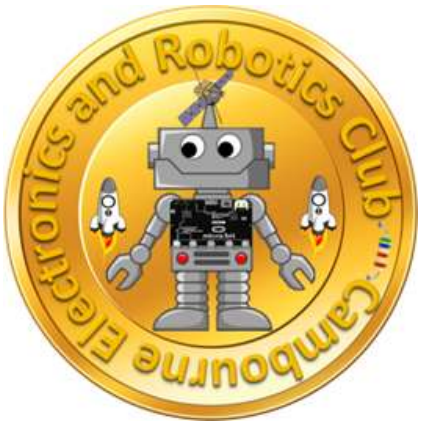


Ignite

CERC Newsletter

FEBRUARY 2021

Shrobona
Founder

Sujit Bhattacharya
Mentor

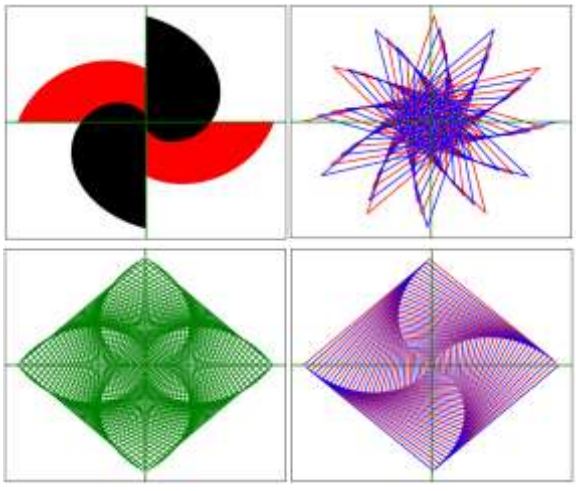
Maya & Sreenidhi
Editors

Message from Mentor

January 2021 witnessed more than 40 Young Scientist demonstrations from the students of the Robotics course. We had many interesting and innovative projects from the students including flood warning system, automatic street lighting, testing the conductivity of material, theft protection, etc. We had students from Sri Lanka, South Africa and UK. All the participants received a certificate for completion of the course.

Python for Pre-Teens and Teens courses also witnessed many interesting Young Scientist challenges. These courses delve deep into the fundamentals of Maths that are being taught in the school. We have seen that these problems-based approach of executing projects are unlocking the true potential of the children. They are slowly being directed to do more self-learning through plethora of information that are now accessible through internet.

The new batches for the Robotics Beginners, Intermediate and Advanced courses have now started with more than 50 students joining from Australia, India, Sri Lanka, South Africa, England, Scotland, Wales, Northern Ireland and US. We have also initiated a new Deep Dive into Maths Group Learning online sessions to support students in Year 9, 10 and 11 based on GCSE curriculum during the lockdown. We have good number of students in the new batches of Python for Pre-Teens and Teens courses.



Spirograph by Python for Pre-Teens student, Sreenidhi

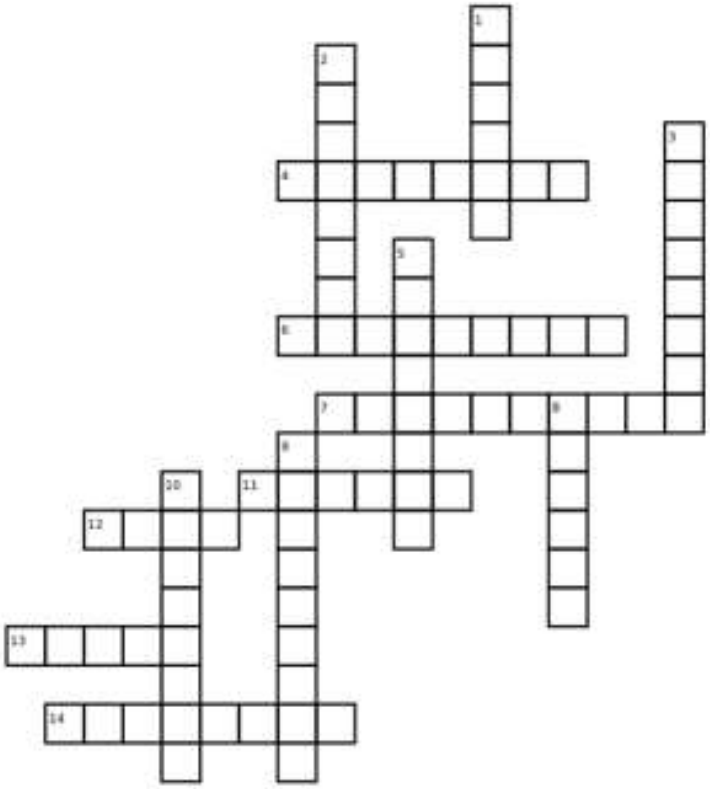
A workshop on **Internet-of-Things (IoT)** based on BBC Micro:bit is planned during the term break of the school on 20th-21st February 2021. This workshop is developed to give an opportunity to students, parents, teachers and professionals to get a hands-on experience of developing IoT projects.

