Computing Concepts

Year 7 Digital Technologies
2020 Semester 2
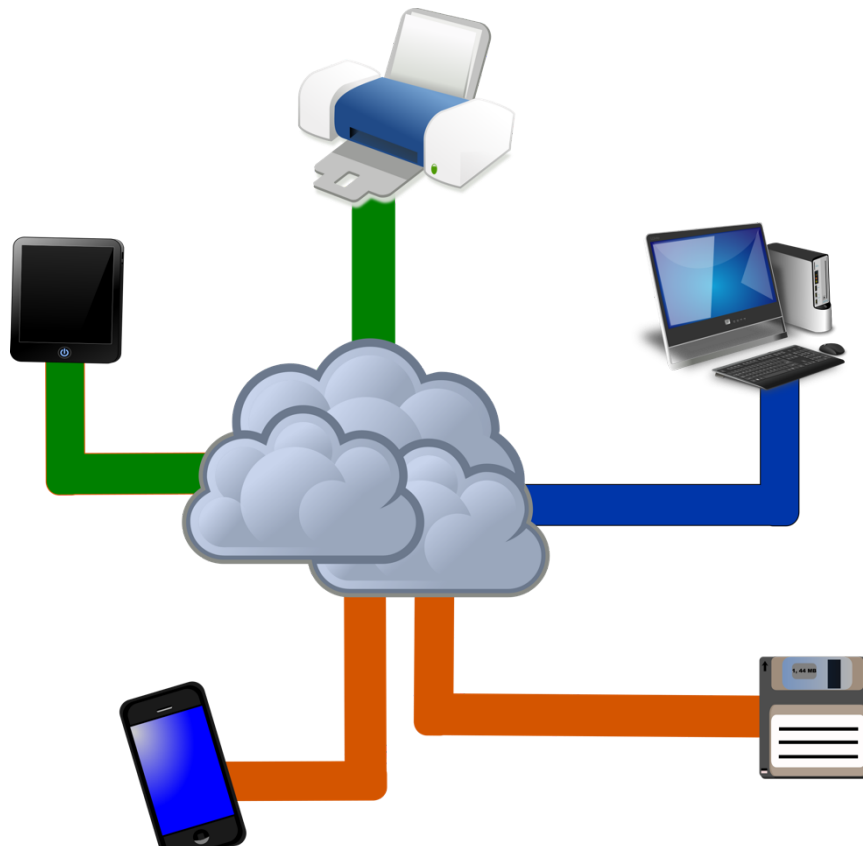
Image Source:

Intro to Digital Technologies

What is Digital Technologies about?
Learning in Digital Technologies focuses on skills in computational thinking such as decomposing problems and prototyping. This unit and the entire Google Doc is divided into individual topics (which may take more than a lesson to complete). You are encouraged to work through each topic **independently and progress at a faster pace** if you feel confident in doing so. For each topic, there will always be: 1. **Learning Intentions:** What we are learning and why 2. **Evidence of Success:** Things you should be able to know, understand and do 3. **Core Concepts:** What you should revise after completing the topic 4. **Tasks / Questions:** Activities for you to complete in class and for homework

Learning Intentions	Evidence of Success
1. Get to know your teacher 2. Understand classroom expectations 3. Define core concepts about Digital Technologies 4. Get an overview of the Year 7 course (Semester One) 5. Record Assessment Dates 6. Share this document with your teacher, and submit a link in CGS Connect	1. One hobby/interest that my teacher is involved in outside of school is ... 2. In class it is important to ... 3. Today, I learnt that Digital Technologies is about ... 4. This semester, we will be learning about ... 5. I have a test on … and assignments that are due on … 6. I shared this document by … and submitted a link in CGS Connect by ...

