YEAR 11 ATAR COMPUTER SCIENCE

REVISION BOOKLET

2021

Semester II

Name: _____

System Analysis and Development

Computer System Overview Exercises

1. What is hardware?

   Physical parts or components of a computer.

2. Write a definition of software.

   Software are the programs, or step-by-step instructions that run

   the computer.

3. List the four main sub-systems of a computer system.

   Storage, input, output, processing.

4. What does the CPU do?

   The CPU processes raw data into meaningful, useful information.

   It interprets and executes programs instructions and communicates

   with the input, output and storage devices.

5. List four input devices.

   Keyboard, mouse, bar-code scanner, joystick, microphone.

6. Which input device would be most useful for a blind person to use to communicate with the computer?

   Voice synthesizer, microphone, Braille keyboard for input,

   speech recognition devices

7. Which input device can be used to create a digital photo for computer use?

   Scanner, digital camera

8. What does POS stand for?

   Point of Sale

9. Describe a barcode

   A pattern of vertical marks like zebra stripes

10. What is a computer terminal? Give an example of a place that would be using a computer terminal.

    A computer terminal consists of an input device (such as a

    keyboard or bar-code scanner), an output device (usually a screen)

    and a connection to the main computer. Example; supermarket

    checkout

11. List three output devices.

    Printer, monitor/screen, speaker, plotter, projector.

12. What does memory hold?

    It holds data and instructions that will be used by the CPU.

13. List four secondary storage devices.

    USB key, CDs, DVDs, hard disk, SD card

14. What is the difference between memory and secondary storage?

Memory storage is working memory by the CPU. Secondary storage

provides permanent storage of programs and data when computer

is turned off.

15. List one advantage and one disadvantage of using Solid State Drive?

Advantage: **Faster**

Disadvantage: **More expensive, lower storage capacity**

16. What is peripheral equipment?

Peripheral equipment includes all the input, output and secondary

storage devices attached to a computer.

17. What is Plug and Play?

Technology that allows the computer to automatically configure

adapter cards and other peripherals as you install them.

18. What is the difference between a notebook computer and a PDA?

A notebook is a fully functional portable computer. PDAs are

handheld computers that does not always have all the functions

that a computer has.

Storage Capacity

1. Complete the table below and list 2 examples that are expressed in each measurement.

Term	Definition	Examples
Bit	*Smallest unit of storage used by computers*	*1 or 0*
Byte	**8 bits. A byte is normally used to represent one character of text**	**A or 7**
Kilobyte (KB)	**1024 bytes (≈1000 bytes)**	**An email OR a word document with a couple of paragraphs of text OR a graphic sized for the web**
Megabyte (MB)	**=1024 kilobytes (≈1000 KB)** **= 1024^2 bytes**	**A digital photo OR a couple of minutes of a MP3 audio file**
Gigabyte (GB)	**=1024 megabytes (≈1000 MB)** **=1024^2 kilobytes** **= 1024^3 bytes**	**DVD OR a thumb drive**
Terabyte (TB)	**=1024 gigabytes (≈1000 GB)** **=1024^2 megabytes** **=1024^3 kilobytes** **= 1024^4 bytes**	**A hard disk OR about 300 hours of good quality video**

2. Sam has a 2 GB thumb drive. He has already used 730 MB of data and needs to copy a file 825 MB from Joyce. Will the file fit onto Sam's thumb drive? Justify your answer.

730 + 825 = 1555 MB.

1555/1024 = 1.519 GB (≈1.5 GB)

Yes the files will fit onto the 2GB thumb drive.

3. Alice has 160 small images, each of which is 600 KB. How much space do they take up overall in MB?

600 * 160 = 96000 KB

96000/1024 = 93.75 MB (≈94 MB)

Systems Analysis and Development

1. The John Forrest Secondary College Library Loan System is an example of an information system. Consider borrowing a resource (book, DVD).

   For each component, give examples to show that the John Forrest Secondary College Library is an information system.

Input	**1 Student details from Student card** **5 Resource Details**
Processing	**2 Check that the student is a current student** **3 Check that there are no outstanding loans** **6 Record loan details**
Output	**8 Resource so that you can take it home.**
Feedback	**4 Any outstanding loan comments** **7 Date due**

2. Define the each of the following terms:

   System development   **Is a set of activities used to build an information system**

   Prototype   **Is a scaled down system (or part of a system) is constructed in a short time, tested, and improved in several iterations.**

   SDLC   **is a linear system of defined stages each of which requires completion before the next stage is started**

Project Management

1. What is project management and why is it needed?

    Project management is the process of planning, organising and monitoring

   **the project. It is needed so that the project is completed on time and within**

    budget.

2. What are the four main "steps" of project management?

    Plan, Budget, Schedule, Track

3.

Activity	Estimated Duration (length)
Select play to perform	2 days
Run auditions and select cast	6 days
Rehearsals	20 days
Dress rehearsals	2 days
Performances	8 days

a. Use the estimated data provided above to complete the Gantt chart below. Each square represents 2 days. Hint: Can "performances" be done at the same time as "run auditions"?
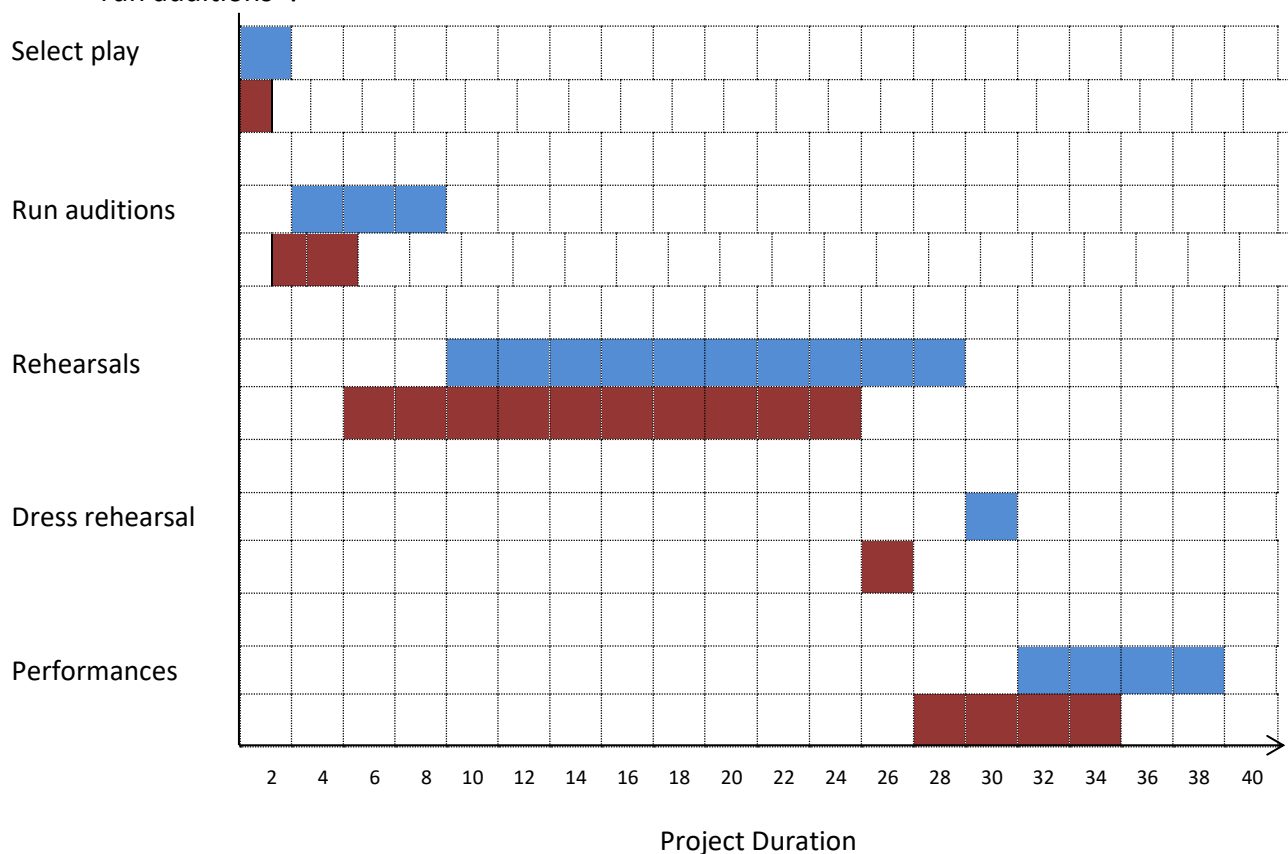
b. How long is the project expected to take? **38 days**.

c. The actual duration for each task is provided below:

Activity	Actual Duration (length)
Select play to perform	1 day
Run auditions and select cast	3 day
Rehearsals	20 days
Dress rehearsals	2 days
Performances	8 days

i. Add the actual duration to the Gantt chart on page 2.

ii. How long did the project take? **34 days**

4. What is a Gantt chart?

A Gantt chart is used in project management to show activities (tasks or events) displayed against time. On the left of the chart is a list of the activities and along the top is a suitable time scale.

Prototyping Exercises

1.   What is prototyping?

Is a system development method where a scaled down system (or

part of system) is constructed in a short time, tested and

improved in several iterations (versions).

2.   List two advantages and two disadvantages of using prototyping.

Advantage	Disadvantage
It can be a quick development method **Errors and problems can be identified and fixed easily** **Users are involved in the development so they will be happy to use the new system** **Users have lots of input into the development, so it will be exactly what they want.** **Because it is quick, it will be relative cheap to construct**	**Sometimes the user will always want extra things added that weren't in the initial design (project will never end!!)** **Users may have different opinions on what improvements are needed.** **It may move closer to the old system if users don't want to change, even though it is not efficient.** **(The old system can do this, I want the new system to also do that)**

System Development Life Cycle Exercises

1. List the 6 stages of the Systems Development Life Cycle (SDLC).

Preliminary analysis
Analysis
Design
Development
Implementation
Evaluation and maintenance

2. Why is a feasibility study carried out before a project commences?

   A feasibility study is carried out before a project begins to work out whether the problem is worth solving and whether a solution is possible

3. For each of the following methods of gathering information, list an advantage and a disadvantage for using the method.

Method	Advantage	Disadvantage
Questionnaire	**Cheap, quick and cover many people** **Anonymous (secret) responses** **Perceived to be more objective**	**Can't tell if false information is being given** **The question may not be interpreted correctly by the reader.**
Observation	**Look at behaviour, not just what people are saying**	**Can cause people to change their behaviour**
Interview	**Gets user involved** **Flexible – can adapt interview to individual** **Good for discovering areas of resistance, misunderstanding** **Body language cues**	**Time consuming** **Separate interviews may lead to conflicting "facts", opinions and priorities** **May need a follow up interview**
Document analysis	**Cheap** **Easy**	**Documentation may be out of date** **Describe procedures may not be not followed**

4. For each of the following situations, recommend a change over strategy to implement the new system.

Situation	Strategy
Giggles' Bentley branch uses the new bookings system. When all problems are fixed then the other Giggles stores will use it.	**Pilot**
The current system has lots of errors and doesn't work properly.	**Direct cut**
Changing from an inkjet printer to a colour laser printer.	**Direct cut**
ABC Printing will start with the electronic payroll component, after two months it will add the accounts component, then two months later will add the online booking component.	**Phased**

5. Trish wants to use the SDLC to produce a Student Marksbook software package that tracks her Computer Science Year 11 students' results. For each of the following activities, indicate what stage the activity would in the SDLC.

Activity	SDLC Stage name
Create the marksbook in Excel	**Development**
Sketch up the layout of the desired marksbook	**Design**
Check whether the College already has a system for recording student results.	**Preliminary analysis**
Identify formulae that will be needed to calculate each student's test average and cumulative total.	**Design**
Investigate what software would be appropriate to use to create the marksbook.	**Analysis**
Add functionality such as online help.	**Development**
Explain to the other computing teachers how to use the marksbook.	**Implementation**
Determine what information has to be supplied to the *School Curriculum and Standards Authority*	**Preliminary analysis**
Add "dummy" student data into the marksbook to ensure that the calculations are working correctly.	**Development**
Conduct a survey of students and parents.	**Analysis**
Check that the marksbook is easier and more efficient to use than writing the marks on a piece of paper.	**Evaluation and maintenance**

Data Flow Diagrams

The Payroll System (class example)

(1.0 Determine hours worked) At the end of each week, each <mark>employee</mark> submits their time cards with their *start time and finish time*. The payroll clerk uses the time cards to determine the *Hours Worked* by an <mark>employee</mark> and enters this data into the **Time Card File**.

(2.0 Calculate Gross Pay) The clerk then checks the **Employee Card File** to determine the *Pay Rate* for the employee, calculates the *Gross Pay* and records the amount in the **Pay Book**.

(3.0 Calculate Tax Amount) The clerk calculates the *Tax Amount* by referring to the **Employee Card File** to obtain the employee's *Tax Category* and the **Tax Rate Book** to obtain the *Tax Rate* for the employee. The Tax Amount is recorded in the **Pay Book**.

(4.0 Calculate Net Pay) Next the clerk calculates the *Net Pay* by getting the gross pay from the **Pay Book** and deducting *tax amount*. The *Net pay* is then recorded in the **Pay Book**.

After the pay calculations have been completed for all employees, the *Gross Pay, Tax* Amount and *Net Pay* amounts for each employee are copied onto the employee's *Pay slip*. The correct amount of pay is then deposited into the employee's <mark>bank</mark> account and the pay slip is given to the <mark>employee</mark>.

a.   Fill in the missing labels of the Payroll System context diagram.

Context Diagram
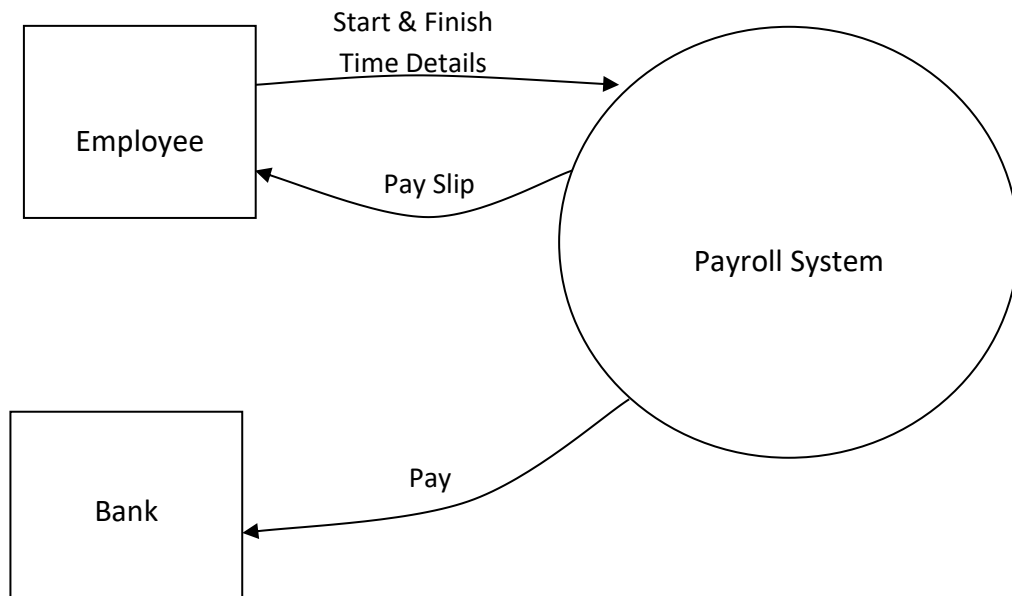
b.   Fill in the missing labels of the Payroll System's Level 0 DFD.