Please register your interest for the IoT workshop at https://forms.gle/ggDjhfkK4DvmBzum8

Message from Editors

Maya and Sreenidhi prepared following Puzzles, encourage children to send answers to puzzles ignite.camcare@gmail.com

The periodic table



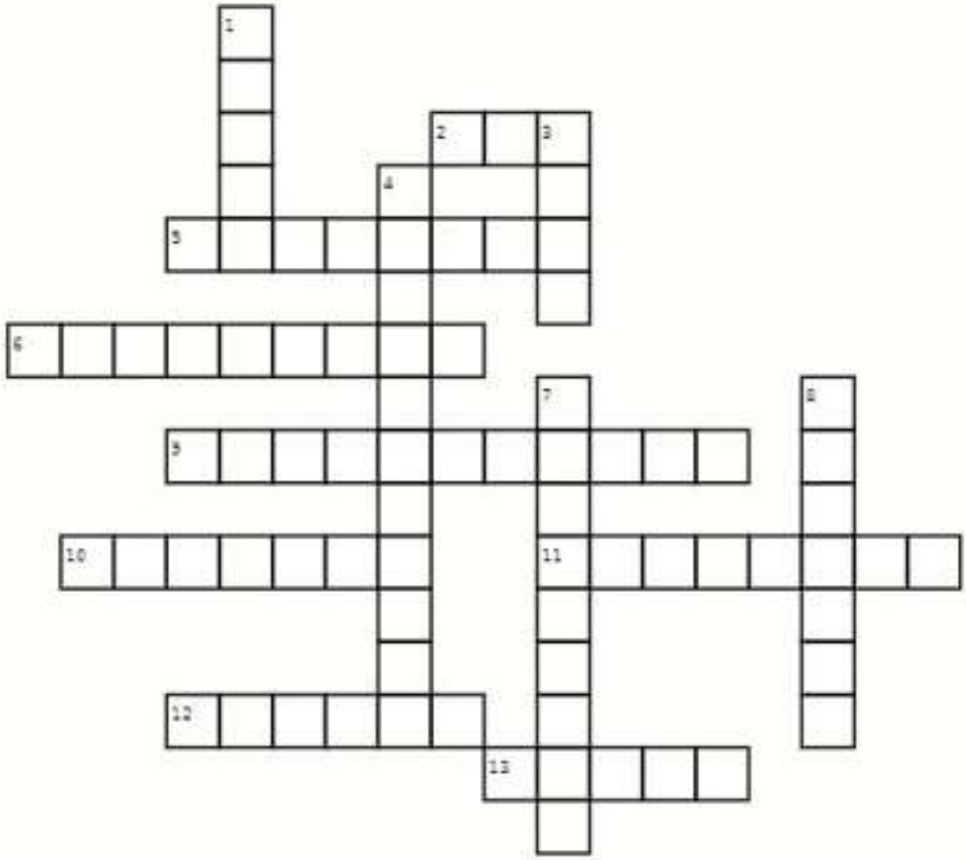
Down:

1. Named after Marie Curie
2. Commonly to keep swimming pools clean
3. The name of group 7
5. The first element in the periodic table
8. What we breathe in
9. Found in bananas
10. Used in toothpaste

Across:

4. Where two or more elements are chemically bonded together
6. The creator of the periodic table
7. The oldest element in the world
11. The material coins are made out of
12. The symbol of this element is Au
13. The substance called H2O
14. The rarest element on earth

Animals



Down:

1. Lives in deserts and has humps
3. King of the jungle
4. Largest dolphin
7. Largest animal
8. Very long neck

Across:

2. Can move its head 360 degrees
5. Stands on one leg
6. Biggest reptile
9. A baby butterfly
10. Fastest land animal
11. Largest land animal
12. Swings on trees
13. Slowest land animal

Message from Editorial board by Venkat Kommi

If the children can send all the right answers above the puzzles we will publish their names in the March Magazine.

