Designed for Australian
Secondary Schools
Years 7 - 10

Digital Technology

Vic Farrell

To teachers everywhere who battled through 2020 & 2021 by supporting each other so they can provide the best education for their students.

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About this book

Many students arrive at secondary school with plenty of experience with mobile devices. They have become dependent on easy-to-use touch screen interfaces and some have rarely used a mouse. An ever-dwindling number of students bring basic desktop computer skills to Year 7. Few are able to demonstrate basic use of office software and the storage and retrieval of files.

This text book brings together ICT techniques and the Australian Digital Technologies curriculum to assist teachers and students to navigate secondary school computing.

Instead of identifying year levels, the chapters are identified as Foundation, Intermediate, Advanced and Specialised. Foundation and Intermediate are based on the ACARA Australian Curriculum for Years 7 and 8, but the activities are just as relevant for Years 9 and 10. If you have especially skilled or experienced middle school students who need to be challenged, move them up into the Advanced and Specialised activities and content.

Each chapter is made up of three sections

·   ICT Skills

·   Digital Technologies

·   Assessment Tasks

ICT Skills provides step by step practical techniques to create solutions, analyse data and use various applications.

Digital Technologies covers the theory content that can be examined.

Assessment Tasks include a range of practical projects that can assess students' skills and knowledge of the digital technologies curriculum.

All programs presented in this book along with the assessment tasks and their rubrics have been implemented in years 7 - 10 over the period of 2010 - 2020.

A Teachers Companion Guide is also available with sample solutions and rubrics.

Australian Curriculum

FOUNDATION - INTERMEDIATE LEVEL
(Aimed at Years 7 - 8)

Digital Technology Knowledge and Understanding

ACTDIK023 Investigate how data is transmitted and secured in wired, wireless and mobile networks, and how the specifications affect performance

ACTDIK024 Investigate how digital systems represent text, image and audio data in binary

Digital Technologies Processes and Production Skills

ACTDIP025 Acquire data from a range of sources and evaluate authenticity, accuracy and timeliness

ACTDIP026 Analyse data and visualise using a range of software to create information, and use structured data to model objects or events

ACTDIP027 Define and decompose real world problems taking into account functional requirements and economic, environmental, social, technical and usability constraints

ACTDIP028 Design the user experience of a digital system, generating, evaluating and communicating alternative designs.

ACTDIP029 Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors.

ACTDIP030 Implement and modify programs with user interfaces involving branching, iteration and functions in a general purpose programming language.

ACTDIP031 Evaluate how student solutions and existing information systems meet needs, are innovative, and take account of future risks and sustainability.

ACTDIP032 Plan and manage projects that create and communicate ideas and information collaboratively online, taking safety and social contexts into account.

Australian Curriculum

ADVANCED - SPECIALIST LEVELS
(Aimed at Years 9 - 10)

Digital Technology Knowledge and Understanding

ACTDIK034 Investigate the role of hardware and software in managing, controlling and securing the movement of and access to data in networked digital systems.

ACTDIK035 Analyse simple compression of data and how content data are separated from presentation

Digital Technologies Processes and Production Skills

ACTDIP036 Develop techniques for acquiring, storing and validating quantitative and qualitative data from a range of sources, considering privacy and security requirements

ACTDIP037 Analyse and visualise data to create information and address complex problems, and model processes, entities and their relationships using structured data

ACTDIP038 Define and decompose real-world problems precisely, taking into account functional and nonfunctional requirements and including interviewing stakeholders to identify needs

ACTDIP039 Design the user experience of a digital system by evaluating alternative designs against criteria including functionality, accessibility, usability, and aesthetics

ACTDIP040 Design algorithms represented diagrammatically and in structured English and validate algorithms and programs through tracing and test cases

ACTDIP041 Implement modular programs, applying selected algorithms and data structures including using an object oriented programming language

ACTDIP042 Evaluate critically how student solutions and existing information systems and policies, take account of future risks and sustainability and provide opportunities for innovation and enterprise

ACTDIP043 Create interactive solutions for sharing ideas and information online, taking into account safety, social contexts and legal responsibilities

ACTDIP044 Plan and manage projects using an iterative and collaborative approach, identifying risks and considering safety and sustainability

Fundamentals

For decades it has been assumed that kids know more than adults about technology. This is becoming increasingly incorrect with the advent of touch screen mobile devices.

You cannot assume all students in your class know how to use email, store and retrieve files or even use a mouse. This section of the text covers fundamental ICT skills that will support all students navigate their way through high school using digital technology. It is broken into four sections:

- IT at School. How students keep records for access email, the school moodle or portal and printing.

- Google Apps for School. Focuses on storage and work processing so students can write school assignments without losing them.

- Social and Ethical use of IT . This supports students in acknowledging sources and understanding responsible technology use.

- Shortcuts using the keyboard.

This chapter focuses on skills using Google Apps because they are free and are easily accessible from Google Chrome browser. For students without home internet access, please skip to the Foundation Chapter for word processing.

Suitable for all year levels

This section could be used as a "licence" to use digital technology at your school.

Fundamentals I
ICT at School

SETTING UP YOUR LAPTOP

1. Create a password for your laptop and change it every school Term.

Write a HINT here to help remind you what your laptop password is for each term:

      Term One: _____

      Term Two: _____

      Term Three: _____

      Term Four: _____

Here are some ideas for memorable passwords that are hard to guess: a neighbour's car rego plate, a distant relative's name and their date of birth, highest game score inside the name of a band you hate, your parents anniversary date inside the name of the location of a favourite holiday.

2. Create FOLDERS or DIRECTORIES for each subject on your laptop. This is where you will save all the files and notes you wish to store on your computer. You might like to create a folder for friends or for your sports team. If you start the year organised and use your organisation always, you will never lose track of where you saved a photo or a document. Sometimes, it is a good idea to store everything for school in a folder named School2020 and then put your subject folders inside. This way you can tell the difference between English this year and English next year.

If you use a PC, you will use Windows Explorer. The Windows Explorer icon on the left can be found in the menu on the bottom of your screen. You can also just hold down the Window key and then click on the E key.

If you have a Mac, you will use Finder. The Finder icon on the left can be found in the menu on the bottom of your screen. You can also just hold down the Command key and then click on the F key.

3. You will need the Google Chrome browser installed on your computer to make it easier to use free Google Apps. You can do this by using a browser you already have installed.

Use this website: **https://www.google.com/chrome/**

If you have a PC you will have Microsoft Internet Explorer or Edge.

If you have a Mac you can use Safari.

4. Remove all distractions from your school laptop. Do not use your school laptop for:

· Games

· Social Media

· Chat

A good rule of thumb is to have a work machine (your school laptop) and a personal machine (your Games console, mobile phone or tablet). Keep them separated so you can reward yourself with fun activities without being tempted while working on school tasks.

YOUR SCHOOL PORTAL, EMAIL & PRINTING

1. Your school will have some portal, website or moodle for you to log into each day to access lesson resources, your timetable, school news information or other instructions.

Write the web link here:_____

2. Your school will have provided you with an email address.

Write your email address here: _____

3. You will need a separate password for your school logins. You will need to change these passwords each term. DO NOT make them the same as your laptop password.

Write a HINT ONLY here to help you remember the passwords each term

      Term One: _____

      Term Two: _____

      Term Three: _____

      Term Four: _____

4. Your school will have provided you with a storage location for your school work. Below, write the instructions on how to store you work while at school.

_____

_____

_____

_____

Each school will have their own instructions for accessing the school portal or website. It is important that all students have a guide to using the school portal and instructions on how to access the school email. The next two page have been left blank for these instructions to written or affixed.

Fundamentals

Page 14

IT CLASSROOM RULES

There are special rules for school IT labs and computer classes. Please fill in the space below by writing the rules provided by your teacher.

Fundamentals II
Google Apps for School

The number one software application used all over the world and on nearly every computer in all organisations is a word processor. You will need to learn how to use a word processor efficiently so you can write and submit your school assignments. We will be using the free online app, Google Docs.

You have been instructed in the first section of this chapter to install Google Chrome. This will ensure all your Google apps work well.

Word Processing using Google Docs

Open Google Chrome. It should open directly to Google as the homepage. At the top right of the page is an icon called a "waffle" made of nine dots. This opens a menu to all the Google Apps.

Google Docs Icon is a blue page icon.

1. Creating a File:

When you open Google docs, you should always rename your file first.

Select FILE and RENAME.

Rename your file – "MyWordSkills"

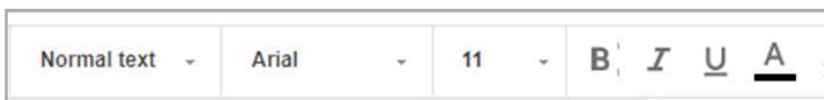**2. Creating a Table:**

A table is a great way to organise your information.

Choose the INSERT menu then TABLE.

3. Editing Text:

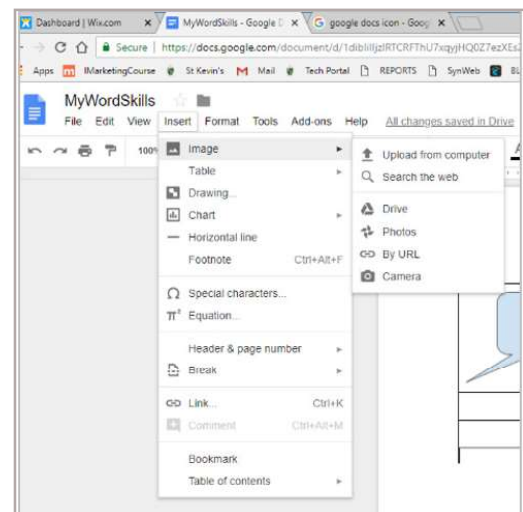Changing font, font colour and size can be done in this menu below.

4. Adding Drawn Shapes & Pictures:

Insert a shape. Choose INSERT, then DRAWING.

Create an object with text in it.

Insert a picture. Choose the INSERT Menu.

File Storage using Google Drive

In Fundamentals I we created folders on your computer to store your files. This is a great way of organising your notes, assignments and homework. If we save files into these folders we can access them if we have access to our laptop computer.

What if something were to happen to your computer? It might break-down, run out of battery or get left behind at home. You would not be able to access the files that are stored on it.

Google Drive allows you to save files "in the cloud". This means if you can access the internet and your Google Drive account, then you can access your files that you have saved there, from any computer.

Just like Google Docs, you access it from the waffle icon on the Google home page. You can see the icon circled on the right.

Once you open your Google Drive you will see your "MyWordSkills" document stored under Quick Access.

Google Drive is very easy to use.
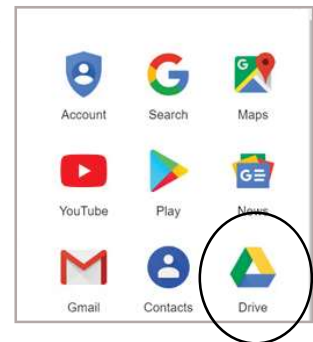
1. Click on the + New or "My Drive" buttons on the top left. They reveal a menu that allows you to create a new Google Docs file or a folder.