Level 0 Data Flow Diagram
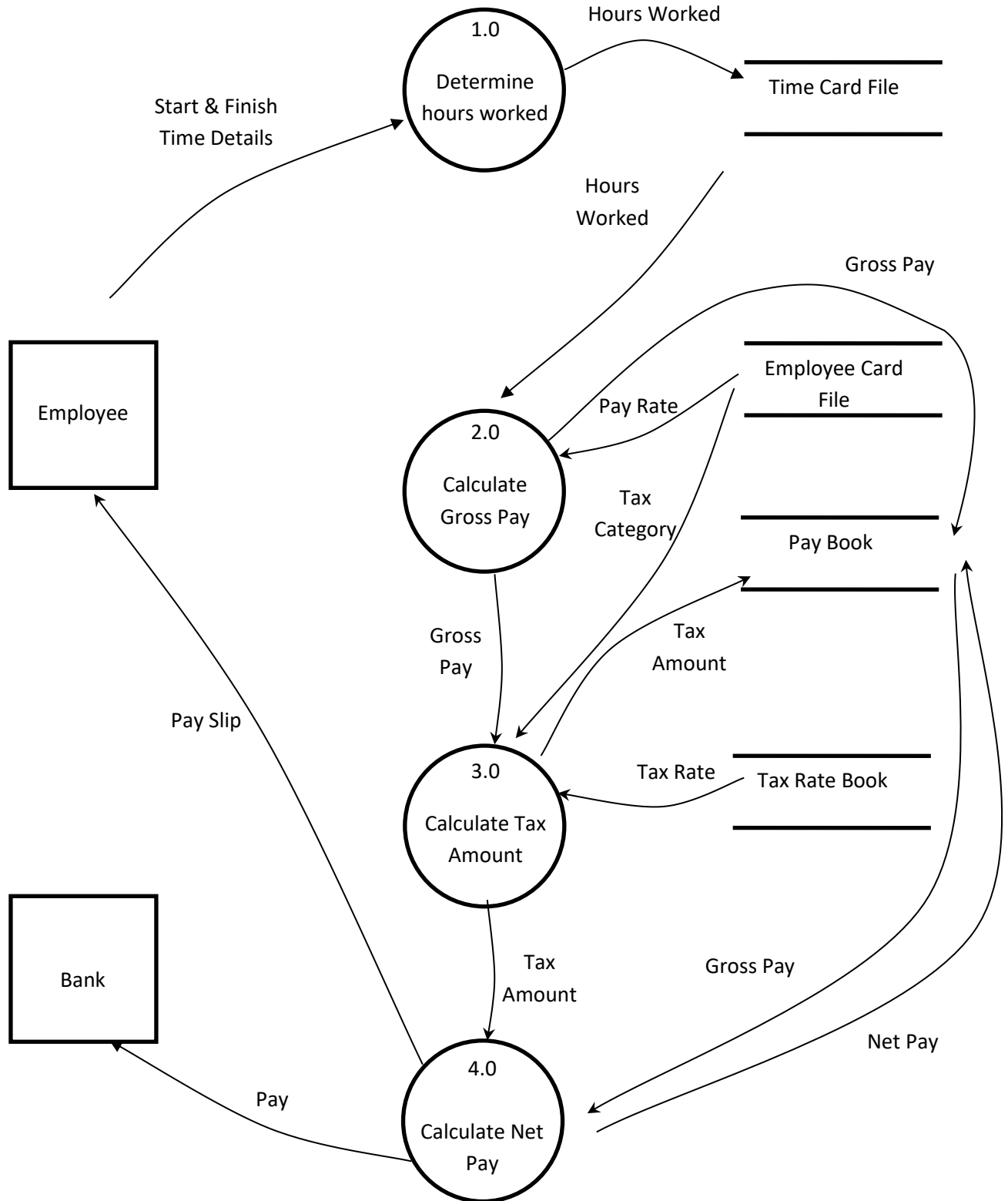
Practice Question 1

A mail-order business deals with the sale of computer consumables to the general public. The analyst gathers and records the necessary information about the existing system and notes the flow of data within the store related to the sale of goods, monitoring of stock levels and the ordering of stock of the Computer Store business.

1.0 Process order form

Observation shows that when a *customer order form* is received, the owner processes the order form and adjusts the *item quantity* for the ordered items on the **stock list**. The *processed customer order form* is place in the **pending invoices file**.

2.0 Invoice item

The owner prepares the invoice for the ordered items by referring to the *processed customer order form* from the **pending invoices file**. Then items and *invoice* are sent to the customer. A *copy of the invoice* and are then placed in the **pending invoices file**.

3.0 Order item

Once a week, the owner uses the **stock list** to look at the *item quantities* to determine which items need to be ordered. These are recorded on the *stock order form* which is sent to the supplier.
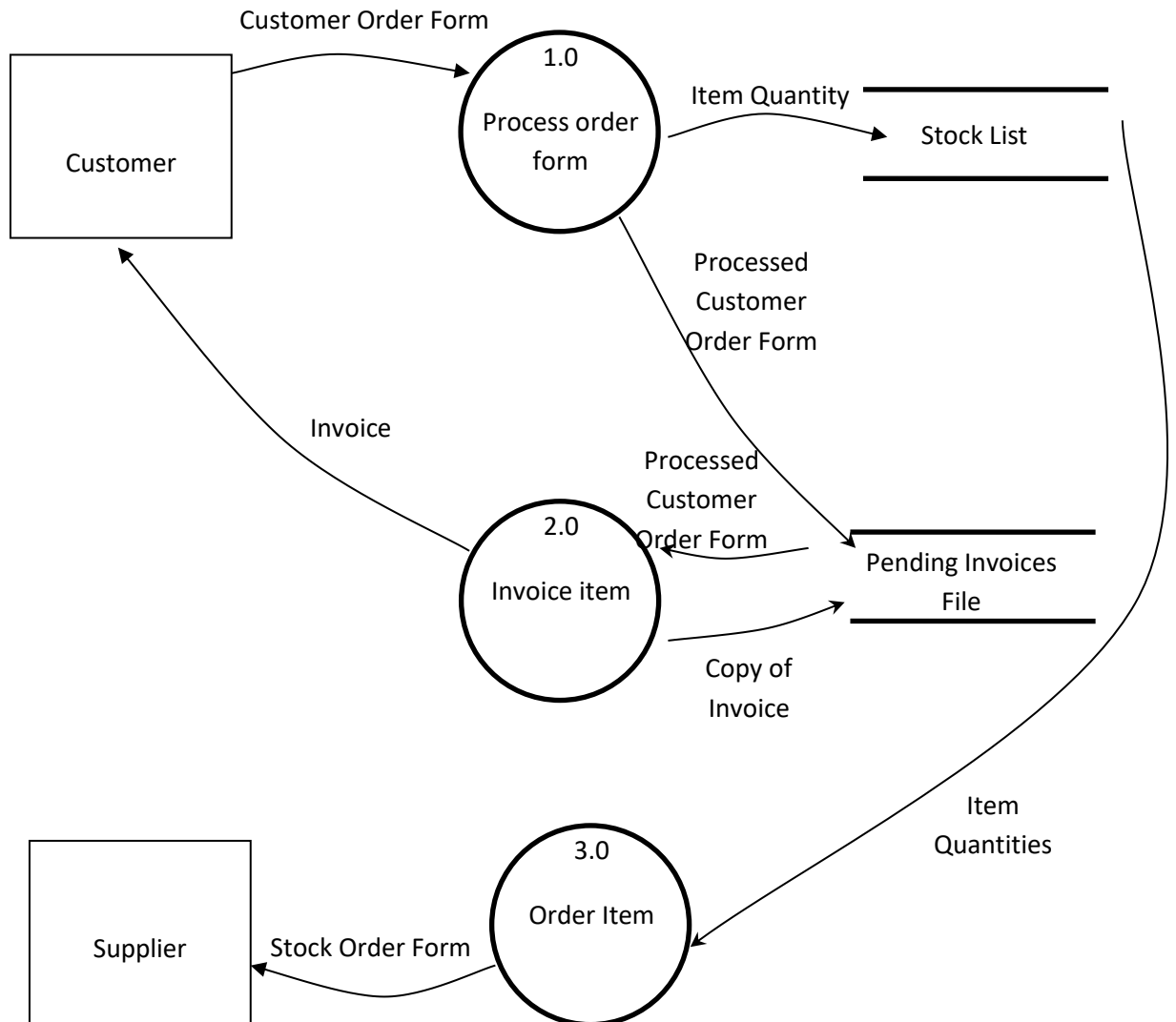
a. Use the description above to draw the Stock Order and Monitoring System context diagram.
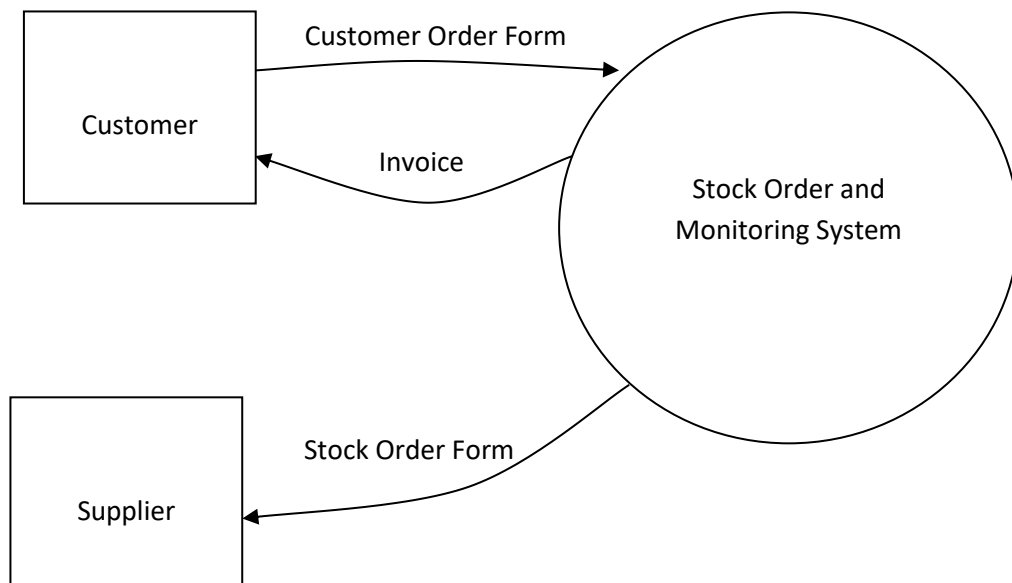
Context Diagram

b. Use the description and context diagram to draw the Stock Order and Monitoring System's Level 0 DFD.
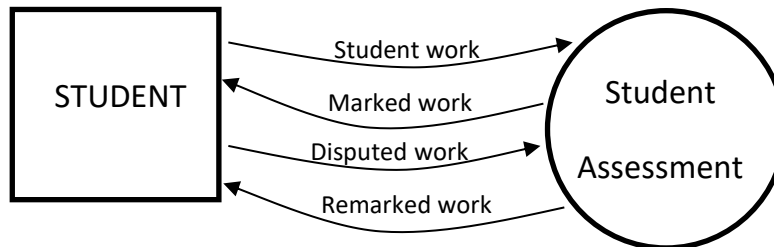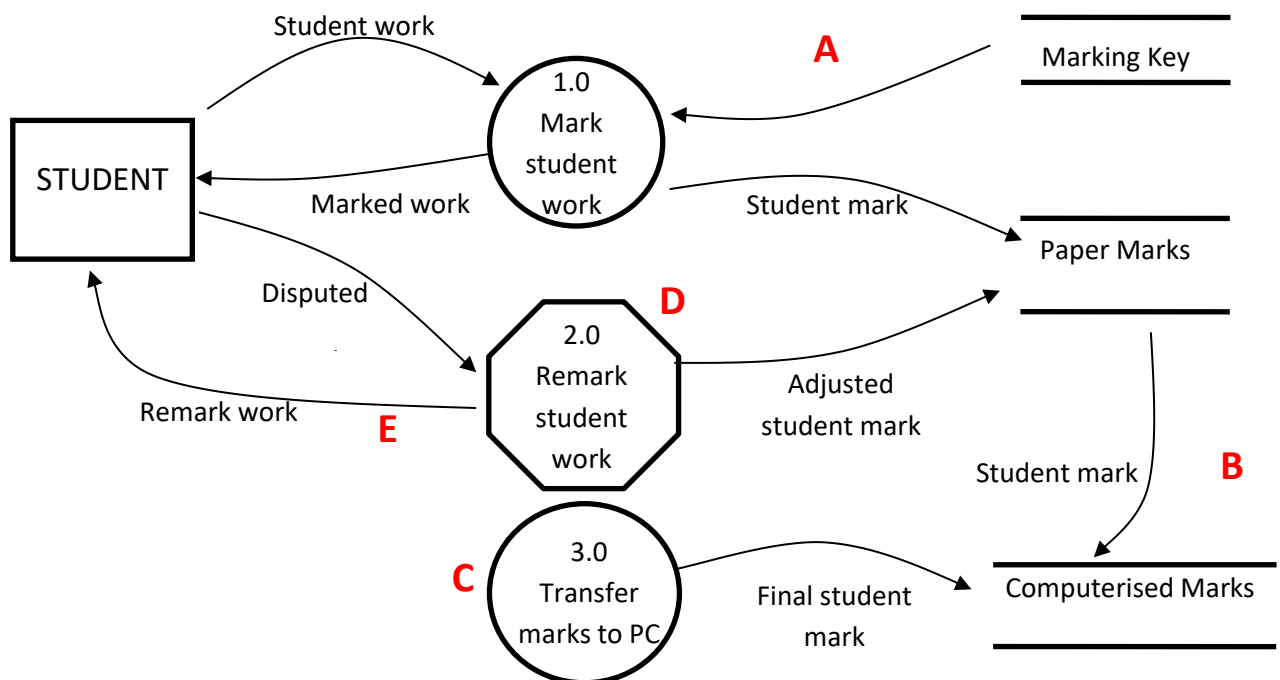
Level 0 Data Flow Diagram

Data Flow Diagrams Checklist

1. List 5 things that are wrong with the following data flow diagram. Label the diagram with the letters A, B, C, D and E to indicate the location of the errors.

Context Diagram for the Student Assessment System

Level 0 Data Flow Diagram for the Student Assessment System

A	**There is no name on the data flow**
B	**Data can't flow directly from one data store to another data store (must go through a process)**
C	**Only has a data flow coming out of the process. Must have data going in and out.**
D	**Process must be a circle.**
E	**Remark work data flow doesn't match data flow on context diagram (it is a process name)**

2. Ignoring the fact that the text is missing, list 4 things that are wrong with the following <u>data flow</u> diagram. Label the diagram with the letters A, B, C and D to indicate the location of the errors.
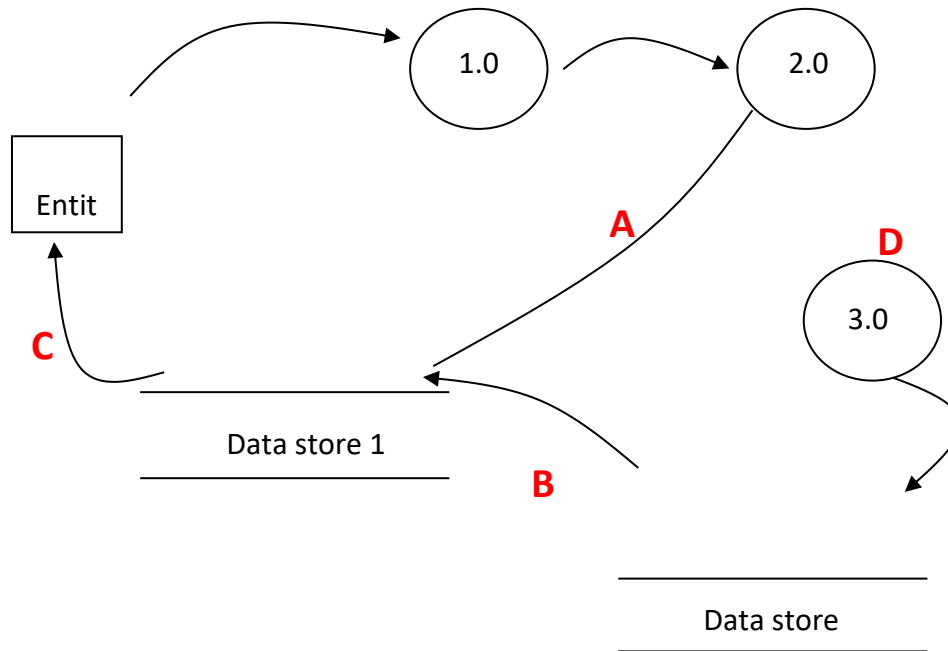
A   **The data flow has no direction**

B   **Data can't flow from one data store to another. It must go**

through a process.

C   **Data can't go directly from a data store to an entity. It must go through a**

process

D   **Must have data flowing in and out.**

The Central Processing Unit and Memory

System Unit

1. Describe the motherboard/mainboard.

It is the flat board within the PC (personal computer) case that holds the chips and circuitry that organize the computer's activities.

The CPU

2. Describe the task that the CPU performs.

The central processing unit executes program instructions.

3. Microprocessors contain tiny transistors, describe these transistors.

They are electronic switches that may or may not allow current to pass through, representing either a 1 or a 0 bit.

4. Explain why the processor needs primary storage (also known as memory or RAM) while the computer is executing a program.

Memory or primary storage provides temporary storage of data and instructions while the computer is executing the program.

5. The CPU consists of the Control Unit, the ALU and registers.

   a. Draw a labelled sketch of the CPU components.

Control Unit	Arithmetic Logic Unit
Registers	
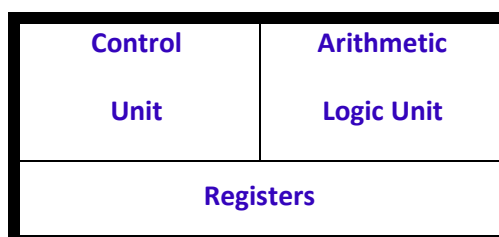
   b. Describe each of these.

   Control Unit (CU) coordinates execution of the program instructions by communicating with the ALU (arithmetic logic unit) and memory.

   ALU (arithmetic logic unit) executes all the arithmetic and logical operations.

   Registers are special-purpose, high speed areas for temporary data storage.

6. List four arithmetic operations that the ALU can perform.

Addition, subtraction, multiplication, division

7. List three logical conditions that the ALU can test.

Equal to (=), less than (<), greater than (>)

8. What does the program counter do?

It stores the address of the next instruction to be processed.

9. List the 4 steps that the central processing unit uses to perform each instruction.

   i. uses the address in the program counter **to fetch** (get) the instruction from memory

   ii. **decodes** the instruction and determines the memory location of the data required

   iii. moves the data from memory to ALU registers and directs the ALU to **perform the actual operation** on the data (**executes** the instruction)

   iv. directs the ALU to **store** the result of the operation in memory or a register.

Primary memory

10. What is primary memory?

Primary memory provides temporary storage of data while the computer is executing the program.

11. What does RAM stand for?

Random-access Memory

12. RAM is volatile. What does this mean?

(Changes easily) Data is only held while the computer is running, it will lose this data if the power is turned off.

13. What does ROM stand for?

Read Only Memory

14. Describe what ROM is.

ROM contains programs and data that are permanently recorded at the factory, they can be read and used but cannot be changed by the user. It is non-volatile meaning it holds the data even when the power is off.

15. What is cache?

Cache is a relatively small amount of very fast memory that stores data and instructions that are used frequently by the CPU.