Core Concepts (complete this table after you have finished the tasks/questions below)		
What is Digital Technologies	**Computational Thinking**	**Decomposing Problems**
Prototyping	**Notes About Your Teacher**	**Classroom Expectations**
Course Overview	**Assessment Dates**	**Class Forum & Tutorials**

Task 1 - Learn about the difference between ICT and Digital Technologies

Briefly read the main concepts in this PDF and/or watch some of the videos.
https://www.digitaltechnologieshub.edu.au/docs/default-source/resource-bank/dthub_infographic_final.pdf

ICT - Using technology e.g. word, ppt, etc
Digital Tech - Creating, coding, computational thinking (analysing how computers solve problems)

Task 2 - View the course website

Visit the below URL and bookmark the website so that you always remember it!
http://year7.cgscomputing.com

On this site, you will find information about:
- Teacher names and email addresses
- Class forum and tutorial sessions
- Assessment dates
- Course overview

Take notes here:

Task 3 - Definitions
In pairs, research and discuss the following terms, and write your own definitions

Term	Definition
Computational Thinking	
Decomposing Problems	
Prototyping	

Task 4 - Core concepts table

Look at the core concepts table and type in some short sentences or keywords to help you remember the most important things you've learnt about this topic (computational thinking has already been done for you). You may also like to write some questions about things you didn't clearly understand, or concepts you would like to explore further.

Cloud Storage

What is Cloud Storage about?
Most of you will be familiar with the use of Google Drive and/or Google Classroom, allowing you to store and retrieve files via the "cloud". How does it work? Investopedia provides a simple explanation: *Cloud storage works by allowing a client computer, tablet, or smartphone to send and retrieve files online to and from a remote data server.*[1] During this lesson, you will explore the use of cloud storage, developing your skills on good file and folder management, as well as understanding the use of different types of files.

Learning Intentions	Evidence of Success
1. Log into Google Drive 2. Understand how files are stored in the cloud. What does that mean? What are the advantages/disadvantages? 3. Understand and apply good file and folder management 4. Know how to share files and folders with your teacher. 5. Understand different file formats and when it would be appropriate to use them.	1. I can login to Google Drive by …. 2. Cloud Storage means … This is good because … 3. I should create folders because … Files should have appropriate names such as … because … 4. I shared this document by … I shared this folder by ... 5. I would use this type of file when … because ...

Core Concepts (complete this table after you have finished the tasks/questions below)		
What is Cloud Storage	Advantages	Disadvantages
Good file and folder management	Different file formats	When to use Docs
When to use Spreadsheets	When to use Slides	When to use Forms

Now that you have successfully logged into your CGS Google Drive account you can use this to store files and documents for all your subjects.

[1] https://www.investopedia.com/terms/c/cloud-storage.asp

Task 1 - Investigate the benefits of cloud storage

Briefly explain why storing your files in a cloud-based storage provider, like Google Drive, is beneficial. **Make sure you write in full sentences, professionally and completely with correct spelling and grammar.**

Task 2 - Investigate different file formats

Google Drive provides a variety of different file formats. Provide two examples of how you could possibly use each file format in one of your subjects this year. Bullet point responses are okay for this question.

Google Docs:
-
-

Google Sheets:
-
-

Google Slides:
-
-

BONUS if you can provide examples for using Google Forms:
-
-

Task 3 - Create folders for each of your subjects
Create a folder for each of your subjects, including Digital Technologies.

Note: This is a space for you to use, so that you can **manage your own learning**. You are encouraged to share your folders with your teachers, but remember that **your work is your responsibility**. Here are some recommended ways to use your subject folders:
- **Class Notes**: As you are studying 10+ subjects this term, it is easy to forget important ideas and concepts you may learn about in class.
- **To Do List / Deadlines:** After week 2, you will also be expected to manage homework and assignments (later in the term), for each of your subjects. You may like to create a Google Doc to help you stay organised.
- **Assessment Drafts / Notes:** If you are concerned about doing well in each of your subjects, a great strategy is to use your Google Drive to store drafts and notes for each of your assessments

Task 4 - Practice linking to files within this Google Doc
A table has been provided below, as a way for you to keep track of all the different pieces of work you are working on this term.
- An example has been provided, to give you ideas about how you might like to use this
- Create at least two files in Google Drive that you think may be helpful for any subject you are studying this semester
- **Challenge:** Have at least one file of each type of file format (Doc, Sheet, Slide and Form)

