qpdc Digital Business Community

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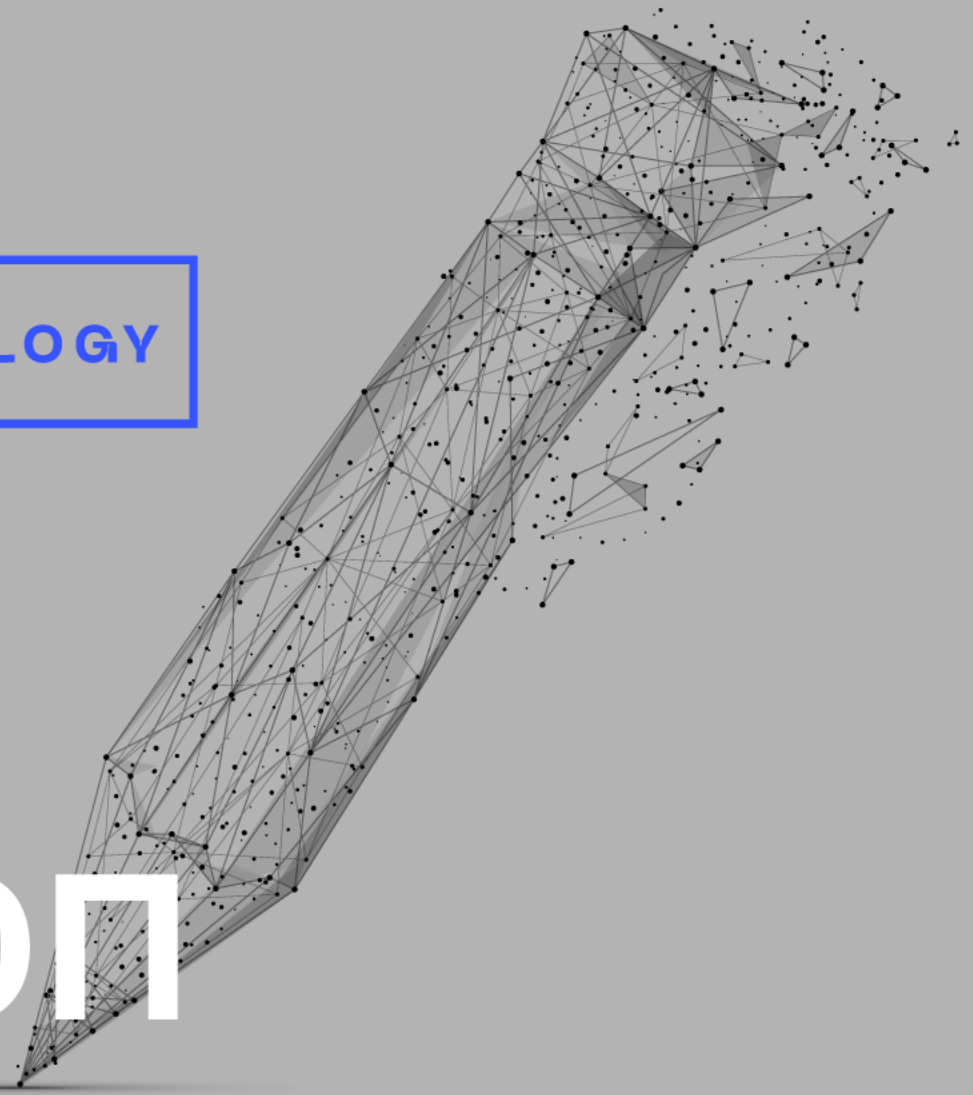
CONFERÊNCIA LIVING WITH TECHNOLOGY

Innovation in Education



Com o apoio:

U.PORTO FEUP FACULDADE DE ENGENHARIA UNIVERSIDADE DO PORTO

Erasmus+

Porto.

FUNDAÇÃO CALOUSTE GULBENKIAN

PORTUGAL INCoDe.2030

Sonae

CS 4 ALL

Público

Com o Alto Patrocínio de Sua Excelência

O Presidente da República

Closing Session
“Why now and ever?”

Luís Neves
Co-founder and President at ENSICO

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THANK YOU.

To our founders. To our partners. To the participants.
To our schools. To our teachers. To our master teachers.
To our students and their parents and educators.
To our board of directors.