Bus, Expansion Slots and Ports

16. Describe the bus lines.

Sets of parallel electrical wires that transport electrical signals (data) on the mainboard.

17. The system bus transfers data between which two components on the mainboard?

It transfers data between the CPU and memory.

18. List the 3 parts of buses and explain what it does.

   i. data bus - transmits the actual data

   ii. address bus - transfers the information about where the data should go

   iii. control bus - controls memory access and input/output operations.

19. What is the advantage of a computer with a larger bus size (width)?

A larger bus size can transfer more data faster than a smaller bus size.

20. What is the unit measurement for bus speed?

Gigahertz

Standard Operating Environment

21. What is the role of standard operating environment?

SOE provides mass deployment of custom configurations as required to multiple computers in an organisation as it is very cost-effective and efficient.

Booting the System Worksheet

22. What is booting?

Process of starting the computer.

23. How is a warm boot different to a cold boot?

A warm boot is using the operating system to restart the computer whereas a cold boot is turning on the computer after it has been powered off.

24. In the table below, complete the information about the chips:

	BIOS	CMOS
What does it stand for?	Basic input/output system	Complementary metal-oxide semiconductor
What does it store?	the instructions to startup the computer	computer configuration information such as: • amount of memory, • type of disk drives, keyboard and monitor; • current date and time

25. Number the steps of the boot process so that they are in the correct order.

The operating system loads configuration information, may request user information (eg username and password), start several background processes and display the desktop on the screen.	7
The results of the POST are compared with data in a CMOS chip	4
The power supply sends a signal to the components in the system unit.	1
The BIOS performs the POST which checks components such as the mouse, keyboard, and adapter cards.	3
The processor finds the ROM chip that contains the BIOS.	2
The system files and the kernel (core) of the operating system are loaded into RAM from secondary storage.	6
The BIOS may look for system files on a USB flash drive or CD or hard disk.	5

Troubleshooting and Preventative Maintenance Exercise Worksheet

1.   What is troubleshooting?

Troubleshooting is the process of identifying and fixing problems in a computer system.

2.   Describe the three strategies of troubleshooting.

i.   Fault diagnosis procedures - include checking the power source, checking physical connections and cables and the removal or replacement of selective component.

ii.   Implement a solution - Once you have diagnosed (figure out) what is the problem with your computer (hardware, software or both), then a solution can be decided and implemented.

iii.   Document troubleshooting procedure – involves take notes about error messages, write/record down troubleshooting steps and keeping the troubleshooting document accessible.

3.   What is preventative maintenance?

Preventive maintenance involves performing regular checks on the system hardware and carry out tasks to ensure that the computer operates at optimal performance before problems occur.

4.   Give two advantages of preventative maintenance on a computer system.

- *Saves Money*: Handling the problem areas in a PC before actually facing a problem, essentially reduces the possibility of a sudden breakdown and the associated expenditure.

- *Saves Time*: Troubleshooting the components and their repair procedures take more time as compared to preventive maintenance procedures. Performing preventive maintenance procedures reduces the possibility of system failures and data loss.

- *Improves Performance*: As time goes by, some components of a PC such as mouse and keyboard degrade in performance. Preventive maintenance helps in improving the performance and life of these components

- *Safeguards Data*: Preventive maintenance procedures can be used to protect hardware devices such as hard disk drives and as a result, to safe guard the software(s) and the user data stored on these drives

5.   List 3 type of tasks that would be performed during preventative maintenance?

Any 3 appropriate tasks.

6.   You return to your computer from a short lunch break to find the screen is blank. What steps would you take to troubleshoot the problem?

- System reboot

- Check physical cables and connections, such as and power cables

- Try a different monitor

Managing Data

Managing Data: Data Protection Methods Worksheet

1.   What is data protection?

Data protection refers to protective digital privacy measures that are applied to prevent unauthorized access to computers, databases and websites from either accidental or deliberate corruption.

2.   What is data encryption?

Encryption is the conversion of electronic data into another form, called ciphertext, which cannot be easily understood by anyone except authorized parties.

3.   Describe how the private and public keys work in encryption.

The sender will encrypt data using the receiver's public key. Once the receiver received the data, he/she will decrypt the data using his/her own private key. E.g. If Joe wants to send an encrypted data to Cynthia, Joe would need to encrypt the data using Cynthia' public key. Once Cynthia received the data, she will decrypt the data sent by Joe using her own private key.

4.   Define the purpose of a digital signature.

A digital signature guarantees or used to validate the authenticity of an electronic document or message in digital communication and uses encryption techniques to provide proof of original and unmodified documentation.

5.   What is authentication?

Authentication is a process in which the identifications provided are compared to those on file in a database of authorized users' information on a local operating system or within an authentication server. If the credentials match, the process is completed and the user is granted authorization for access.

6.   Describe biometrics authentication.

Biometrics is the technology of authenticating a person's identity by verifying a personal characteristic. Biometric devices grant users access to programs, systems, or rooms by analysing some biometric identifier, i.e. finger print, retina, voice recognition.

7.   List any four types of biometrics authentication. **(any four answers)**

   a) Eyes - Retina Recognition
   b) Face Recognition
   c) Fingerprint Recognition
   d) Hand Geometry Recognition
   e) Signature Recognition
   f) Voice - Speaker Verification / Authentication

8.   List two advantages and two disadvantages of using biometrics authentication.

Advantages:
- **They stop users of system sharing passwords, only the authorised person will be able to have access**
- **Help people who have difficulty remembering passwords by allowing them to access systems with a simple finger print scan**

Disadvantages:
- **Biometrics they can be very costly to implement**
- **Maybe hard for people with disability e.g. Visually impaired person cannot use the eyes – retina recognition reader for authentication.**

9.   Discuss how passwords work.

A password is a private combination of characters associated with the user name that allows access to certain computer resources. After entering a user name and password, the operating system compares the users' entry with a list of authorised user names and passwords. If the entry matches the user name and password kept on file the operating system grants the user access. If the entry does not match, the operating system denies access to the user.

Spreadsheets

Common Statistical Functions

Find the AVERAGE of a set of numbers

1.   Click where the answer is to go

2.   Click on the picklist (triangle) to the right of the autosum button (∑ ▼

3.   Select **Average**

4.   Make sure the highlighted numbers are the ones required

5.   Press ENTER

Find the MAXIMUM of a set of numbers

1.   Click where the answer is to go

2.   Click on the picklist (triangle) to the right of the autosum button (∑ ▼

3.   Select **Max**

4.   Make sure the highlighted numbers are the ones required

5.   Press ENTER

Find the MINIMUM of a set of numbers

1.   Click where the answer is to go

2.   Click on the picklist (triangle) to the right of the autosum button (∑ ▼

3.   Select **Min**

4.   Make sure the highlighted numbers are the ones required

5.   Press **ENTER**

Find the COUNT of a set of numbers

1.   Click where the answer is to go

2.   Click on the picklist (triangle) to the right of the autosum button (∑ ▼

3.   Select **Count Numbers**

4.   Make sure the highlighted numbers are the ones required

5.   Press **ENTER**

Absolute Cell Referencing

When entering a formula a cell reference is used to refer to any cells needed in the formula.

A relative cell reference is a cell address that changes as the formula is extended using the fill handle i.e. the cell reference is relative to its location.

	A	B	C	D
1	Trish's Lunch Bar			
2				
3	Item	Unit Price	Quantity	Total Cost
4	Beef roll	2.3	5	=B4*C4
5	Pastie	1.6	3	
6	Pie	1.65	4	
7	Chips	1.5	2	

When the formula is filled using the fill handle each cell changes according to its location.

	A	B	C	D
1	Trish's Lunch B			
2				
3	Item	Unit Price	Quantity	Total Cost
4	Beef roll	2.3	5	=B4*C4
5	Pastie	1.6	3	=B5*C5
6	Pie	1.65	4	=B6*C6
7	Chips	1.5	2	=B7*C7
8	Sanwich	1.95	5	=B8*C8
9	Burger	3.5	6	=B9*C9
10	Salad	2.5	1	=B10*C10

An absolute cell reference is a cell address that doesn't change as the formula is extended using the fill handle i.e. the cell reference is remains in its original location.

	A	B	C
1		WEEKLY WAGES	
2		Rate/Hour	$25.50
3			
4	NAME	HOURS	WAGES
5			
6	Smith	20.0	=$C$2 *B6
7	Jones	30.0	
8	Taylor	40.0	
9	Evans	37.5	
10	Johnson	35.0	

To create an absolute cell reference:

1. Press the equal sign

2. Click in the cell that is to remain the same

3. Press the F4 function key

A mixed cell reference has a combination of relative and absolute cell referencing i.e. some cells in the formula change and some don't as the formula is extended using the fill handle.

	A	B	C
1			
2		Rate/Hour	25.5
3			
4	NAME	HOURS	WAGES
5			
6	Smith	20	=$C$2*B6
7	Jones	30	=$C$2*B7
8	Taylor	40	=$C$2*B8
9	Evans	37.5	=$C$2*B9
10	Johnson	35	=$C$2*B10
11	Brown	15	=$C$2*B11
12	Cain	40	=$C$2*B12

Exercise 1

Use the following spreadsheet to answer questions the questions below.

	A	B	C	D	E	F	G	H
1		Client	Item	QTY	Unit Price	Cost	Discount	Price
2	1	Target	102	26				
3	2	Coles	101	25				
4	3	Myers	102	15				
5	4							
6								
7						**Prices and Discounts**		
8						Item	Unit Price	Discount %
9						100	30.25	5
10						101	40.50	7
11						102	125..25	8

1. Describe the formatting of the heading Prices and Discounts

   Select F7:H7

   Click the Merge and Centre button

   Click the bold button

2. What is the general term used to describe cells: F8:H11?

   Look up table

3. Cells F8:H11 have been named Prices. Why is it useful to name these cells?

   It is then easy to refer to these cells in a formula

4. Write the correct formula for cells:
   (a) E2 **= vlookup (C2, Prices, 2)**
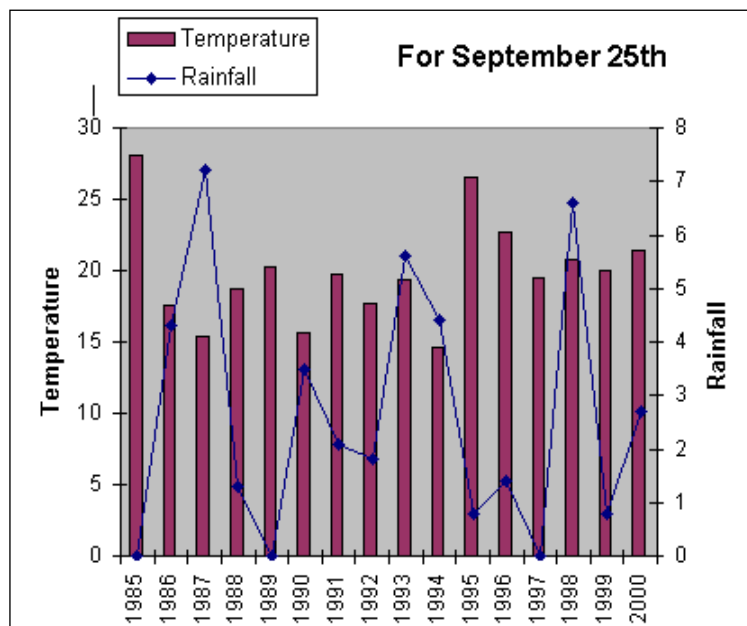
   (b) F2 **=D2 * E2**
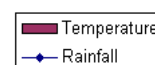
   (c) G4 **= vlookup (C4, Prices, 3)**

   (d) H4 **= F4 – (F4 * G4) OR   = F4 * (1 –G4)**

Exercise 2

Study the chart below and answer the questions based on the 16 years weather details for September 25th.

For September 25th

1.   Between 1985 and 2000, which year had the most rainfall?

   1987

2.   Between 1985 and 2000, which year had the hottest temperature?

   1985

3.   Write down something significant that happened in 1985, 1989 and 1997.

   No rainfall for each of these 3 years

4.   Explain what this chart is graphically representing.

   16 years weather details for September 25th

5.   On the chart above, what is the name given to this part of the chart?

   Legend

	A	B	C	D	E	F
1	Movie Booking Sheet				Prices	
2					Child	$15.00
3					Adult	$24.50
4						
5	Name	Age	Child/Adult	Price		
6	Lee	12				
7	Chun	25				
8	Sammy	19				
9	Yo	17				
10	Chen	15				

6.   Write the if statement formula you would use in cell

Criteria for child and adult are: Child < 18   Adult >= 18

C6   **= if(B6<18, $E$2, $E$3)**   OR   **= if(B6>=18, $E$3, $E$2)**

D6   **= if(B6<18, $F$2, $F$3)**   OR   **= if(B6>=18, $F$3, $F$2)**

Databases

- ## Opening a database

A **database** is an organised collection of related data.

- ## Tables, Fields, Primary Keys and Records

A **table** is the structure that stores the data.

A **field** is a category under which a piece of information is stored.

A **primary key** is a unique identifier for each record in the table.

A **record** is the data about 1 particular item.

- ## Sorting – placing records in order (ascending or descending)

- ## Filtering – locating a subset of data

- ## Queries

A **query** extracts a **subset** of the data. The **rules for the query are saved** not the subset of data.

- ## Forms

A **form** provides a more **user-friendly interface** to data in the database. Forms can be used to view and enter data or to provide easy access to other forms or reports in the database.

- ## Reports

A report provides a **formatted summary and analysis of data**. A report is usually designed for printing.

Database Terminology Worksheet

Database	An organised collection of related data.
Table	The basic structure that stores the data in the database.
Field	A category under which a piece of information is stored. A field is the smallest unit of information that can be accessed in a database.
Primary Key	A unique identifier for each record in the table.
Record	A set of related fields which holds data for one particular item in the table. A record consists of one row in the table.
Sort	Organise all records in order – either ascending or descending order.
Filter/Search	Create a subset of data from all the records that match the filter/search criteria
Query	Extracts a subset of data and the rules for the query are saved for later use. Access uses QBE – Query by Example.
Report	Provides a formatted summary and analysis of data. A report is usually designed for printing
Form	Provides a user friendly interface to the data in the database. Forms can be used to view and enter data or to provide easy access to other forms or reports in the database – these are known as navigation or switchboard forms
Data type	Defines the type of data that can be stored in each field such as text, memo, number, date/time, currency.
Datasheet View	The view displays all records and fields in a spreadsheet (rows & columns) format.
Design View	The view displays the structure of each table – this includes the field names, primary key, data types and field properties.
Field Properties	A set of properties including field size, format, default value, validation rules and text that help improve the accuracy of the data being entered into the database.

Exercise 1

Using the tables below to answer the following questions.

tblDepartment

DepartmentID	DeptName	DeptPhone	Location
100	Accounts	9457 2346	Bentley
200	Human Resources	9385 1234	Subiaco
400	Sales	9457 1982	Bentley

tblEmployees

StaffID	DeptID	Surname	First Name	Date Of Birth	Private Health Cover	Salary	Number Dependents	Mobile Phone	WorkHistory
BT2002	400	Turner	Brad	5/07/1983	No	$17,500	0	0413 728 123	Trainee
FB1997	400	Brown	Fabian	12/07/1967	Yes	$46,000	5	0408 128 023	Senior sales rep - awarded salesman of the year in 2000 and 2001.
HG1996	400	Green	Harman	9/11/1975	No	$24,500	1	0407 391 023	Part-time only as cares for disabled child.
HK1999	200	Kennedy	Henk	9/03/1955	Yes	$47,500	4		B Psych UWA, 10 years experience with Education Dept.
JL1999	200	Lim	Janet	7/08/1972	Yes	$32,000	0	0412 876 123	Studying part-time at Murdoch Uni for BA
JV1988	100	Vucens	Jim	4/07/1968	Yes	$35,000	1		B Sc UWA, travelled overseas, likes hockey and movies
MB2001	100	Bartlett	Mary	12/06/1981	No	$27,500	0	0401 872 123	TEE and has started business course at Curtin Uni - needs Friday pm off for studies.

b.   Explain what will happen if you try and add the following data to the tblEmployees. Make sure you use the above tables to help you with your explanation.

StaffID	DeptID	Surname	First Name	Date Of Birth	Private Health Cover	Salary	Number Dependents	Mobile Phone	WorkHistory
YM2000	300	Monk	Yvonne	4/10/1982	Yes	$38,000	0	0413 234 123	Published several important research articles in medical journals.

There is no Department 300 so you will not be able to enter the DeptID

OR

We don't know the Department details so we cannot enter the Department info into tblDepartment

c.   List the data types for each of the fields in tblEmployees.

StaffID – text / short text   **Private Health Cover – Yes/No**

DeptID - number   **Salary - Currency**

Surname – text / short text   **Number Dependents – number/byte**

FirstName – text / short text   **Mobile Phone – text /short text**

Date of Birth – date/time   **Work History – Memo/ Long text**

d.   List the primary key for tblDepartments.   **DepartmentID**
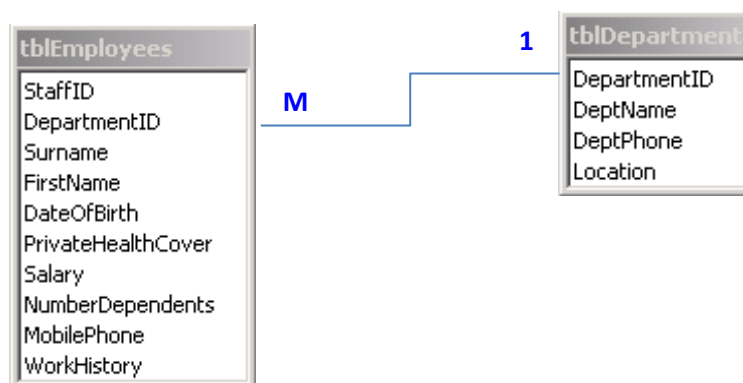
e.   List the primary key for tblEmployees.   **StaffID**

f.   List the table that has the foreign key and name the foreign key field.

