

SHARING INSPIRATION 2019

THE POWER OF REALIZATION



WS2.4

Innovator and Rover in the classroom

John Bament

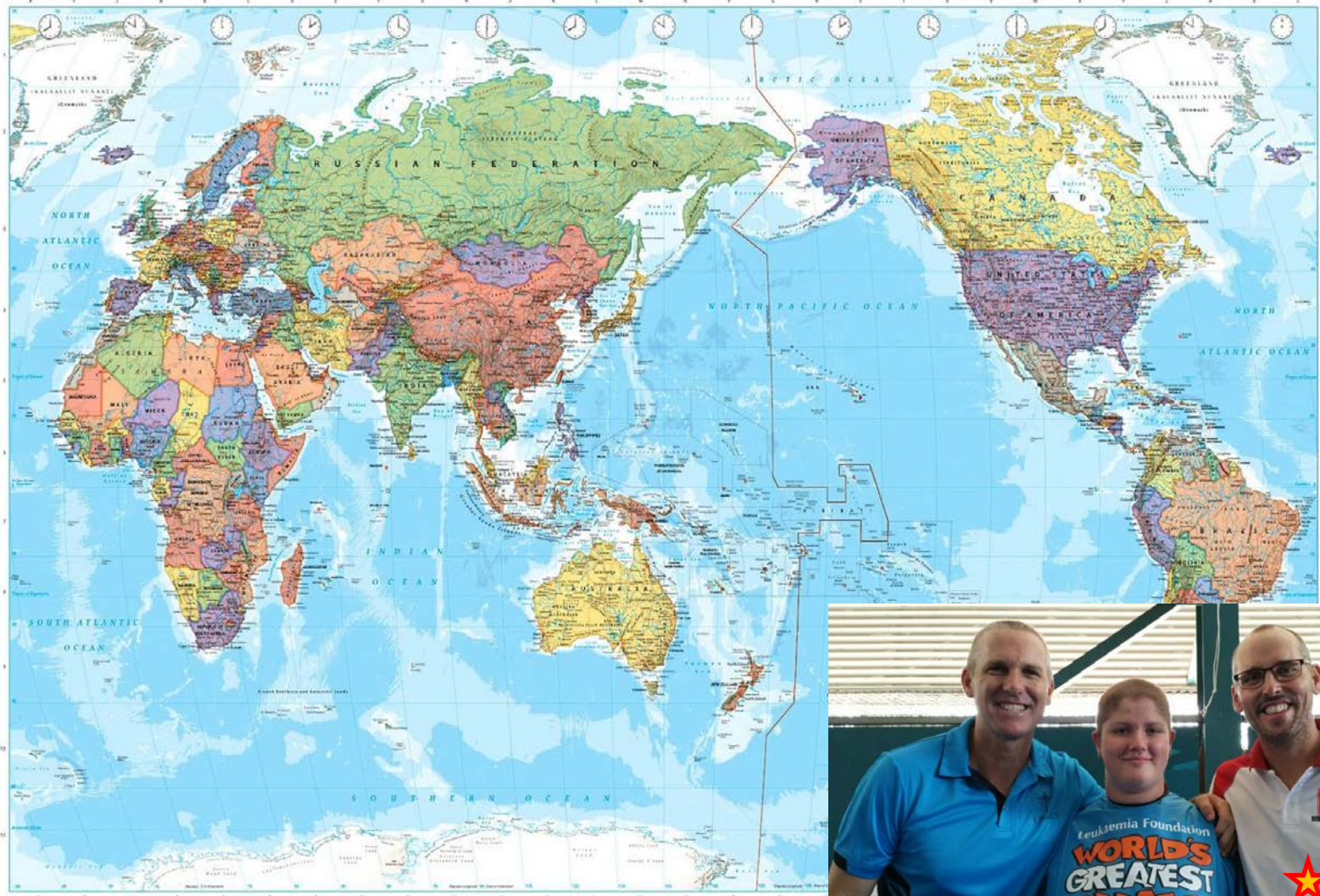


for joining me

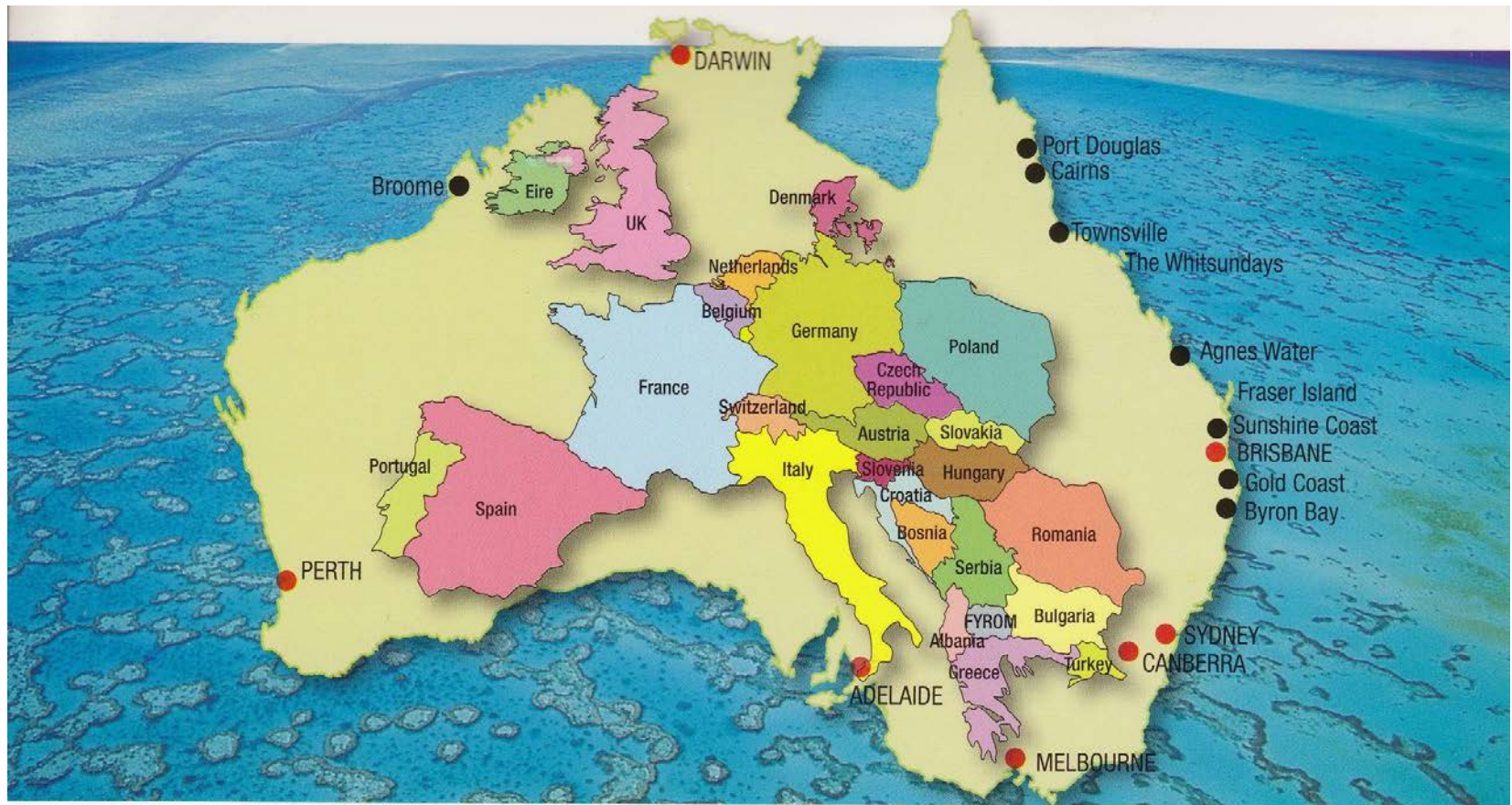




TI Australia



Just for you Abir



Australia and Europe Area size comparison

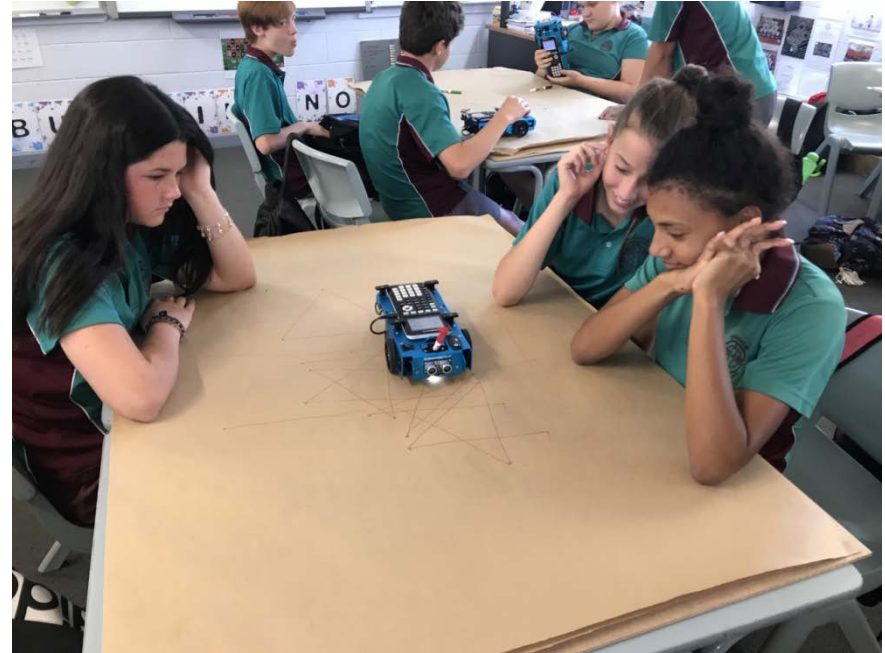
Darwin to Perth 4396km • Perth to Adelaide 2707km • Adelaide to Melbourne 726km
Melbourne to Sydney 887km • Sydney to Brisbane 972km • Brisbane to Cairns 1748km



