June 2020

Week 11 #SolveItWithSTEM@Home Experiment Pack for Secondary Schools

featuring Alice and Eddie - our STEM Gurus

Hi everyone, welcome to Week 11.
For those of you who don't know me, I am Alice and this is Eddie!
We both work at the Fawley Manufacturing Complex in Southampton.
This week we have turned our attention to – cyber security. It is a huge part of our lives and we want to make sure you are all safe when using the internet or media apps.
Why not check it out!

Reminder: Make sure you do the experiment safely and with an adult present!

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Cyber Security: Encryption

So using a simple formula like A=1, B=2 is great if you want everyone to be able to understand what you have written in computer code...but what if you want to keep your message secret?

Well one simple way is to change which number represents which letter, e.g. A=23, B=6, C=13. This is called **encryption**!

For anyone to be able to understand the code or 'decrypt' the message they would need to understand which number represented which letter, this is known as the '**Key**'.

Probably one of the most famous uses of encryption was by the armed forces in World War 2.

There is lots more information on the Enigma machine (pictured right) and the effort to try and 'break the code' or 'discover the key' here: https://en.wikipedia.org/wiki/Enigma_machine

The Enigma machine used in WW2

Using the link above...

1. What is the name of the special encryption device used by Nazi Germany in World War 2?
2. What is the name of the decryption centre set up by the United Kingdom to break the code / decrypt the message?

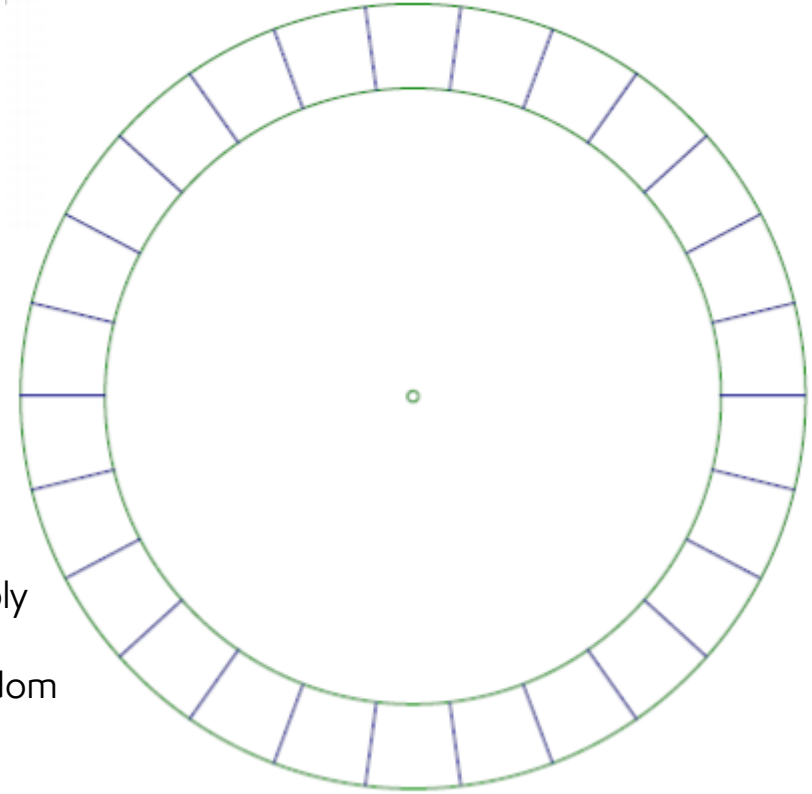
Experiment #19: Encryption

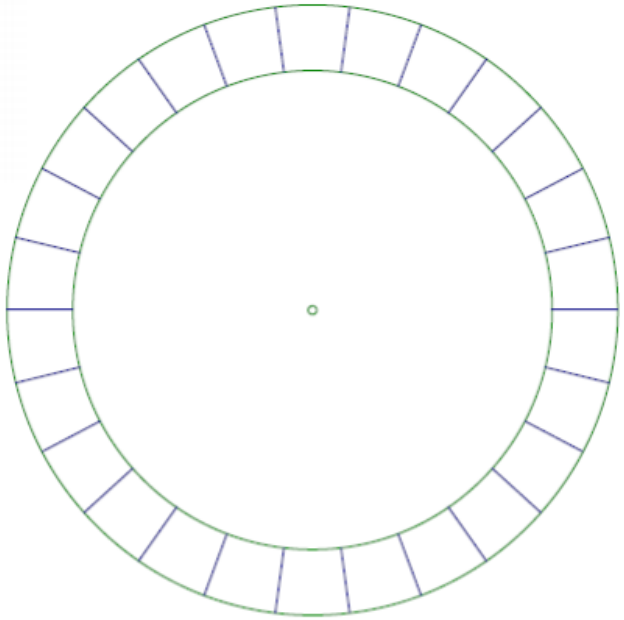
Items Required:

- Paper
- Pens
- Scissors
- Drawing pin (not essential)
- Printer (optional)

Instructions:

- Print and cut out the two circles on this page. If you are unable to print, you can simply draw the circles (as they appear on the right) on a piece of paper.
- In the larger wheel, write all the letters of the alphabet in each of the spaces in a random order.
- In the smaller wheel, put the numbers 1-26 in each of the spaces in a random order.
- Place the smaller wheel on top of the larger wheel – put a drawing pin through the middle of both wheels to steady them if you have one.
- Select a single number and letter e.g. A=23 and rotate the wheels until they match.
- Keeping the wheels in this position use the letter/number combination to write your message.
- Pass your message and code wheels to your parent or household member and see if they can work out the message you wrote down. *Note: they will need to have an exact copy of your encryption wheel and they will also need to tell them that A=23 for them to be able to decrypt your code.*





The great thing about a encryption tool like this is you can change the code anytime e.g. A=12 and then anyone trying to work out your code would need to start again. This is exactly what the Enigma machine did by changing the encryption key after each letter entered to make it very hard to break!