2. Create a new folder called "Homework". You will see the folder appear below.

3. Find an image on your laptop.

4. Click on + New or "My Drive" and select "File Upload"

5. Browse for the location on your file on your laptop.

6. Select your file and click Open or Upload.

7. Your file will upload and will appear in your drive.
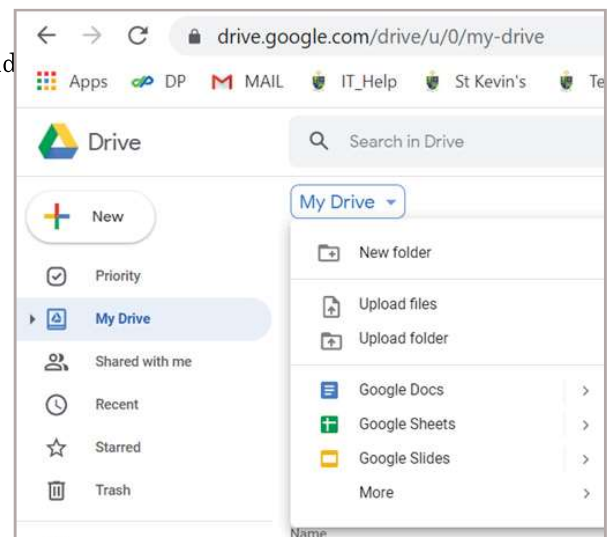
Cloud Computing is useful for sharing files too. Sometimes you might need to work on the same document with a fellow student in a team. Google Drive allows for two or more people to edit the same file.

If your school uses Gmail this means all the email addresses at your school are managed by Google. This makes sharing files with teachers a lot easier. This could be a great way to submit your work or ask for some feedback on a draft assignment.

Effective Online Searching

What is Google?

Google is search engine. It is not a website and it is not a source of information. Google takes your keywords and searches for them on other websites. Google then displays links to those websites with some descriptive text about the pages. If you use an image search, it will display images from those websites. Google does not own or store that data. It merely displays the data. You need to click on the links to go to the author's web pages to view the source of the text, images or video. If you go to the source of data you will understand the context of the data better.

Google Search Example:

You are asked to do a research project on the history of computing where you must report on an important innovator. You decide to research who the first computer programmer was and discover more about them.

You enter the following key words into Google:

"Who was the first computer programmer?"

The search returns the results below. The two main sections circled are summaries from two separate web sites. The summary on the right hand side is from a Wikipedia page and the smaller at the top of the left hand side of the page is a highly ranked web site called "World Science Festival".
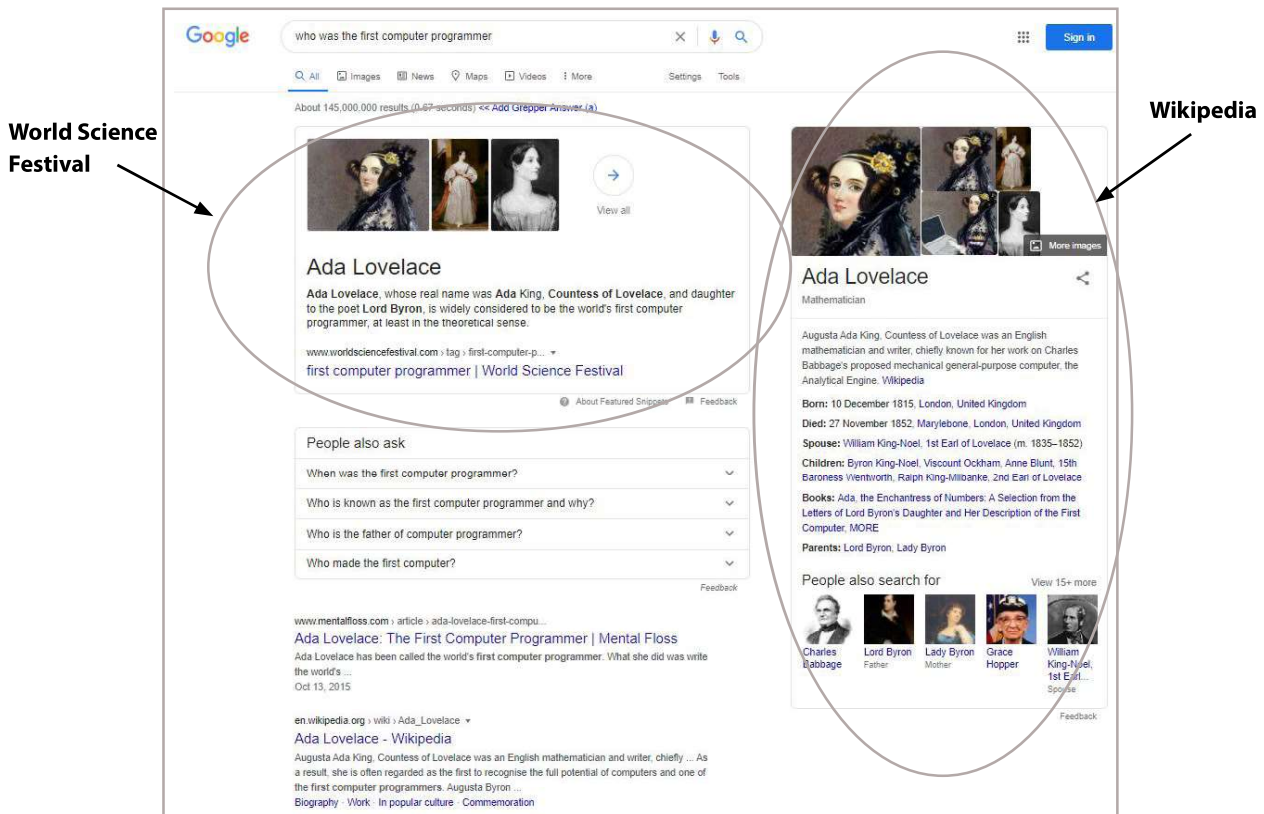
It is essential that if you wish to use the images or text you see displayed in either of these two summaries, to go to the original source pages to read the context and get further information. On the right you can see that the link to the World Science Festival page automatically highlights the summary text in yellow. Always check if the website is an authoritative source that you can rely on for correct information.
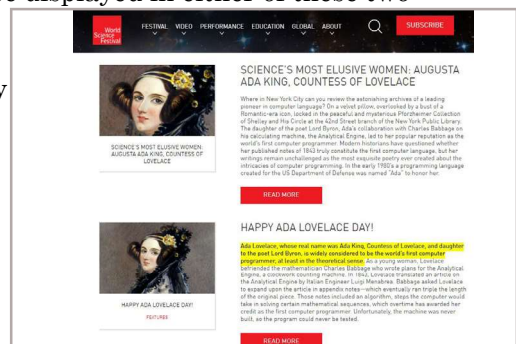
Keywords & Google

Sometimes you might search Google for an answer to a question and not find what you are looking for. There are some techniques you can use to find what you are looking for. Here is an example:

You are reading a science article with the word "cholate" in it. You want to know more about this word so you type it into Google and you get in return: "Did you mean chocolate?"

There are a couple of things you can do:

1. Add the context of the word to your search. It was a science article, so you can add the word "science" to the search.

2. You know you don't want information about chocolate, so you can remove it from your search by typing a minus sign in front of it.

Q   cholate science - chocolate

3. Now once you have a look through these search results, you will see more information more closely related to the term you are searching for. Some terms that are coming up are "Sodium" and "Salt". We can add these to our search now and get more information. If we write "What is sodium cholate salt?", we get a more detailed answer:

"It is an organic sodium salt. A trihydroxy bile salt that is used as a digestive aid in dietary supplements."

As you can see, you do not always get what you are looking for in the first attempt to search, you need to experiment with adding and removing different keywords and looking beyond the first page of search returns. Click on the links rather than just reading the Google return page.

Let's see if you can successfully answer the following questions using these techniques.

1.   What does the term "Hoi Polloi" mean and where does it come from?

2.   What is the name of Ashley McBryde's song that is about a bar in a place with a name starting with "D"?

3.   What is the oldest living thing in the world and where is it?

4.   How long have humans been living in Australia. (The latest finding).

5.   What is a logic gate? Describe it in words you understand.

6.   Find other words for: "Enthusiastic"

7.   "Get The Party Started" by P!nk was written by a member of which famous band?

8.   Which species of crane is the tallest?

Writing a Report

When writing a submission for any subject it is important that you include some information and formatting to assist your teacher in being able to mark the submission and return it to you.

Below is a list of things you MUST include with every electronic document you create!

1. Name the file. Include YOUR name and the name of the task.

   For example: "Brian Evans_Science Report".

2. Put your name in the document. The best location is the top right. *(See example below)*

3. Put the name of your teacher in the document. *(See example below)*

4. Include a TITLE that identifies the assessment task.

   For example: "Book Report: The Outsiders by S. E. Hinton"

5. If you have used an online source in developing your submission, you must include the link in your bibliography. You must also identify the date you visited the website. *(See example below)*

Fundamentals III
Social & Ethical Use

RESPONSIBLE USE OF TECHNOLOGY

Digital technology and networks are powerful tools, When used responsibly, access to information on the world wide web, connections across networked computers can enhance your learning and your life. With great power, comes responsibility! You have the power to send a tweet that could make someone smile, or cause a defamation legal battle. You could keep in contact with friends from far away, or allow a criminal into your life. It is your behaviour with these powerful tools that will determine your safety and the safety of others. In this section we will examine the following key areas of responsible use of technology:

- Protect your Technology
- Staying Safe Online
- Authentic Sources
- Copyright and acknowledgement
- Netiquette

Protect your Technology

There is a wide range of intelligent software out on line that is ready to do damage to your computer. This is called 'malware'. Malware is any software build to be deliberately destructive. There are a wide range of malware types.

- Viruses are the oldest form of malware, and most people have heard of them. These are applications that are hidden from view, that install themselves to do harm to your computers. Sometimes they slow down your computer, sometimes they destroy your data or crash your computer device. Some capture your personal information to be sent to criminals to sell on the dark web.
- Worms are self replicating code that fills a network slowing down the transfer of data. The worm code fill the network band width so that user on the network can not access their data stores or the internet.
- Trojans are malware that appear to be games or some type of app that is desirable. When it is downloaded and installed, it unleashes it's destructive powers on your computer.

Some malware has been responsible for shutting down entire organisations, destroying years of hard work and wasting a lot of time and money.