Innovator



Rover



in MY classroom
with students from Year 4 to 12

TI STEM looks something like this



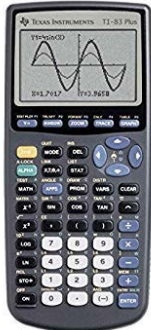
The Beginning – for Bill Gates



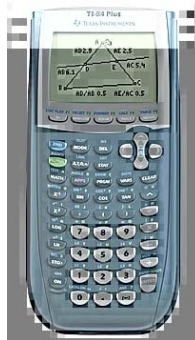
Learning to write programs stretches your mind, and helps you think better, creates a way of thinking about things that I think is helpful in all domains.

- Bill Gates, Co-Founder of Microsoft

The Beginning – for John Bament



Area formulas



Quadratic Equation formulas



Flow Diagram questions



AUSTRALIAN MATHS TRUST



Computational
& Algorithmic
Thinking

Computational and Algorithmic Thinking 2018—Intermediate Questions

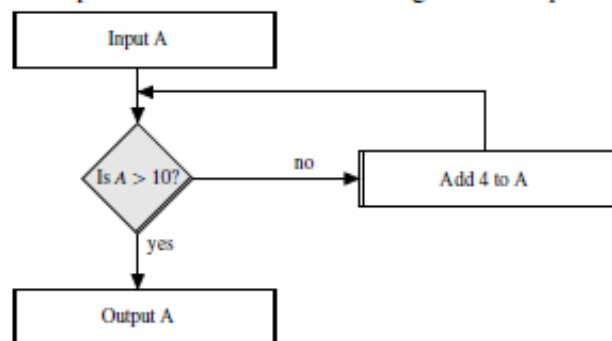


Teachers Teaching with Technology™

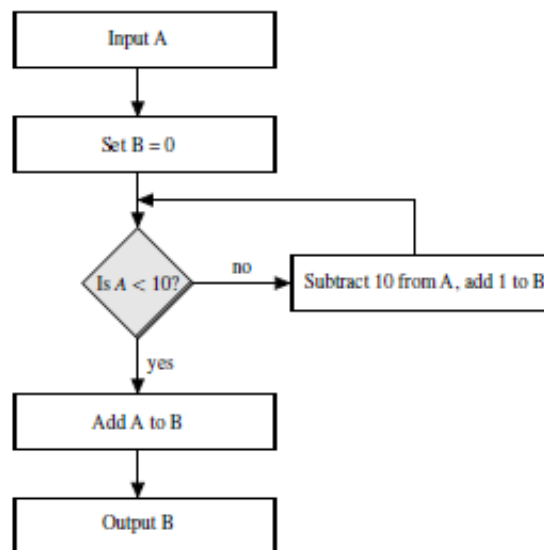
6. Flow Diagram

Flow diagrams provide a visual way of showing a process or algorithm: a box is used for an action, a diamond (shaded) for making a decision, and arrows indicate the flow of control.

For example, in the flow diagram below, if A was input as 9 it would be output as 13, whilst if it was input as 11 it would be unchanged and output as 11.



Each of the values 23, 47, 119, and 123456 in turn is input to the flow diagram below.



How many of the outputs are even?

(A) 0

(B) 1

(C) 2

(D) 3

(E) 4

The Collatz Conjecture

aka Hailstone Sequence

The Hailstone sequence of numbers can be generated from starting with **any positive integer**.

Let's call it ***n*** then:

If ***n*** is **1** then the sequence ends.

If ***n*** is **even** then the next ***n*** of the sequence $= \frac{n}{2}$

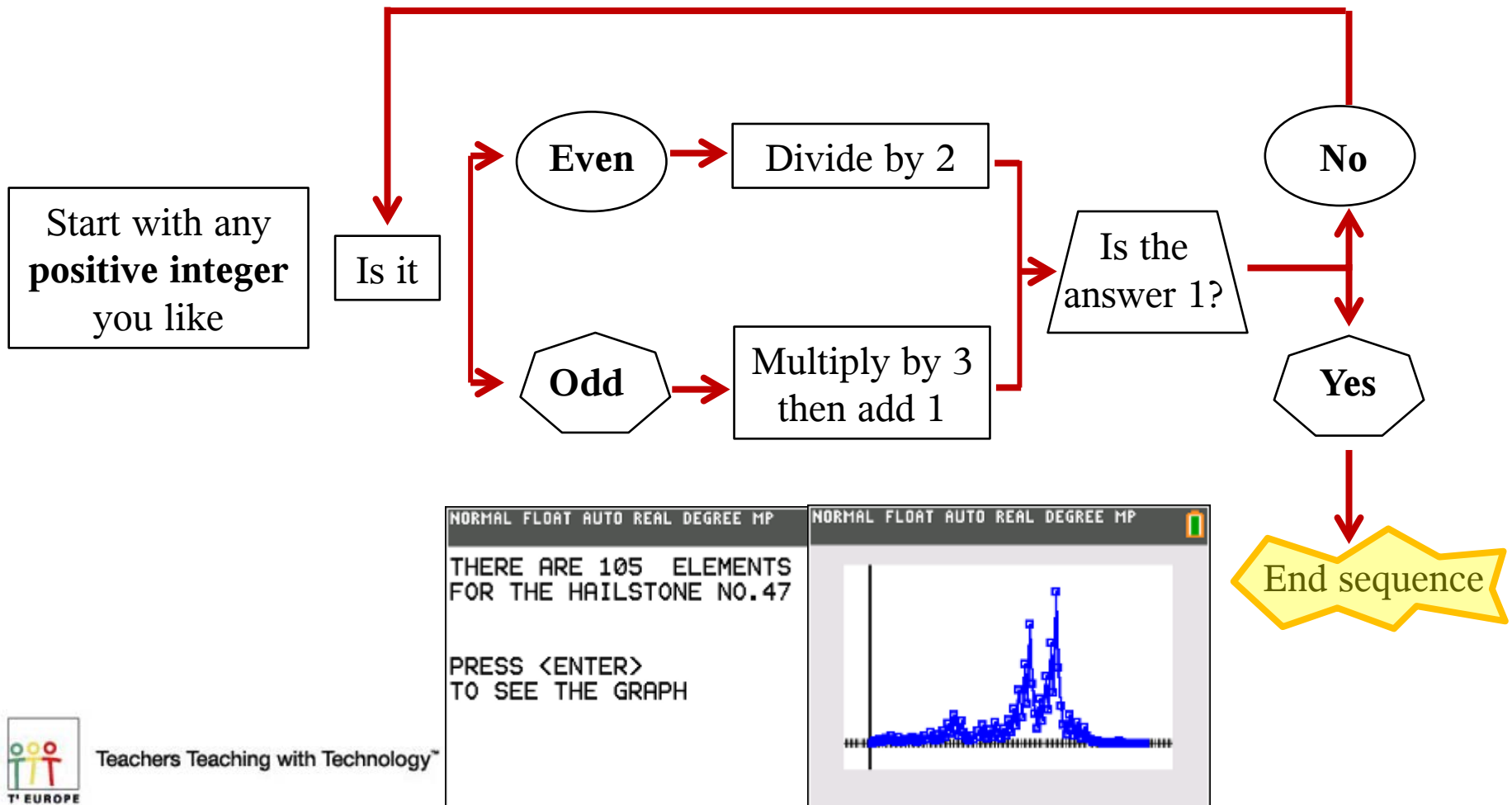
If ***n*** is **odd** then the next ***n*** of the sequence $= 3 \times n + 1$

*The (unproven) **Collatz conjecture** is that the hailstone sequence for any starting number always terminates.*

The hailstone sequence is also known as hailstone numbers (because the values are usually subject to multiple descents and ascents like hailstones in a cloud).

Hailstone Sequence

HAILSTON



Google Docs

I have several classroom Rover and Innovator activities which I'd like you to experience. Select the ones below that interest you the most.