It is nice to see different topics for the 3rd edition of Ignite. We are looking forward to seeing more response from the readers.

Readers please feel free to comment on their articles. This will boost their confidence levels.

The Ignite magazine is a community based volunteered magazine, where a group of professionals, academics and young children are working together.

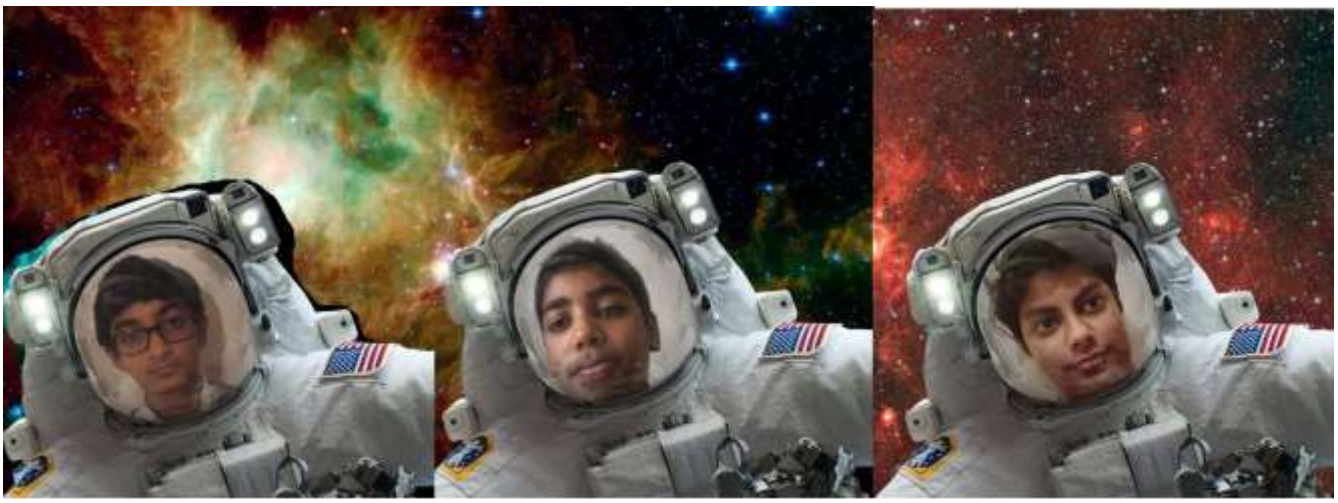
These articles are written by the children and are edited by a team.

The editorial team is in charge of the publication of the magazine.

If you have any questions, suggestions, or concerns, please address them to ignite.camcare@gmail.com

Astro Pi Mission by Team CERC

(Vivek Kommi, Akshith Katuri, Sairam Batchu 12 years old from Perse School, Cambridge, UK*)*

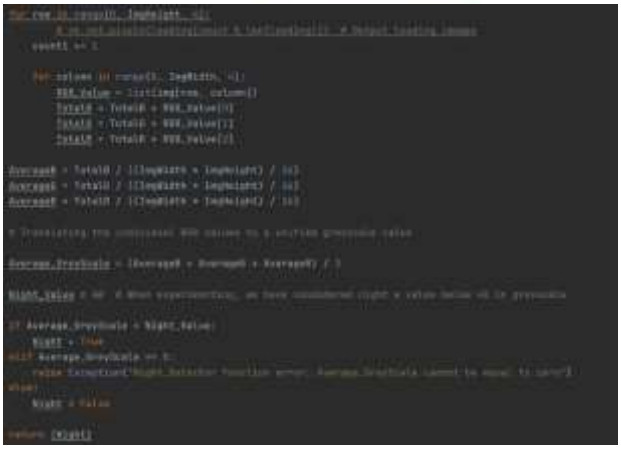


In this project, our goal was to detect the vegetation of the sea, locate coral reefs and seaweed in the sea. This could help in the field of science because coral reefs support more species per unit area than any other marine environment, including about 4,000 species of fish, 800 species of hard corals and hundreds of other species. Scientists estimate that there may be millions of undiscovered species of organisms living in and around reefs. According scientists marine vegetation will contribute more than 50% oxygen compared to all the other plants on the Earth. After initial study our team concluded that with the hardware, resources we had available, investigating parameters such as raster's, clouds and sensing sea was the best way to gather useful data.