   Table name: **tblEmployees**

   Foreign key field name: **DepartmentID**

g.   Draw the link or relationship between the tables. Be sure to show which is the one side and which is the many side.
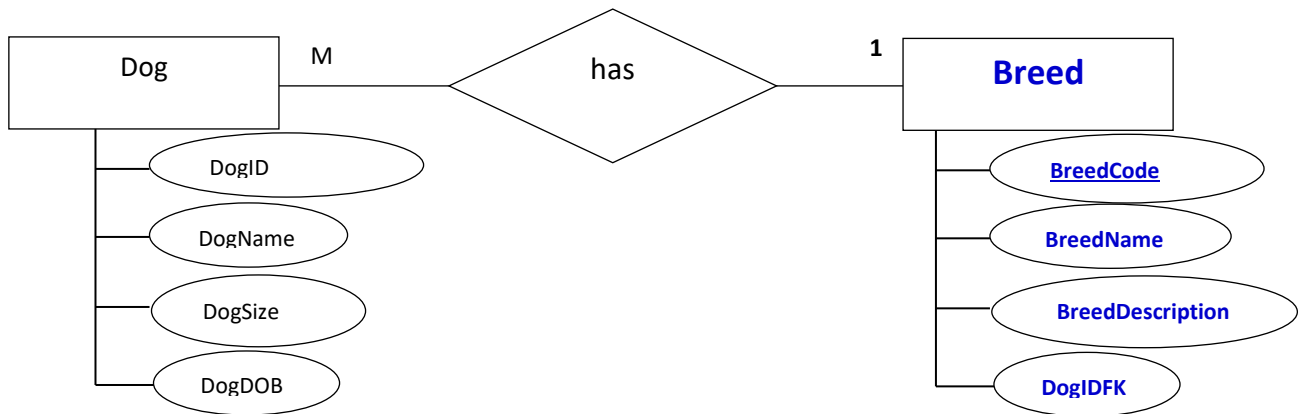
Entity Relationship Diagram

Exercise 1:

Create an ER diagram to show details about an individual dog, with links information about the dog breed (2 entities)

Add the following to the below diagram:

1. Add missing entity
2. Add primary key
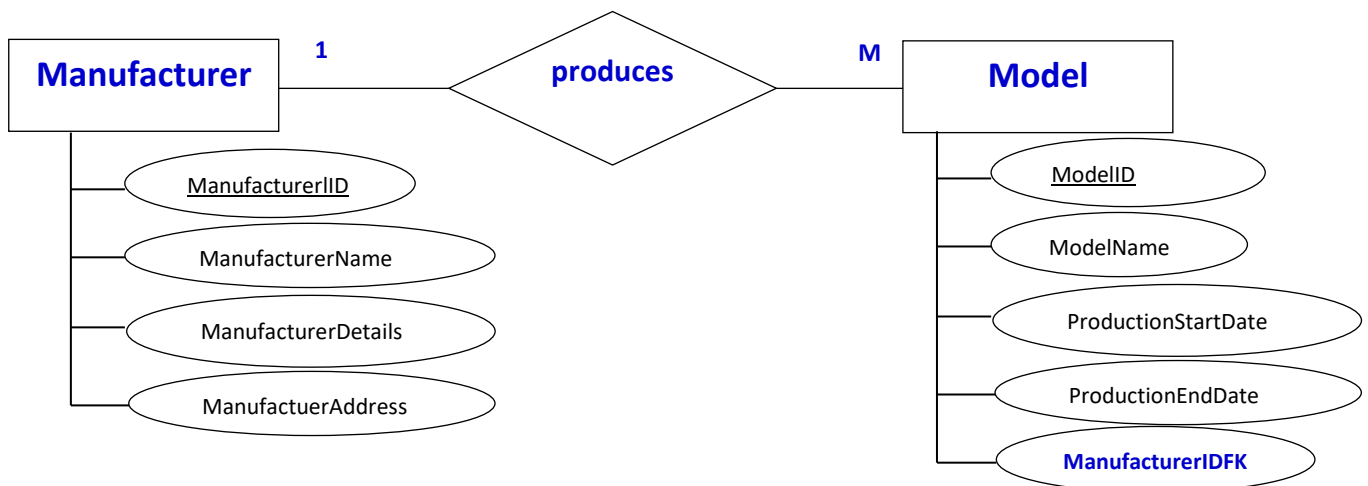3. Make up attributes for the entity
4. Write in the foreign key

Exercise 2:

Create an ER diagram to show details of car manufactures and models (2 entities)

Complete the rest of the diagram. You will need to add:

5. Missing entity boxes
6. The relationship
7. Cardinality (1:M)
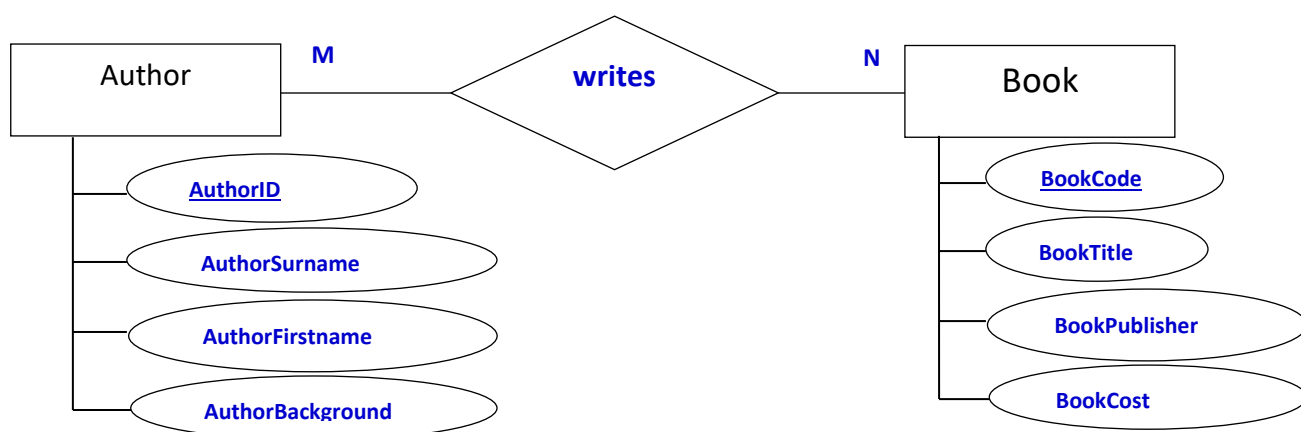8. Insert foreign key

Exercise 3:

Database to show details of authors and their books (3 entities). Create an ER diagram to show the following:

- one author can write many books
- one book can be written by many authors.
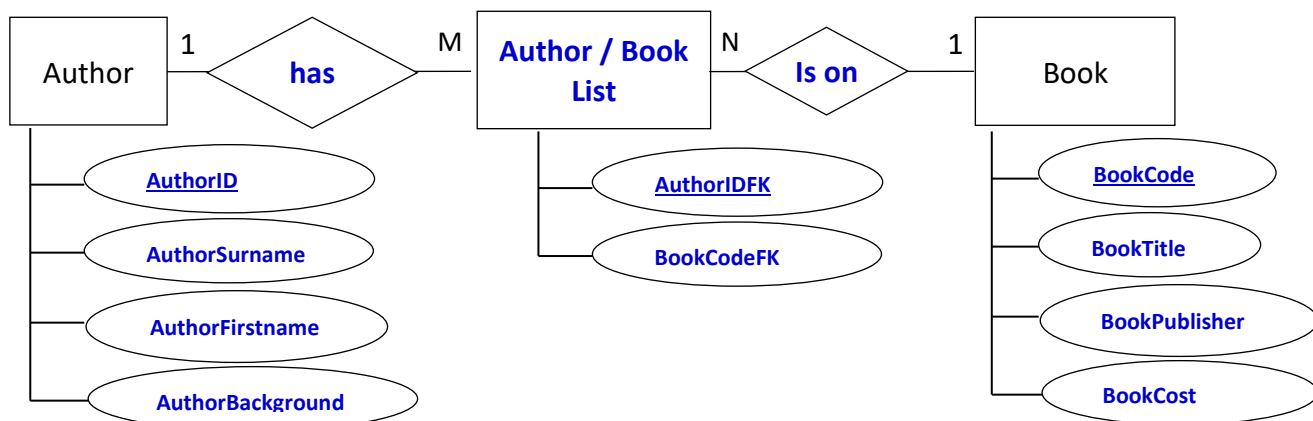- hence the cardinality is M:N

Complete the ER diagram by adding
- the relationship
- the cardinality M:N
- attributes to both entities
- underline the primary keys

You will need to resolve the M:N relationship:

1. Give an appropriate name to the third entity
2. Add type of relationship
3. Add attributes to all entities
4. Add foreign key – there are 2 foreign keys
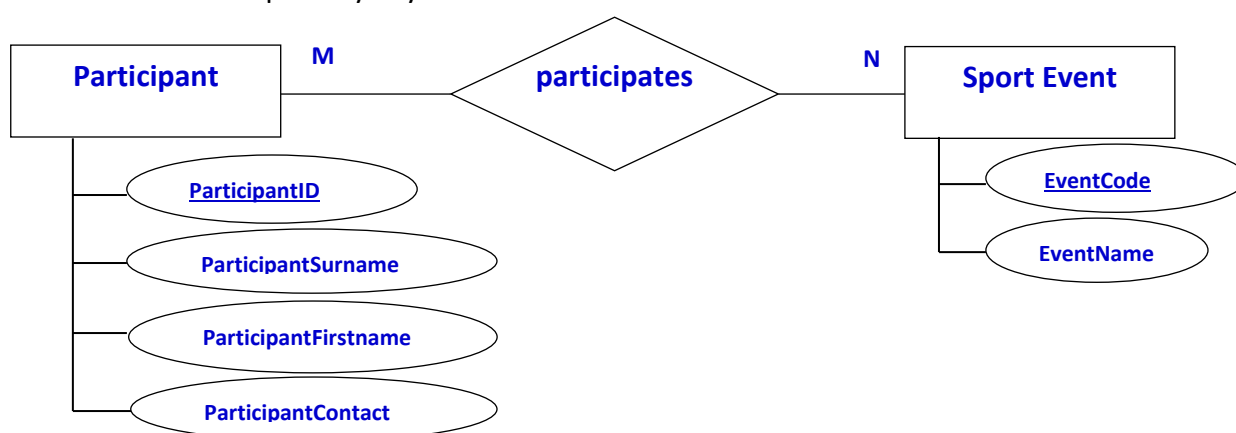5. Underline all the primary keys including the composite primary key.

Exercise 4:

Database to show details of sports events and the participants (3 entities). Create an ER diagram to show the following:

- one sport event can have many participants
- one participant can participate in many events.
- hence the cardinality is M:N

Complete the ER diagram by adding
- the entities and the relationship
- the cardinality M:N
- attributes to both entities
- underline the primary keys

You will need to resolve the M:N relationship:

1. Give an appropriate name to the third entity
2. Add type of relationship and the cardinality
3. Add attributes to all entities
4. Add foreign key – there are 2 foreign keys
5. Underline all the primary keys including the composite primary key.
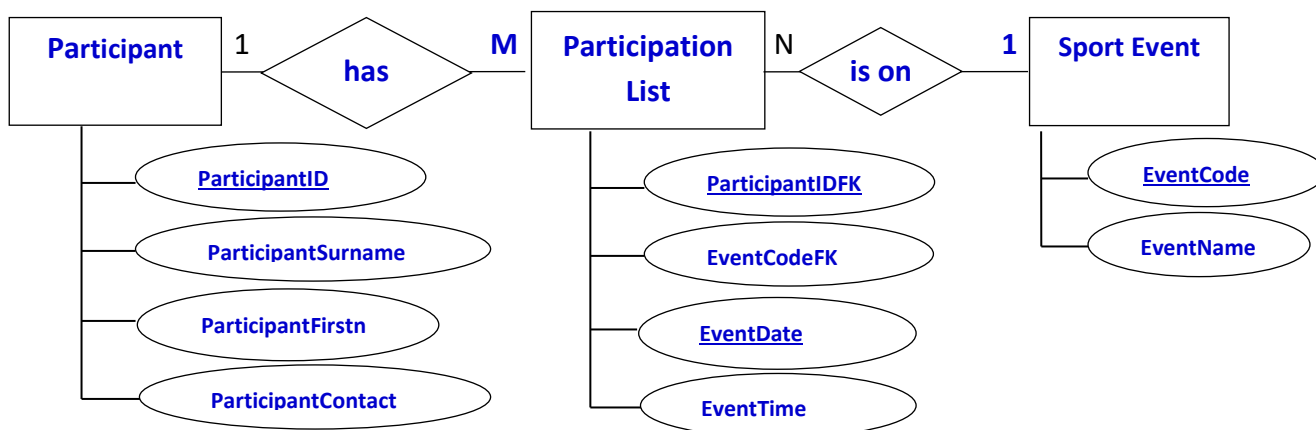
Database Documentation Worksheet

1. Why do we need to document database?
   A written text or illustration that accompanies computer software which explains how it operates or how to use it. It helps in understanding the program better and how to operate it appropriately.

2. What is user documentation?
   Manuals for the end-user, system administrators and support staff. It is designed to assist the end users to use the product or service.

3. What is technical documentation? Give an example.
   It refers to the documentation that describes how a product or service operates in technical terms. For example: software code documentation, algorithms and technical specifications.

4. What is naming conventions and why it is important?
   Every field and object within a database must be named properly so that it can easily be identified.

5. Describe two design tools that represent the structure of databases?
   Data dictionary is a set of information describing the contents, format, and structure of a database and the relationship between its elements, used to control access to and manipulation of the database.
   Entity Relationship Diagrams show the structure and flow of data.

6. Describe one design tools that representing input form to capture data?
   Forms layout of the fields should be laid out in a logical order (top to bottom) and headings can be used for groupings if needed.

Legal and Ethical Responsibilities Exercises

Exercise 1

1. What are the legal responsibilities involved in managing data?
   Legal responsibilities include those actions to which a person can be held accountable under law. Breaching a legal responsibility has the implication of litigation of facing charges in a court of law.

2. Give 2 appropriate examples of ethical responsibilities in data management? Any two:
   - Ensuring that no sexually explicit material is stored or accessible
   - Defamatory comments are not posted in email, in messages or on websites
   - Metadata (a set of data that describes and gives information about other data) from tweets and other social media should not allow individuals to be identified.

3. What is the purpose of having acceptable work practices in placed in an organisation?
   So conflict due to legal and ethical issues does not arise and any problem arises, every stakeholder knows what to do. They would have something to refer to or follow.

4. List down the stages involved in resolving conflicts that arises due to legal, ethical or social issues.

   - Identify the problem
   - Identify the stakeholders
   - Identify possible alternatives
   - Identify ethical standards
   - Evaluate options
   - Make a decision

Developing Software

Software Questions - Answers

1.   Define software.

   Software or programs are the step-by-step set of instructions

   that control the operation of a computer.

2.   What is **application** software?

   Application software is used to perform a particular task such

   word processing, desktop publishing and image manipulation.

3.   List 3 examples of application software that you have used this semester.

   Internet explorer (browser), Microsoft Word (Word processor),

   Microsoft Access (Database), PowerPoint (Presentation) etc.

4.   What does user-friendly mean?

   User-friendly means the software is easy for a beginner to use or

   that the software can be used with little training.

5.   What is open source software?

   Open source is software provide for use, modification and

   redistribution which has no restrictions from the copyright holder.

6.   What is freeware?

   Freeware is software for which there is no fee applied for an

   unlimited time period. The developer retains copyright ownership.

7.   What is copyrighted software?

   Commercial software that costs money and is copyrighted.

8.   What is software piracy?

   Making illegal copies of commercial software.

9.   What does having a site license let an organisation do?

A site license allows an organisation to install a program on a

number of computers.

10.   What is an **operating system**?

A set of programs that controls the components of a computer

system and assists the operation of applications.

11.   List the 3 main functions of an operating system.
- **to manage the computer's resources, such as the CPU, memory, disk drives, and printers.**
- **to establish a user interface**
- **to execute and provide services for applications software**

12.   Write a definition for each of these applications:

Word processor   **is used to create, edit, format, store, and**

print text and graphics in one document.

Spreadsheet   **is made up of columns and rows of numbers,**

automatically recalculates the results when a number is changed.

Database   **manages a collection of related facts/data.**

Desktop publisher   **is used to produce professional-looking**

newsletter, reports, and brochures that combine pictures and text.

Browser   **is used to view web pages that contain text,**

graphics and hyperlinks.

Email   **is electronic mail - a method of exchanging digital**

messages using the computer networks.

13.   What is a utility program?

A type of system software that allows a user to perform

maintenance-type tasks.

14.   What is a file compression program?

It shrinks the size of a file and uses lesser memory space.

15.   What is a defragmenter?

It reorganizes the files and unused space on a computer's hard

disk so that the operating system accesses data more quickly and
programs run faster.

16.   What is antivirus software?

It protects a computer against viruses by identifying and removing

any computer viruses found in the computer.

17.   What is malware and how can you protect your computer from it?

Malware is malicious software which normally comes from the

internet. You have to install anti-malware software to detects

and removes malware from your computer system.