☐ Hub - Torch and LED Brightness

☒ Hub - Light Intensity v Distance

☒ Hub - Make your own Theremin

☐ Hub - Using the Light and Color LED's

☐ Hub - Create your own song

☒ Rover - Drawing Polygons, Stars and much more

☐ Rover - Auto stop

☒ Rover - Autonomous Driving



Abir Marina
Erich Mommers
François Le Ninan
Jorge Santos

The SOUND of MUSIC





Theremin

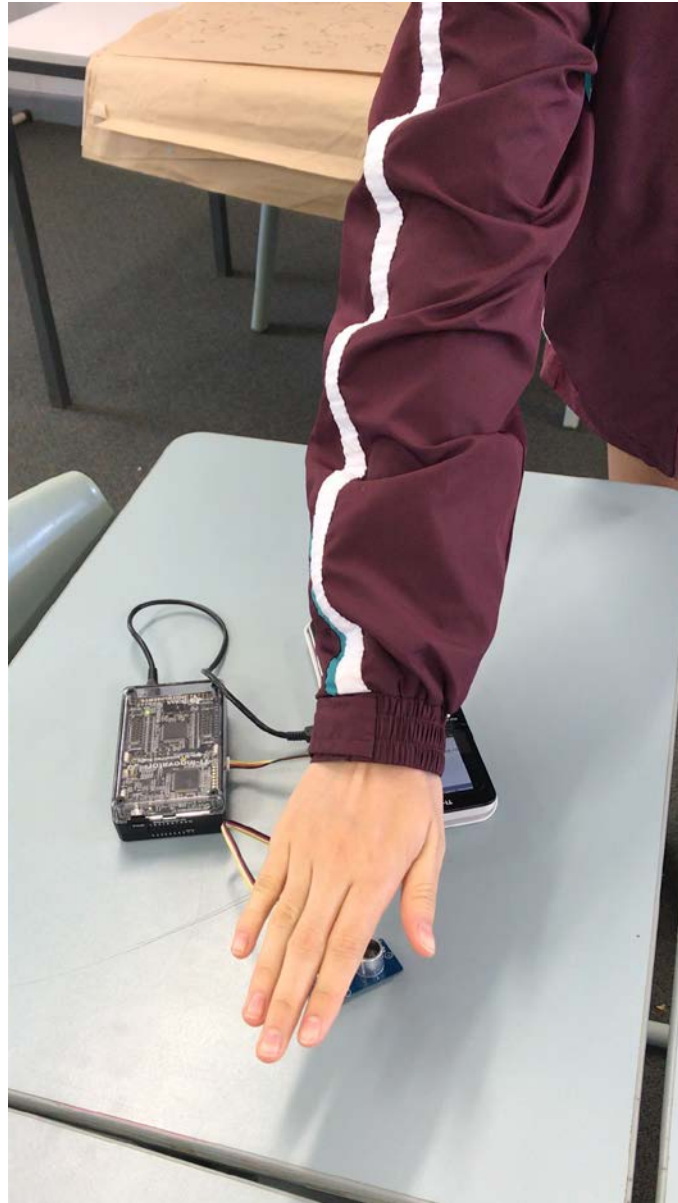


Theremin



Theremin

THEREMIN



Octave

FREQ



Concert Pitch



What Wikipedia has to say ...

Before standardization on 440 Hz, many countries and organizations followed the French standard and Austrian government's recommendation since the 1860s of 435 Hz.

Johann Heinrich Scheibler recommended A440 as a standard in 1834 after inventing the "tonometer" to measure pitch.

The American music industry reached an informal standard of 440 Hz in 1926, and some began using it in instrument manufacturing.

A440 is widely used as concert pitch in the UK and US. In continental Europe the frequency of A4 commonly varies between 440 Hz and 444 Hz. In the period instrument movement, a consensus has arisen around a modern baroque pitch of 415 Hz (with 440 Hz corresponding to A \sharp), baroque for some special church music (Chorton pitch) at 466 Hz (with 440 Hz corresponding to A \flat), and classical pitch at 430 Hz.

The US time and frequency station WWV broadcasts a 440 Hz signal at two minutes past every hour. This was added in 1936 to aid orchestras in tuning their instruments.

Octave



440 Hz

Standard Tuning Fork



Frequency of Middle C ?


A# C# D# F# G# A#

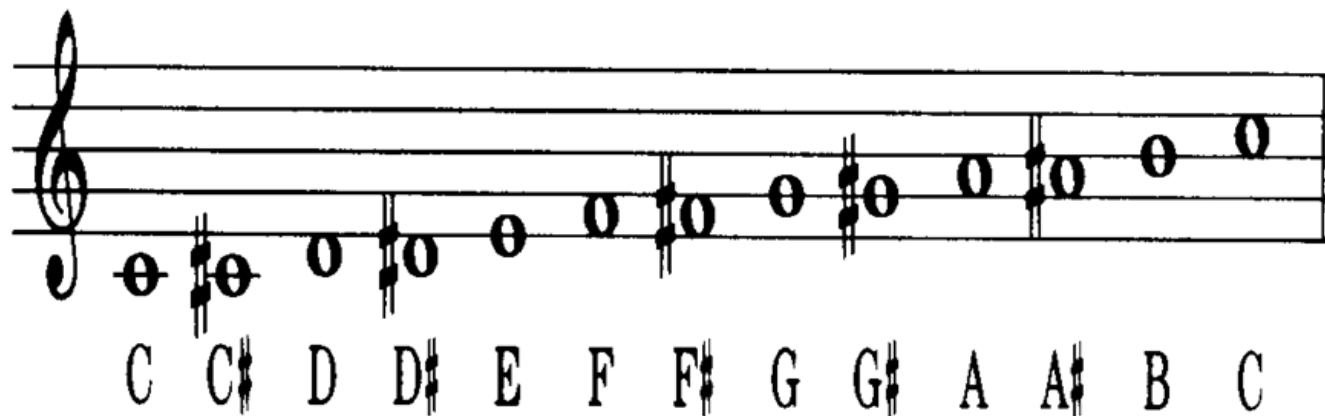
A B C D E F G A B C

12

$$220 \text{ Hz} \quad ?_3 \times 2^{\frac{12}{12}} \times 2^{\frac{12}{12}} = 261.6 \text{ Hz}$$

440 Hz
Standard Tuning Fork





$n = 0 \ 1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 10 \ 11 \ 12$

$$= 261.6 \times 2^{\frac{n}{12}}$$

SCALE
SCALE2

All 12 semitones in C-scale

```
NORMAL FLOAT AUTO REAL Radian MP
EDIT MENU: [alpha] [f5]

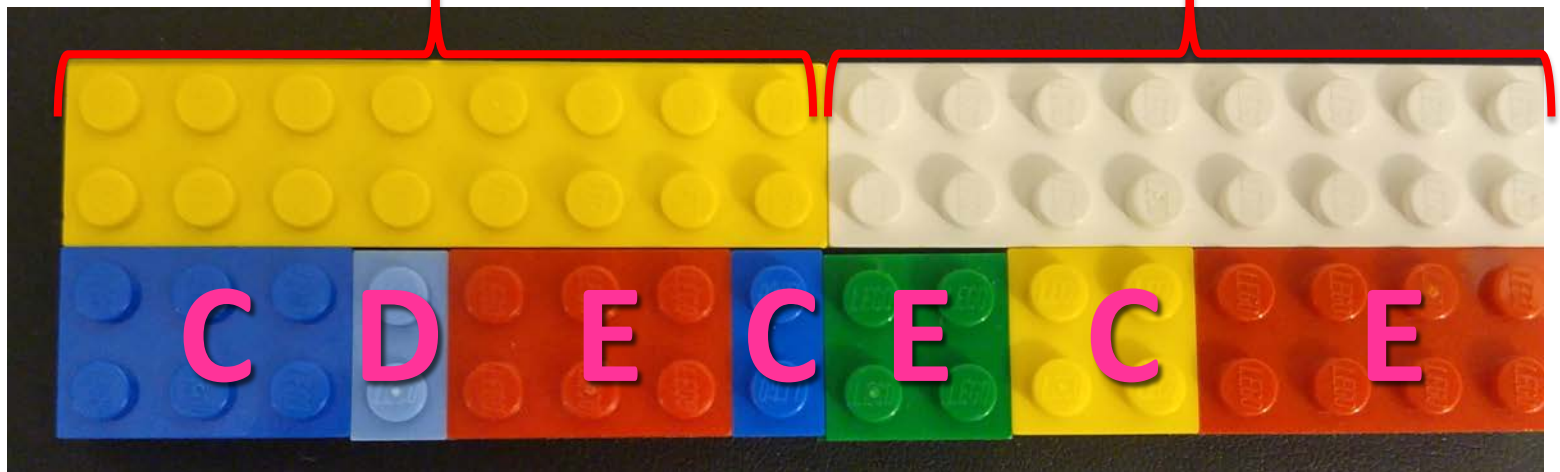
PROGRAM: SCALE2
:ClrHome
:Disp "MUSIC SCALE..."
:261.64→F
:For(I,1,12)
:Send("SET SOUND eval(F)
TIME .5")
:F*2^(1/12)→F
:Wait .5
:End
```