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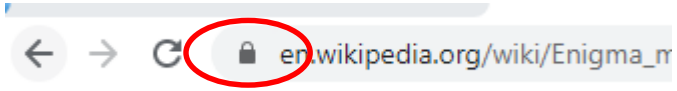
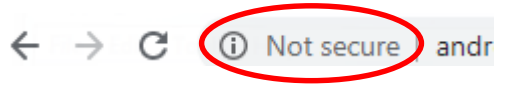
Cyber Security: Encryption

The internet uses 'Encryption' to keep your data safe, if you look in the address browser of an internet browser you will often see the small lock which indicates a encrypted connection:



Never put your bank card details or personal information into a website that doesn't have that padlock symbol or that says 'not secure'. That's the internets way of telling you your details are not encrypted or protected:



23 5 6 10

Hi Eddie, how's it going?

23 5 6 10

If the connection isn't secure its like I am sat in the room with them and can hear all their conversation

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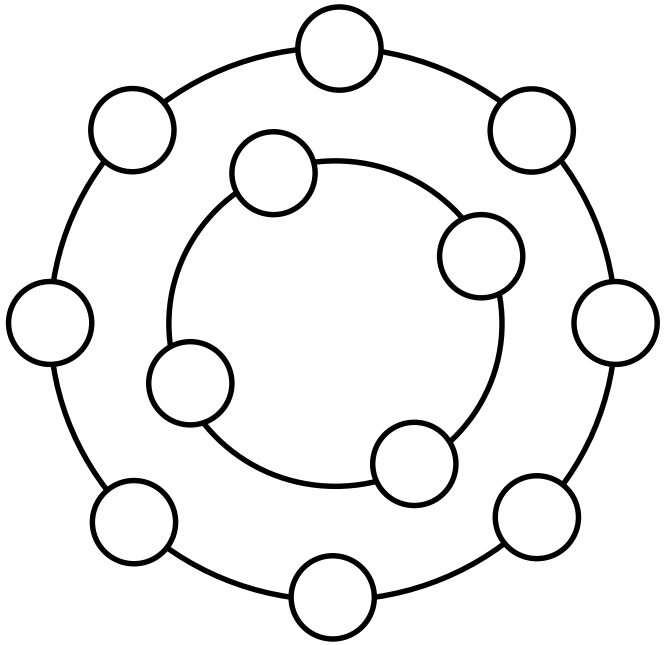
Week 11 – Maths brain teasers!

30			**7**
	8		
5		**3**	
	31	**6**	

Complete the Magic Square so that each row, column and the two centre diagonals total 50. You cannot use the same number more than once.

Why not give these a go! The correct answers will be included within next week's pack...stay tuned.



Write the numbers 1-12 in the circles in the diagram. Use each number only once. The sum of the numbers in the outer circle must be twice the sum of those in the inner one.

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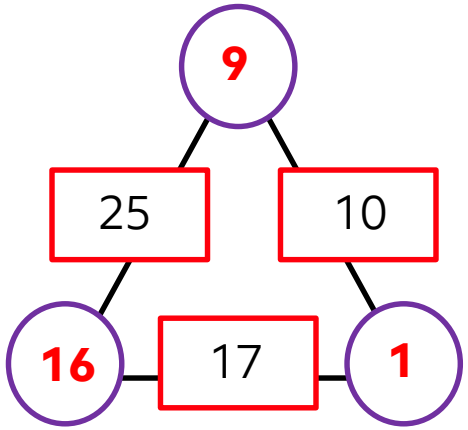
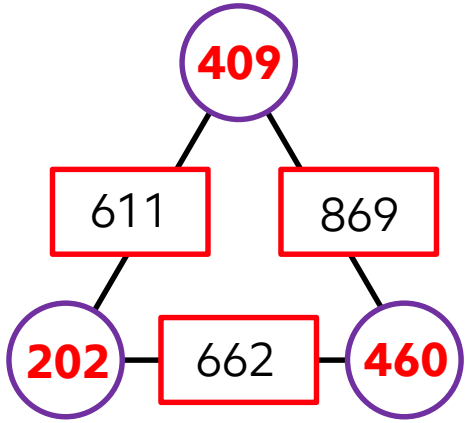
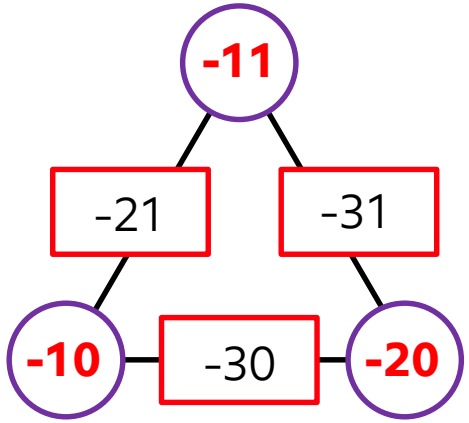
Week 10 – Answers to the Maths Questions!







Answers in red

We hope you enjoyed the Week 11 activities.

Week 12 will be coming soon.

Best wishes
The ExxonMobil Fawley #SolveItWithSTEM Team!