Method:

After reading and analyzing several studies about coral reefs and their importance, we decided to use just the NIR camera on the AstroPi, as it can receive the NDVI data (Normalized Difference Vegetation index) with this we could reach our goal. From the image our code detects if it is night or not, if the picture has sea or not, if the picture is cloudy or not and to find the vegetation using NDVI. We then stored all this data in a csv file.

Our Phase1 idea was to find the volume of carbon dioxide or greenhouse gases in the atmosphere. We were planning to detect the gas wavelengths using spectroscopy because it was in an infrared range. The wave lengths of Co2 were outside the range of the AstroPi Izzy NIR camera.

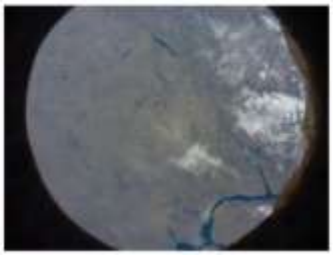


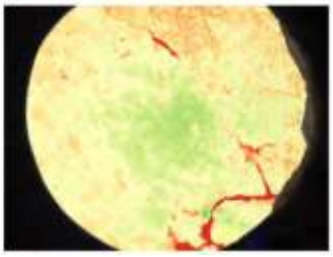
Example code to detect image was dark:

https://github.com/vivek-kommi/Astro-Pi-CERC

We calculated the average greyscale value and if it was higher than 40, we would know it was night so we could delete the image. We did the same process with finding if the sea was present in the picture or not, but this time we analyzed the blue value.

NDVI is used to quantify vegetation greenness and is useful in understanding vegetation density and assessing changes in plant health.





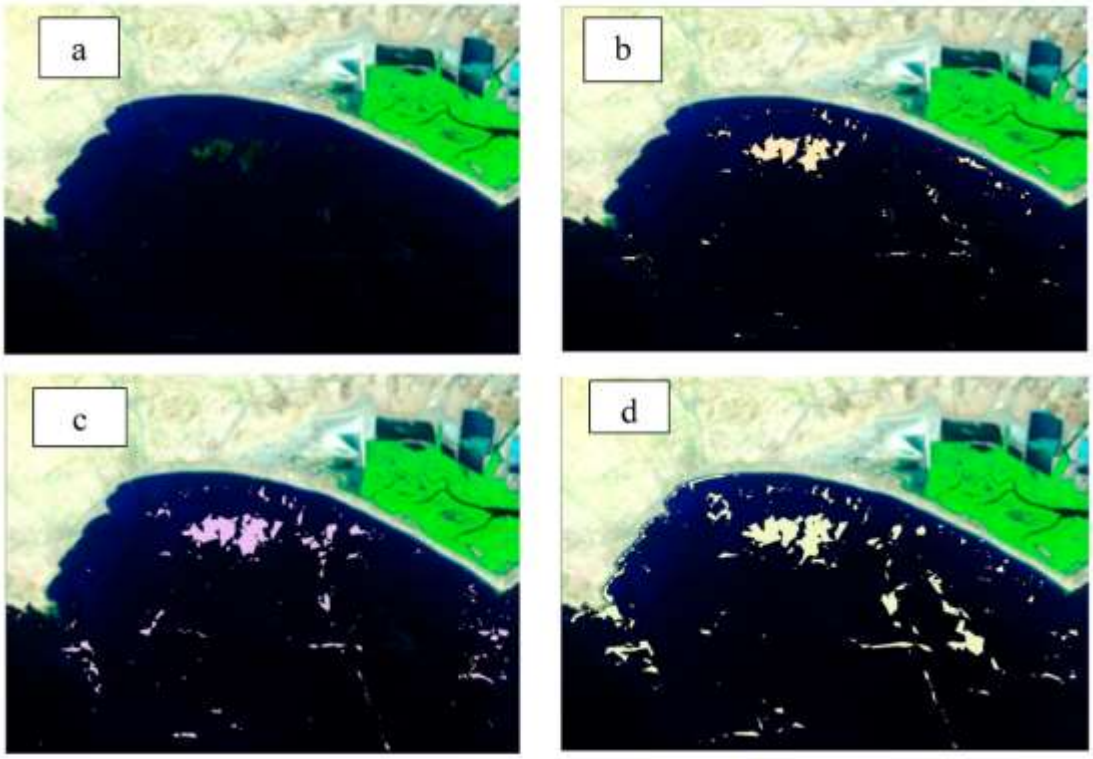
NDVI is calculated as a ratio between the red (R) and near infrared (NIR) values:

(NIR - R) / (NIR + R)