Subject	Task Description	Due Date	File Format	Link to Google Doc
Digital Technologies	Worksheet to practice and understand how binary numbers work	Term 1 Week 5	Google Doc	binary data worksheet

Task 5 - Core Concepts table
Check and revise your understanding of the core concepts of computational thinking by completing the table

Computational Thinking

What is Computational Thinking?
Digital Technologies is not about learning to write code - it's learning the skills of **computational thinking**. That said, computational thinking is most often used to write computer software to solve a particular problem. What is *computational thinking?* [Wikipedia](https://en.wikipedia.org/wiki/Computational_thinking) provides a great definition: *Computational thinking is the thought processes involved in formulating a problem and expressing its solution(s) in such a way that a computer—human or machine—can effectively carry out.*[2]

Learning Intentions	Evidence of Success
1. Explain computational thinking and algorithms 2. Identify the characteristics of a good algorithm 3. Instruct your teacher on how to make a vegemite sandwich (this may be harder than it sounds!) 4. Test your algorithm, and learn how to improve algorithms	1. Computational thinking is about … An algorithm is … 2. A good algorithm is … because … 3. To make a vegemite sandwich, follow these instructions: … 4. That didn't work properly because … I can improve my algorithm by ...

| Core Concepts (complete this table after you have finished the tasks/questions below)		
Algorithm	Characteristics (of a good algorithm)	Test Results

[2] https://en.wikipedia.org/wiki/Computational_thinking

Task 1 - Investigating algorithms
We express a solution to a problem as an algorithm. What is an algorithm?
(Hint: see the example below)

DEFINITION of algorithm:

Algorithm Example: Baking a cake[3]
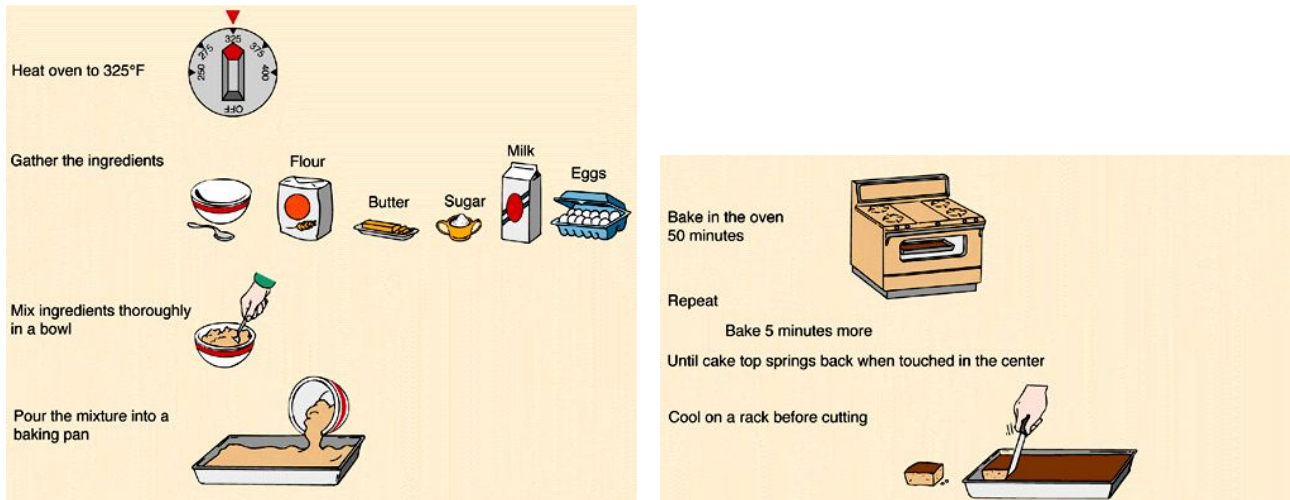
Task 2 - Characteristics of algorithms
What are characteristics of a good algorithm? Bullet points are okay to answer this question.