Here are some things you can do to keep your devices free of malware:

- Keep your operating systems up to date. Every time new malware become prevalent, operating system developers make 'patches' to keep the bad guys out.
- Install anti-malware software and keep it updated. Following instructions your anti-malware provides you to eliminate any threats.
- Keep your firewall security set to 'High' and do not visit websites that result in a warning from your firewall or other anti-malware software.
- Do not give any of your usernames or passwords to anyone.
- Do not leave your device unprotected by a password.
- Do not open emails from people you do not recognise.
- Create regular back-ups of all your work on a USB memory stick, in the cloud or on an external disk.

Staying Safe Online

Venturing onto the world wide web can be like walking out into an unknown city. This can include playing MMO games where there are no controls over who has access to the games. You can never be sure who you are playing with unless you have arranged to be play with known friends and family.

Here are some rules that you should always keep in mind, while online.

1. If you are entering your email address into a website, expect to receive emails from that site. Create an email address that you use when signing up for 'free' online services. You can use that email address to collect the advertising messages, so you don't have to deal with them in your day-to-day email at school.

2. Never provide anyone with your photo, address or phone number online. If you use social media, ensure you have set our privacy settings to limit who can access your posts and photos. While you are under 18 years of age, you should limit your social media interactions to friends and family who you know in real life.

3. Passwords are for you and you only. No one will ever ask you for your password. If your family members share your device you should share your device password with your parents or guardians in case you need assistance. Keep you passwords changing each month.

4. If you find yourself disagreeing with someone online - always remain respectful in they way you communicate. There is no need to be rude online. Think carefully before posting something that could be hurtful online.

5. If you see, hear or read something that makes you feel uncomfortable, tell an adult about it immediately.

Authentic Sources

When we go online we can end up on any web pages hosted by anyone. The world wide web, is not written entirely by reputable content developers. We have to know where we can find reliable information.

Wikipedia is a massive information website that is developed and edited by keen volunteers. It is mostly reliable, and provides a detailed source list on the bottom of each page. A Google search will often return a Wikipedia page very high on the list. Although, Wikipedia is not 100% reliable, it is a great place to begin your research. Wikipedia will give you an overview of what you need to know. It may even be a bit out of date in some instances. Use the source listings at the bottom of the page to verify the information is correct.

Scholarly reviewed books and articles produced by researchers and professionals in their field for use in research, are the best sources. Unfortunately, unless you are member of a university that covers the cost to accessing these articles, you will find it very difficult to get access. You might even have difficulty in understanding sources at that level.

The next best thing are sources that have been developed by educational institutions and government organisations. Website that use the following n their URL web addresses:

- .edu/ sites come from U.S. academic institutions, and may be indicators of academic quality or thoughtfulness.
- .gov/ sites come from U.S. state, local, federal or foreign governments; these may be indicators of reliability, accuracy.
- .org/ sites can be non-profit organizations (museums, institutes, charities); these may indicate advocacy, thoughtfulness, reliability.
- .int/ sites come from international organizations, United Nations and sites involving treaties and international agreements.

Anyone who tries to register a domain name like 'jeffsmith.edu.au' would have to prove that they are a registered educational organisation and provide documentation to the domain server hosting the site.

Always look for a date on the page. Is it the most recent information? If you can not find a date, the information may not be reliable.

If you are unsure about a source, you can perform a Google search on the source (ie. jeffsmith) and find out what other website have to say about his authenticity.

Copyright & Acknowledgement

All students must get into the habit of identifying where they are getting their information, images and other data from, so that they can acknowledge their sources. It is not just an annoying thing teachers make you do, it is a habit you will need to develop throughout your academic life.

Copyright refers to the ownership of literary works, artistic works, musical works, computer programs, sound recordings, films and broadcasts. Basically, copyright is the exclusive right to copy. If you write an essay, take a photo, create a painting or write a song, you have exclusive right to copy, perform or publish that work. If anyone else wishes to perform, publish or copy your work, they must ask you permission. In most cases, you would could charge them a fee and outline the rules for its use.

Copyright is important so that composers, writers, artists and other content creators have a legal right to their own work and how it is used by others. It allows content developers to earn a living from their work.

Now if you use text, an image or ideas taken from a book or a website without acknowledgement you are essentially 'stealing' that information and telling your teacher that you created all the elements yourself.

In high school and in undergraduate study it is perfectly acceptable to find relevant sources for your academic work, and to write about what you find. However, it is crucial that you keep records of the original authors of the work and acknowledge them in a bibliography.

The APA (American Psychological Association) style of referencing is used in computer science and social sciences. If you have copied text from a document you have found online or ina book, you can use it as long as it is presented as a quote. For example:

> "All students must get into the habit of identifying where they are getting their information, images and other data from, so that they can acknowledge their sources. It is not just an annoying thing teachers make you do, it is a habit you will need to develop throughout your academic life." (Farrell, 2021)

The text has been taken from this page of the textbook and it is presented in quotations and followed by the name of the author and the year it was published. This means the reader can then go to the reference section of your report, or your bibilography and find the full reference.

Farrell, V.(2021) Digital Technology 2021-2022, A textbook for Australian Secondary Schools Year 7 - 10. Melbourne, Australia.

A reference is constructed like this:

Author's surname, Initial, (Date Published) Title of Book, Location of publisher.

<p align="center">or</p>

Author's surname, Initial (Date Published) Title of Article, Location of publisher, Retrieved from (URL).

Netiquette

Most people experience abuse or other negativity online, through email, social media and other platforms. Do not be one of the people responsible for that negativity. Try the Grandma Rule - "If you wouldn't want your grandma to know about it - don't do it!"

Don't take on trolls who want to start arguments. Ignore them!

If you or a friend are being bullied by abusing or threatening messages, tell and adult. That behaviour is against the law. It is always a good idea to create a folder to store records of the abuse so you will have legal evidence later.

If a website has been banned by you school or parents, it is because there is a safety reason.

Never attempt to access someone's else's' email or computer without their permission. This is also against the law.

Foundation Level

Digital Technology Knowledge and Understanding

ACTDIK023 Investigate how data is transmitted and secured in wired, wireless and mobile networks, and how the specifications affect performance.

ACTDIK024 Investigate how digital systems represent text, image and audio data in binary.

Digital Technologies Processes and Production Skills

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ACTDIP029 Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors.

ACTDIP030 Implement and modify programs with user interfaces involving branching, iteration and functions in a general purpose programming language.

ACTDIP031 Evaluate how student solutions and existing information systems meet needs, are innovative, and take account of future risks and sustainability.

Suitable for all year levels

1a. Foundation ICT SKILLS

Word Processing

Mastering word processing is essential at all levels of education. Many students rely on Google Docs because it is freely accessible but the most commonly used application is Microsoft Word. In this chapter we will look at some features of Microsoft Word that will assist all students in presenting their school assignments effectively.
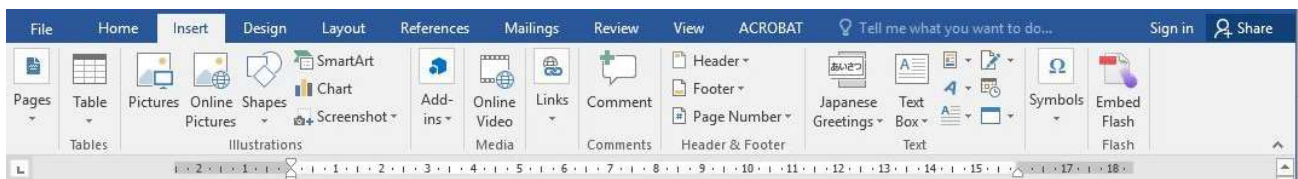
Microsoft Word is organised with "Ribbons" that appear under each of the menus. We are going to use the following ribbons: Home, Insert, Design, Format, Layout and View.
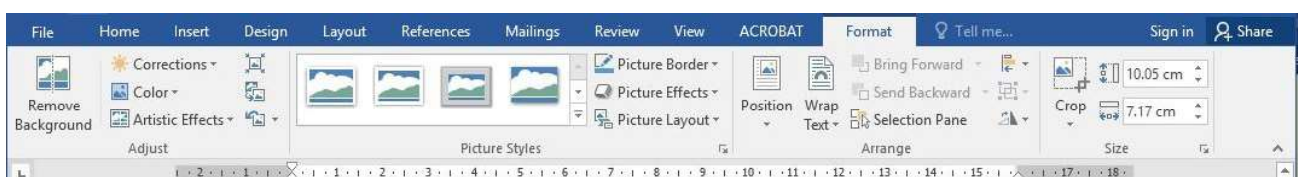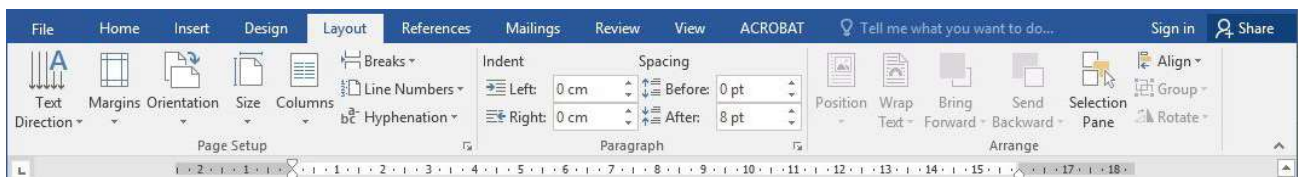
Home Menu

Insert Menu

Design Menu

Format Menu

Layout Menu

View Menu
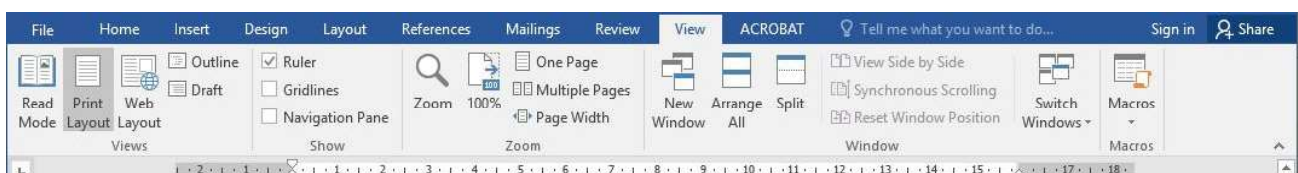
We are going to create an assignment with the following features:

- Header with student name
- Footer with page numbers
- Inserted image
- A table that has been edited with the ruler
- Use of shapes
- Numbered lists and dot points
- Edited fonts

We are going to make the following document in Figure 1.1 below.