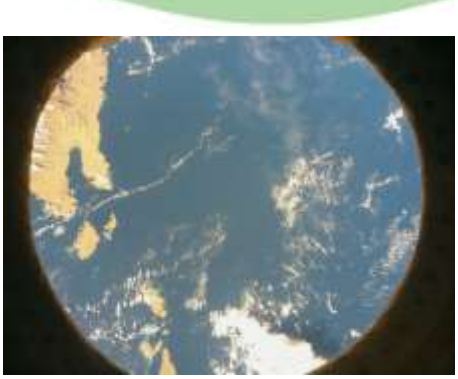
In Landsat 4-7, NDVI = (Band 4 – Band 3) / (Band 4 + Band 3).

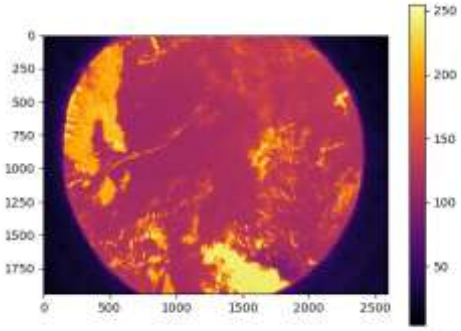
In Landsat 8, NDVI = (Band 5 –Band 4) / (Band 5 + Band 4).

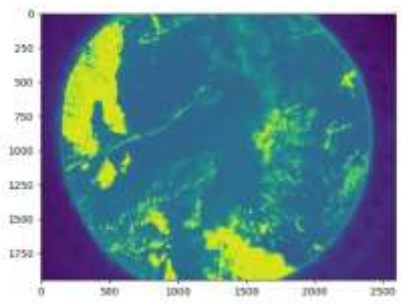
The example of an experiment on the coral reefs. From this data we can see that coral reefs are just off the seaside and can be scattered widely.

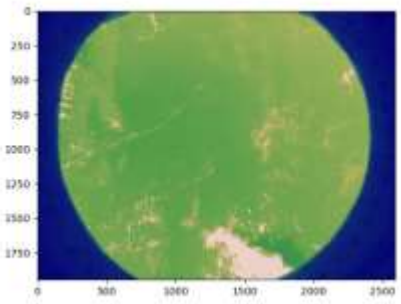


https://www.mdpi.com/2072-4292/11/12/1434/htm#









The first image is supplied by ESA with the AstroPi kit. It clearly shows marine vegetation in the sea.

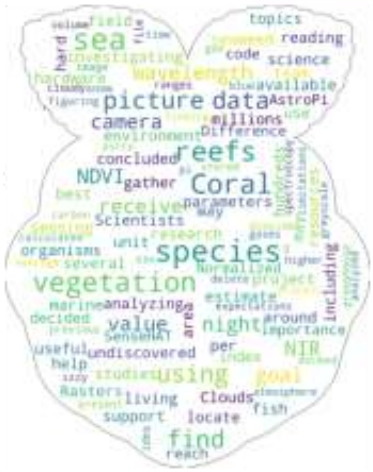
With our NDVI code, the last image has detected bright areas with marine Vegetation.

Conclusion:

With this experiment we have managed to discard night-time photos and distinguish ocean and cloud-covered images.

The next step would be to do a ground survey of this location aiming to verify whether the locations flagged by this experiment really are coral reefs or marine vegetation exists. This experiment suggests that it is possible to handle existing satellite imagery and data to identify locations that can be investigated in real-time. The main limiting factor in the project is sea reflection. It can be easily remedied by accepting white pixels. Our aspiration is to have an automated system of the map of the globe, where each pixel is color coded to indicate its sea vegetation, this is a tool to help scientists discover new species of wildlife.

Because team has limited knowledge about satellite images, if anyone has experience in geosciences or any experience with satellite images and wants to help us out, please reach out to us ignite.camcare@gmail.com



Word Cloud for this project

Source Repository:

https://github.com/vivek-kommi/Astro-Pi-CERC

References:

https://www.mdpi.com/2072-4292/11/12/1434/htm

https://www.usgs.gov/media/images/landsat-satellite-image-submerged-aquatic-vegetation-alaska

Google Foo Bar Challenge *by Avni Balan, 13 years, IVC School, Histon, UK*

A few weeks ago, my brother and I gave a brief introduction of google foobar, and the little stories it gives. However, we wanted to show everyone a little more about the kinds of things foobar could offer, and our personal experience. So, we decided every month we would explain one of our problems, starting from our very first each. This is my first problem, and my result.