Number System Exercises

1. Convert the following **binary** numbers into the **decimal** equivalent. **Show all working**.

10101_2 **$= (1*2^4)+(0*2^3)+(1*2^2)+(0*2^1)+ (1*2^0)$**

$= 16 + 0 + 4 + 0 + 1$

$= 21_{10}$

1100110_2 **$= (1*2^6)+(1*2^5)+(0*2^4)+(0*2^3)+(1*2^2)+(1*2^1)+ (0*2^0)$**

$= 64 + 32 + 0 + 0 + 4 + 2 + 0$

$= 102_{10}$

0101010_2 **$= (0*2^6)+(1*2^5)+(0*2^4)+(1*2^3)+(0*2^2)+(1*2^1)+ (0*2^0)$**

$= 0 + 32 + 0 + 8 + 0 + 2 + 0$

$= 43_{10}$

11111111_2 **$= (1*2^7)+(1*2^6)+(1*2^5)+(1*2^4)+(1*2^3)+(1*2^2)+(1*2^1)+ (1*2^0)$**

$= 128 + 64 + 32 + 16 + 8 + 4 + 2 + 1$

$= 255_{10}$

2. Convert the following **hexadecimal** numbers into the **decimal** equivalent. **Show all working**.

13_{16} **$= ((1*16^1) + (3*16^0))$**

$= 16 + 3$

$= 19_{10}$

$9F2_{16}$ = $((9*16^2) + (15*16^1) + (2*16^0))$ **F=15**

= 2304 + 240 + 2

= 2546_{10}

$10B2_{16}$ = $((1*16^3) + (0*16^2) + (11*16^1) + (2*16^0))$ **B=11**

= 4096 + 0 + 176 + 2

= 4274

30_{16} = $((3*16^1) + (0*16^0))$

= 48 + 0

= 48

3. Convert the following **binary** numbers into the **hexadecimal** equivalent. Show all working.

11010101_2 = **1101**   **0101**

= $(1*2^3)+(1*2^2)+(0*2^1)+ (1*2^0)$ ■ $(0*2^3)+(1*2^2)+(0*2^1)+ (1*2^0)$

= 8 + 4 + 0 + 1   ■ 0 + 4 + 0 + 1

= 13   ■ 5

= $D5_{16}$

11110110_2 = **1111**   **0110**

= $(1*2^3)+(1*2^2)+(1*2^1)+ (1*2^0)$ ■ $(0*2^3)+(1*2^2)+(1*2^1)+ (0*2^0)$

= 8 + 4 + 2 + 1   ■ 0 + 4 + 2 + 0

= 15   ■ 6

= $F6_{16}$

1101010_2	**= 110**		**1010**
	= $(1*2^2)+(1*2^1)+ (0*2^0)$ ■		**$(1*2^3)+(0*2^2)+(1*2^1)+ (0*2^0)$**
	= 4 + 2 + 0	■	**8 + 0 + 2 + 0**
	= 6	■	**10**
	= $6A_{16}$		

10011_2	**= 1**		**0011**
	= $(1*2^0)$ ■		**$(0*2^3)+(0*2^2)+(1*2^1)+ (1*2^0)$**
	= 1	■	**0 + 0 + 2 + 1**
	= 1	■	**3**
	= 13_{16}		

4. Convert the following **decimal** numbers into the **binary** equivalent. Show all working.

17	**17/2 = 8 r 1**
	8/2 = 4 r 0
	4/2 = 2 r 0
	2/2 = 1 r 0
	1/2 = 0 r 1
	Answer: 10001_2

26	**26/2 = 13 r 0**
	13/2 = 6 r 1
	6/2 = 3 r 0
	3/2 = 1 r 1
	1/2 = 0 r 1
	Answer: 11010_2

5. In computer networking, a Media Access Control (MAC) address is a unique identifier assigned to a network interface card (NIC) by the manufacturer for identification. If the MAC address for an iPhone is 00:1C:B3:09:85:15, express the MAC address in binary and decimal numbers.

    NO NEED TO DO – PLEASE IGNORE THIS QUESTION

6. Convert following binary numbers to decimal numbers, then use the ASCII table in your course booklet to help decode this message!

    1010111 1100101 1101100 1101100 0100000 1100100 1101111 1101110
    1100101 0100001

    = (1+2+4+16+64) : (1+4+32+64) : (4+8+32+64) : (4+8+32+64) : (32) : (4+32+64) : (1+2+4+8+3+32+64) : (2+4+8+32+64) : (1+4+32+64) : (1+32)

    = 87 : 101 : 108 : 108 : 32 : 100 : 111 : 110 : 101 : 33   in decimal

    = Well done!   in ASCII

Programming

Languages Terminology Worksheet Answers

1. What is a program?

   An <u>organised list of instructions</u> that <u>can be run by a computer</u> to <u>perform a particular task</u>.

2. For each of the following samples of programming code indicate the specific language type and definition.

Sample	Language	Definition
ADD #B7, 17	Assembler	Assembler (assembly) language consists of mnemonic codes that correspond to specific CPU instructions. E.g. &, A, 7. It needs to be translated into machine code.
Input (Num1) Input (Num2) Diff = Num1 - Num2 Output (Diff)	Procedural	Procedural language consists of writing a series of well-structured steps and procedures that are performed in a particular order. Needs to be translated into machine code.
011010101000111	Machine	Machine language consists of binary instructions and data that are directly understood by a computer's CPU. It does not need to be translated and is written as a string of 1s and 0s
	Object oriented	Object orientated language requires the creation, use and manipulation of reusable objects to perform specific tasks. Each object has certain properties and methods.
Select Names From Workforce	Non-procedural	Non-procedural language concentrates on defining the required input and output (**what needs to be done**) rather than the specific steps required (how it is done).

3. What is an algorithm?

    A detailed plan consisting of an ordered set of steps that shows how the computer program will work.

4. What is pseudocode?

    Pseudocode is a set of steps written in a way that looks like simple English, without using the specific syntax of the HLL program. It is the simplest form for writing an algorithm.

5. What is a flow chart?

    A flow chart is a visual form of writing an algorithm. It shows the flow of the steps.

6. Name 4 high-level programming languages.

    Java, C++, Scratch, Pascal, Python, Swift, COBOL, PHP, Visual Basic Express

7. What is the difference between a low-level programming language and a high-level programming language?

    A low-level language program is more difficult to write than high-level language code.

    Low level language code is closer to the language used by the computer's CPU and high-level language code is closer to human language.

8. What do compilers, interpreters and assemblers do?

    They convert the source code written in a particular programming language into machine code that is run by the computer.

9. What is a variable?

    A container (memory location) that is used to store a value that can change as it is used in a program.

10. What is a constant?

    A constant is a container (memory location) that is used to store value that cannot be changed as it is used in a program. It stays the same throughout the running of the program

11. Name the three basic control structures that can be used in programming.

    Sequence, Selection, Repetition/Iteration

12. Which control structure would be used in a program that accepts the height and width of a rectangle and then calculates the area of that rectangle?

    Sequence

13. Which control structure would be used in a program that accepts the goals scored by 11 soccer players and then calculates the total goals scored?

    Repetition or Iteration

14. Read the following VB code and complete the questions below.

```
TotalWeight = 0

For Num = 1 To 4

    Weight = InputBox("Enter the weight of Wrestler" & Num)

    TotalWeight = TotalWeight + Weight

Next Num

MsgBox ("The total weight of " & Num & " sumo wrestlers is " & TotalWeight & " kg")
```

List one example of each of the following from the VB code above:

Input statement   Weight = InputBox("Enter the weight of Wrestler" & Num)

Output statement

MsgBox ("The total weight of " & Num & " sumo wrestlers is " & TotalWeight & " kg")

Assignment statement   TotalWeight = TotalWeight + Weight

Variable name   TotalWeight or Num or Weight

Remember only need **one** of these answer

Algorithms in Pseudocode and Flow Charts - Sequence

1. **Task**: Calculate the retail price of an item based on its wholesale price and a 15% percentage mark-up.
    Hint: RetailPrice = Wholesale * 1.15
    or   RetailPrice = Wholesale + (Wholesale * 0.15)

    Algorithm in Pseudocode

    Module CalculateRetailPrice

    Input (Wholesale)
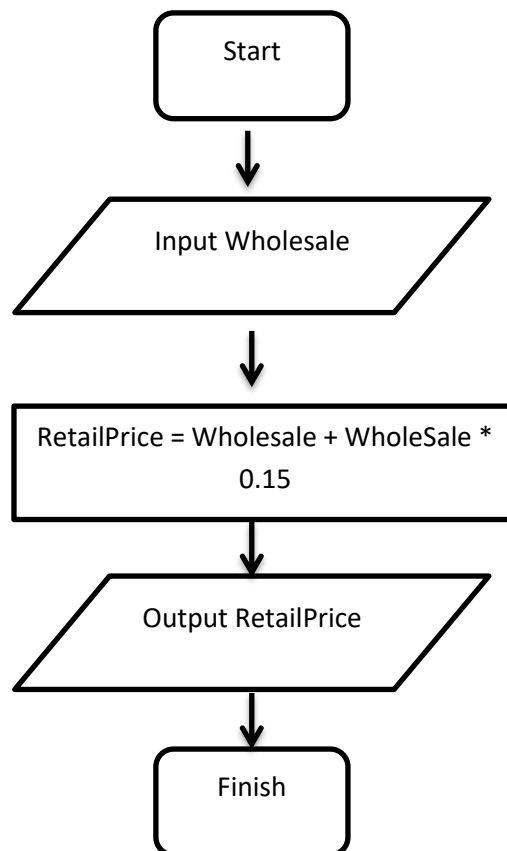
    RetailPrice ← Wholesale + Wholesale * 0.15

    Output ("The retail price is $ " , RetailPrice)
    End Module

    Check algorithm: If Wholesale = $300 then RetailPrice = 300 + 45 = 345

    Algorithm in flow chart

2. **Task**: Calculate the final cost of an item based on its retail price and the 10% GST.
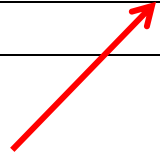
Algorithm in Pseudocode

Module CalculateFinalCost

	GST = 0.1
Input (RetailPrice)	Input (RetailPrice)
GSTCost ← RetailPrice * 0.10	FinalCost ← RetailPrice * (1+GST)
FinalCost ← RetailPrice + GSTCost	Output("Retail price = $", RetailPrice, "then final cost = $", FinalCost)
Output ("The final price is $ " , FinalCost)	

End Module

Check algorithm: If RetailPrice = $500 then FinalCost = 550

3. **Task**: Convert a distance in miles into kilometres.
   Hint: Kilometres = Miles * 1.6

Algorithm in Pseudocode

Module CalculateKm

Input (NumMiles)
NumKm ← NumMiles * 1.6
Output (NumMiles, " miles is ", NumKm, " kms.")

End Module

Check algorithm: If Miles= 20 then Kilometres = **32**

Algorithm in flow chart

```
                    ┌──────────────┐
                    │    Start     │
                    └──────┬───────┘
                           │
                   ╱───────▼────────╲
                  ╱  Input NumMiles  ╲
                  ╲                  ╱
                   ╲────────┬───────╱
                            │
                    ┌───────▼──────────┐
                    │ NumKm = NumMiles │
                    │      * 1.6       │
                    └───────┬──────────┘
                            │
                   ╱────────▼───────╲
                  ╱  Output NumKm    ╲
                   ╲────────┬───────╱
                            │
                    ┌───────▼──────┐
                    │    Finish    │
                    └──────────────┘
```
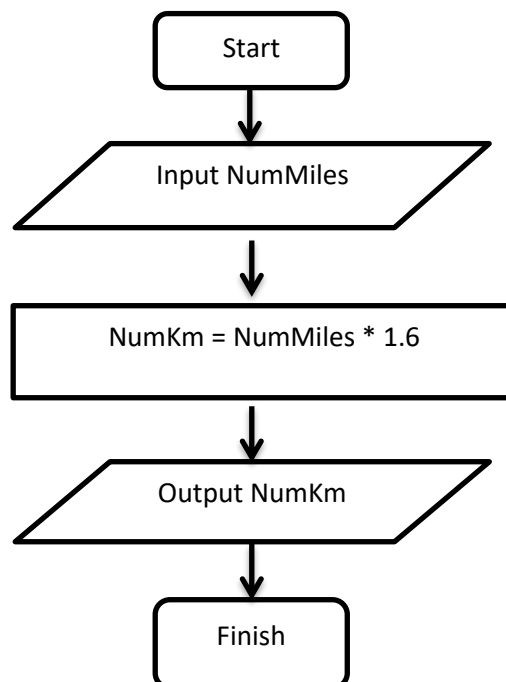
4. **Task**: Convert a weight in pounds into kilograms.
   Hint: Kilograms = Pounds * 0.45

Algorithm in Pseudocode

Module CalculateKg

Input (NumPounds)
NumKg ← NumPounds * 0.45
Output (NumPounds, " pounds is ", NumKg, " kgs.")

End Module

Check algorithm: If Pounds= 300 then Kilograms = **135**

5. Convert a temperature in Fahrenheit into Celsius.
   Hint: Celsius = (Fahrenheit – 32) * 5 / 9

Algorithm in Pseudocode

Module ConvertFah2Celsius

Input (NumFahrenheit)
NumCelsius ← (NumFahrenheit – 32) * 5 / 9
Output (NumFahrenheit, " F is ",NumCelsius, " C.")

End Module

Check algorithm: If Fahrenheit = 100 then Celsius = **37.78**

Integer Division Using Mod and Div

Write an algorithm to:
1. Convert a total number of weeks to years and weeks.

   Module ConvertToYrsAndWeeks

       Input (TotalWeeks)

       Years ← TotalWeeks div 52

       Weeks ← TotalWeeks mod 52

       Output(TotalWeeks, " weeks is " , Years , " years and " , Weeks , " weeks.")

   End Module

   Deskcheck: Any appropriate test data and Column headings are based on variables' names from the algorithm

   Example

	TotalWeeks	Years	Weeks	Output
Test data 1:				
Test data 2:				
Test data 3:				

2. Convert a total number of days to weeks and days.

   Module ConvertToWeeksAndDays

       Input (TotalDays)

       Weeks ← TotalDays div 7

       Days ← TotalDays mod 7

       Output(TotalDays, " days is " , Weeks , " weeks and " , Days , " days.")

   End Module

   Deskcheck: Any appropriate test data and Column headings are based on variables' names from the algorithm

3. Convert a total number of hours to days and hours.

   Module ConvertToDaysAndHours

       Input (TotalHours)

       Days ← TotalHours div 24

       Hours ← TotalHours mod 24

       Output(TotalHours, " hours is " , Days , " days and " , Hours , " hours.")

   End Module

   Deskcheck: Any appropriate test data and Column headings are based on variables' names from the algorithm

Selection – making a decision based on a Boolean statement

Exercises

1. **Weekly Commission:** Write an algorithm using **pseudo-code** to calculate a weekly commission based on the sales amount. A commission rate of 10% is paid for sales under 1000 and a commission rate of 15% is paid for sales of 1000 or more.

Algorithm in pseudocode
Input(Sales)
If Sales < 1000 then
CommissionRate ← 0.1
Else
CommissionRate ← 0.15
End if
TotalCommission ← Sales * CommissionRate
Output(TotalCommission)

Algorithm in flow chart
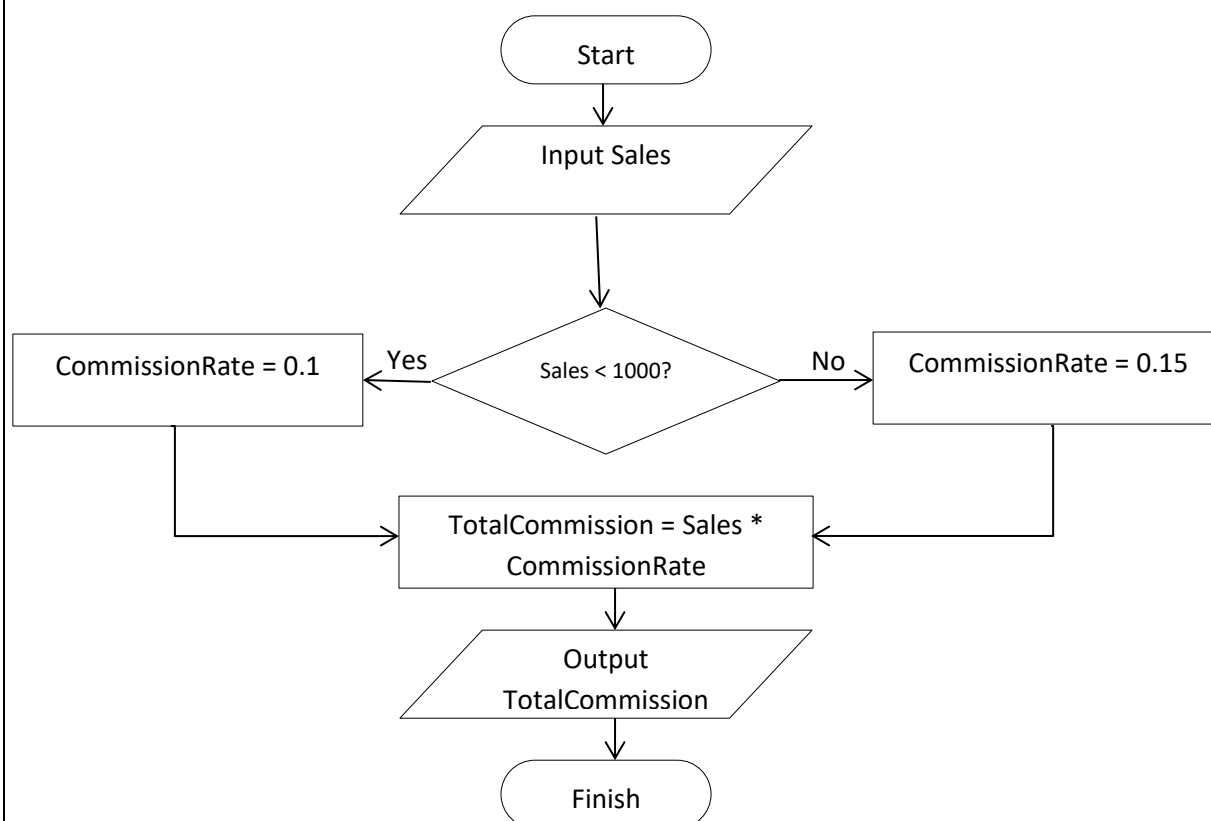
Test data used:

	SalesAmount	SalesAmount<1000?	Commission Rate	TotalCommission	Output
Test data 1:	200	Y	.1	200 * 0.1	20
Test data 2:	999.99	Y	.1	999.99* 0.1	99.99
Test data 3:	9009	N	.15	9009 * 0.15	1351.35

2. **Sporting:** Write the algorithm as **pseudo-code** that asks for the user's name and whether they prefer playing football or watching football. If they prefer to watch, tell them that they may need more exercise, otherwise tell them that playing sport will keep them healthy.