Doe a Deer



1 measure = 4 beats

1 measure = 4 beats



Doe a Deer

DOE A DEER

```
NORMAL FLOAT AUTO REAL Radian MP
EDIT MENU: [alpha] [f5]

PROGRAM:DOE A DEER
:ClrHome
:Disp "DOE A DEER"
:ClrList L4,L5
:261.6→N
:{0,2,4,0,4,0,4}→L4
:{1.5,0.5,1.5,0.5,1,1,2}→L
5
:For(I,1,7)
:Send("SET SOUND eval(N*2^
(L4(I)/12)) eval(L5(I)")
:Wait L5(I)
:End
:
```

STAR WARS

(Main Theme)

Majestic march ♩ = 120

Music by
JOHN WILLIAMS

The musical score for the Star Wars Main Theme is presented in five staves. The first staff begins with a treble clef, a 4/4 time signature, and a tempo marking of 'Majestic march ♩ = 120'. The melody starts with a triplet of eighth notes (D, D, D) on the first line, followed by a quarter note (G) on the second line. The second staff continues the melody with a quarter note (D) on the second line, a quarter note (C) on the first line, and a quarter note (B) on the first line. The third staff features a quarter note (A) on the first line, a quarter note (G) on the first line, and a quarter note (F) on the first line. The fourth staff shows a quarter note (D) on the second line, a quarter note (C) on the first line, and a quarter note (B) on the first line. The fifth staff concludes the melody with a quarter note (A) on the first line, a quarter note (G) on the first line, and a quarter note (F) on the first line. The score includes various musical notations such as eighth notes, quarter notes, and rests, along with dynamic markings like '3' for triplets. Chord symbols (G, C, F, D, Bb) are placed above the notes.

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Violin

La Marseillaise

National anthem of France

C. J. Rouget de Lisle

Alla marcia (♩=100)

4

f

8

13

ff *p*

18

23

ff

28

The image shows a single-staff violin score for the first 28 measures of the French national anthem, 'La Marseillaise'. The music is in G major (one sharp) and common time (C). It begins with a 4-measure rest, followed by a series of eighth and sixteenth notes. Dynamic markings include *f* (forte) at measure 4, *ff* (fortissimo) at measure 13, and *p* (piano) at measure 14. The tempo/style is 'Alla marcia' with a quarter note equal to 100 beats per minute. The score ends with a double bar line at measure 28.

La Marseillaise

Alla marcia (♩=100)

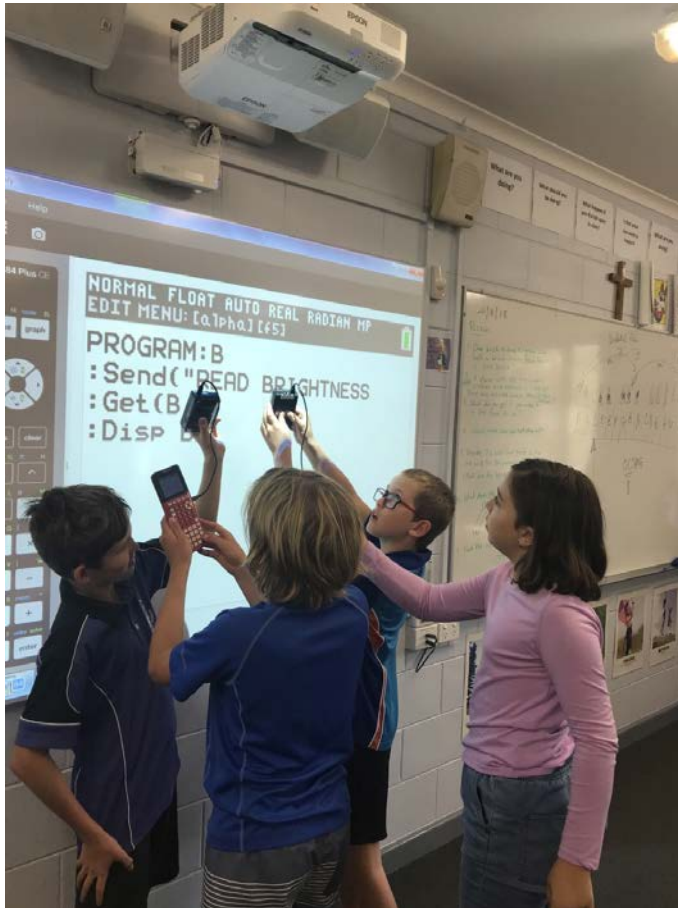
4

Handwritten musical notation for the first system of 'La Marseillaise'. The staff is in treble clef with a key signature of one sharp (F#). The tempo is marked 'Alla marcia' with a quarter note equal to 100 beats per minute. The time signature is 4/4. The notation includes a series of notes with handwritten fingerings (1, 3, 5, 8, 8, 10, 12, 13, 15, 17, 18, 19) and a dynamic marking 'f'. Below the staff, there are handwritten rhythmic values: 1/4, 3/4, 1/4, 1, 1, 1, 1, 1.5, 1/2, 1/2, 1/4, 1/4, 3/4, 1/4.

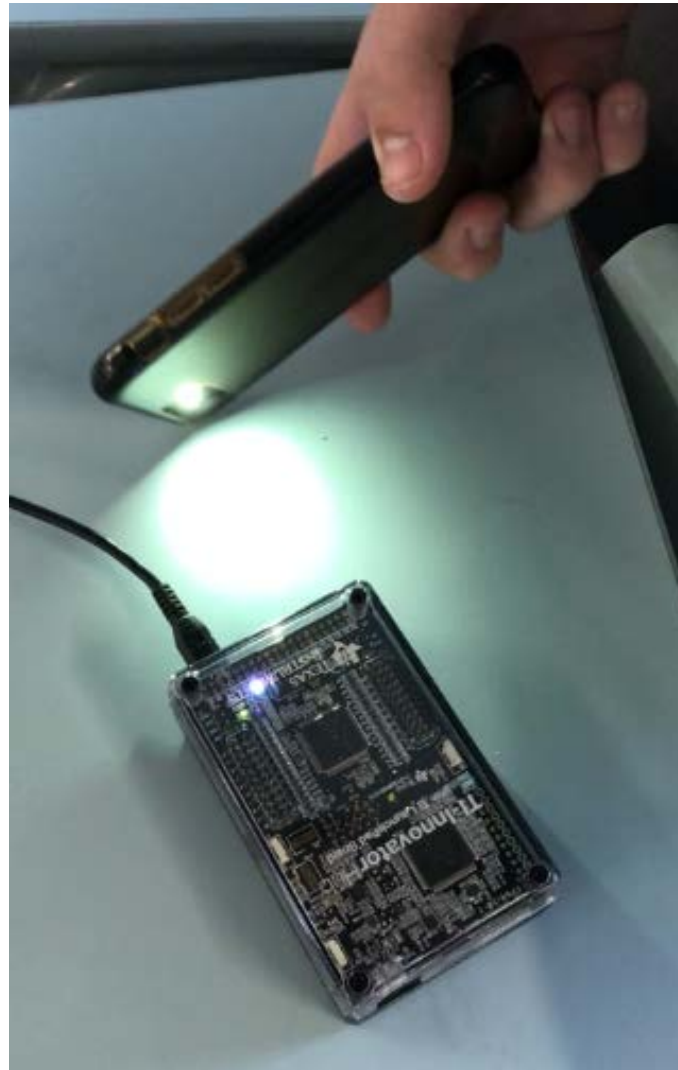
8

Handwritten musical notation for the second system of 'La Marseillaise'. The staff is in treble clef with a key signature of one sharp (F#). The notation includes a series of notes with handwritten fingerings (5, 13, 10, 6, 8, *, 8, 10, 12, 12, 12, 13, 12, 12, 10, *) and a dynamic marking 'f'. Below the staff, there are handwritten rhythmic values: 1, 2, 1/4, 1/4, 2, 1, 3/4, 1/4, 1, 1, 1, 1/4, 1/4, 1, 1, 1, 3/4, 1/4.