Fig 1.1
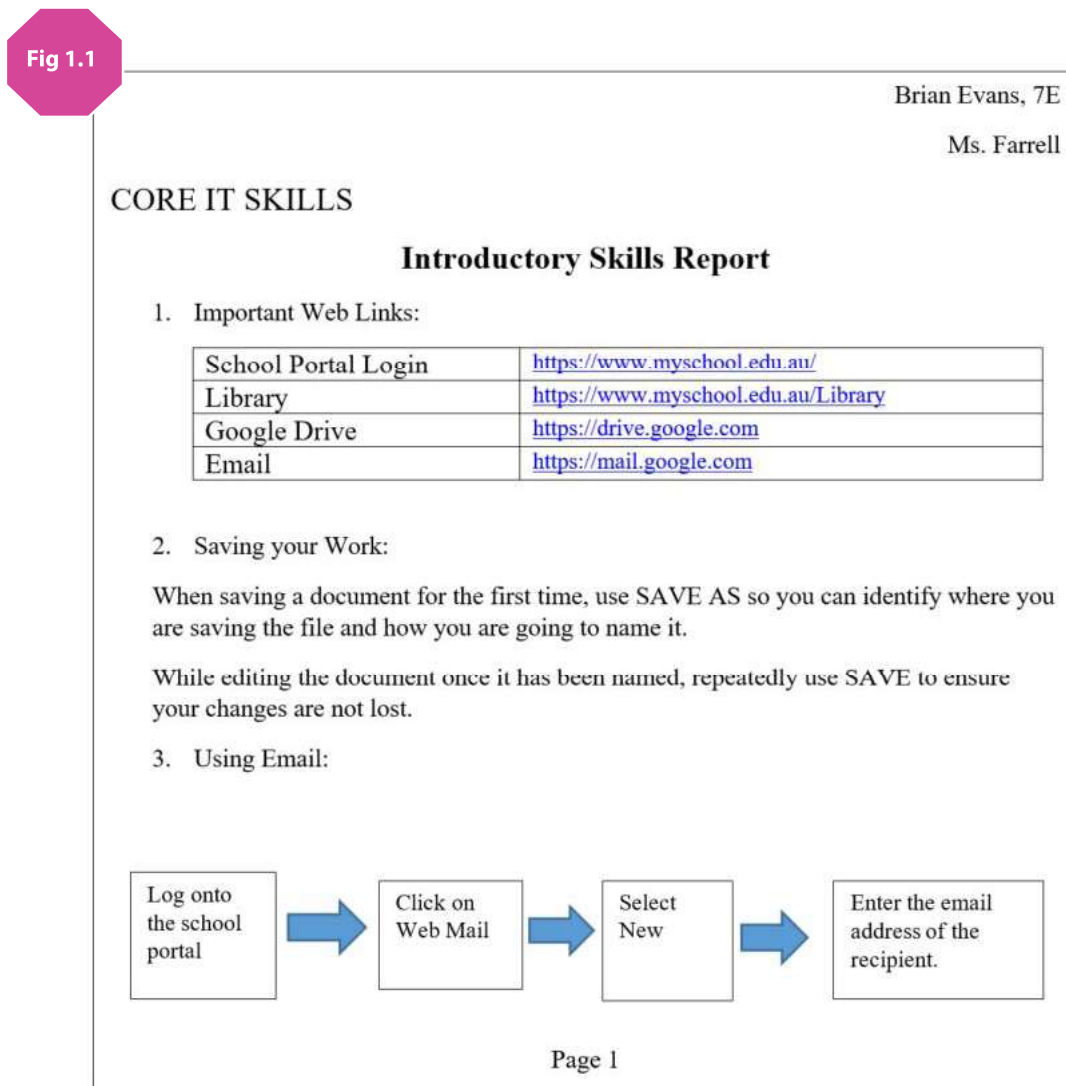
First we need to set up the screen with the ruler visible. Go to the "View" menu and make sure the ruler box is checked.
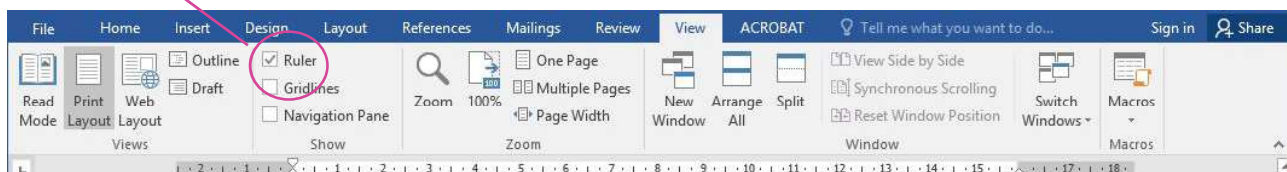
This will show the ruler across the top of your word document. The ruler allows you to control the margins of the pages and the size of the rows and columns in a table.

We are now going to edit the header and footer of our document on the "Insert" menu. This will open two new sections on your document. All your assignments that you submit at school should have your full name and class included in your Header. No matter how many pages you create, each page will have your name and class on it.

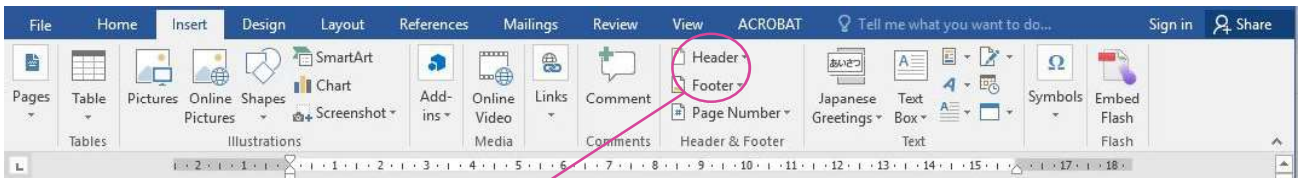Now scroll down to the bottom of your page and write "page". We are going to add a page number using an automated feature in Word. Select "Page Number" and "Current Position" and it will automatically update the page number as you add pages to your document.

We are going to assume you know how to add text and edit bold, alignment and other font elements.

Let's type:

CORE IT SKILLS and Introductory Skills Report.

When we type "1. Important Web Links" Word may automatically indent from the left. When you hit enter it may automatically create a new line beginning with " 2. ". We can use the ruler to control our tab indents.

There are two white controls on the ruler that show the depth of the indent and the location of the number.
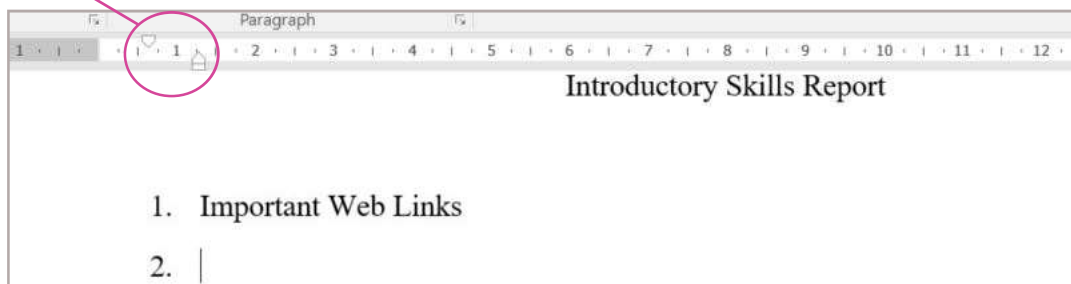
Click and drag these controls back and forth to see how they work.

We don't want the "2" just yet, so hit the enter button a couple of times to provide some room for your table.

We want to add a table under our first point. Let's open the "Insert" Menu again and select "Table" to see the pull down menu. Select "Insert Table" and a new window will open. Add 2 columns and 4 rows and hit "OK".

Now you should have something like the table below. You can see three grey tabs on the ruler. Try clicking and dragging them and see how they affect the table column widths.
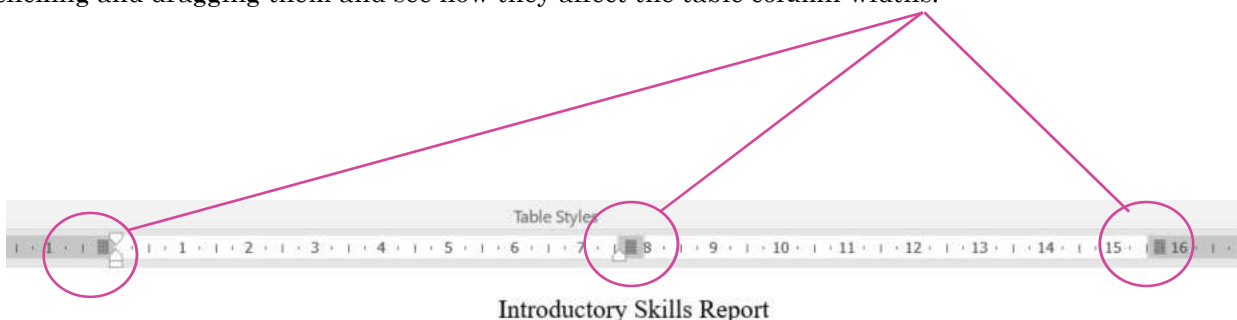
Complete the table with the important school web links that your teacher will provide. Complete the second and third points.

Below the third point we are going to create a diagram using Shapes in Word. We need the "Insert" menu.

Under Shapes we can choose Text Boxes and other shapes. Experiment with some of the options. Create a diagram that illustrates how you access your school email.

PowerPoint Animation

There is an old saying: "Death by PowerPoint". It refers to the boredom experienced by audiences and students everywhere having to sit through a long boring PowerPoint Presentation.

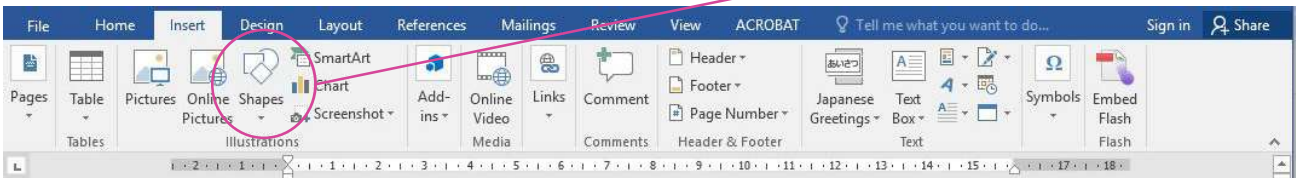This section will teach you how to make real animations in PowerPoint so you can demonstrate exactly what your presentation is about.

We are going to animate this illustration below. It depicts a circuit turning on and off. When the circuit is on (and the light globe is lit) it creates ones. When the circuit is off it creates zeros. Ones and zeros are the basis of the binary system. This is the way computers store data.