Input(UserName)

Output("Do you like to play or watch football? Enter "P" for playing and "W" for watching instead.")

Input(Response)

If Response =P then

      Output(UserName, "You are Healthy")

Else

      Output(UserName, "Need more Exercise")

End if

Test data used:

	Name	Preference	Preference = "watch"?	Output
Test data 1:				
Test data 2:				
Test data 3:				

3. **Age:** Write the algorithm in **pseudo-code** that asks the user what year they were born. If they are 17 years or younger, display a message that they can have a student discount price, otherwise display a message that says, sorry you are too old for a discount. (Hint: use a constant for ThisYear)

Input(YearBorn)

YourAge ← 2016 - YearBorn

If YourAge =< 17 then

      Output("You get Discount")

Else

      Output("Sorry You don't Get discount")

End if

Test data used: ThisYear = 2016

	BirthYear	Age	Age <= 17?	Output
Test data 1:				
Test data 2:				
Test data 3:				

4. **Smaller Number:** Write the algorithm as a **flow chart** that asks the user to enter 2 numbers. Use an "if statement" to determine which is the smaller number and output that number together with the words "is the smaller number".

Algorithm in flow chart
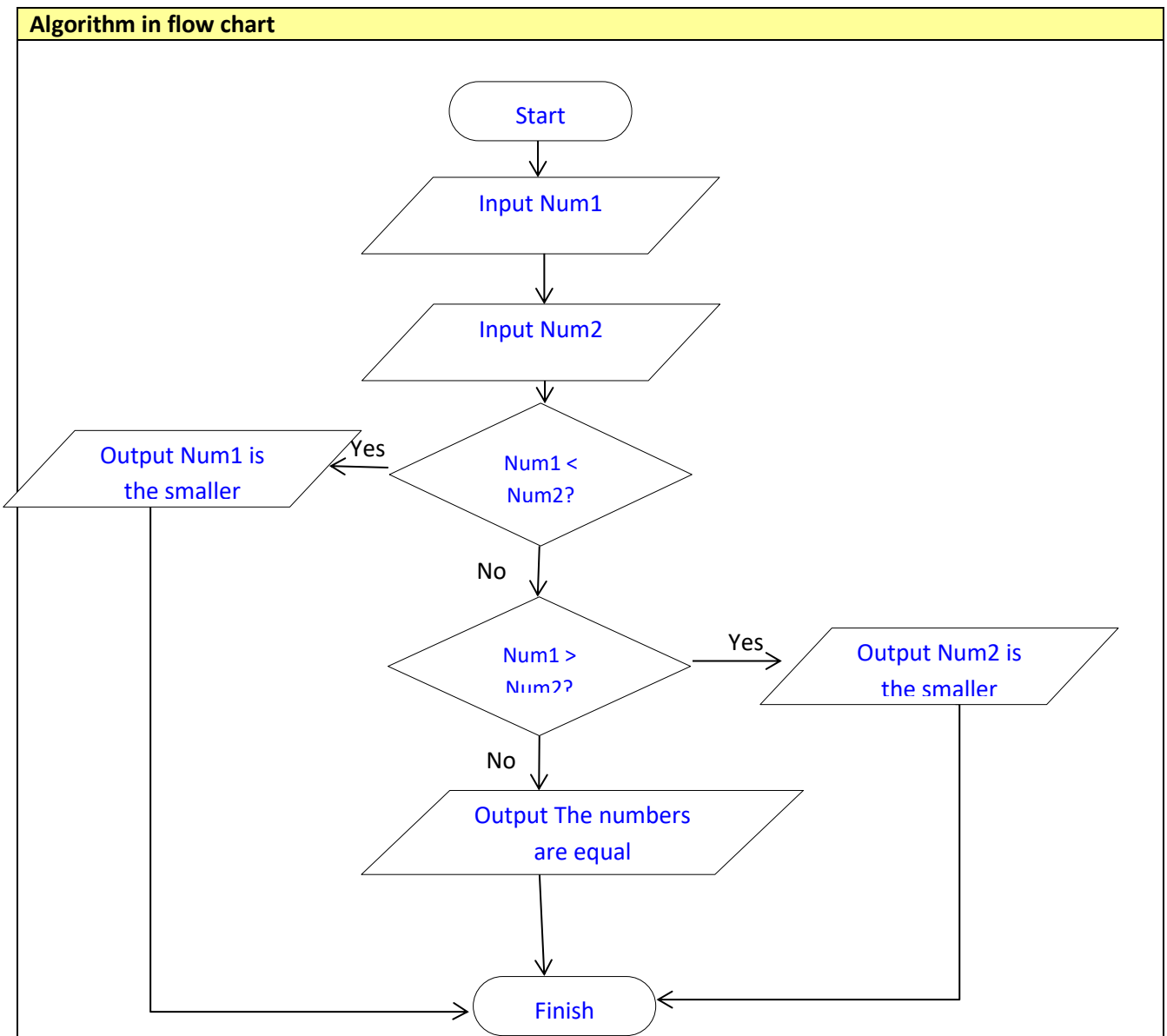
Test data used:

	FirstNum	SecondNum	FirstNum<SecondNum?	Output
Test data 1:				
Test data 2:				
Test data 3:				

But what happens if the 2 numbers are the same??? You will need to adjust your algorithm!

Selection Algorithm Practice

1. Write an algorithm that will accept the current temperature. If the temperature is over 45 degrees it will display a message "It is too hot, you may go home" otherwise it will display a message "The temperature is OK, keep on working."
    Module Temperature

    Input(Temperature)

    If Temperature > 45 then

    Output("It is too hot, you may go home")

    Else

    Output("The temperature is OK, keep on working.")

    End If

    End Module

 Test data used: 46, 40, 45

Temperature	Temperature > 45 ?	Output
46	46 > 45 = True	It is too hot, you may go home
40	40 > 45 = False	The temperature is OK, keep on working.
45	45 > 45 = False	The temperature is OK, keep on working.

2. Write an algorithm that accepts a number between -10 and 10, then displays whether the number is positive or negative. For example, if -3 is entered then the message "-3 is a negative number" is displayed.

Example 1

Module DetermineNumber

    Input(Num)

    If Num < -10 OR Num > 10 then

        Output("Number has to be between -10 and 10 only.")

    Else

        If Num > 0 then

            Output (Num, " is a positive number.")

        Else

        If Num < 0 then

            Output (Num, " is a negative number.")

        Else

            Output (Num, " is neither a positive nor a negative number.")

        End If

        End If

    End If

End Module

Test data used: -20, -3, 7, 0

Num	Num<-10 OR Num>10?	Num>0?	Num<0?	Output
-20	-20<-10 OR -20>10 = T			Number has to be between -10 and 10 only.
-3	-3<-10 OR -3>10 = F	-3>0=F	-3<0=T	-3 is a negative number.
7	7<-10 OR 7>10 = F	7>0=T		7 is a positive number.
0	0<-10 OR 0>10 = F	0>0=F	0<0=F	0 is neither a positive nor a negative number.

Example 2

Module DetermineNumber

    Input(Num)

      If Num > -10 OR Num <10 then

          Case Num **of**

              0   :   Output (Num, " is neither a positive nor a negative number.")

              >0   :   Output (Num, " is a positive number.")

              <0   :   Output (Num, " is a negative number.")

          End Case

      Else

          Output("Number has to be between -10 and 10 only.")

      End If

End Module

Test data used: -20, -3, 7, 0

Num	Num>-10 OR Num<10?	Output
-20	-20>-10 OR -20<10 = F	Number has to be between -10 and 10 only.
-3	-3>-10 OR -3<10 = T	-3 is a negative number.
7	7>-10 OR 7<10 = T	7 is a positive number.
0	0>-10 OR 0<10 = T	0 is neither a positive nor a negative number.

3. Write an algorithm that accepts an age of a person then displays the ticket type and price of entry to the zoo. The entry rates are as follows:

Age	Ticket Type	Price
<4 years	Toddler	$0
4 – 15 years	Child	$15
16 – 65 years	Adult	$29
>65 years	Concession	$22

Module ZooTicketPrice

    Input(Age)

    If Age > 0 then

        Case Age of

            <4   :   TicketType ← "Toddler"

                                Price ← 0

            4 .. 15 :   TicketType ← "Child"

                                  Price ← 15

            16 .. 65 :   TicketType ← "Adult"

                                  Price ← 29

            >65   :   TicketType ← "Concession"

                                  Price ← 22

        End Case

        Output("Age is", Age, " and ticket type is ", TicketType, " = price is $" , Price)

    Else

        Output("The age given is invalid.")

    End If

End Module

Test data used: 0, 3, 28, 67

Age	Age > 0?	TicketType	Price	Output
0	0>0=F			The age given is invalid.
3	3>0=T	Toddler	0	Age is 3 and ticket type is Toddler = price is $0
28	28>0=T	Adult	29	Age is 28 and ticket type is Adult = price is $29
67	67>0=T	Concession	22	Age is 67 and ticket type is Concession = price is $22

4. Write an algorithm that will accept a student's test score then display a grade and a message from the teacher.

Score	Grade	Message
0 .. 35	E	Make sure you attend all lessons and ask questions when you don't understand concepts.
36 .. 49	D	Improvements can be made by getting assistance in the Learning Centre.
50 .. 64	C	Good work. Remember to review your work every day.
65 .. 79	B	A very good effort. Keep consolidating your work.
80 .. 100	A	Excellent work! Continue with your current study plan.

Module DisplayGrade
    Input(Score)
    If Score >= 0 then
        Case Score of
            0 .. 35   :   Grade ← "E"
                        Message ← "Make sure you attend all lessons and ask questions when you don't understand concepts"
            36 .. 49 :   Grade ← "D"
                        Message ← "Improvements can be made by getting assistance in the Learning Centre"
            50 .. 64 :   Grade ← "C"
                        Message ← "Good work. Remember to review your work every day"
            65 .. 79 :   Grade ← "B"
                        Message ← "A very good effort. Keep consolidating your work"
            80 .. 100 :   Grade ← "A"
                        Message ← "Excellent work! Continue with your current study plan"
        End Case

        Output("Test score is", Score, " and your grade = ", Grade, "Message is: " , Message)
    Else
        Output("The test score must be >=0.")
    End If
End Module

Test data used: 0, -5, 55, 90

Score	Score >= 0?	Grade	Message	Output
0	0>=0=T	E	Make sure you…..	Test score is 0 and your grade = E Message is: Make sure ….
-5	-5>=0=F			The test score must be >=0.
55	55>=0=T	C	Good work.…	Test score is 55 and your grade = C Message is: Good work.…
90	90>=0=T	A	Excellent work!	Test score is 90 and your grade = A Message is: Excellent work! ….

5. In a game of golf the expected number of hits on a hole is called par. The number of hits taken in relation to par is given a name. Write an algorithm that will:
    *   accept the player's score for that hole (eg 7) and the par value of the hole (eg 4)
    *   calculate the difference (score – par)
    *   display the official golfing term for the score.

Difference	Golfing term
-3	Albatross
-2	Eagle
-1	Birdie
0	Par
1	Bogey
2	Double bogey
3	Triple bogey

Module DisplayParDifference
    Input(Score)
    Input(Par)

    ParDifference ← Score - Par

        Case ParDifference of

            -3   :   Output("You have got an Albatross")
            -2   :   Output("You have got an Eagle")
            -1   :   Output("You have got a Birdie")
            0   :   Output("You have got a Par")
            1   :   Output("You have got a Bogey")
            2   :   Output("You have got a Double bogey")
   3   :   Output("You have got a Triple bogey")
        End Case
End Module

Test data used: 7,4

Score	Par	ParDifference	Output
7	4	7-4 = 3	You have got a Triple bogey
4	3	4-3 = 1	You have got a Bogey
3	5	3-5 = -2	You have got an Eagle
2	2	2-2 = 0	You have got a Par
7	8	7-8 = -1	You have got a Birdie
5	3	5-3 = 2	You have got a Double bogey
6	9	6-9 = -3	You have got an Albatross

6. Sketch the form layout so that you can implement the questions 1 to 6 in VB Express. Include all controls needed and make sure you include the names for each control.
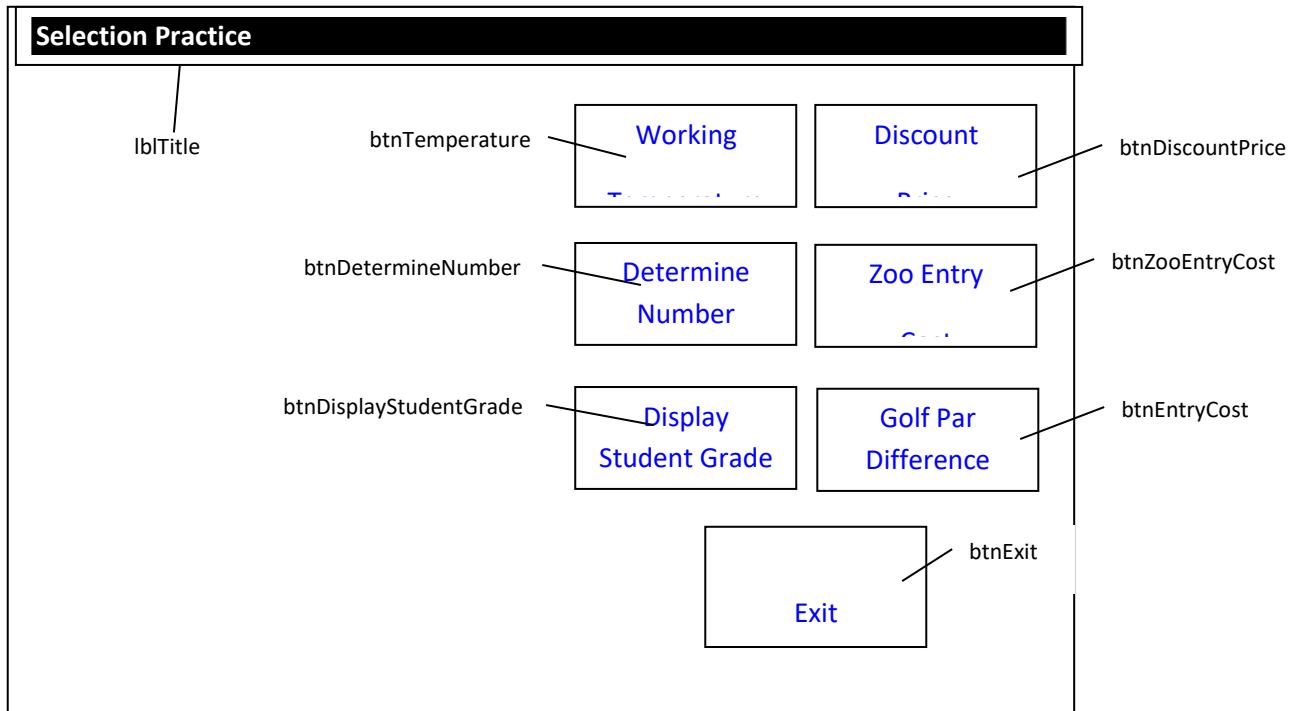
Repetition – Fixed

Exercises

1. Write the algorithm in pseudo-code to calculate the total cost of 5 different items.

Module CalcTotalCost

    TotalCost ← 0

    For Item ← 1 to 5

        Input (Cost)

        TotalCost ← + Cost

    End for

    Output("The total cost for 5 items is $", TotalCost)

End Module

Desk check: **10, 15, 20, 25, 30**

Item	Cost	TotalCost	Output
		0	
1	**10**	**0 + 10 = 10**	
2	**15**	**10 + 15 = 25**	
3	**20**	**25 + 20 = 45**	
4	**25**	**45 + 25 = 70**	
5	**30**	**70 + 30 = 100**	**The total cost for 5 items is $100**

2. Write the algorithm in pseudo-code to calculate the total weight of 4 different sumo wrestlers.

Module CalcTotalWeight

    TotalWeight ← 0

    For Sumo ← 1 to 4

        Input (Weight)

        TotalWeight← + Weight

    End for

    Output("The total weight for 4 sumo wrestlers is", TotalWeight, "kg")

End Module

Desk check: **85, 95, 110, 99, 120**

Sumo	Weight	TotalWeight	Output
		0	
1	85	0 + 85 = 85	
2	95	85 + 95 = 180	
3	110	180 + 110 = 290	
4	120	290 + 120 = 410	The total weight for 4 sumo wrestlers is 410

3. Write the algorithm in pseudo-code to calculate the total number of runs for 11 different cricketers.

Module CalcTotalRuns

    TotalRuns ← 0

    For Cricketer ← 1 to 11

        Input (Runs)

        TotalRuns← + Runs

    End for

    Output("The total runs for 11 cricketers is ", TotalRuns)

End Module

4. Write the algorithm in pseudo-code to calculate the average height of 6 basketball players.

Module CalcAverageHeight

    TotalHeight ← 0

    For Player ← 1 to 6

        Input (Height)

        TotalHeight ← + Height

    End for

    Average ← TotalHeight / 6

    Output("The average height of 6 players is ", Average)

End Module

Desk check: **110, 155, 230, 198, 209, 230**

Sumo	Weight	TotalWeight	Average	Output
		0		
1	**110**	**0 + 110 = 110**		
2	**155**	**110 + 155 = 265**		
3	**230**	**265 + 230 = 495**		
4	**198**	**495 + 198 = 693**		
5	**209**	**693 + 209 = 902**		
6	**230**	**902 + 230 = 1132**	**1132 / 6 = 188.67**	**The average height of the 6 basketball players is 188.67**

5. Write the algorithm in pseudo-code to ask the user for the number of fish caught then calculate the average weight of the fish.