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Why now…

… and _ever

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Part I

Why now…?

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Why now…?

Because we are late.

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Why now…?

Because we are late.

TOO

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2006 (16 years ago)

Computational Thinking

Jeannette M. Wing

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"Computational thinking is a fundamental skill for everyone, not just for computer scientists."

Computational Thinking

It represents a universally applicable attitude and skill set everyone, not just computer scientists, would be eager to learn and use.

LISA HANEY

Computational thinking builds on the power and limits of computing processes, whether they are executed by a human or by a machine. Computational methods and models give us the courage to solve problems and design systems that no one of us would be capable of tackling alone. Computational thinking confronts the riddle of machine intelligence: What can humans do better than computers? and What can computers do better than humans? Most fundamentally it addresses the question: What is computable? Today, we know only parts of the answers to such questions.

Computational thinking is a fundamental skill for everyone, not just for computer scientists. To reading, writing, and arithmetic, we should add computational thinking to every child's analytical ability. Just as the printing press facilitated the spread of the three Rs, what is appropriately incestuous about this vision is that computing and computers facilitate the spread of computational thinking.

Computational thinking involves solving problems, designing systems, and understanding human behavior, by drawing on the concepts fundamental to computer science. Computational thinking includes a range of mental tools that reflect the breadth of the field of computer science.

Having to solve a particular problem, we might ask: How difficult is it to solve? and What's the best way to solve it? Computer science rests on solid theoretical underpinnings to answer such questions precisely. Stating the difficulty of a problem accounts for the underlying power of the machine—the computing device that will run the solution. We must consider the machine's instruction set, its resource constraints, and its operating environment.

In solving a problem efficiently, we might further ask whether an approximate solution is good enough, whether we can use randomization to our advantage, and whether false positives or false negatives are allowed. Computational thinking is reformulating a seemingly difficult problem into one we know how to solve, perhaps by reduction, embedding, transformation, or simulation.

Computational thinking is thinking recursively. It is parallel processing. It is interpreting code as data and data as code. It is type checking as the generalization of dimensional analysis. It is recognizing both the virtues and the dangers of aliasing, or giving someone or something more than one name. It is recognizing both the cost and power of indirect addressing and procedure call. It is judging a program not just for correctness and efficiency but for aesthetics, and a system's design for simplicity and elegance.

Computational thinking is using abstraction and decomposition when attacking a large complex task or designing a large complex system. It is separation of concerns. It is choosing an appropriate representation for a problem or modeling the relevant aspects of a problem to make it tractable. It is using invariants to describe a system's behavior succinctly and declaratively. It is having the confidence we can safely use, modify, and influence a large complex system without understanding its every detail. It is