Fig 1.2

OFF = **0**   ON = **1**
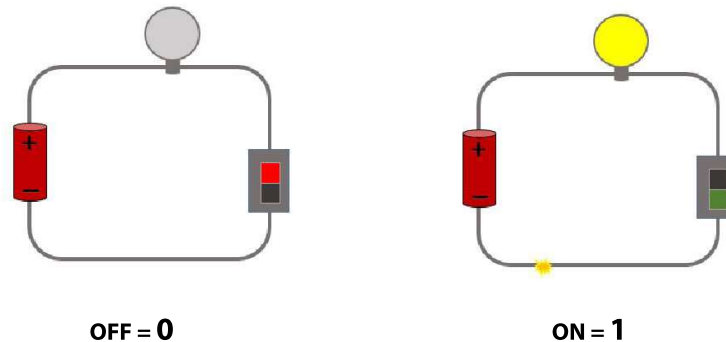
We are going to draw this circuit using the same Shape tools in PowerPoint that we used in Word. They can be found in the "Insert" and the "Home" menu. You will need to edit your shapes using Format. You can edit the fill colour and the "Shape Outline".
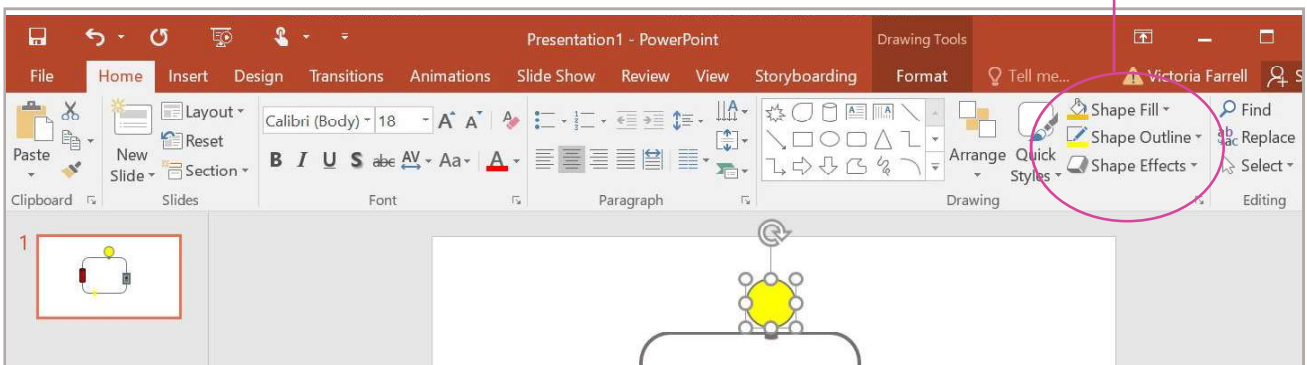
You can see that the yellow circle is selected and the Format Drawing Tools is visible. Once the object is selected , you can edit the colour and the width of the outline.

Before we start animating our drawing we need to open the Animation Pane. It must be open all the time so we can edit the order of the animations and durations.

Select the "Animation" menu and then the "Animation Pane"

When we animate an object we must click on the "Add Animation" button and then we can select the type. Select the object that we have put on the circuit to signify the electrical pulse. The first animation we are going to do, is a "Custom Path". You need to scroll down to the bottom of the Animation Types pull down menu to find it. We can now draw our animation around the circuit.
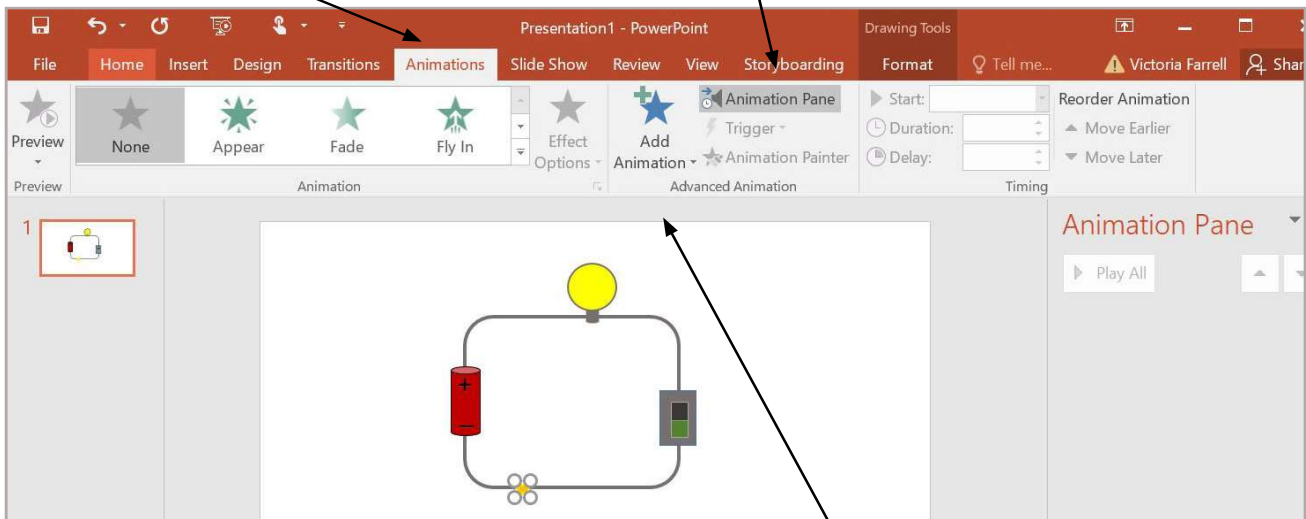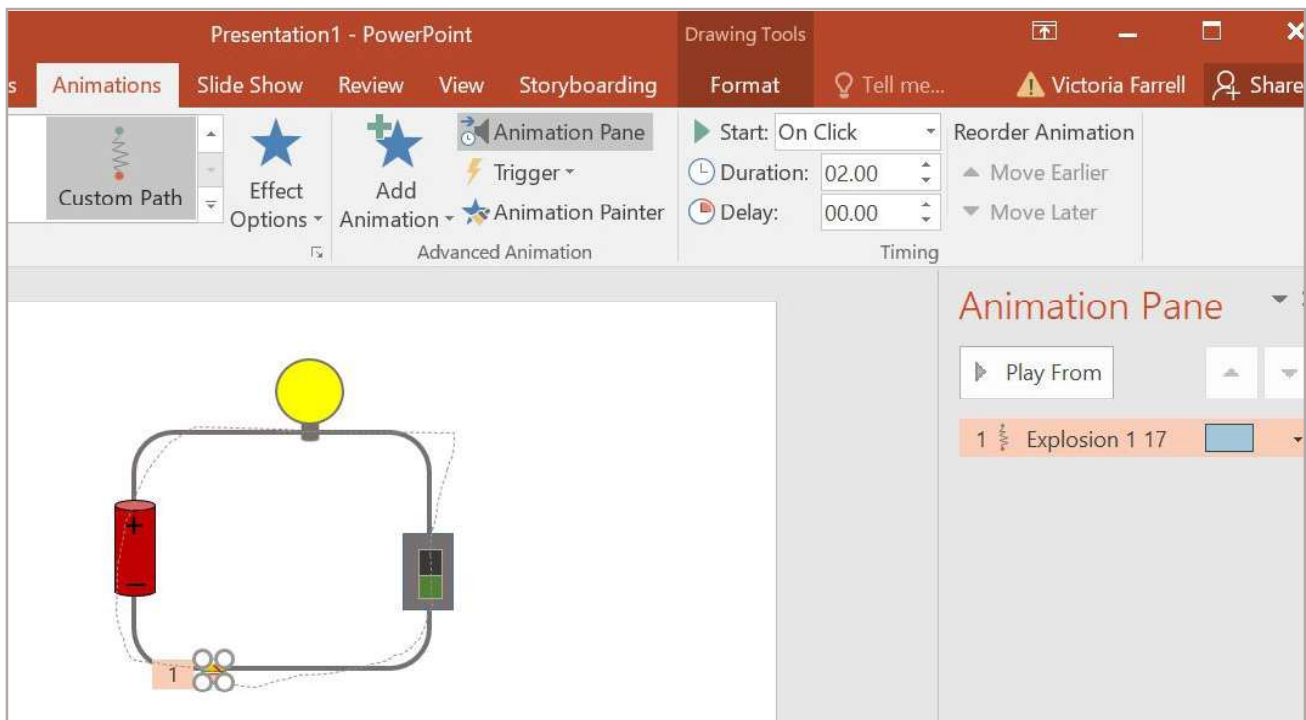

You should be able to watch the animation once you complete your path with a double click. The animation will now appear in the Animation Pane. It will be numbered and the dotted line on the diagram will also be numbered to show which animation it is.

Now we need to make sure the animation doesn't wait for a mouse click, in fact we want our whole animation to just play like a video.

We can change the "Start" setting from "On Click" to "After Previous".

We can even make two animations happen at the same time by setting "With Previous".

If we want to change the speed of the animation we can change the Duration.

Finally, we can delay the beginning of the animation by adding values here.
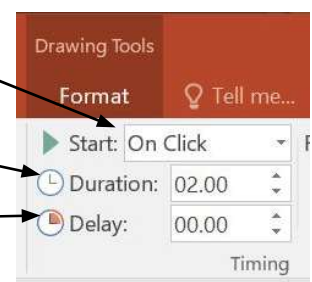
You can see above that there are now two more animations in the Animation Pane. The one that is selected is a Fade Out. It is set to "After Previous". The animation below it is the oval that represents the light globe in the diagram. It is set to "With Previous" so it will Fade Out at the same time as the electrical spark.
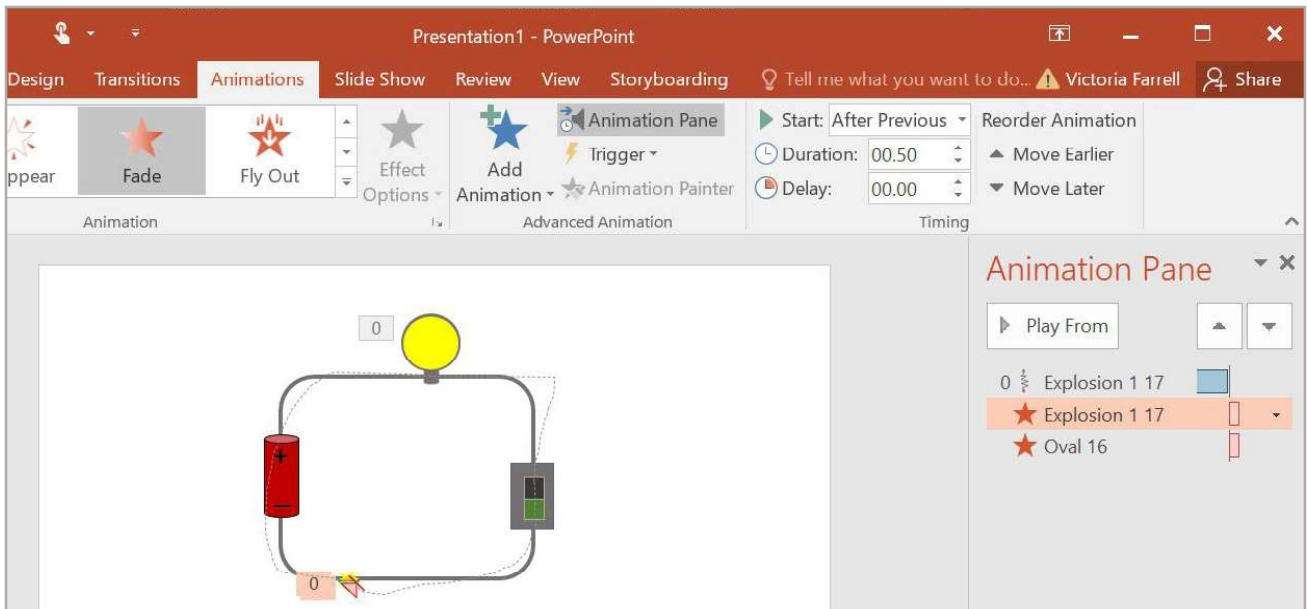
You can also click and drag the order of the animations in the Animation Pane. Ideally the next option is to turn off the switch from On to Off, by fading the green square out and fading the red one in.