Before we begin, you'll need some background information on the places foobar can take you, and the little adventures and misadventures it leads you on.

Commander Lambda and the DOOMSDAY device

Bunny HQ has just received information that your fellow bunnies are being captured by the almighty Commander Lambda and are being held prisoner on her spaceship. This is bad news for Head Quarters - you figure as much - but it only gets worse. Lambda plans to take over all of Bunny Planet, and she plans to do so using what she calls the LAMBCHOP DOOMSDAY device. As their best undercover agent, you've been told that you're sent on a mission to infiltrate Lambda's spaceship and work there as a double agent, until you're able to completely destroy the LAMBCHOP and bring home all the prisoners there and yourself safely. You need to disguise yourself, and to do that you'll need to gain Lambdas trust and show her your worth. It'll be a tough journey, but you've got what it takes. Bunny HQ, your whole home planet, is relying on you.

Foobar #1: Minion Labour Shifts

In this part of the story, you find yourself as a minion on Commander Lambda's ship. Minions are given all the dirty work on the ship. To put it simply, each task has an assigned number, and each minion is given a list of up to 99 of those numbers to show them what tasks to do each day. Said lists are planned well in advance, since they are derived from each minion's ID number. However, sometimes minions are given the same task multiple times, and if the number of times they repeat goes too high for them, they'll complain about it until they're taken off the task completely.

You figure you can automate this by removing whichever tasks appear more than however long that minion can handle it before they start complaining. This way you might just get Commander Lambda to promote you and give you access to the files you need! For example, if the minion's task list (data) was [10, 15, 17, 15, 8] and the highest number the minion wouldn't complain about (n) was 1, the function we want to write should return [10, 17, 8] since 15 is on there more than once. I used Python for this problem, which I will continue to use throughout the course.

This was my solution:

```
def solution(data, n):                                          new_data =
[i for i in data if data.count(i) <= n]                         return new_data
```

What I'm doing here is first making this new list called 'new_data', which is what I'll later return from the function. Then I'm saying what goes inside of new_data, which I'm saying is 'i' for every 'i' we find in data, but only if the number of times the value of 'i' appears in data (data.count(i)) is less than or equal to the number n. Finally, I return new_data, which foobar would then analyze to see if it matches up.

I personally found this quite easy, yet I learned a couple things too. I learned about list comprehension, which saved me a couple of lines, and the .count() function, which saved me many more. I think this, while a teensy bit advanced, would be quite good for beginners.

To keep you waiting until next month, I'll give you my second problem, but not my solution. This is so you can try and solve it at home yourself, if you can, and if you're up for a challenge!

Foobar #2: Power Hungry

Commander Lambda's space station is... pretty big. And 'pretty big' space stations take... quite a bit of power. 'Pretty big' space stations with doomsday devices take even more 'quite a bit of' power. To help meet the station's power needs, Commander Lambda has installed solar panels on the station's outer surface. But the station sits in the middle of a quasar quantum flux field, which wreaks havoc on the solar panels. As your new position as henchman, you have assigned to repair the solar panels, but you can't take them all down at once without shutting down the space station (and all those pesky life support systems!).

You need to find out which panels you can take down while maintaining the maximum power-product for the station. So if you were given a list of panel power outputs (xs) containing [10, -7, -3, 5, -8], you would first get from it the list [10, -7, 5, -8], since -3 would drain the power (make the output negative) and would be the least effective, as it's the closest to 0. Then you would return 10 x (-7) x 5 x (-8) = 2800. As you can see, the numbers can get quite large, so you'd need to return this as a string, so you'd return 'str(2800)' instead of '2800'.

Test your code with these 3 lists:

[10, -7, -3, 5, -8]

Output: “2800”

[7, 4, -3, -2]

Output: “168”

[3, 0, 0, 4, 0]

Output: ”12”

You can reach me

https://github.com/not-that-python

Google Foo Bar Challenge *by Aaron Balan, 11 years, Histon, UK*

Last month, my sister and I wrote an article about an introduction of foobar (choose the one published on 4th December 2020). This month, I will write about my first problem and how I solved it. I will then end this article with my second challenge that you can ponder on and maybe solve. I will reveal my solution in the next issue and give you another problem to work on and we will continue like this in the following issues. Hope you enjoy my articles and solving the problems in the coming months.