Module CalcAverageFishWeight

    TotalWeight ← 0

    Input (NumFish)

    For Fish ← 1 to NumFish

        Input (Weight)

        TotalWeight ← + Weight

    End for

    Average ← TotalWeight / NumFish

    Output("The average weight of ", NumFish, " fish is ", Average)

End Module

Desk check: **2, 3.15, 6.349, 1.2, 0.911**

Fish	Weight	TotalWeight	NumFish	Average	Output
		0	**5**		
1	**2**	**0 + 2 = 2**			
2	**3.15**	**2 + 3.15 = 5.15**			
3	**6.349**	**5.15 + 6.349 = 11.499**			
4	**1.2**	**11.499 + 1.2 = 12.699**			
5	**0.911**	**12.699 + .911 = 13.61**		**13.61 / 5 = 2.722**	**The average weight of the 5 fish is 2.722**

Repetition – Variable

Exercises

1. Write an algorithm using pseudocode to make sure that a height entered is between 80 and 250 cm. Display the height when it is valid. **Use variable test first**.

Module ValidateHeightTestFirst

    Input (Height)

    While (Height <80) OR (Height > 250)

> *If the conditions are TRUE, it will get into the loop (because the data is NOT VALID).
>
> *If the conditions are FALSE, it will NOT get into the loop (because the data is VALID).

Test First Loop

        Output ("Not a valid height. Please try again!")

        Input(Height)

    End While

    Output ("Your valid height is ", Height)

End Module
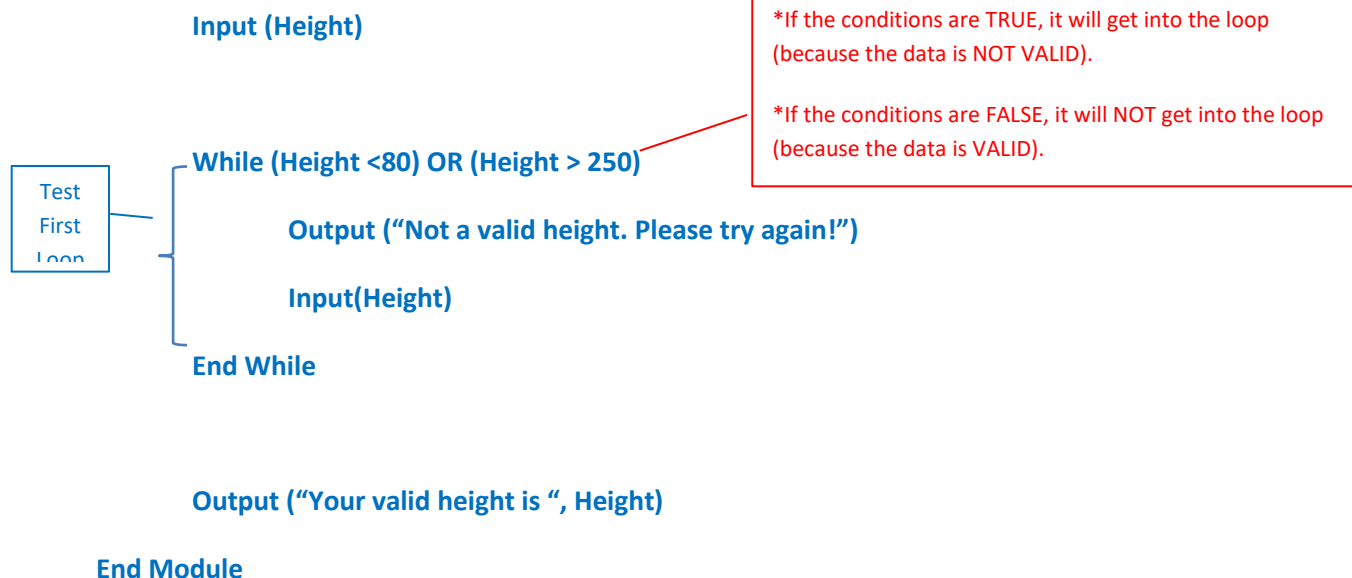
- Desk check using your own test data. **65, 253, 185**

Height<80 OR Height>250?	Output	Height
		65
T OR F = T	Not a valid height. Please try again!	253
F OR T = T	Not a valid height. Please try again!	185
F OR F = F	Your valid height is 185	

2. Write an algorithm to make sure that the password entered is U4Me. When the password is valid, display the message "Password entered is valid". **Use variable test last**.

Module ValidPassword

    Repeat

        Input (Password)

    Until (Password = "U4Me")

    Output("Password entered is valid")

End Module

- Desk check using the values provided : **MyLove, Cat, U4Me**

Password	Password = "U4Me"?	Output
MyLove	MyLove = U4Me = F	
Cat	Cat = U4Me = F	
U4Me	U4Me = U4Me = T	Password entered is valid

3. Limit the number of attempts at entering the password to 4. If they get it correct display the message "**OK you may enter**" if they did not get it correct in 4 attempts display the message "**Sorry entry forbidden**".

HINT: You will need to have

- 2 conditions in your algorithm
- use 2 way selection and a repetition control structures
- keep track of NumAttempts.

Module ValidPassword4Atttempts

    Attempt ← 1

    Repeat

        Input (Password)

        If Password = "U4Me" then

            Output ("OK you may enter")

        Else

            Output ("Sorry entry forbidden")

            Attempt ← Attempt + 1

        End If

    Until (Attempt = 5) OR (Password = "U4Me")

    End Module

- Desk check using your own test data **MyLove, Cat, U4Me**

Password	Password = U4Me	Output	Attempt	Attempt=5 OR Password=U4ME?
			1	
MyLove	MyLove=U4Me = F	Sorry entry forbidden	1+1=2	F OR F = F
Cat	Cat=U4Me = F	Sorry entry forbidden	2+1=3	F OR F = F
U4Me	U4Me=U4Me = T	OK you may enter		F OR T = T

- Desk check using your own test data **MyLove, Cat, NotMe, MyDog, U4Me**

Password	Password = U4Me	Output	Attempt	Attempt=5 OR Password=U4ME?
			1	
MyLove	MyLove=U4Me = F	Sorry entry forbidden	1+1=2	F OR F = F
Cat	Cat=U4Me = F	Sorry entry forbidden	2+1=3	F OR F = F
NotMe	NotMe=U4Me = F	Sorry entry forbidden	3+1=4	F OR F = F
MyDog	MyDog=U4Me = F	Sorry entry forbidden	4+1=5	T OR F = T

4. A plane has a maximum capacity of 200 passengers. Write an algorithm using pseudocode that

- asks a person how many tickets they want
- checks that there are enough tickets left and if there are enough tickets left then deducts the number of tickets from the total.
- If there is not enough tickets left, displays an appropriate message
- This continues until all tickets are sold. Once all tickets are sold, the program will display a message that the plane is full.

Using Variable Test Last (Repeat..Until)

Module PlaneTickets

    TotalTickets ← 200

    Repeat

        Input (NumTickets)

        If NumTickets <= TotalTickets then

            TotalTickets ← TotalTickets - NumTickets

        Else

            Output ("Sorry, there is only", TotalTickets, " tickets left")

        End If

    Until TotalTickets = 0

    Output("The plane is full!")

End Module

Using Variable Test First (While..End While)

Module PlaneTickets

    TotalTickets ← 200

    While TotalTickets <> 0

        Input (NumTickets)

        If NumTickets <= TotalTickets then

            TotalTickets ← TotalTickets - NumTickets

        Else

            Output ("Sorry, there is only", TotalTickets, " tickets left")

        End If

    End While

    Output("The plane is full!")

End Module

- Desk check using your own test data

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5. A clown has 50 balloons to give away. Write an algorithm using pseudocode that

- asks a person how many balloons they want
- checks that there are enough balloons left and if there are enough balloons left then deducts the number from the total.
- If there is not enough balloons left, displays an appropriate message
- This continues until all balloons are given out. Once all balloons are distributed, the program will display a message that all the balloons are gone!

Using Variable Test Last (Repeat..Until)

Module FreeBalloons

TotalBalloons ← 50

Repeat

Output("How many balloons do you need?")
Input (NumBalloons)

If NumBalloons <= TotalBalloons then
TotalBalloons ← TotalBaloons - NumBalloons
Else
Output ("Sorry, there is only", TotalBalloons, " balloons left")
End If

Until TotalBalloons = 0

Output("All the balloons are gone!")
End Module

Using Variable Test First (While..End While)

Module FreeBalloons

TotalBalloons ← 50
While TotalBalloons <> 0

Output("How many balloons do you need?")
Input (NumBalloons)

If NumBalloons <= TotalBalloons then
TotalBalloons ← TotalBaloons - NumBalloons
Else
Output ("Sorry, there is only", TotalBalloons, " balloons left")
End If

End While
Output("All the balloons are gone!")
End Module

- Desk check using your own test data

Networks and Communications

Network Diagrams

Exercises

1.
    a.   Draw a network diagram that connects 4 computers (work stations), a switch, WAP, 2 servers and a wireless laptop.
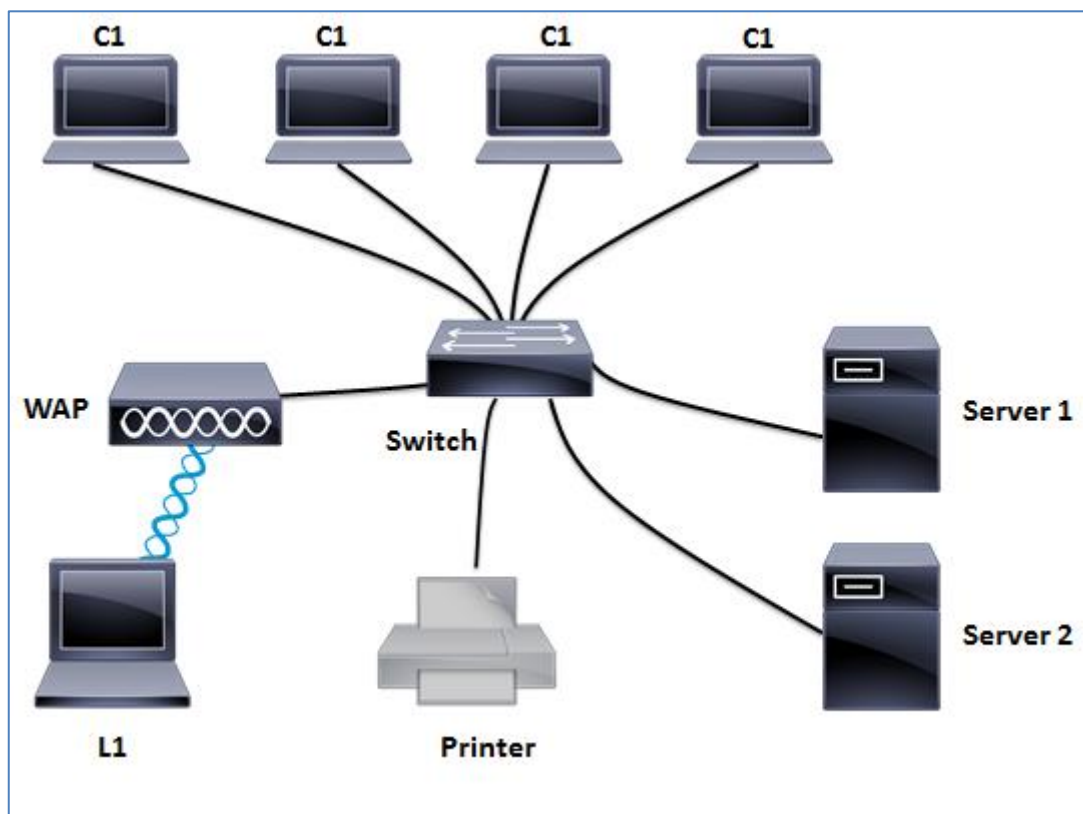
    b.   What transmission media did you need to include?

        Unshielded twisted pair cable

        WiFi

    c.   What type of network is this?

        Local Area Network (LAN) in a star topology

    d.   Add a printer so that all of the work stations and the laptop can print to the one printer. Why did you connect the printer where you did?

        The printer needs to be connected to the switch so that all the

        computers and notebook can access it

2. Caitlin uses Bluetooth to connect her iPod to her car stereo system so that she can listen to her music playlist through the stereo.

    a. What type of network is this?

    Personal Area Network (PAN)

    b. Draw the network diagram.
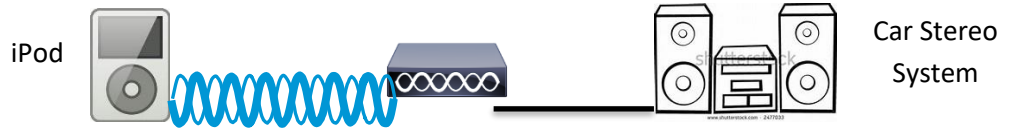
3. A home user would like to connect to following devices together: smart TV, network aware printer, computer, smart phone, tablet and notebook. He would also like to be able to connect to the Internet.

    a. What extra devices would he need to buy?

    Wireless router which combines WAP, router, switch, firewall and modem

    b. What type of network is this?

    Local Area Network (LAN)

    c. Draw a sketch of your proposed network.
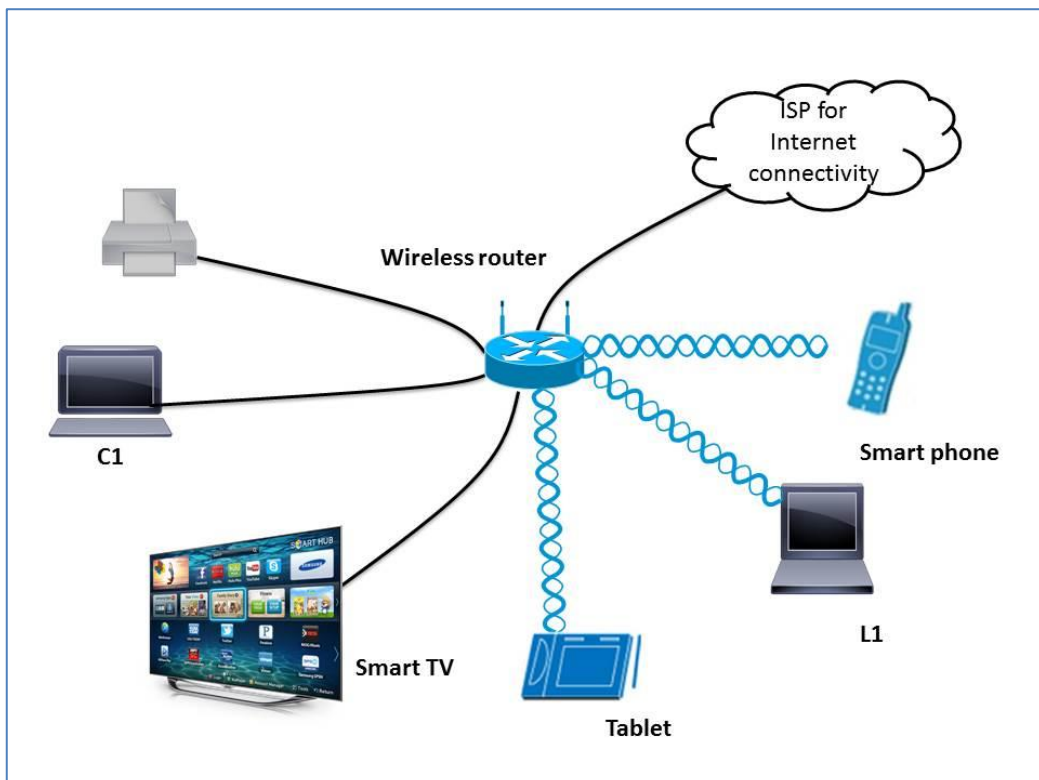
4. A library is planning to set up a combined wired and wireless network so that people can access to the internet via their own devices. The network will have 2 computers in the librarian's office, 2 computers on the loans table (each with a barcode scanner attached), 2 printers (1 in the office and 1 near the loans table), database server, media storage server, a switch, a router with firewall and **3** wireless access points distributed throughout the library.