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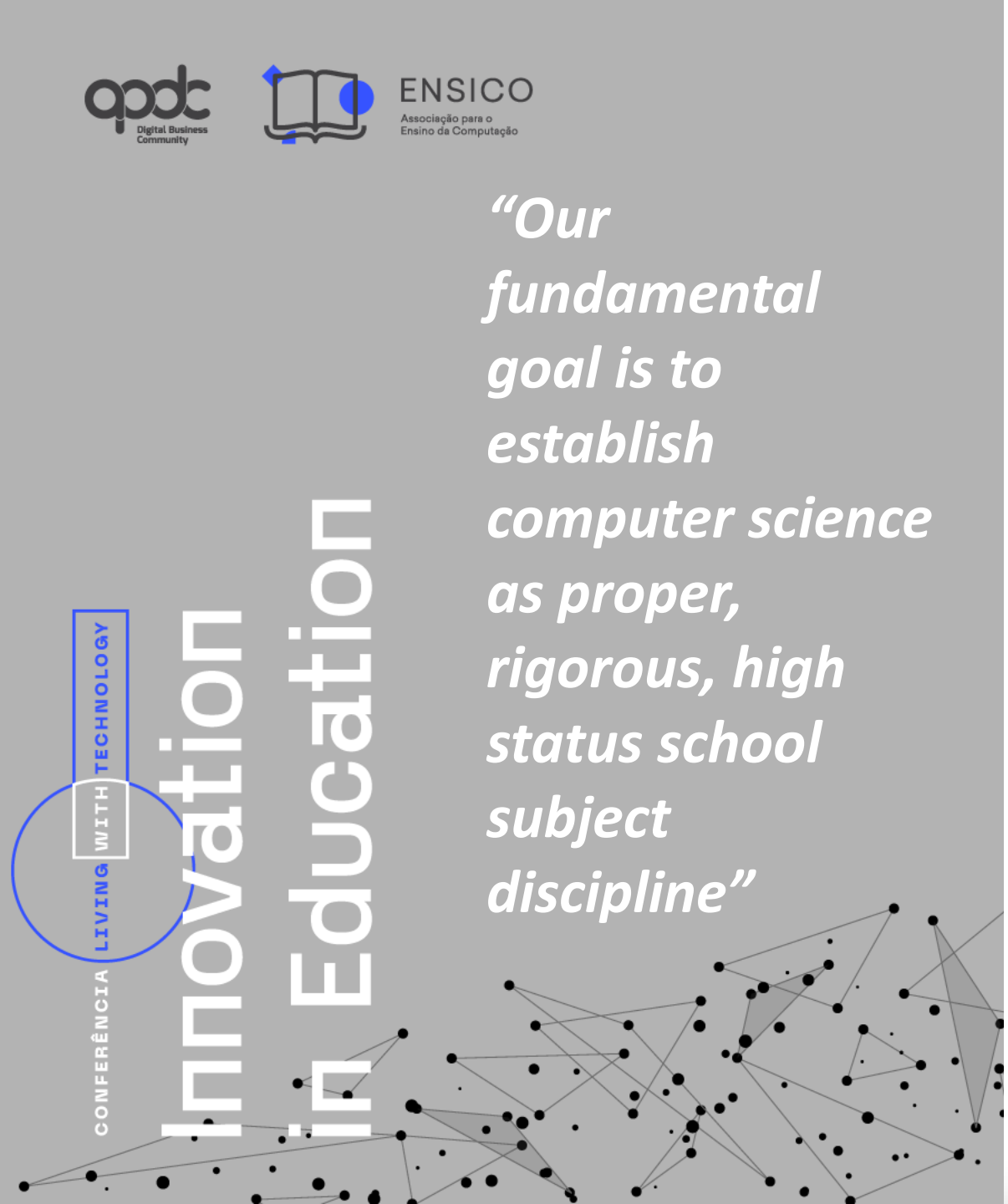
2008 (14 years ago)

Computing At School Working Group (CAS)

Simon P. Jones



There is another important benefit to the "start early" approach. Every reader of CACM will be well aware of the horrendous gender imbalance in our discipline. Once gender stereotypes are established, it seems that they are extraordinarily difficult to dislodge. Starting computing early, in primary school, before these stereotypes have formed, seems to be the most plausible way to address this issue.

3. The birth of CAS

The Computing At School working group (CAS) was born at Microsoft Research Cambridge, at a meeting in 2008. Our fundamental goal is to establish computer science as a proper, rigorous, high status school subject discipline —the "fourth science" — and to build a network that supports teachers as they engage with computer science in their classrooms.

3.1. Partnership with BCS

CAS is, first and foremost, a grass-roots group of *individuals*, not of institutions or companies. Membership is free, is open to everyone, and is very broad, including teachers, parents, governors, exam boards, software professionals, members of professional societies, and university academics.

Serendipitously, at the very same time the BCS (the British Computer Society, the UK's equivalent of the ACM), was undergoing an internal renaissance, which led to the formation of the BCS Academy of Computing in 2009. The Academy plays the role of a learned society, and is intended to have deep engagement with research and education.

At this point the BCS Academy had legitimacy but relatively little activity, while CAS had a tremendous buzz of activity but no institutional legitimacy. The solution was obvious: with some trepidation, CAS formed a collaborative partnership with BCS. The partnership has turned out to be resoundingly beneficial for both parties. BCS has given CAS substantial resources and air cover, while CAS has become one of BCS's highest-impact and most visible activities.

3.2. A thousand flowers

We were not the only ones to feel frustrated about ICT. A number of other independent groups have also sprung up in the UK over the same period. Rather than try to absorb them all in one mega-movement, we have sought to work together in partnership rather than competition, for common goals. Prominent among them are:

- **Cs4fn**[5] is a print magazine and supporting web site about "computer science for fun". For example, magic tricks each with a computational component, feature prominently.
- **Apps for Good**[6] helps young people at school create apps, stressing entrepreneurial as well as technical skills.
- **Young Rewired State**[7] runs hack days for teenagers.