Okay, so here's the background story - You are a double agent from Bunny Planet. You've been sent by Bunny HQ to infiltrate the spaceship of the evil Commander Lambda. She is planning on destroying Bunny planet using her LAMBCHOP (Lambda's Anti-matter Biofuel Collision Hadron Oxidating Potentiator) doomsday device she is currently working on. Your mission is to stop the LAMBCHOP device from destroying Bunny Planet and to save any bunny prisoners on the way. You will have to work your way up to the top of the hierarchy to get access to the doomsday device and save your home planet.

My level one problem was called Re-ID and goes as follows:

> the lowest rank of workers in the spaceship called minions are having some problems because minions with boring ID numbers are jealous of minions with cool ID numbers like "1" and "42". Because of this, Lambda has tasked you to reassign everyone new, random IDs based on her Completely Fool proof Scheme. She's concatenated the prime numbers in a single long string: "2357111317192329...". Now every minion must draw a number from a hat. That number is the starting index in that string of primes, and the minion's new ID number will be the next five digits in the string. So, if a minion draws "3", their ID number will be "71113". You need to help the Commander assign these IDs by writing a function solution(i) which takes in the starting index i of Lambda's string of all primes and returns the next five digits in the string. Commander Lambda has a lot of minions, so the value of i will always be between 0 and 10000.

Here is how I solved the problem:

```
def solution(i):
    primes = ""
    n = 1
    while len(primes) <= i+5:
        n += 1
        if all(n%m for m in range(2, int(n**0.5)+1, 1)): primes += str(n)
    return primes[i:i+5]
```

I was first initializing a prime-variable as an empty string and an iterator n as 1. I then wrote a while loop concerning if the number of characters in the string was greater than i+5 or not. This repeats everything in the while loop until the length of the prime-string is greater than i+5.

Inside the loop, I add one to the iterator n and adds a string value of n if all (n%m)

for m in range(2, int(n**0.5)+1, 1), which basically asks if n is prime. This prime string needs to have a length greater than i+5 so I can return on the last line a chunk of this string which starts at the index i and ends at the index i+5. I personally found this very easy and think this could be a good exercise for beginners as it uses some fundamentals and primes, which are always good fun in trying to make them efficient (although this program's prime finder is quite slow and I would like to leave it to the reader to maybe try and improve it).

Once I had finished level 1, I was feeling pretty confident to start on my level 2 challenge1 called Lovely Lucky LAMBs. Here is the problem which you can start working on:

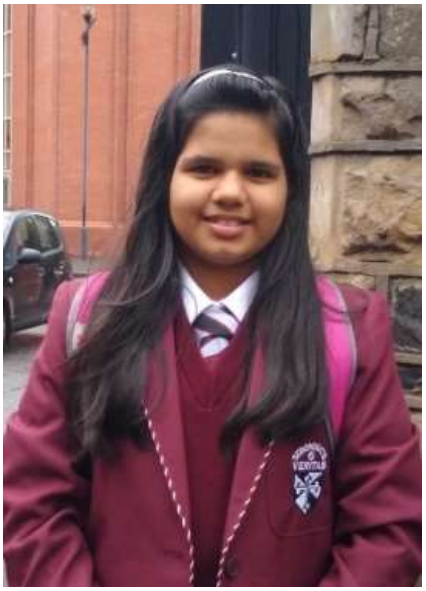
```
Occasionally, when Commander Lambda is feeling generous, she'll hand out Lucky LAMBs
(Lambda's All-purpose Money Bucks). Henchmen can use Lucky LAMBs to buy things like a
second pair of socks, a pillow for their bunks, or even a third daily meal!
However, actually passing out LAMBs isn't easy. Each henchman squad has a strict
seniority ranking which must be respected - or else the henchmen will revolt and
you'll all get demoted back to minions again!
There are 4 key rules which you must follow in order to avoid a revolt: 1. The most
junior henchman (with the least seniority) gets exactly 1 LAMB. (There will always be
at least 1 henchman on a team.) 2. A henchman will revolt if the person who ranks
immediately above them gets more than double the number of LAMBs they do. 3. A
henchman will revolt if the amount of LAMBs given to their next two subordinates
combined is more than the number of LAMBs they get. (Note that the two most junior
henchmen won't have two subordinates, so this rule doesn't apply to them. The 2nd
most junior henchman would require at least as many LAMBs as the most junior
henchman.) 4. You can always find more henchmen to pay - the Commander has plenty of
employees. If there are enough LAMBs left over such that another henchman could be
added as the most senior while obeying the other rules, you must always add and pay
that henchman.
Note that you may not be able to hand out all the LAMBs. A single LAMB cannot be
subdivided. That is, all henchmen must get a positive integer number of LAMBs.
Write a function called solution (total_lambs), where total_lambs is the integer
number of LAMBs in the handout you are trying to divide. It should return an integer
which represents the difference between the minimum and maximum number of henchmen
who can share the LAMBs (that is, being as generous as possible to those you pay and
as stingy as possible, respectively) while still obeying all of the above rules to
avoid a revolt. For instance, if you had 10 LAMBs and were as generous as possible,
you could only pay 3 henchmen (1, 2, and 4 LAMBs, in order of ascending seniority),
whereas if you were as stingy as possible, you could pay 4 henchmen (1, 1, 2, and 3
LAMBs). Therefore, solution(10) should return 4-3 = 1.
To keep things interesting, Commander Lambda varies the sizes of the Lucky LAMB
payouts. You can expect total_lambs to always be a positive integer less than 1
billion (10 ^ 9). That problem should keep you going for some time!
```