Can you animate the circuit to show the switch ON and the electricity moving around the circuit with the light globe glowing?

Can you animate the switch so it is turned off and the electricity disappears and turns off the light?

How will you show that the ON light = 1 and the OFF light = 0?

Web Development I

There are plenty of ways to make a web site, but it is important to learn how web pages are made. All web pages are made of HTML (HyperText Markup Language). It is very easy to learn and we are going to make a very basic website. We only need a text editor and a browser. We also need to be very good at knowing exactly where we are saving our files and what we are saving them as.
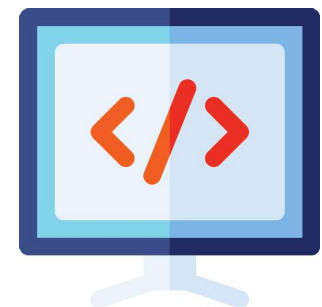
We need a text editor. PC computers come with Notepad which is fine. Mac computers may need to download a text editor like Atom from https://www.atom.io.

We need a browser. Chrome is very forgiving with wonky HTML so I recommend using it in preference to Safari or Internet Explorer.

The first step is to create a directory (or folder) to store all the files you will use in your website. Let's call this main directory "Website". Inside it, we will need another directory for our images. If you look at the Figure 1.3, you can see how we need to organise our files. You can not use any short-cuts. You must ensure you know exactly where the files are stored.

If you use Windows, avoid using "Recent Files". You can get into some sticky situations where you have two identical files in different locations.

If you use Mac, get to know your Finder menu. Save your directory in your "Documents" directory. Keep your folder open and visible on your screen at all times!

Fig 1.3
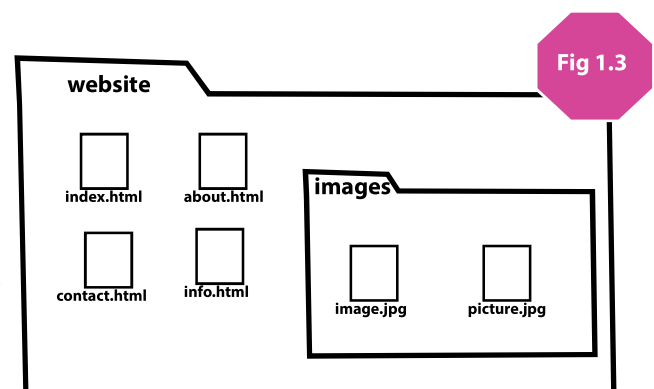
HTML is a scripting language. This means it needs a program to interpret it. HTML creates instructions for an internet browser to organise text, images and other media on the screen. At the foundation level, we are going to make some very basic HTML pages with a menu so that all pages are linked together. This section is not comprehensive. For more information about HTML visit: https://www.w3schools.com.

HTML controls content with tags. For example:

This is bold text

<center>This text is centred</center>

You can see in the example above that there is an OPEN bold tag and a CLOSE bold tag . Everything between these two tags ill be formatted bold. The open and close <center> tags affect the text between them the same way. You might notice that 'center' is spelt in the American way because HTML was developed in America.

<!DOCTYPE html>   ← Open HTML tag. Declares the whole document as HTML

<head> My First Website </head>   ← Places text in the header of the window

<body>   ← Open Body tag. Everything between the body tags is visible on the web page.

<center>   ← Open Center tag to centre the Heading.

<h1>Heading</h1>   ← H1 is the largest heading size.

</center>   ← Closes the Centre tag.

This is some content written on the page.   ← Content text

<p>   ← P tag creates a paragraph break

<img src="images/picture.jpg">   ← Image tag finds the image file in the Images folder

</body>   ← Close Body tag.

</html>   ← Close HTML tag.

When writing HTML you will need the text editor and the browser visible on the screen as well as the file finder or windows explorer so you can see the location of your files. When all three windows are visible on your screen you can make changes easily and see those updates immediately. In Figure 1.4 you can see the file "index.html" in the Website directory (Folder) so it can be clicked and dragged into either the browser or the text editor.

Fig 1.4

Internet Browser

Heading

This is some content written on the page

File Browser

website

index.html   about.html   **images**

contact.html   info.html   image.jpg   picture.jpg

Text Editor

```
<!DOCTYPE html>
<head> My First Website </head>
<body>
<center>
<h1>Heading</h1>
</center>
This is some content written on the page.
<p>
<img src="images/picture.jpg">
</body>
<html>
```
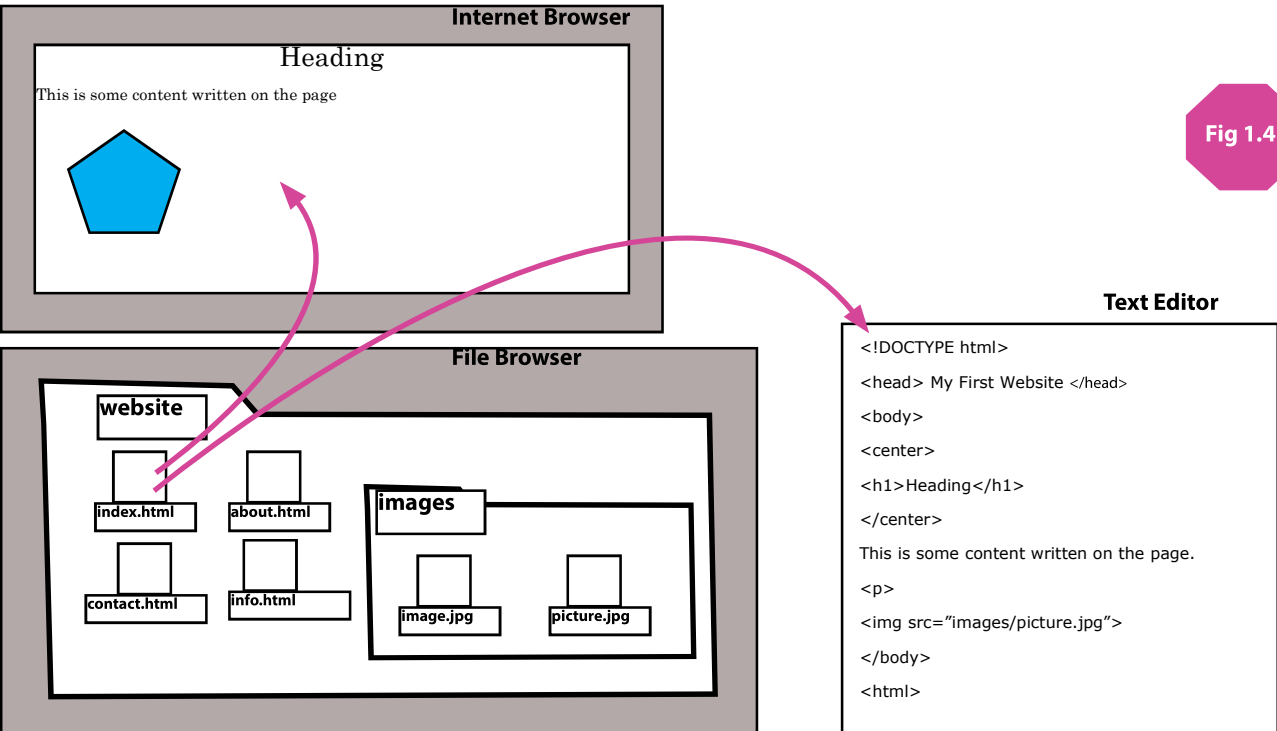
We are going to design our index.html home page and then create copies of it to make the other pages. We need to include tables to organise the content and we need links to connect the pages together.

A table organises the layout of the content. If we want two columns and three rows, we use <tr> for row and <td> for each data cell.

```
<table>
<tr>   <td></td>  <td></td>    </tr>
<tr>   <td></td>  <td></td>    </tr>
<tr>   <td></td>  <td></td>    </tr>
</table>
```


```
<table>
<tr>   <td>One</td>  <td>Two</td>    </tr>
<tr>   <td>Three</td>  <td>Four</td>    </tr>
<tr>   <td>Five</td>  <td>Six</td>    </tr>
</table>
```

One	Two
Three	Four
Five	Six

The other thing we need to do is create a menu of links to all the other web pages in the site. We also need to create a link to our images in our image folder.

Our four pages are called:

- index.html
- about.html
- contact.html
- info.html

We only need to complete ONE page (index.html). Once we have finished the page and we are happy with the design, we can make copies of it for the remaining three pages, so we don't have to repeat the coding. We only have to change the content.
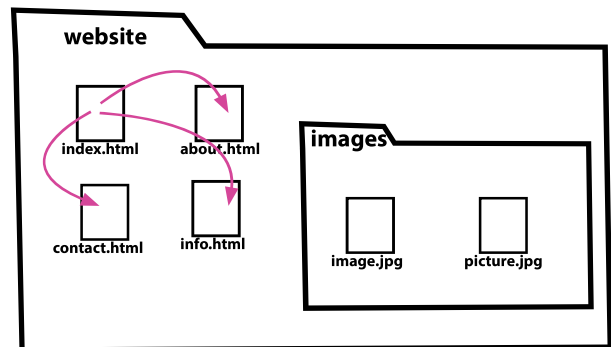
We need to design the links. We know what the pages are called so our links will be:

```
<a href="index.html">HOME</a>
<a href="info.html">INFO</a>
<a href="about.html">ABOUT</a>
<a href="contact.html">CONTACT</a>
```

Open Link tag is .

Close Link tag is .

The text between the tags is the visible link.

Let's put it all together:

```
<!DOCTYPE html>
<head> My First Website </head>
<body>

<center>
<h1>Heading</h1>
<table>
        <tr>
                <td> <a href="index.html">HOME</a> </td>
                <td> <a href="info.html">INFO</a> </td>
                <td> <a href="about.html">ABOUT</a> </td>
                <td> <a href="contact.html">CONTACT</a> </td>
        </tr>

</table>
</center>
This is some content written on the page.
<p>
<img src="images/picture.jpg">
</body>
<html>
```

This is our original website from the previous page with the menu in a single row table.

You can see that the table has only one row and four data cells.

In each data cell is a link.

You should look closely to see where the close <center> tag is located. What will be centered?