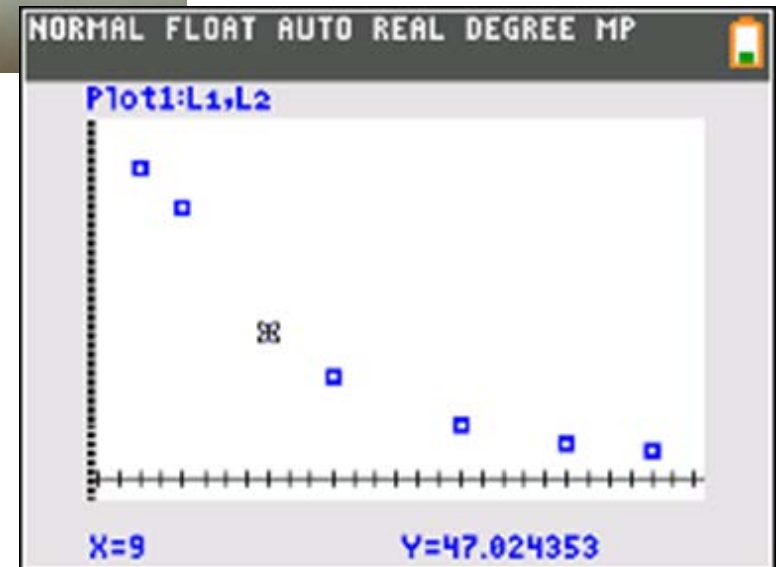
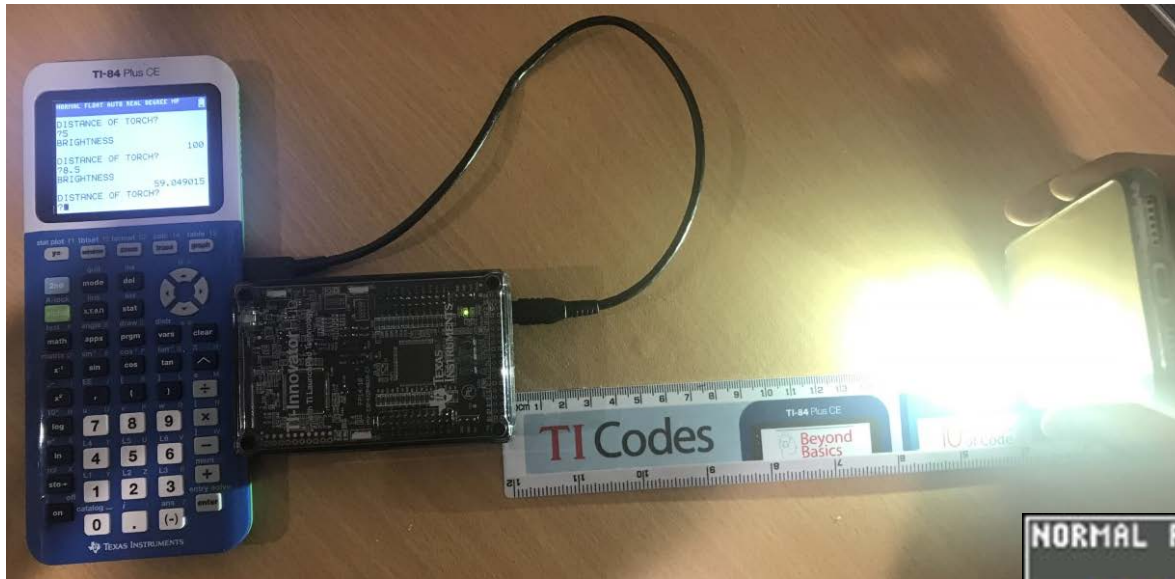
Torch and LED Brightness



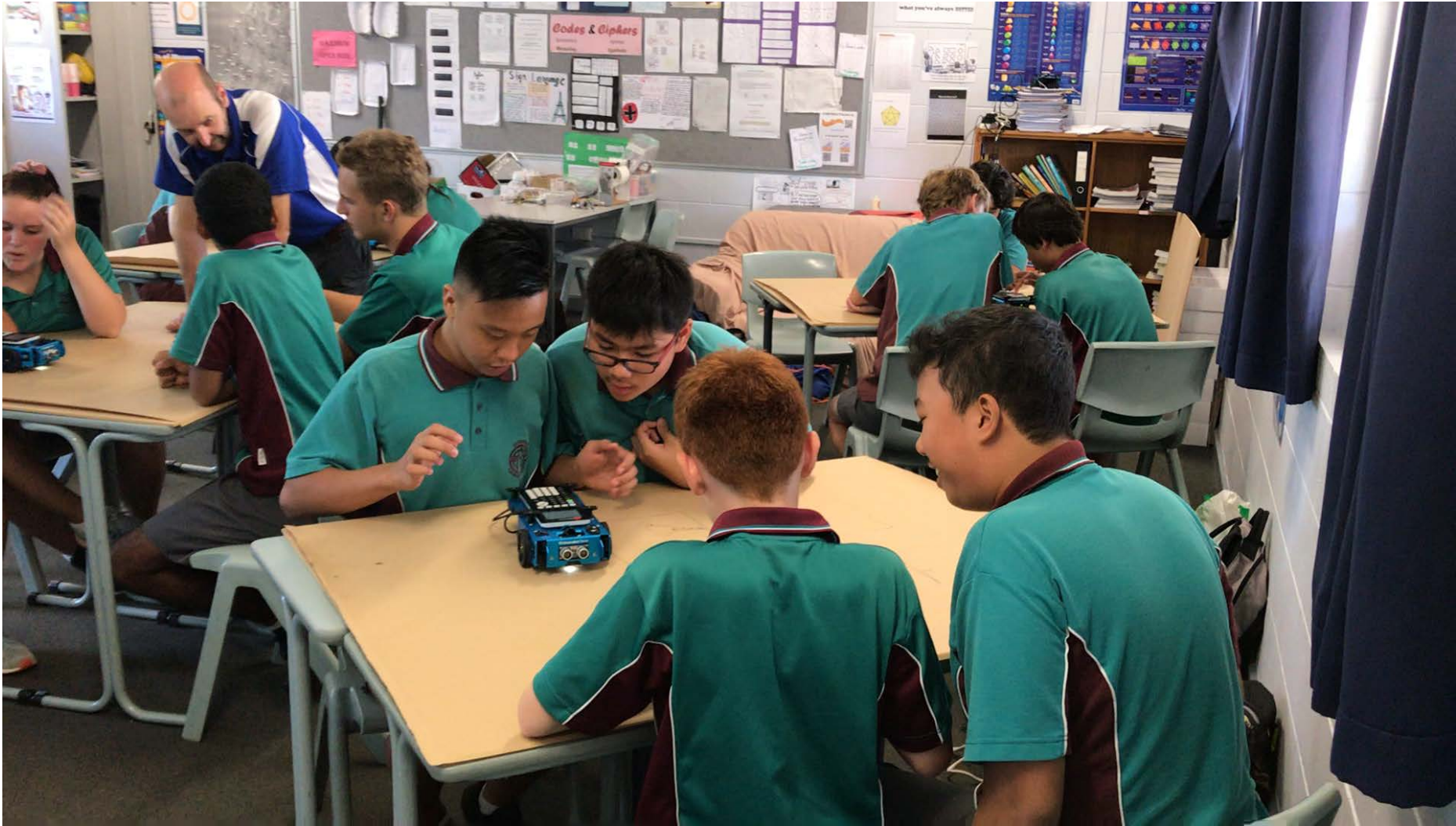
Light Theremin



Light Intensity v Distance



TI Rover looks something like this

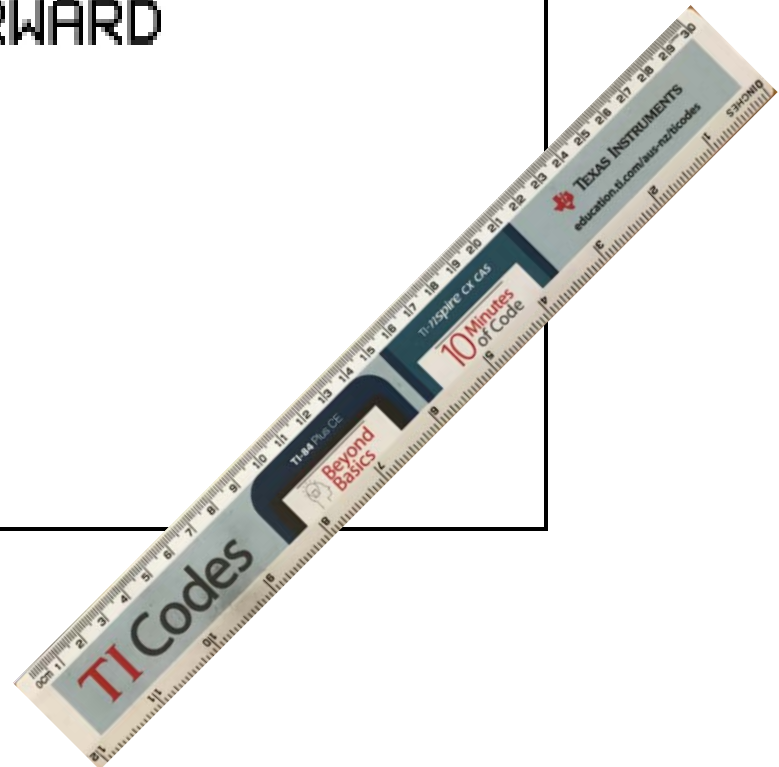


Introducing Rover

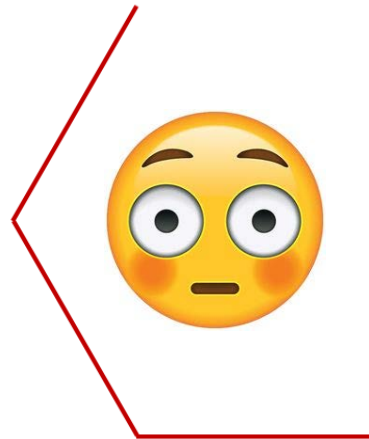
NORMAL FLOAT AUTO REAL RADIANT MP
EDIT MENU: [alpha] [f5]



