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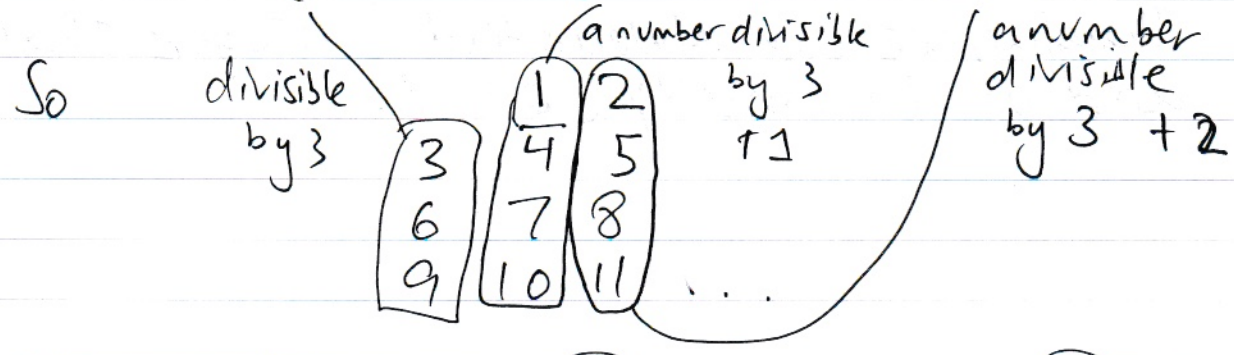
Take Three from Five

BVGS

You can classify ~~numbers~~ integers into 3 types

x $x+1$ $x+2$



If $x = 1$, $x+1 = 2$ and $x+2 = 3$

and we needed to give 5 integers,

the possible combinations are

1	1	1	1	1
1	1	1	1	2
1	1	1	1	3
1	1	1	2	2
1	1	1	3	3
1	1	1	2	3
1	1	2	2	3
1	1	2	2	2
1	1	3	2	3
1	1	3	3	3
1	2	2	2	2

1	1	2	2	3
1	2	2	2	3
1	2	2	3	3
1	2	3	3	3
2	2	2	2	2
2	2	2	2	3
2	2	2	3	3
2	2	3	3	3
2	3	3	3	3
3	3	2	3	3

These patterns could be arranged in a different order, but you will have the same composition [Order doesn't matter]

Now, to pick 3 of these integers and add them to get a multiple of 3, you could pick

1	1	1
2	2	2
3	3	3
or 1	2	3

Why?

whole number

$x + x + x = 3x \rightarrow 3x/3 = x$

$x+1 + x+1 + x+1 = 3x+3 \rightarrow 3x+3/3 = x+1$

$x+2 + x+2 + x+2 = 3x+6 \rightarrow 3x+6/3 = x+2$

$x + x+1 + x+2 = 3x+3 \rightarrow 3x+3/3 = x+1$

And we can always pick one of these set.
Look at the numbers underlined in purple

Therefore, we can always find 3 integers that add up to a multiple of 3.