The diagram on the right illustrates how the HTML code above will look in Chrome.

This design is ok, but it's not very attractive with text links. We can use what we know about image links to create buttons in our menu instead.

Why not make four buttons and save them as jpeg files in the "images" folder?! You can use Word and Snipping Tool to create your buttons if you have Windows. If you have a Mac, use Word and then Shift ⌘ + 4 to capture your images and save them.
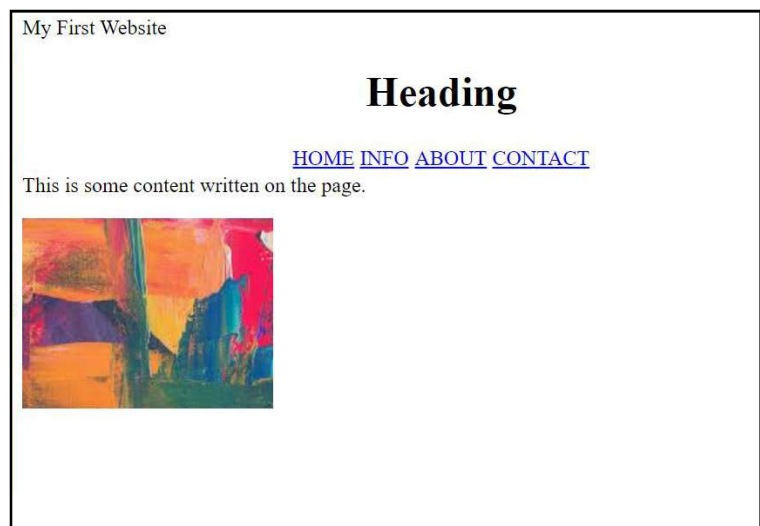
In Figure 1.5 on the next page, you can see how the four buttons need to be saved into the "images" folder and how the code must be put together to make the menu.

```
<!DOCTYPE html>
<head> My First Website </head>
<body>

<center>
<h1>Heading</h1>
<table>
        <tr>
          <td> <a href="index.html"><img src="images/HomeButton.jpg"></a> </td>
          <td> <a href="info.html"><img src="images/InfoButton.jpg"></a> </td>
          <td> <a href="about.html"><img src="images/AboutButton.jpg"></a> </td>
          <td> <a href="contact.html"><img src="images/ContactButton.jpg"></a> </td>
        </tr>

</table>
</center>
This is some content written on the page.
<p>
<img src="images/picture.jpg">
</body>
</html>
```
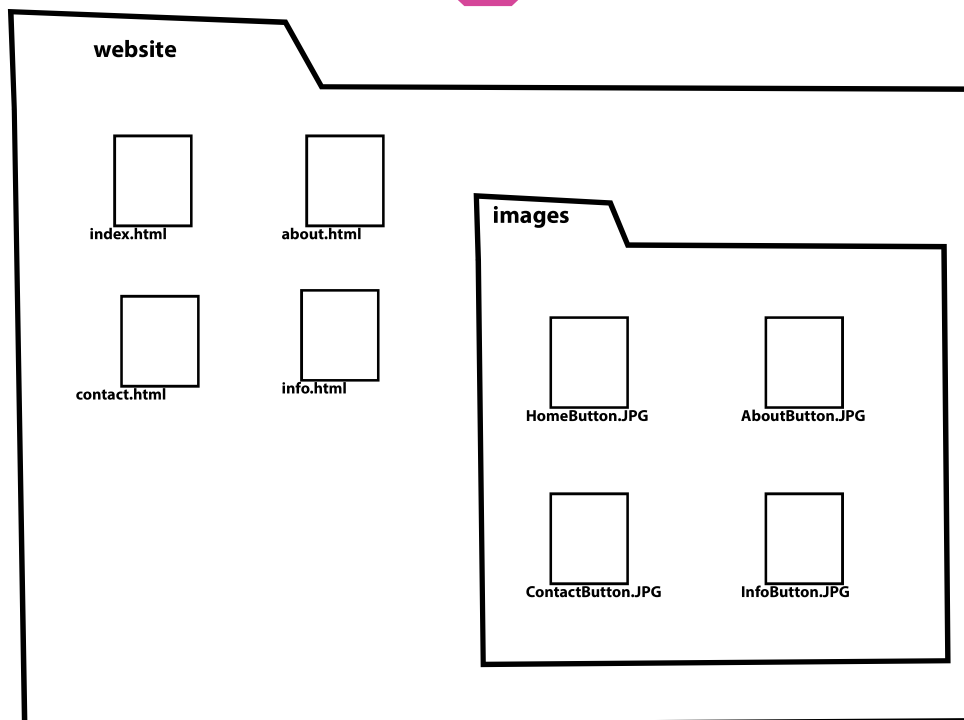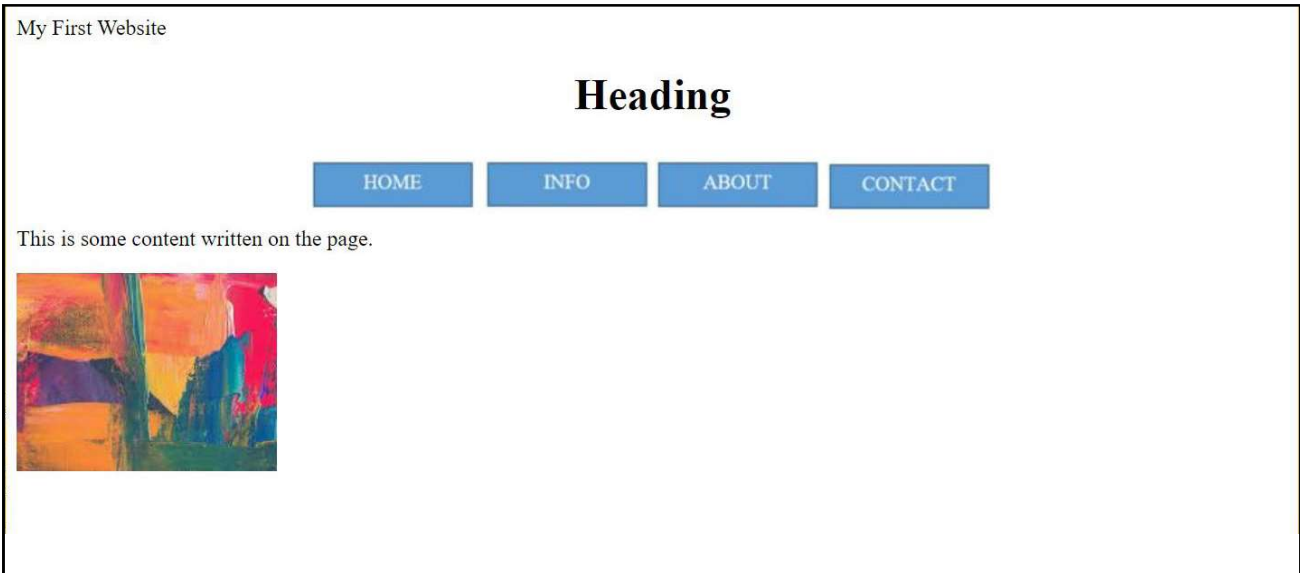
Fig 1.5

My First Website

Heading

HOME   INFO   ABOUT   CONTACT

This is some content written on the page.

Once you are happy with your design (see the example above) you can complete your website. It is really very easy. Just SAVE AS "info.html"! Then edit the heading to "Information". Then SAVE AS "about.html" and edit the heading and do the same for "contact.html".

All your documents are complete and the links should all work. If they don't, check your spelling of the files and the location of the files.

Now you can put information into each of the pages! Happy Web Making!

Turtle Programming

We are going to start to learn programming with real code. The code is called Python and there are a lot of free resources online to learn this language. Just look for the Python logo when googling for free lessons.

When you start to learn programming it can be tricky to get your head around it. We start by giving a little turtle instructions. In the Python language we can create all kinds of cool designs using instructions that boss a turtle around the screen leaving behind a trail or line.

Imagine our turtle is facing right and we give it an instruction to go FORWARD 100 steps.
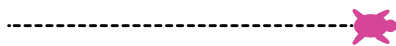
Then we can tell the turtle to turn RIGHT by 90 degrees! and then FORWARD 20 steps.

We could get our turtle to create a square:

FORWARD 20 steps, RIGHT 90 degrees, then FORWARD 20 steps, RIGHT 90 degrees, and

FORWARD 20 steps, RIGHT 90 degrees, and then FORWARD 20 steps, RIGHT 90 degrees.

Looks like we have some repetition going on there!

What computers are really good at is automated repetition so we, the humans, don't have to!

We know the square needs to include FORWARD 20 steps then RIGHT 90 degrees four times. Let's tell the computer to repeat the instructions four times rather than writing the instructions out line by line. (We don't want to get RSI from typing!)

We can use a FOR Loop: "for Counter in range 4:"

This will repeat any following instructions four times. Here is what the actual Python code will look like:

```
from turtle import *

for COUNTER in range(4):
        forward(20)
        right(90)
```

The first line is importing the turtle module so we can use it to program our designs. It uses an asterisk (*) which indicates ALL the sub routines are needed to make the turtle programming work in Python. The next line uses a counter will change in value from 1 to 4 because the range is set to four. Finally, the instructions for the turtle require the words "forward" and "right" to be all lowercase and the sets and degrees must be in brackets. These rules are called Syntax. Syntax is the grammar of the programming language - just like English has rules, we must follow rules in Python too. You will also notice the instructions under the "for" loop are indented. This is not just to make it easier to read, but is an essential part of the syntax rules of Python.

OK! Now we can give directions to our turtle to draw anything we like. Let's draw an equilateral triangle. All the sides must be the same and all the angles the same. Your Maths teacher will have told you that the internal angles of a triangle should add up to 180 degrees.
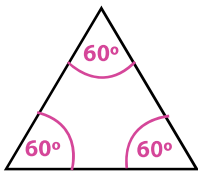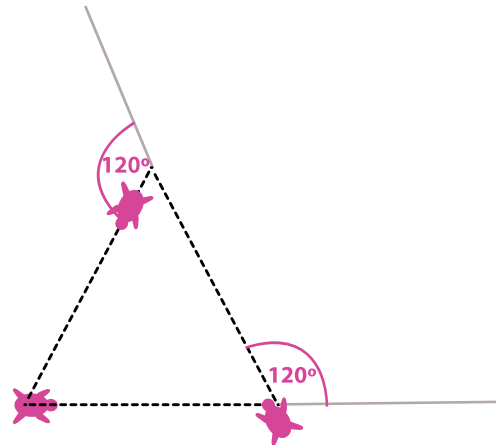
Each of the three internal angles will equal 60° as you can see in the triangle on the left.
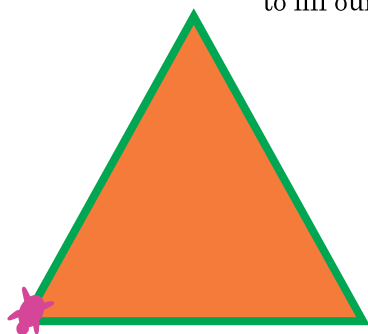
But let's look at the journey of our turtle on the right.