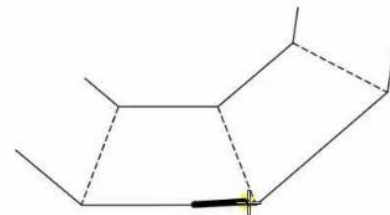
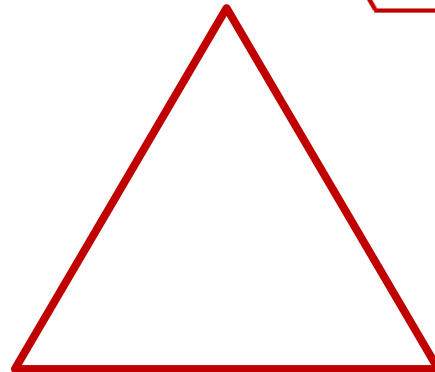
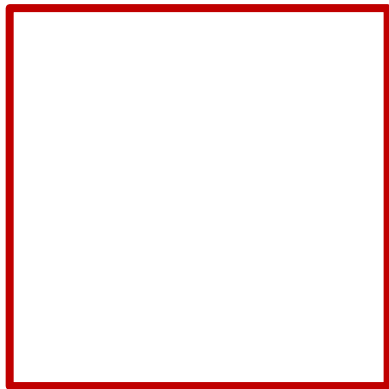
```
PROGRAM:ROVINTRO
:Send("CONNECT RV")
:Send("RV FORWARD
:
```



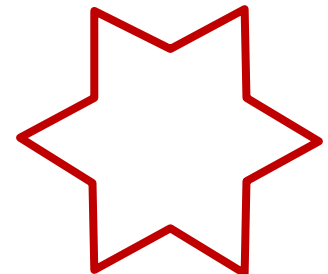
Drawing Polygons, Stars and



```
NORMAL FLOAT AUTO REAL RADIANT MP  
EDIT MENU: [a1pha] [f5]  
  
PROGRAM: ROVINTRO  
: Send("CONNECT RV")  
: Send("RV FORWARD  
:  
  
ROVINTRO
```



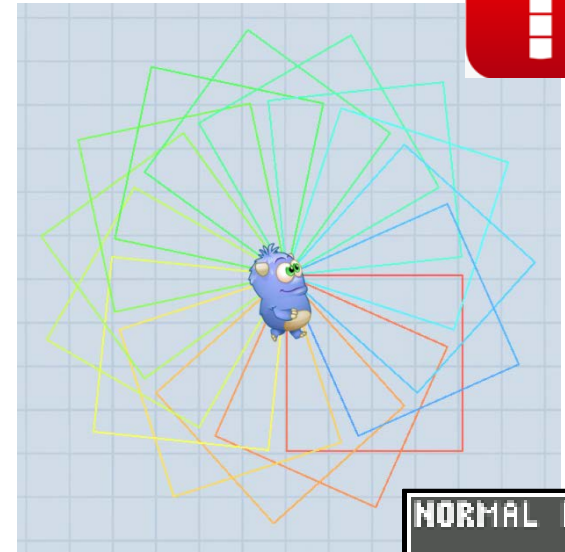
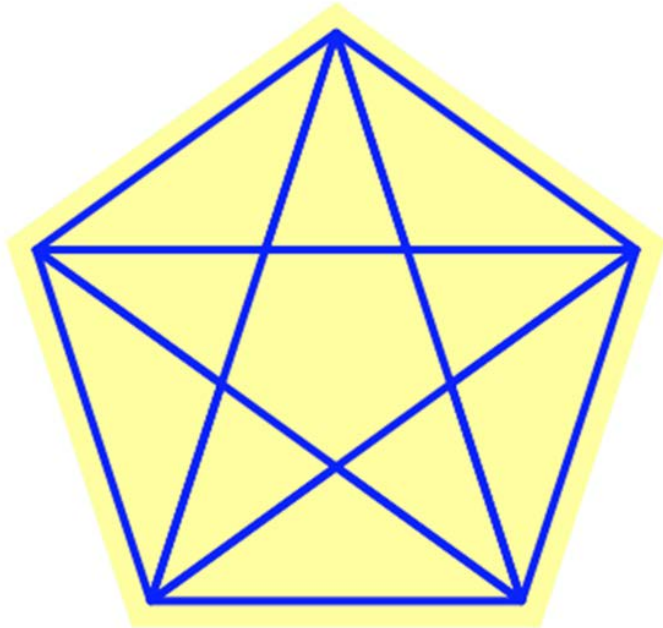
POLY



Drawing Extensions



Counting the Triangles:



NORMAL FLOA

CTL I/O

8↑Pause

Draw the figure shown on the left; it's a pentagon with each its vertex connected with every other.

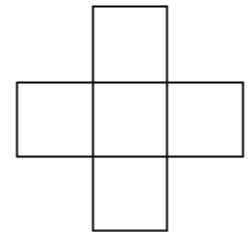
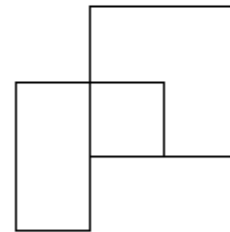
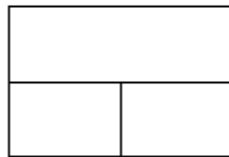
The question is how many different triangles are hidden in this figure?



Dodecagon

3. Only Turn Right

How many of the following diagrams can you draw without lifting your pen and without making any left turns? (You can start wherever you like, start drawing in any direction, and draw over lines more than once.)



(A) 1

(B) 2

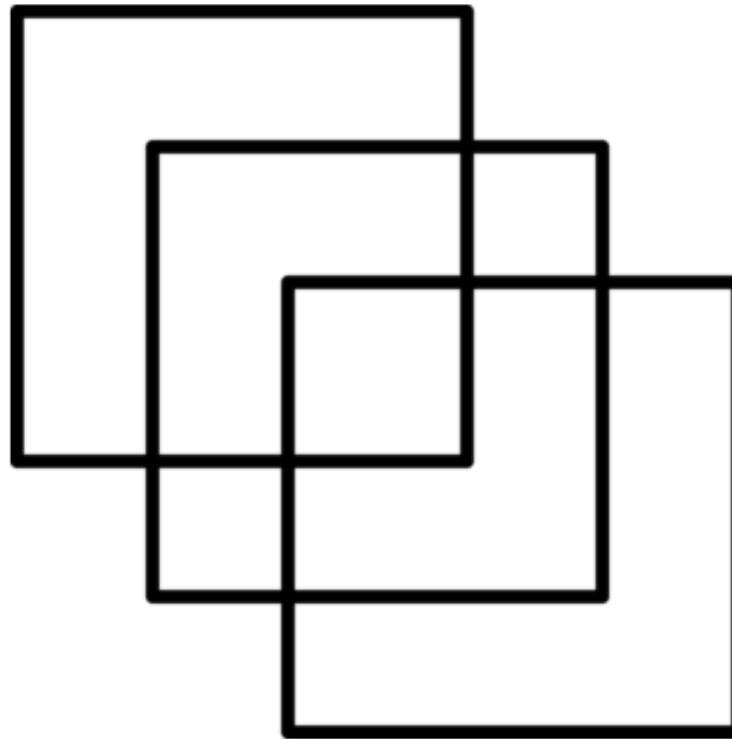
(C) 3

(D) 4

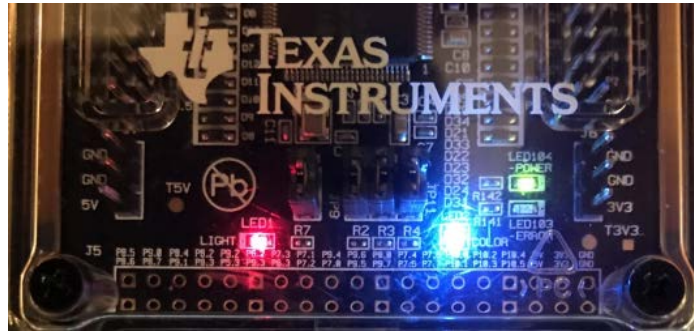
(E) 5

Alice's Adventures in Numberland by Lewis Carroll

Can you draw this shape made from three interlaced squares, using one continuous line, without going over any parts of the line twice, without intersecting the line you've already drawn, and without taking your pen off the paper?