My GitHub page

https://github.com/wandering-kiwi

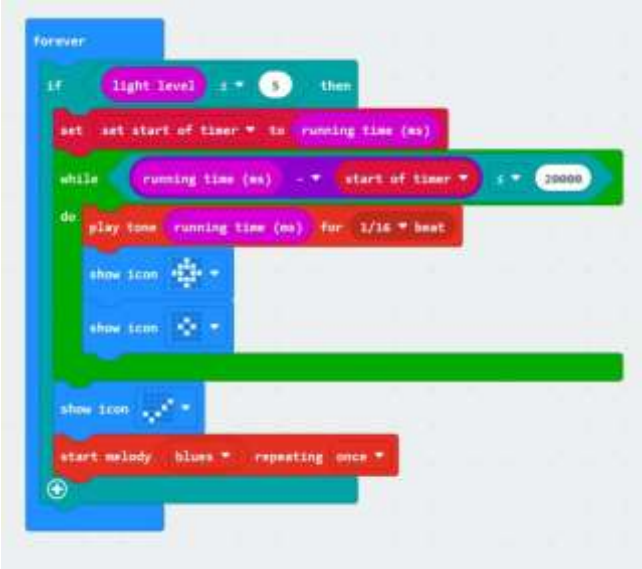
The Timer to Perfection

by Ananyaa R. Rahate 12 years ,
St. Dominic's Grammar School for Girls, Belfast, Northern Ireland, UK



When I first started micro:bit I found it pretty boring and was wondering "Why do I need to learn this? What do I need it for?" But when I moved to the intermediate batch, I learned how to do many more things and used my imagination to create codes that could also be used in real life! If you're wondering the answers to my questions, they are: you can have it as a hobby and it is the first step of learning if you are hoping to achieve a career in computer science and there are too many things to be listed for the second one. One day I wondered, "What could I do to improvise the times in the pandemic?" So I thought about the hand washing rule (wash your hands for 20 seconds) and thought I could maybe make a hand washing timer.

Subject:



So the first part of the code (If light level is less than five) means that when there is less than 5 units of light, the program will start. Then I created the variable called "timer". The next bit is basically when the 20 seconds start. It will play a beat and show fun icons that will represent that the timer is not done yet. When the timer is done it will play a melody and show a tick! Here is the link to watch the video:

https://drive.google.com/file/d/1T4KUwb2mj-gz6jFsnm4U-k93T8I8NpeM/view?usp=sharing

Conclusion:

We could use the hand washing timers in public bathrooms. One of the challenges I faced was the first bit. Sometimes there would be no sound so I had to rework the code again and again until the code finally worked.

Message from Founder

Each child carries extraordinary possibilities, CamCare UK tries to bring and make those hidden possibilities into a reality. Life is beautiful and do not play too small with your possibilities and talents. Do not let your aloof and unresponsive behaviours to block those possibilities that you are born with.

Opportunities can be grasped from anywhere, nature, house, schools, friends, books, parents, family and everything that you can gather. And, when you feel empowered with some knowledge, try to disseminate who needs it more. Be thankful that you can give, be thankful that you can help, you get the opportunity to serve.

Never limit yourself and do not let your potential to go. Another request to practice a healthy living from early age. Give your body enough nourishment to grow and behave best, look after your body and mind with the food from nature. Learn internal engineering of the body mechanism and how micronutrients help to run this sophisticated machine and how you can help to provide the fuel to this machine.