First turtle is facing right so it needs to turn left a full 120°. Turtle can travel forward and again needs to turn left 120°.

So you do need to know a bit of geometry to get this right.

Why is the angle 120°? Do you know?

Once we know what we want to draw, we can add colour to our lines and colour to fill our shapes.

```
from turtle import *
pencolor('green')
pensize(5)
fillcolor('orange')
begin_fill()
for COUNTER in range(3):
    forward(100)
    right(120)
end_fill()
```

It is difficult to draw what you want when you can't lift your pen off the page and move it somewhere else. So python lets you you do that with the instructions: penup() and pendown().

Read the code below and draw the shape it makes in the space below. If you are not sure, run the code in Python and see what it does!

```python
from turtle import *
pencolor('black')
pensize(5)
fillcolor('red')
begin_fill()
for COUNTER in range(3):
    forward(100)
    left(120)
end_fill()
penup()
right(90)
forward(10)
pendown()
pencolor('black')
pensize(5)
fillcolor('blue')
begin_fill()
for COUNTER in range(4):
    forward(100)
    left(90)
end_fill()
```

Draw the result of the code in the box below.
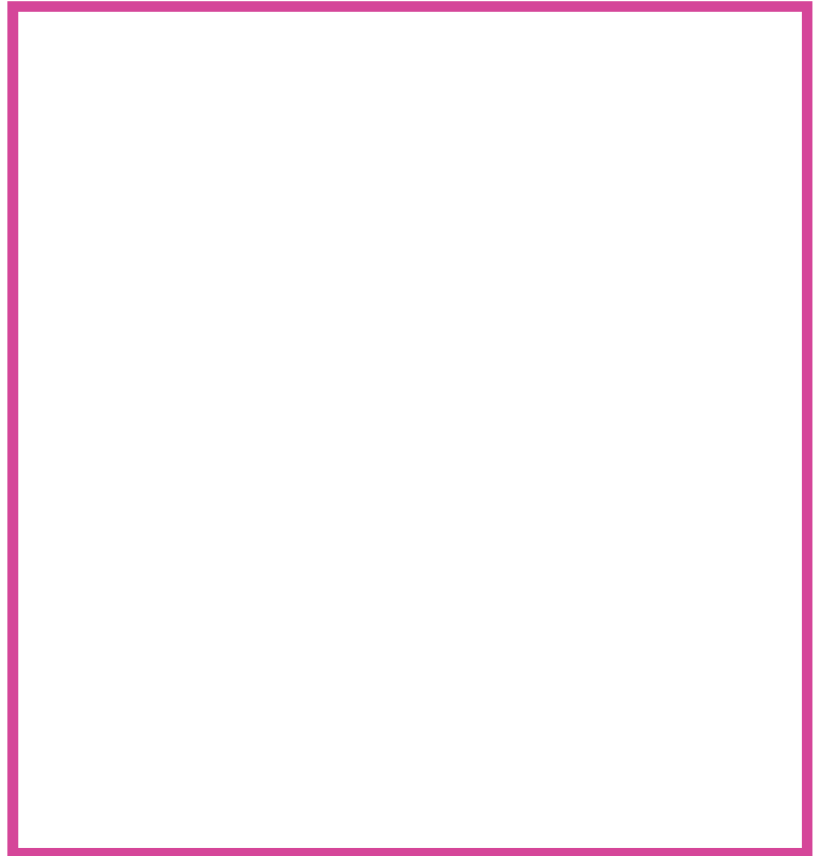
Where you can find resources for PythonTurtle for free:

Grok Learning: https://www.groklearning.com

Online Python: https://repl.it/languages/python_turtle

PythonTurtle: http://pythonturtle.org/

Trinket: https://trinket.io/python

RealPython: https://realpython.com/beginners-guide-python-turtle/

Turtle Online: https://www.turtle.ox.ac.uk/online/
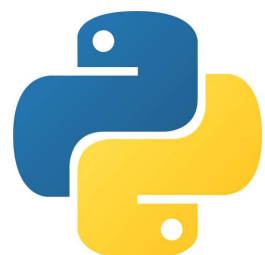
Python is a great language to learn. It's easy, commonly used and... it's the language that Google is built with!!

If you are keen to learn more, the Python IDLE (Integrated Development and Learning Environment) can be downloaded for free from: https://www.python.org/

You can install the IDLE on your own computer and be a real computer programmer.

1b. Foundation Digital Technology

Binary

Computers are just things made of glass, metal and plastic. They do not understand anything. They do not think. The only thing computers really understand about the world around them is where electricity is moving through their circuits. A circuit allows electricity to flow in order to do work, like turn on a light or turn a wheel. When electricity flows through a computer circuit it is registered as a ONE. When the electricity stops it is registered as a ZERO.
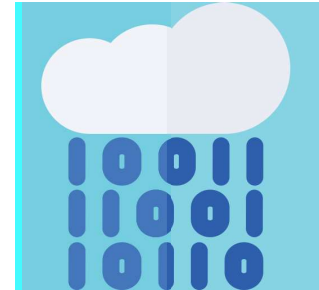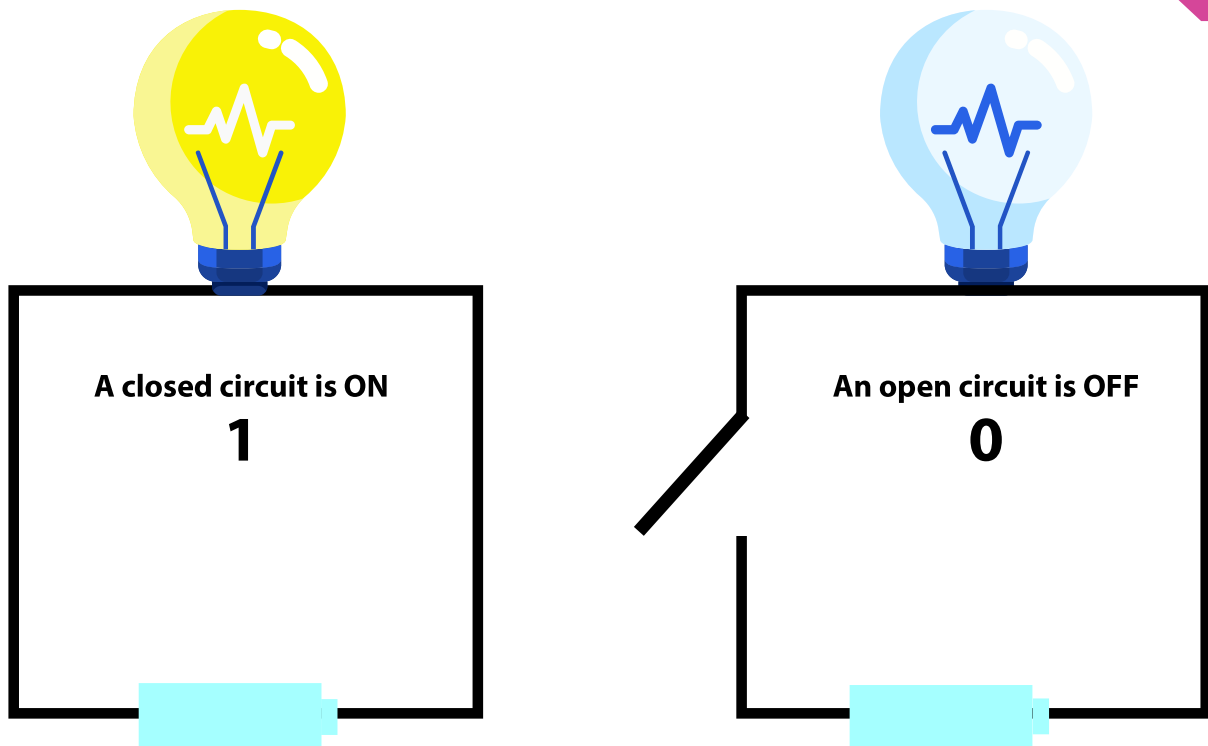
Fig 1.6

A closed circuit is ON
1

An open circuit is OFF
0

In Figure 1.6 above you can see the two states a circuit can be ON and OFF. Humans have a hard time understanding data as circuits flashing on and off, so if we call the two states, one and zero, we can make a system that humans can understand. With these two values we can make a number system called Binary.

We are familiar with the Roman number system that used Is and Vs and Xs.

For example:

I, II, III, IV, V, VI, VII, VIII, IX, X, XI etc...

We don't use this number system anymore because it was too hard to do mathematics. How would you calculate CXXVI ÷ VI without the use of the decimal system? Roman Numerals look great carved on buildings and on the credits of movies, but they're too hard to use in simple arithmetic.

Let's go back to something we are more familiar with: Decimal! Decimal is a number system based on the number 10 and it uses 10 symbols (0,1,2,3,4,5,6,7,8 and 9) to make all the numbers. In the Table below you can see how decimal numbers are made up of powers of 10. The three is in the thousands place, the 2 is in the hundreds place, 4 is in the tens place and 8 is in the unit's place = 3248.

10^3	10^2	10^1	10^0
1000	100	10	1
3	2	4	8
3 x 1000	2 x 100	4 x 10	8 x 1

In the decimal system we have 10 symbols to play with to make our numbers, but in binary we only have two symbols: 0 and 1. In the table below you can see that each column is set up the same way as the table above. Instead of powers of 10 we are using powers of 2. Instead of the 1's place, the 10's place the 100's place and the 1000's place, we have the 1's place, the 2's place, the 4's place the 8's place, etc. You may be familiar with these numbers. When you buy a computer device such as a mobile phone or a USB memory stick, the memory is always one of these numbers 4, 8, 16, 32, 64, 128 and so on. Binary code is the reason.

In the table below you can see the numbers 0 to 7 completed as binary. Since you only have 0 and 1 to put in each location, you need to add up the values at the top of the columns.

For example 5 is (1 x 4) + (0 x 2) + (1 x 1). You will see a 1 in the 4 space, a 0 in the 2 space and a 1 in the 1's space. This means 4 + 1 = 5.

Let's look at 7 and 8.

7 = (1 x 4) + (1 x 2) + (1 x 1)

8 = (1 x 8) + (0 x 4) + (0 x 2)+ (0 x 1)

Now it's your turn. Fill in the rest of the table Fig 1.7

Fig 1.7

2^5	2^4	2^3	2^2	2^1	2^0	
32	16	8	4	2	1	DECIMAL
					0	0
					1	1
				1	0	2
				1	1	3
			1	0	0	4
			1	0	1	5
			1	1	0	6
			1	1	1	7
						8
						9
						10
						11
						12
						13
						14
						15
						16
						17
						18
						19
						20