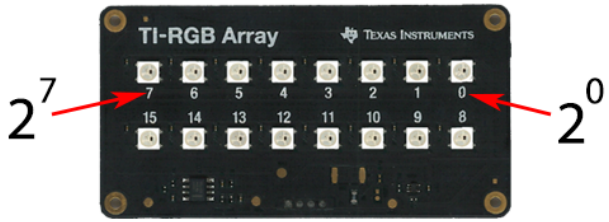
TI-RGB Array Flippy Do

PROJECTS WITH THE TI-INNOVATOR™ SYSTEM (TI-NSPIRE CX) **Student Document**

Overview:

Build a flippy do and slip it over your TI-RGB Array to explore base two numbers using the manipulatieve. Write a TI-BASIC program to abstract a representation of a decimal number in a binary format on the TI-RGB Array.

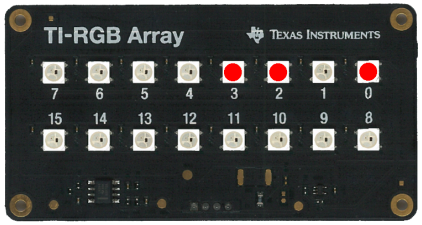


The TI-RGB Array can be used as a binary display. Notice the numbering of the pixels is in place value order. A pixel that is on represents the digit 1 while off represents the digit 0.

AP Computer Sceience Principles Computational Thinking Practices:

- LO 2.1.1 – Describe the variety of abastractions used to represent data.
- LO 2.1.2 – Explain how binary sequences are used to represent digital data.
- LO 2.2.1 – Develop an abstraction when writing a program or creating other computational artifacts.

An example of the decimal number 13 displayed on the TI_RGB Array with the coresponding calculation.

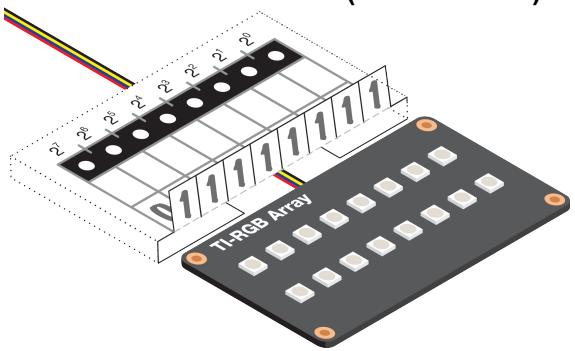


$1x2^3+1x2^2+0x2^1+1x2^0=13$

Directions:

- Follow the instructions on the printout to Build you Flippy-Do.
- Slide the Flippy-Do on the TI-RGB Array.
- Fold the tabs up or down to match the binary number in the table.
- Fill in in the remainder of the table on the right. Do you see a pattern?

Decimal	4–bit binary number	Pixel 3	Pixel 2	Pixel 1	Pixel 0
0	0000	off	off	off	off
1	0001	off	off	off	on red
2	0010	off	off	on red	off
3	0011	off	off	on red	on red
4					
5					
6					
7					
8					
9					



Decimal	4–bit binary number	Pixel 3	Pixel 2	Pixel 1	Pixel 0
10					
11					
12					
13					
14					
15					

The table to the right contains every 8-bit number that has a single 1 in it. Do you notice a pattern?

- Fill out the remainder of the table writeing down the power of two and the decimal equivalent next to each binary number.

Decimal	8-bit binary number	Power of 2
1	0000 0001	2^0
2	0000 0010	2^1
4	0000 0100	2^3
	0000 1000	
	0001 0000	
	0010 0000	
	0100 0000	
	1000 0000	

Challenge 3:

- Write a program to turn on the TI_RGB Array for the number 13 and display the calculated decimal value as the sum of powers of 2^3 through 2^0.
- Set the tabs of the Flippy-Do up or down for the number 13. Run the program. Do the pixels on the TI_RGB Array match the number on the Flippy-Do?
- Modify your program to match a few more numbers from the table. Do you see how the TI_RGB Array can display binary numbers?

Challenge 3 Optional Extension: Try to represent the decimal 170 as an eight bit binary number.

```
Define c2()=
Prgm
Send "CONNECT RGB "
Send "SET RGB 0 255 0 0"
Send "SET RGB 1 0 0 0"
Send "SET RGB 2 255 0 0"
Send "SET RGB 3 255 0 0"
decimal:=1*2^3 + 1*2^2 +0*2^1 + 1*2^0
Disp "Decimal = ",decimal
EndPrgm
```