RESEARCH

UNE application de la théorie des groupes

David Strainchamps

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ABSTRACT

This article present a new conjecture that define a method to

INTRODUCTION

Let G_b a group of order b and $G_b = \{g_0, g_1, \cdot, g_{b-1}\}$ where g_0 is the neutral element of G.

The purpose is to made a surjection, using the group G, between \mathbb{N} and the set of integers {0, 1, 2, ..., b – 1} and to do a conjecture with it [1].

In this introduction I will use an example to illustrate this surjection with $G = \mathbb{Z}/4\mathbb{Z}$.

Let $n \in \mathbb{N}$. We convert *n* in base b = 4. So the integer is equal to: $n = \sum_{i=0}^{\alpha} c_i \times b^i$ where any c_i is an element of the set {0, 1, 2, 3} and where:

 $\exists ! \alpha, \forall i > \alpha c_i = 0$

We decide now $\forall i <= \alpha$ that all c_i equals to 0 are replaced by g_0 and the 1 replaced by g_1 and so on respectively the 2 replaced by g_2 and the 3 replaced by g_3 .

We can name this new value C_i

 $\forall i C_i \in G = \mathbb{Z}/4\mathbb{Z}$

And after we made the surjection f with:

 $\forall_n \in \mathbb{N} f(n) = \sum C_i$

This sum is made with the + that is the internal law of G.

Remark 1.1.

If the internal law of G is x, we can do a product.

And so all f(n) are element of G, here in your example $\mathbb{Z}/4\mathbb{Z}$

calculate a sort of integral numeric in using the group theory.

Key words: Groups; Surjection; Polynomial sum; Logic

Finally we associate all the f(n) equals g_0 to the integer 0 and so on in the same order for all members of G with an bijection of identification that we name g

In your example of $G = \mathbb{Z}/4\mathbb{Z}$ and all $G = \mathbb{Z}/b\mathbb{Z}$ we can evidently view that:

Lemma 1.2. If $G = \mathbb{Z}/b\mathbb{Z}$ also

If $G = \mathbb{Z}/b\mathbb{Z}$ also

 $\forall n \in \mathbb{N} \ (g \ o \ f)(n) \equiv \sum C_i \ \mathrm{mod} b$

Remark 1.3.

We have used $G = \mathbb{Z}/b\mathbb{Z}$ but it's clearly evident that the surjection *g* o *f* can be defined with the same process with any group G (Figure 1,2).

MAIN PROPERTY OF THE SURJECTION

In this section we will proove that there is *b* periode of b^{b-1} elements in the results of the surjection *g o f*

De N =	à N =	From the law of the Groupe G				
0	b-1	0+0	0+1	0+2		0+b-1
b	2b-1	1+0	1+1	1+2		1+b-1
(b-1)b	b²-1	b-1+0	b-1+1	b-1+2		b-1+b-1
On a donc b ² nombre						
De N =	à N =	d'après le table de la loi du groupe				
b ²	b^2+b-1	1+0	1+1	1+2		1+b-1
b^2+b	b^2+b+b-1	1+1+0	1+1+1	1+1+2		1+1+b-1
b^2+(b-1)b	b^2+(b-1)b+(#	1+b-1+0	1+b-1+1	1+b-1+2		1+b-1+b-1
(b-1)b^2+(b-1)b	(b-1)b^2+(b-1	b-1+b-1	b-1+b-1+1	b-1+b-1+2		b-1+b-1+b-1

So we have b3-b2 numbers and they are not the same as above

And so on unti

De N =	à N =
b^(b-2)	
	b^(b-1)-1

In this last array b^(b-1)-b^(b-2) numbers

So I thus described the first periodicity that I call 0-period and we have b^(b-1) number in all

Figure 1) 0-periode.