●

[3] https://www.wiley.com/college/busin/icmis/oakman/outline/chap05/slides/algor.htm

Task 3 - Vegemite Sandwich Algorithm

When we develop an algorithm to solve a problem we need to provide very precise information. This is easier said than done, particularly if attempting to instruct a computer which (unlike a human) cannot read between the lines and is far less forgiving if ambiguous instructions are provided. Computers are very compliant, they will do <u>exactly</u> what you tell them to do.

To demonstrate this, you are going to write an algorithm to instruct your teacher to make a vegemite sandwich. They are going to follow your instructions exactly! Your teacher will show you what items are available to make the sandwich, and you can only use those along with instructions to your teacher.

Write your algorithm on **how to create a vegemite sandwich** in the space to the right.
 	
Below is an example algorithm on **how to brush your teeth** to get you started.
 	
Algorithm - How to brush your teeth
   1. Pick up toothbrush
   2. Pick up toothpaste
   3. Apply toothpaste to toothbrush
   4. Put toothbrush in mouth against teeth
   5. Scrub for two minutes
   6. Spit
 	
This is NOT a perfect algorithm. How could it be improved?
	Algorithm - How to create a vegemite sandwich

Task 4 - Vegemite Sandwich Algorithm (Version 2)

Sometimes when we test algorithms, the results are different from what we expected.

What could you improve in your algorithm, after testing it? You may like to write a new version of your algorithm below.

What did you learn from the test results?	How to create a vegemite sandwich (Version 2)

Task 5 - Core Concepts table
Check and revise your understanding of the core concepts of computational thinking by completing the table

Binary Data

Learning Intentions	Evidence of Success
1. Communicate using signals to output one of two possible answers 2. Use the signals to output more than 2 possible answers (using a sequence of signals) 3. Understand how 0s and 1s can be used to represent normal numbers 4. Understand how different types of information such as text and colours can be represented using binary data	1. I answered a binary question, "...?" by using a device which … 2. I answered a complex question, "...?", using the same device, by .... 3. I can represent different numbers, such as … and …, using 0s and 1s by … I can count to 32 in binary. 4. I know that the letter … can be represented using 0s and 1s by … Similarly, the colour … can be represented by ...

Core Concepts (complete this table after you have finished the tasks/questions below)		
Binary Question	Binary Message	Binary Number System
Representing normal numbers	Representing text	Representing colours

Task 1 - Silent binary communication

You will be randomly allocated a partner to communicate with. Your task is to find a way to **silently communicate binary questions and answers** and record the other person's answers.

Work your way through this list of binary questions and record their answers **without either person talking.** To decide on a question to ask, you should display the number of fingers corresponding to the question asked.

You will need to agree on a signal to represent the first or second option to answer a question silently.

Signal for the **first option**	
Signal for the **second option**	

Number	Question	Partner's Answer
1	Would you rather be a superhero or a magic wizard?	
2	Would you rather be the author of a best-selling book or star in a movie?	
3	Would you rather have a snowball fight or a water balloon fight?	
4	Would you rather never have homework again or be paid to do your homework?	
5	Would you rather eat a whole onion or eat a whole can of sardines?	
6	Would you rather be able to breathe underwater or be able to run on top of water?	
7	Would you rather have the ability to fly or have the ability to read minds?	
8	Would you rather play inside or play outside?	
9	Would you rather be really cold or be really hot?	
10	Would you rather be able to smell only bad-smelling things or never be able to smell again?	

Task 2 - Silent binary communication with 4 possible answers

This time, you will need to **silently communicate a multiple choice question**, using the **same binary signal to answer**. The trick is to use a combination of two binary signals, to represent each possible answer.