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Part II

… and _ever?

Innovation in Education

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… and _ever?

Never or forever?

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Innovation in Education

… and _ever?

Well, no one doubts that we must do it.

… and _ever?

And so, we can do it…

right ➔ forever. ∞

wrong ➔ never. ✕

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The opportunity!

We must do it RIGHT and as FAST as we can.

2019-2024+

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Innovation in Education

Founders

Board of Directors

Master Teachers

Partners

Universidade do Minho
Escola de Engenharia

CS K12 Program

Notas | Professor

> Nesta fase inicial pretende-se que os alunos sejam confrontados com as bases **intelectuais** e **materiais** da computação.

> Tentaremos, por isso, libertar o seu pensamento do "ruído" tecnológico característico dos dias de hoje.

> Após esta primeira atividade, cujas respostas deverão ser agora guardadas para memória futura, iniciaremos o ciclo de aprendizagem articulando permanentemente estes dois universos (**intelectual** e **material**) que ligam o início (o **pensamento**) e o fim (a **ação**) da jornada **ENSICO**.

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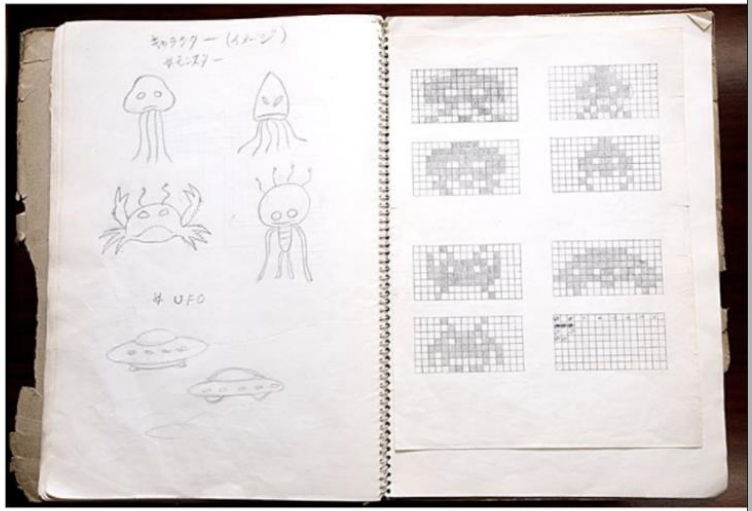
3 Jogos de Computador

Vamos fazer exactamente o que **Tomihiro Nishikado**, o inventor do jogo **Space Invaders**, fez há muitos anos.

Vejam o "*Leibniz*" dele ao lado.



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História

> **Leibniz**, Gottfried Wilhem (1646 - 1716), polímata alemão e impulsionador do "Sistema Binário", é uma figura central na história da matemática e da filosofia 🔗 wikipedia

> O seu nome será aqui usado para identificar a nossa primeira aproximação ao computador pessoal.

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1.2 Vídeo

Computação

(3:45) ▶ iniciar

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Sequências finitas

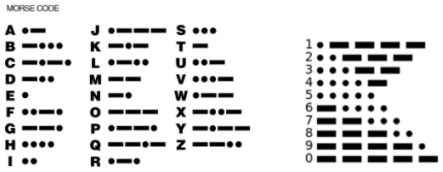
É que, se não nos preocuparmos com isso,

> `ENSICO` = `0` `10` `000` `00` `1010` `111` = `010000001010111`

podemos estar a enviar afinal outra palavra, por exemplo

> `AHIKJ` = `01` `0000` `00` `101` `0111`

Basta que `010000001010111` seja lida de outra maneira.



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Sequências | Matemática

Em Matemática, dizemos que

> `x ++ (y ++ z) = (x ++ y) ++ z`

quer dizer que a **junção** de sequências é uma operação **associativa**, e que

> `x ++ [] = [] ++ x = x`

indica que a **sequência vazia** `[]` é o **elemento neutro** da junção de sequências.

O facto de `x ++ y` $\neq$ `y ++ x` em geral diz-nos que a junção de sequências **não** é **comutativa**.