Light and RGB



My “go to” coding introduction

- Quick and easy to start
- Students (and teachers) love the instantaneous visual of something they have created.
- Fantastic links to real-world, STEM, art and much more!

Students (and teachers) love it!



Light and RGB

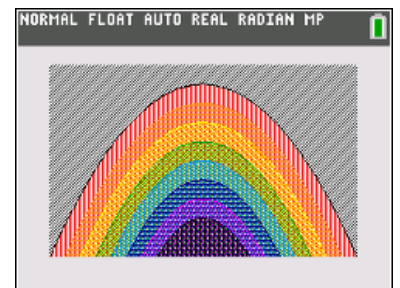
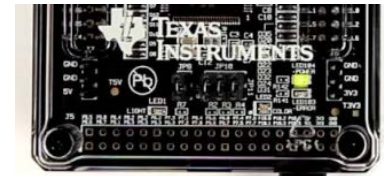
LIGHT

ASCLIGHT

RGBLED

SO many places we see/experience a LED

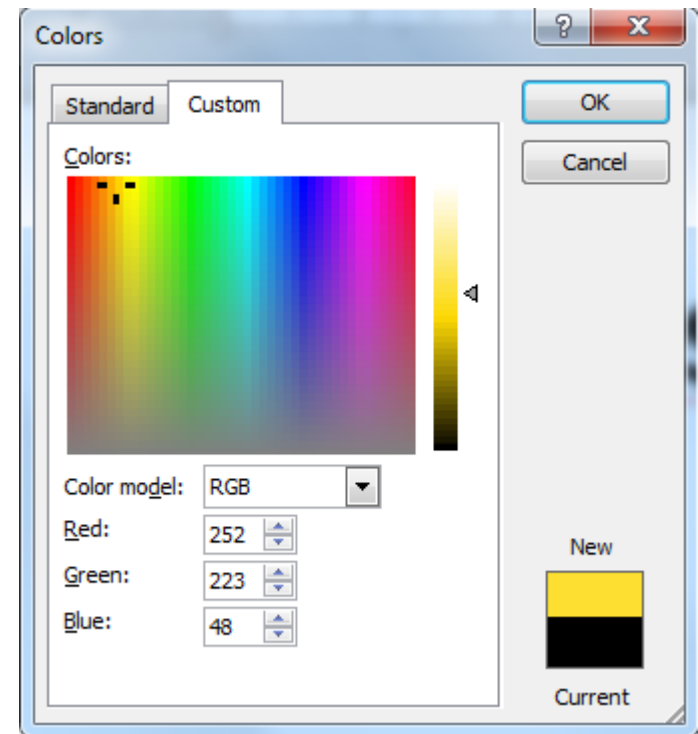
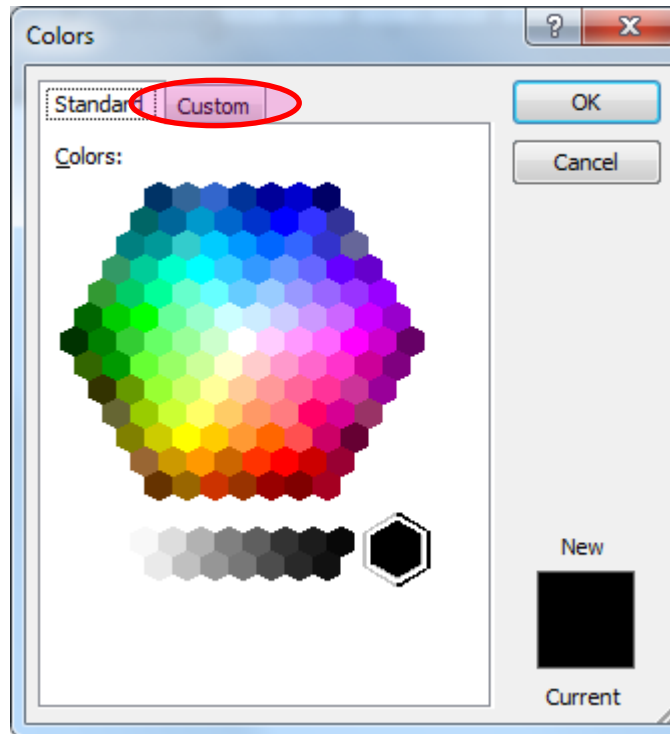
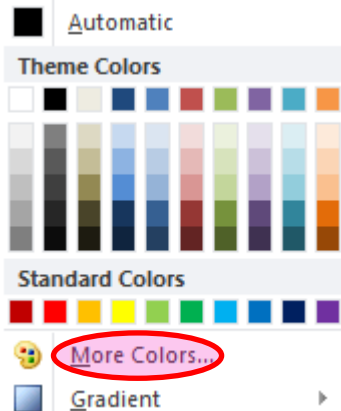
- On lights
- LED Flash for alerts on mobile phone
- Data projector warm up light
- Recharging light
- Traffic lights
- Hard disk access on laptop
- TV remote control



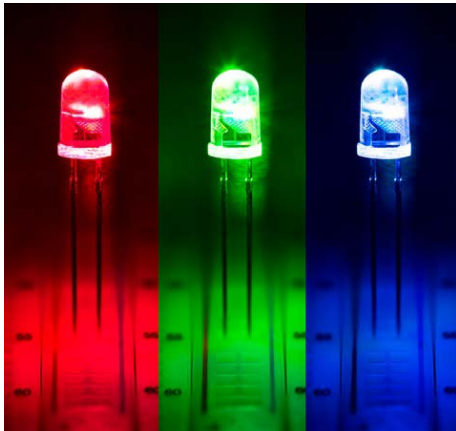
Colouring text in Word



RGBLED



Why is the RGB LED not the same as Printer Ink?



The absorption and emission spectra

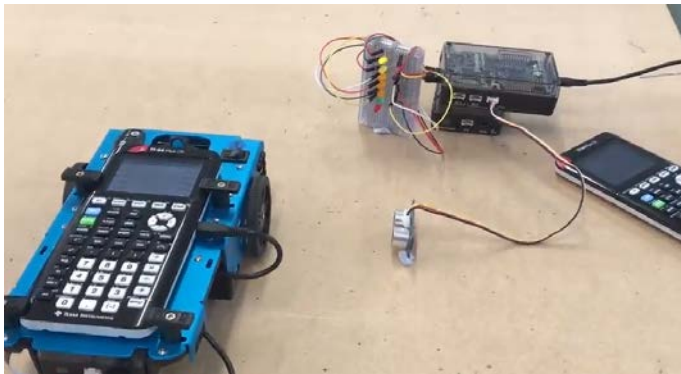
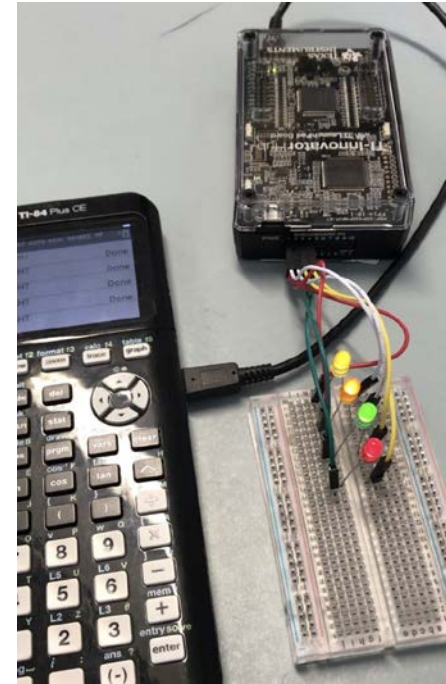
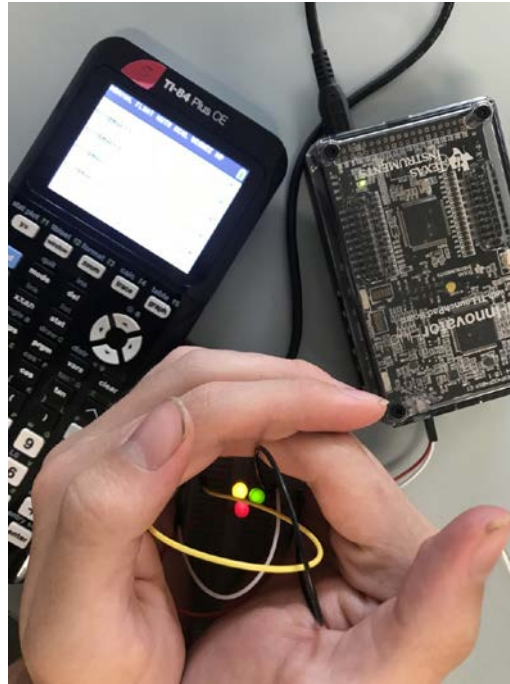
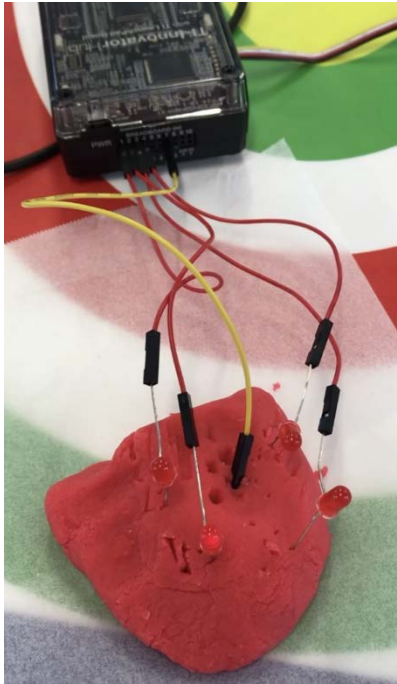
- **Absorption** lines are where light has been absorbed by the atom thus you see a dip in the spectrum.