Fill out this table, then use this code to silently communicate your questions and answers. **You need to ensure that each option has a unique sequence of signals!**

Multiple Choice Option	First signal	Second signal
A		
B		
C		
D		

Number	Question	Partner's Answer
1	If you could have one of these superpowers, which one would you choose? 👀 Be invisible whenever you want 💪 Superhuman strength 🐱 Talk to animals 🧠 Read minds	
2	How are you feeling? 😊 Happy 🤪 Confused 😴 Sleepy 💪 Motivated	
3	How much do you know about Minecraft? 🧢 What is Minecraft? 🤓 I have some basic knowledge 🎓 I have solid background 🧠 I'm an expert	

Extra challenge for Task 2
How could you represent each of the following emotions using 0s and 1s?
Hint: You can use as many 0s and 1s as you like

Excited   Sad   Angry   Sick

Surprised   Happy   Unhappy   Bored

Task 3 - What are binary numbers? (YouTube Video)
As a class, we'll watch this video from James May about what binary numbers are. You are encouraged to take notes to help you understand the concept. Your teacher may also run a brief discussion to check for understanding.

What are binary numbers? | James May's Q&A (Ep 11100) | Head Squeeze

Task 4 - Binary data worksheet
Make a copy of this binary data worksheet, and then create a link to it here: My Worksheet.

Your teacher will demonstrate how to do this if you are unsure. Complete all questions on the worksheet.

Here is a link to a binary odometer widget which may you can use if you are stuck or want to double check your answers.Code.org - Odometer Widget

Task 5 - Binary game in App Lab

Below is a game that will test your binary conversion skills. Try to get the highest score!
Binary Game v2 - App Lab

My highest score	

(Take a screenshot if you want to provide evidence of your score and paste it below)

Task 6 - Research how text and colours are represented in binary and fill in the table

Your teacher will give you some time to **try and learn independently.** After some time, your teacher may run through a class discussion to check and compare your answers.

How text is represented (different characters)	How colours are represented

Task 7 - Binary encoded messages

Communicate to a friend using encrypted binary code! Start with a simple word of 5 or less characters.

Here is an example:

01011001 01100101 01100101 01110100 00100001

Can you work out what the message is?

Send an email to another person in class that is encoded in binary, and let them decode the message!

Task 8 - Core Concepts table

Check and revise your understanding of the core concepts of computational thinking by completing the table

Network Communication & Internet Protocols

What are Networks and Protocols?

Now that we understand how computers process information, we are going to investigate how computers talk to other computers in a network.

A **network** can be defined as a group or a system of interconnected people or things. So the Internet is interconnected computers that can both send and receive information/data.

A **packet** is the data that is sent from one computer to another. To know which computer to send it to, it needs to know the **address** of the receiving computer. The rules that govern what kind of information needs to be sent in a packet are called **protocols.**

It also needs to be **secured**, so that malicious people (aka L33t H@ck3rs) are prevented from causing irreparable damage.

Learning Intentions	Evidence of Success
1. Understand what a protocol is, and why it's necessary for communication of messages in a network 2. Explain why messages need to contain addressing information (sender/recipient identification) 3. Explain the purpose of IP and DNS and how they work 4. Investigate different types of networks and routing, how they're physically designed and how they work	1. A protocol works by … and it serves a necessary role in a network because … 2. An address in a network works by .. The message requires addressing information because … 3. The information that the IP contains is … and DNS is used for … 4. Some different types of networks are … They are different because … The advantages of each network are …

Core Concepts (complete this table after you have finished the tasks/questions below)		
What is a Protocol	What is a Network	Packets and Addresses
How the Internet works	Different types of networks	IP and DNS

Task 1 - Networks

A great example of a network is the transport network. Some of you may even use the transport network to get to and from school on a daily basis. Using the Transport Canberra Weekday Network (provided below), you will be asked to present a document that describes how a network works, how it is similar to the transport network and complete a series of activities.

Transport Canberra Weekday Network pdf

Complete the following table.

Questions	Answers

In pairs, refer to the Transport Canberra Weekday Network to answer the following questions.
 	
1) You have a day off school and you are going to hop on the bus and meet your friends at the City bus station.
 	
    a) You are going to hop on the bus at Phillip, what bus would you take to get you into the city? Why?
    b) Your mum has called and asked you to collect something from the shops near Holder before your bus into town. Would that change the route you have chosen? Why?
 	
2) You have a friend from another school coming down from Gungahlin. They text you as they are heading towards the Gungahlin bus station to ask what route they should take to get to the city to meet you. What route would you tell them to take? Why?
 	
