of other people's work and copyright has become a very difficult area to legislate for and particularly to police.

When printed books were the main source of material, say 20 years ago, laws could be put in place where people were legally restricted to certain percentages of pages which could be photocopied. In those days photographs were admissible evidence in court - before they could be digitally altered and reprinted to prove whatever you wanted to show. And so it is these days with text, diagrams, pictures, etc.

Anyone with a computer and Internet connection, or access to CD's or disks of art work can copy and alter someone’s original work, and pass it off as their own. The television commercial of the young man showing the young lady pictures of him with many celebrities (Nelson Mandella, Prince Charles and Mike Tyson to name a few) shows how the computer and printer technology makes this whole procedure of altering the data so easy.

**Exercise 11** - research the following on the Internet and answer them -

1. What are the copyright laws of Australia considering printed information?
2. What are the copyright laws of Australia considering digital data and information?

To be completed and handed in by - ..........................................................
People Affected by Social and Ethical Issues
These include the
- participants within the information system
- people with the purpose
- people in the environment

All of us are affected to some degree by these issues, whether it be directly as participants or users, or indirectly as simply people in the environment.

System Designers
These are the people responsible for creating information systems that are socially and ethically acceptable. If security and accuracy of data are not planned and work and safety issues not considered, then the operation of the system will not be as successful as it should be. Government legislation to protect the individual can only go so far, and people’s rights to privacy and appropriate use of information tend to ultimately fall back on the design of the information system - planned security measures will always be more successful than attempts to fix problems after they have occurred.

The Range of Information Systems
Information systems are commonly thought of as common for the fields of observation and recording - such as customer and video files for Joes video store or a program to run a sporting carnival, but they are also used in other fields.

Other such fields where information systems are used include -

- **Product Design** - where CAD (computer aided design) systems are now used for many of the design areas such as cars, yachts and space vehicles, (sometimes followed by CAM - computer aided manufacture).

- **Manufacturing** - where applications range from keeping track of inventory (the products in the warehouse for example), and through the use of barcodes and automatic sensors all products can be tracked through all phases of manufacture, packaging and storage.

- **Telecommuting** - where workers spend some or even most of their work days away from their actual place of work, with the work coming to the worker rather than the other way around.
Exercise 12  read through the following and comment on the ethics or social aspects of each -

UK to spy on the Web

ONE in 500 telephone connections to the Internet in Britain will be monitored under Government proposals to extend surveillance powers to the Web. The plans, outlined in a Government document, require Internet service providers to have facilities to intercept one telephone in every 500 that they operate - roughly 20 times the level required in other European countries.

According to a report in The Economist, it would require the Home Secretary to issue 10,000 tapping warrants a year, five times the current level. Police and intelligence agencies will be able to harvest raw data streams containing e-mail or text and pictures. Home Secretary Jack Straw has argued for a need to intercept communications between terrorists and criminals.

The Home Office claims law enforcers now have few powers to fight the increased use of encrypted messages on the Internet to arrange drug deals or pass on paedophile messages. To sift through the vast quantities of tapped data, the Government will also set up a $50 million specialist code-cracking unit using staff from the Government's communications centres at GCHQ, the National Criminal Intelligence Unit and code-breakers from the private sector.

But the code-breakers admit that encrypting technologies would take the most powerful computers several weeks to crack, by which time the information would be redundant. The unworkability, cost and technical ignorance encompassed by the proposals have united the Internet industry with privacy campaigners.

Demon Internet's adviser, Richard Clayton said: "If the Government wants this information they should pay for it." Malcolm Hutty, director of pressure group Liberty, said the proposals were "hideously expensive, technically unworkable and a threat to civil liberties."

From Robert Ubilig in London

Baby auction taken off Net

WASHINGTON: A baby has been offered for auction on the eBay Internet site, a magnet for World Wide Web auctions, but drew no bids.

The starting price for the baby, a boy to be born late this month, was set at US$100,000 (A$156,000). An eBay spokesman Russell Brady, who was made aware of the advertisement during a telephone interview, said the offer would be removed from the site.

It disappeared several minutes later. Mr Brady said the company relied on trust in its "community of sellers".

According to the advertisement for the unborn baby, he is in good health and his parents are law students in Chicago whose families have no medical problems. The advertisement also said a judge would preside over the transaction.

Selling babies is illegal in the United States.

To be completed and handed in by - ..........................................................

Global Information Systems

For some of the larger information systems, the purpose may involve international organisations or at least one international participant. This includes companies with branches in a number of countries as well as companies which import from or export products to other countries.

The significance of these systems is increasing and a whole range of issues come into play, from different cultural aspects (for example siesta time in some countries), different spoken and written language concerns, and all the other differences such as driving on a different side of the road, buttoning shirts differently, using different sized paper, different date formats, using different units for measurement and currency (the Eurodollar for example will cost the world billions of dollars) etc.

The laws operating in different countries presents a whole range of issues to all forms of information systems, as seen by both countries and agencies trying to regulate and officiate over the data sent across the Internet. The data may be sought by a student in Australia, and could be located on a file server in Russia, but it will have to...
travel through a variable number of other countries to get here. Which set of laws do you subject the data transmission to? Those of Australia (or even NSW) or Russia, or any or all of the countries the signal shave travelled through?

**Examples** -

1. In 1989 the French government stopped Fiat from transferring their French personnel records to its factory in Italy because privacy laws there did not meet French regulations.

2. When Kentucky Fried Chicken wanted to operate its corporate distribution system in Mexico, they found they could not use their system because the phone lines available through Telmex could not provide enough reliability in transferring information on sales from individual stores to KFC headquarters.

3. When DHL the international courier company set up new account numbers in China, none could begin with ‘four’ as the spoken word sounds a lot like the word for death.