- **Emission** spectra have spikes in the spectra due to atoms releasing photons at those wavelengths.



Breadboard Ports and Boards

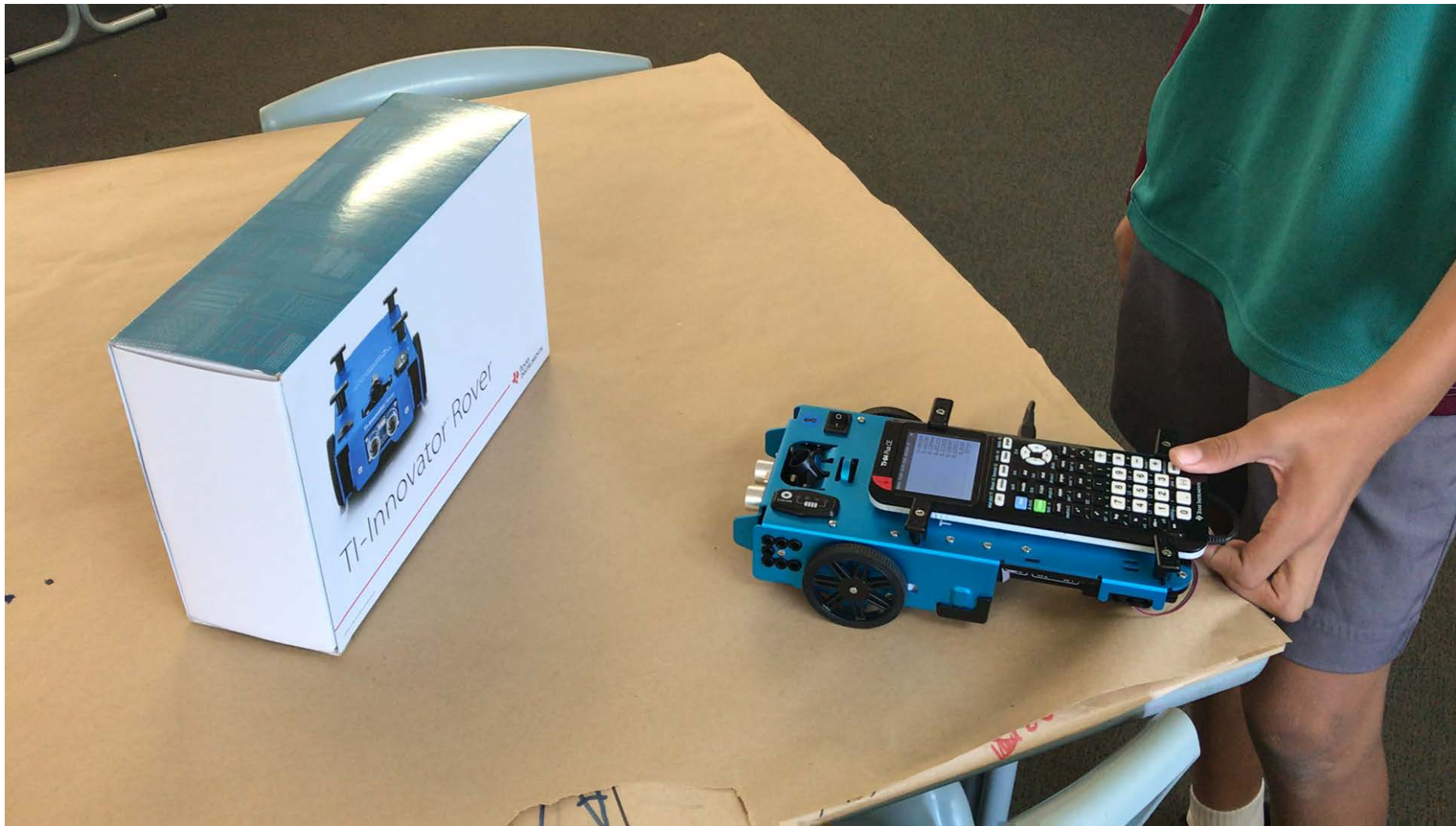


Drag Car Racing



Auto Stop

AUTOSTOP



Dancing Rovers



Forwards & Backwards

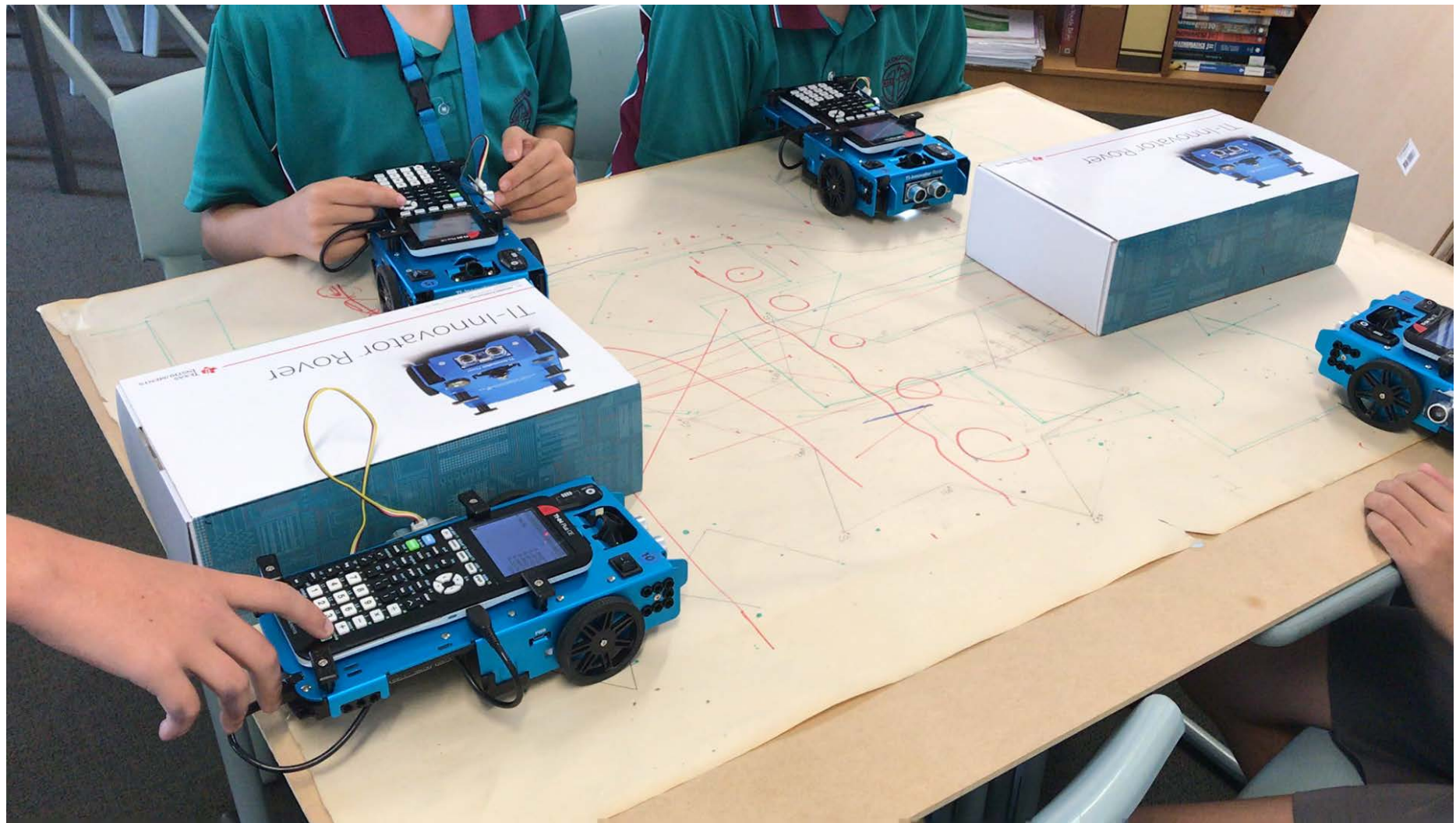
FORBACK

RVBOUNCE



Self parking

PARK



Thank you for your time
I hope you enjoyed my presentation



johnbament@hotmail.com



bamentj



johnbament