3) Once you have finished answering the above questions check with the group next to you and compare your answers. Do you all have the same answers? Why or why not?	

Task 2 - Tablets of Stones

> **Scenario**
> *In an ancient city there are a number of important Governors. These Governors decide how the city is run and make very important decisions. They each live in different houses all over the city. The Governors often want to communicate, they need to send and receive messages all over the city. Governors are identified by their house number and they all have access to a group of messengers whose job it is to deliver the messages.*

The only way to send messages is by writing them on large rectangular stone tablets, which the messengers carry to their destination. The stone tablets are of a fixed size and can only fit 6 pieces of information on them. One piece of information can be one letter or one number. Messages are often split over a number of tablets, and as these tablets are very heavy they can only be carried one at a time.

The Governors want to find a way of making their communication reliable, they want to develop a set of rules that they will all follow. By doing this they can tell whether or not their message has been delivered and if the message was correct. The Governors have already decided that the destination should be written on the tablet.

Task
Step 1.
In your groups your task is to develop the rules that the Governors will use to communicate with each other (the teacher may ask you to role play your scenario so make sure that it's detailed!). You will be following these set of rules when creating your own messages later!

Step 2.
Each group will be given sticky notes that resemble the tablet and the messages. You will need to designate roles for each member of the group (senders, messengers, receivers).

Step 3.
You will only be able to use 6 sticky notes at one time to form the tablet in communicating the message, so make sure you plan out as a group what number or letter you will use for each note. **Remember:** only one number or letter on each note.

What's it all about?
On the internet, data is broken into **packets** for transportation. However, the channels in which these packets travel are not always reliable. Sometimes, individual packets are damaged, lost or lose their ordering.

In Tablets of Stone, tablets are packets and their contents is **data**. Packets contain both data and header information. The size of the header information affects how much data can be transferred – so a balance has to be reached, as packets are of finite size.

Students will find that they will need to swap some of their data boxed for information such as packet number and total packets, or whether or not the packet is an acknowledgement packet. Due to this information taking up data boxes, overall more packets will be needed.

Internet protocols such as **TCP** balance these factors to create reliable and efficient data transfer.

This activity was adapted from *Computer Science Inside*

Task 3 - Protocols
What are protocols?
Computers talk to each other over the internet via messages. However, the internet is not reliable and sometimes these messages get lost. There are certain bits of information we can add to messages to make sure they are sent. This information makes up a protocol.

In this worksheet, you will use ideas covered in the video as well as search for information on the Internet to answer questions… about the Internet!

Video
The Internet: IP Addresses & DNS

Questions	Answers
1. What is a protocol? 2. What is an Internet Protocol (IP) address? How is it organized hierarchically? 3. How many bits are in an IPv4 address? How many IPv4 addresses does that mean there are? 4. What is the difference between IPv6 and IPv4. Why do we need IPv6? 5. What is an IP packet? 6. What is the difference between an IP address and an IP Packet? 7. What is the purpose of the Domain Name System (DNS)? 8. **(For fun)** What is the IP address of the computer you're sitting at right now?	

Task 4 - Core Concepts table
Check and revise your understanding of the core concepts of computational thinking by completing the table

Introduction to Programming

| What is Programming? |
|---|
| In this part of the unit, we are using an online platform called Grok Learning to learn about programming.

What is *programming?* Free Code Camp provides a great definition: *"**Programming** is the act of **instructing computers** to carry out tasks."* *It is often referred to as coding. A **computer program** is a sequence of instructions that the computer executes.*

As we have learnt previously, computers have their own language, which is **binary code** (1s and 0s). *To communicate with machines who speak binary, we do so in a language that's closer to our own natural language.*[4]

In Grok Learning, we are going to use a visual programming language called **Blockly.** |

Learning Intentions	Evidence of Success
1. Store and perform operations on number variables and text variables 2. Manage input and output 3. Understand conditions and solve problems using decision blocks 4. Investigate and make decisions with strings 5. Repeat instructions using loops and counting with code	1. A number is different from a text variable because … The operations I can perform on variables include … 2. To get input from the user, I use … To display information to the user I use … 3. To check a condition and make a decision, I use … 4. To investigate a string, and manipulate the text data, I use … 5. To repeat instructions to a computer, I use … and can solve a complex problem such as … by ...