    a. Draw a network diagram showing the network topology.
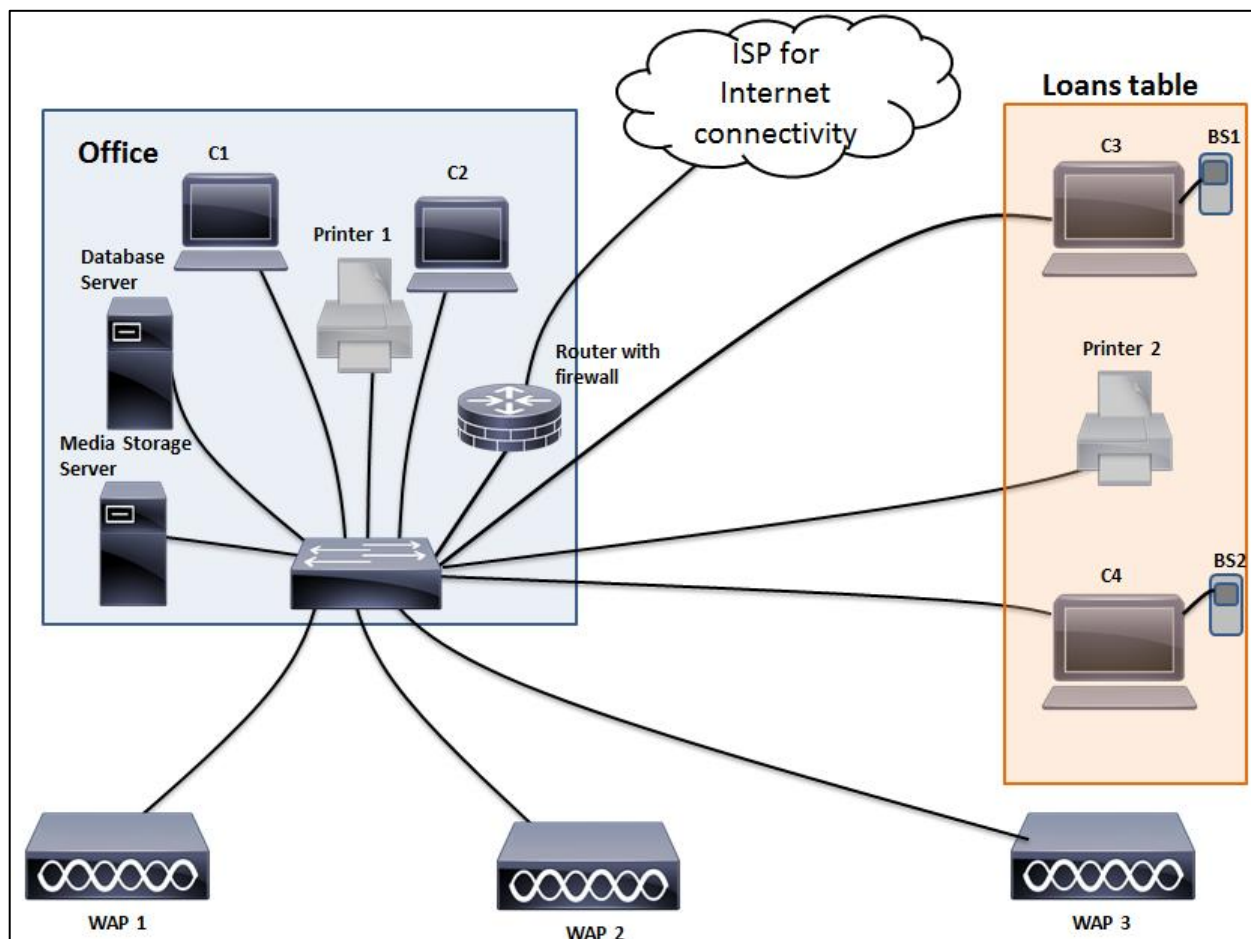
    b. Describe one advantage of using wireless connectivity in the library?
        Users can sit where-ever they like (as long as within WAP range).

        No need for cables in walls

    c. Describe one disadvantage of using wireless connectivity in the library?
        Wireless transmission is not secure, affected by interference

        Objects (eg file cabinets, metal stairs, wood, plaster, water features and plants) affect wireless range by either absorbing or reflecting the signal.

    d. Describe one advantage of using a wired connectivity in the library?
        Very secure transmission, minimal interference

    e. Describe one disadvantage of using a wired connectivity in the library?
        Limited to where you can sit to connect to the network.

5. A business requires a network to be established that links the computers and other network devices which are located across 3 separate buildings on the same site.
The file server, database server, web server and router will be located in small server room in the administration building. The servers will be connected to switch A.

The 2 workstations and network aware photocopier in the administration building will also be connected to switch A via UTP cable.

The 3 workstations and laser printer in the engineering building will be connected to switch B via UTP cable.

The 2 workstations, a laser printer and a wireless access point in the manufacturing building will be connected to switch C via STP cable.

Switch B and switch C will connect to switch A via fibre optic cable. All workstations and notebooks will have Internet access.

a. Sketch the proposed network diagram, clearly labelling all components.
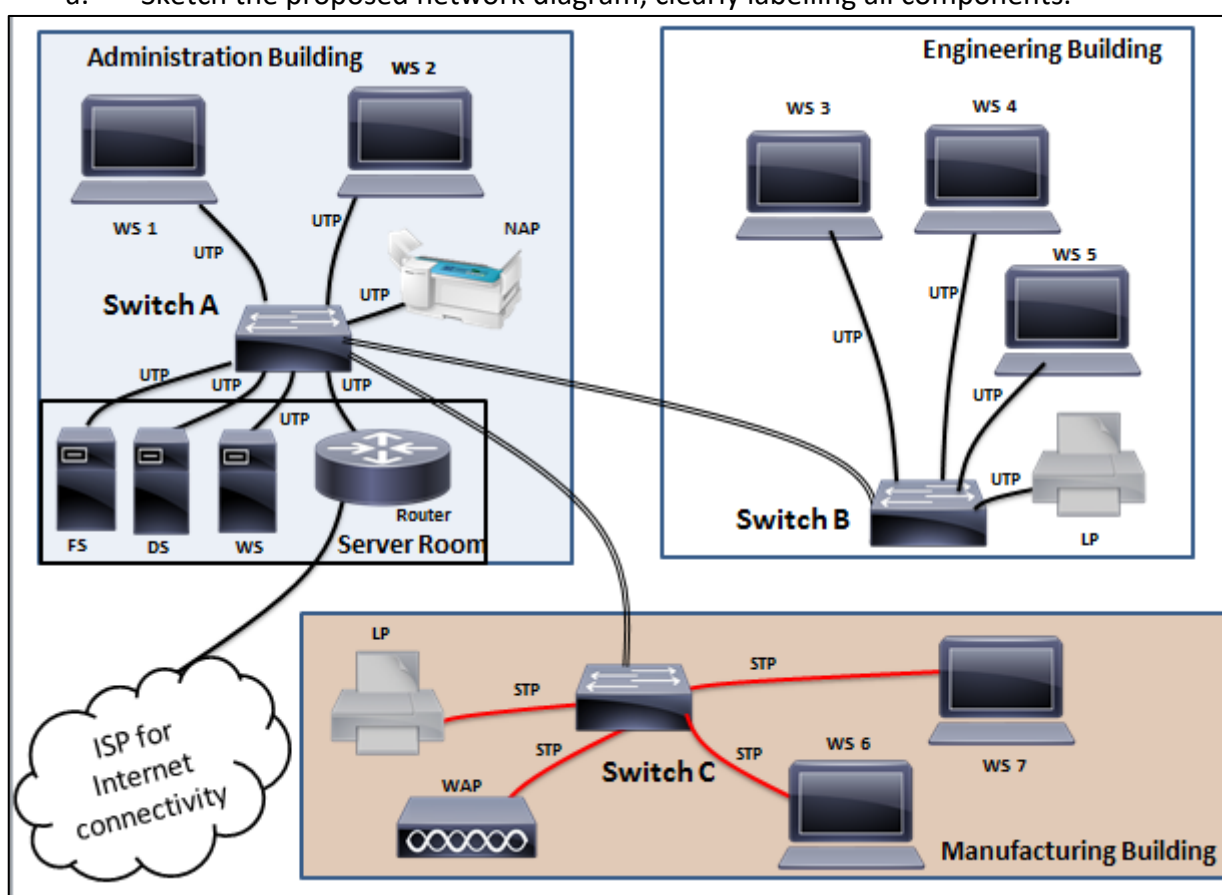
b. Why would STP cable be used in the manufacturing building?

STP cable would provide protection from any electromagnetic

interference that was being generated in the machinery in the manufacturing building (eg by welding equipment)

c. Why fibre optic cable would be used to link the 3 switches.

Faster transmission rates (greater bandwidth)

Not affected by electromagnetic interference

Networking Questions

1. Define (explain) the following terms:

    a. Network

    A network is physical connection of two or more computers where data is transmitted from one computer to another over transmission media. These computers also share resources.

    b. Protocol

    A set of rules or standards for communication (or the exchange of data) between devices.

    c. LAN

    A Local Area Network is a collection of computers connected together over one site (short distances) without the need to use the public telecommunication system

    d. WAN

    A Wide Area Network is a network of computers that span a wide geographical area. Usually uses the public telecommunication system.

    e. NIC
    A Network Interface Card is a small circuit board inserted into a slot inside the device (eg computer) so that the device can connect to the network using the appropriate transmission media.

    f. Server computer

    A computer that controls the network and provides services to other computers

    g. Client computer

    A computer that makes requests to server computers and uses their services.

    h. Wireless access point

    Wireless access point - allows computers, notebooks and other wireless devices to send and receive data without the need for cables. A wireless access point is also usually connected to a wired network.

2. Modem is short for **mo**dulation and **dem**odulation. Explain the function of a modem and include the terms modulation, demodulation, analogue signal and digital signal. Use a diagram to support your answer

A modem is a communications device that enables computer signals to be sent through the phone line. The computer's digital signals are converted to analogue signals by modulation (change) of a characteristic, such as the amplitude (height) or frequency of the carrier wave. Demodulation converts the analogue phone signals back into digital signals.

Demodulation

Modulation
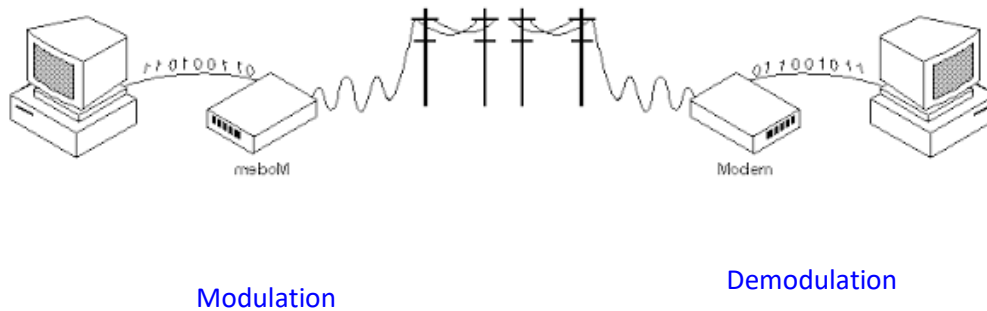
3. Malware is short for malicious software. Name and briefly explain two types of malware.
   - **Viruses** – a potentially damaging computer program that affects, or infects, a computer negatively by altering the way the computer works without the user's knowledge or permission.
   - **Worms** – a program that copies itself repeatedly, using up system resources and possibly shutting down the system.
   - **Trojans** – program that hides within or looks like a legitimate program.
   - **Spyware** – program placed on a computer without the user's knowledge that secretly collects information about the user.

4. Explain what is known as 'noise' in a network transmission.

Noise is anything that causes distortion in the received signal, so that the message is hard to understand/hear etc.

5. Name the two common wired cables used in networking. Sketch a picture of each and explain the main features of each cable.

Cable 1: Twisted pair (UTP and STP) - pairs of copper cable twisted together to reduce the effect of noise (interference - crosstalk and electromagnetic induction). It is cheap and flexible type of local-area network (LAN) cable, most networks contain some twisted-pair cabling at some point along the network.
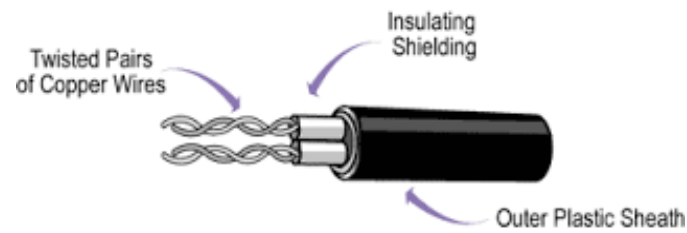

Cable 2: Fibre Optic cable is dozens or hundreds of thin strands of glass or plastic tubes that use light to transmit signals. It provides very fast and secure transmission of data but it is expensive to buy.
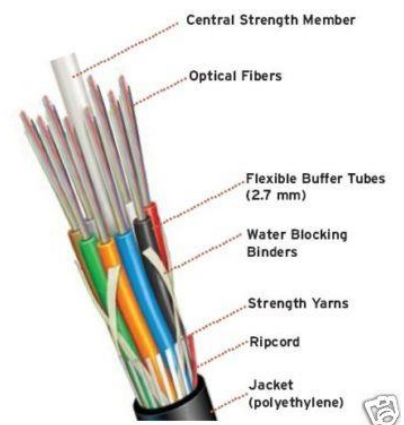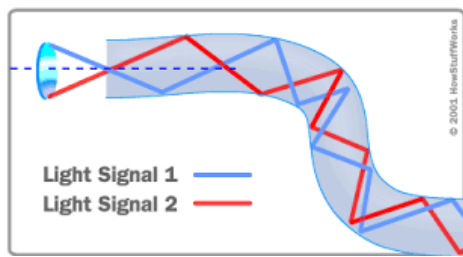
6. Explain the difference between the two types of twisted pairs – unshielded twisted pair (UTP) and shielded twisted pair (STP).

UTP doesn't have extra shielding so is cheaper and more flexible.

STP has extra shielding and not as flexible but a better conductor as it reduces more electrical interference.
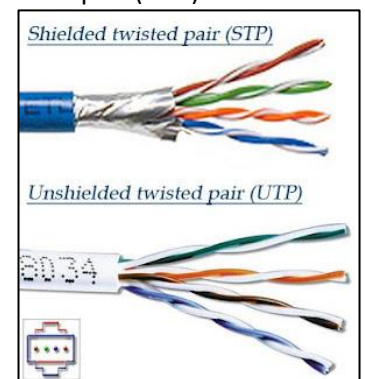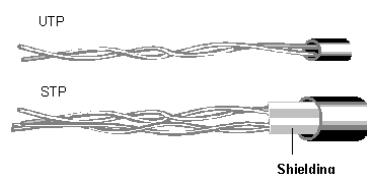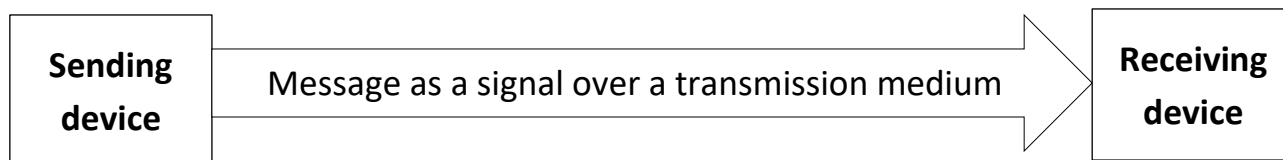

Without extra shielding

7. List the three basic components of a data communications system.
The basic components of a data communications system are a sending device, a communications link, and a receiving device.

8. Draw a diagram to represent the components of a data communications system.

Sending device	Message as a signal over a transmission medium →	Receiving device

Using protocols

Simple Mail Transfer Protocol

Hello class!

9. Name and explain the purpose of **two** different communication protocols.
   - **FTP - File transfer protocol -** a standard for the exchange of program and data files across a network.
   - **HTTP - Hypertext Transfer Protocol -** a set of instructions for communication between a server and a World Wide Web client.
   - **HTTPS - Hyper Text Transfer Protocol with Secure Sockets Layer (SSL)**, protocol primarily developed with secure, safe Internet transactions.
   - **SMTP - Simple Mail Transfer Protocol** - a data transmission format used to send and receive e-mail.
   - **WAP – wireless access protocol** – is a set of rules for accessing information over a mobile wireless network, no matter what type of wireless technology is being used.

10. Computer networks can use wireless communications instead of cables. For each of the following:

    a. indicate whether it is suitable for short distance or long distance.

    b. research the communication range of transmission.

	Short or Long distance	**Range of transmission**
Satellite	long	
Bluetooth	short	
Microwave	long	
Infrared	short	

11. What does a router do?
    Router is a communications device that directs communications traffic and determines the best path for data to travel when several networks are connected together.

12. Sketch a labelled diagram of the topology (physical layout) of a star network.
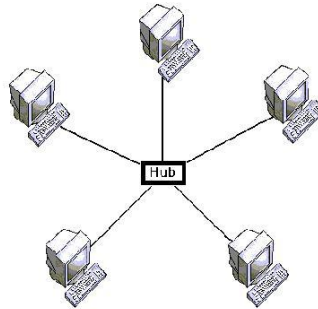
13. Using the following description of the network, draw the network diagram in the space below. You may need to add devices to the network.

Nodes 1, 2 and 3 are connected to the network with unshielded twisted pair cabling. The Printer is network aware. Nodes 4 and 5 are wireless laptops which gain access to the wired network through the wireless access point. All computers can access to the Internet.