Independent Researcher, Singapore

Correspondence: David Strainchamps, Independent Researcher, Singapore, e-mail: david.strainchamps@gmail.com Received: 2 Jan, 2024, Manuscript No. puljpam-246987, Editor Assigned: 3 Jan, 2024, PreQC No. puljpam-246987(PQ), Reviewed: 5 Jan, 2024, QC No. puljpam-246987(Q), Revised: 7 Jan, 2024, Manuscript No. puljpam-246987(R), Published: 31 July, 2024, DOI: 10.37532/2752-8081.24.8(4).01-02



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The 1-period starts with the second line of the first table above (at the very top) and I describe it below

[De N =	à N =	From the law of the Groupe G				
6	o^(b-1)	b^(b-1)+b-1	1+0	1+1	1+2		1+b-1
1	0^(b-1)+b	b^(b-1)+b+b-?	1+1+0	1+1+1	1+1+2		1+1+b-1
Į,							
[o^(b-1)+(b-1)b	b^(b-1)+(b-1)₽	1+b-1+0	1+b-1+1	1+b-1+2		1+b-1+b-1

We have b² numbers

Then we have the same type of tables which always start with the second line of the first table of the 1-period and We obtain in all a 1-period of b^{h} (b-1) number

For the i-period the tables start with the ith line of the 1st table of the 0-period.

And we thus obtain b different periodicities

Il reste maintenant à prouver que (b)-période est une (1+0)-période

The (b th)-period starts with b^b and will have the same values as the 1-period

the (j th)-period starts with j'th'b and j can be decomposed in base b and the decomposition of j in base b is the start. Of one of the b first periods.

This was to be demonstrated

Figure 2) Other-periode.

Theorem 3.1.

If we define the b periods with a group G of order b and if we assign as in the section above to all element of the b periods, one element of the natural element {0, 1, 2, \cdot , b–1} with the surjection *g* o *f* then \forall polynom P of degree < b we have this equality

$$\sum_{i = 0}^{i = b^{b} - 1} P(i) = b * \sum_{j} as \ g \ o \ f \ (c_{j}) \ 0^{P(j)}$$

Proof.

Not yet perfomed but this conjecture do a definition of an integral numeric $\sum_{i} as \ g \ o \ f \ (c_j) \ 0^{P(j)}$

ANNEXES

This script calculate a sum with all their terms in 43 s or calculate the same with 1 term over 6 in 6 s

clear all format long % b si votre pc a beaucoup de mémoire vive peut-être augmenté sur le mien % non b=6X=0; tic for i=(1:(b^b-1)) $X=X+vpi(num2str(i)^5);$ end t = toctic B = (0:(b-1)); $indice1=zeros(1,b^2);$ k=0; for i=(0:(b-1)) indice1(i*b+1:i*b+b)=mod(B+k,b); $k{=}k{+}1;$ end indicetous=zeros(b,b^2); indicetous(1,:)=indice1; for j=(1:(b-1))k=0;

 $\label{eq:states} \begin{array}{l} B2=& indice1(j^*b+1:j^*b+b);\\ for i=B2\\ indicetous(j+1,k^*b+1:k^*b+b)=& indice1(i^*b+1:i^*b+b);\\ k=k+1;\\ end\\ end\\ for h=(3:b-1)\\ indicetous=& indicetous';\\ indicetous=& indicetous';\\ indice=& zeros(b,b^{\circ}(h));\\ indice(1,:)=& reshape(indicetous,1,b^{\circ}(h)); \end{array}$

for j=(1:(b-1)) k=0; B2=indice1(j*b+1:j*b+b);for i=B2 $\begin{array}{l} & \text{indice}(1+1,k^*b^{(h-1)}+1:k^*b^{(h-1)}+b^{(h-1)}) = \text{indice}(1,i^*b^{(h-1)}+b^{(h-1)}) = \text{indice}(1,i^*b^{(h-1)}+b^{(h-1)}); \end{array}$ k=k+1; end end clear indicetous: indicetous=indice; clear indice end ind= $zeros(1,b^b)$; $ind=reshape(indicetous',[],b^b);$ indfinal=find(ind==0)-1; % t=toc s=0

for i=indfinal

 $\begin{array}{l} s{=}s{+}vpi(num2str(i))^{5};\\ end\\ s{=}s^{*}b\\ X{-}s\\ t2{=}toc \end{array}$

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