Core Concepts (complete this table after you have finished the tasks/questions below)		
Your first program	Calculating things	Making decisions
Putting it together	Investigating strings	Looping
Advanced looping	Counting with code	Putting it all together

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[4] https://www.freecodecamp.org/news/a-gentler-introduction-to-programming-1f57383a1b2c/

Task 1 - Login to Grok Learning and begin the course

Log onto https://groklearning.com/ and find the course called **Intro to Programming (Blockly).** This course should already be assigned to you, so you should be able to see it at the top of your screen:
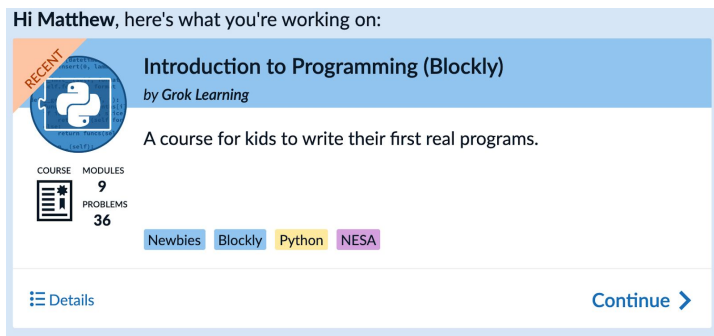

Task 2 - Read and complete all the modules

Read carefully through all the instructions and complete all of the modules. This should take you roughly **4-5 lessons** to complete all the modules.
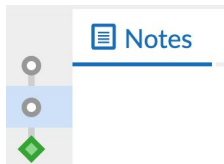
As you go through each module, you will notice that there are circles and diamonds on the left. The **circles** are **pages you need to read,** whereas the **diamonds** are **activities that you need to complete.**
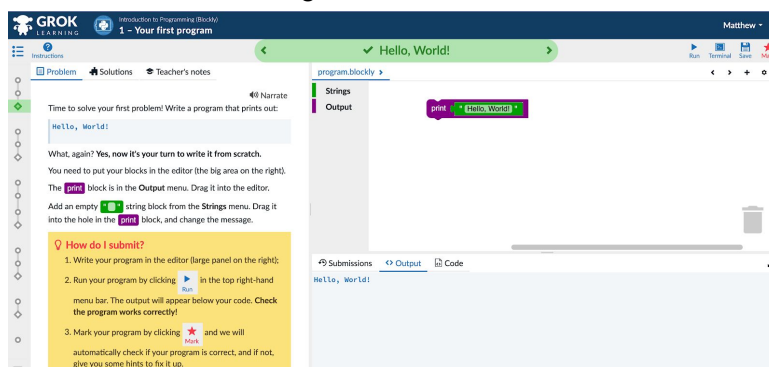
In the **circle** sections, there will often be code snippets that you can run and test. For example, displaying the text "Hello, World". When you click on the ▶ icon, you can see the output of your program below.
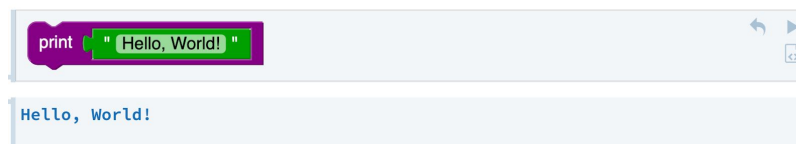
In the **diamond** sections, there will be:
- Instructions to the left
- Your code in the top right, and
- An output & code section in the bottom right.

When you click on **Run**, you will see the output of your program in the bottom right. When you click on **Mark**, it will check if you have written the correct code. If it is **correct**, the diamond will turn **green**, to let you know that you have completed that section.

Task 3 - Core Concepts table

As you complete each lesson, you are encouraged to **take notes**, and update the core concepts table above. This will help you to remember what you've learnt each lesson.