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O fecho-éclair

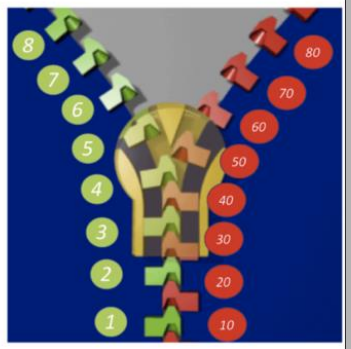
Vamos escrever `esquerda # direita`.

Reparem na diferença entre **juntar** sequências e **emparelhar** sequências:

```
esquerda ++ direita =
   [1,2,...,8] ++ [10,20,...,80] =
   [1,2,...,8,10,20,...,80]
```

é bem diferente de:

```
esquerda # direita =
   [1,2,...,8] # [10,20,...,80] =
   [(1,10),(2,20),(3,30),...,(7,70),(8,80)]
```



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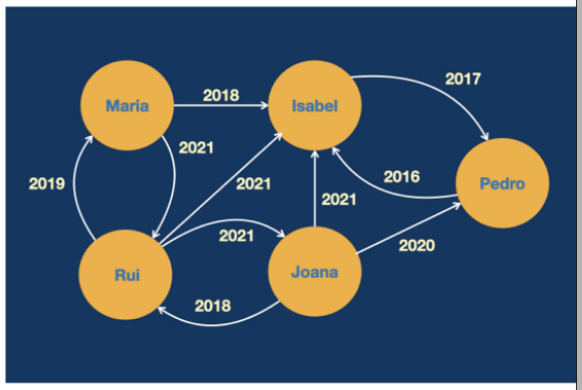
Grafos com etiquetas

Exercício: olhando para o grafo ao lado ou para a sequência `instagram'`, quem mais depressa responde a:

- Quem está a seguir que pessoas no Instagram há mais tempo?
- E quem é que é seguida há menos tempo por alguém?



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CS Unplugged

Leibniz

O meu primeiro Computador

ENSICO

Computação é um corpo de conhecimento independente do uso de computadores.

ENSICO.PT

CS Plugged

File Edit View Run Kernel Tabs Settings Help

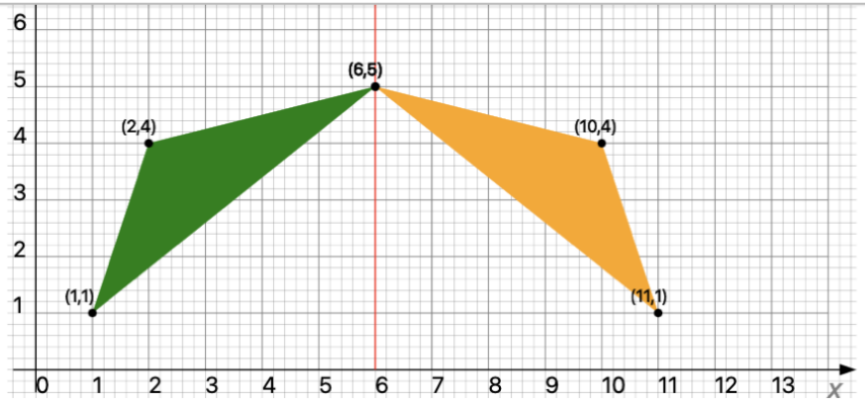
/ jnb-lab /

Name

- src
- lab-00y-2122.ipynb
- lab-01y-2122.ipynb
- lab-02y-2122.ipynb
- lab-03y-2122.ipynb
- lab-cg1.ipynb
- lab-cg2.ipynb
- lab-cg3.ipynb
- lab-comp.ipynb
- lab-crip.ipynb
- lab-help.ipynb
- lab-seq1.ipynb
- lab-seq2.ipynb

Launcher | lab-cg2.ipynb | lab-cg1.ipynb | lab-cg3.ipynb

Markdown



a) Começa por recordar a **sequência de pontos** que define o triângulo verde.

Executa a célula abaixo. ¶

```
[ ]: triangulo = [(1,1),(2,4),(6,5)]
```

b) Agora, define a **sequência de pontos** `triangulo''` que representa o triângulo refletido, a partir da sequência de pontos `triangulo`.

Deves definir `triangulo'' = [ ... | ... <- triangulo]` tal como fizemos no exemplo acima.

Dica 1: Observa que temos a seguinte **correspondência** entre os pontos dos triângulos:

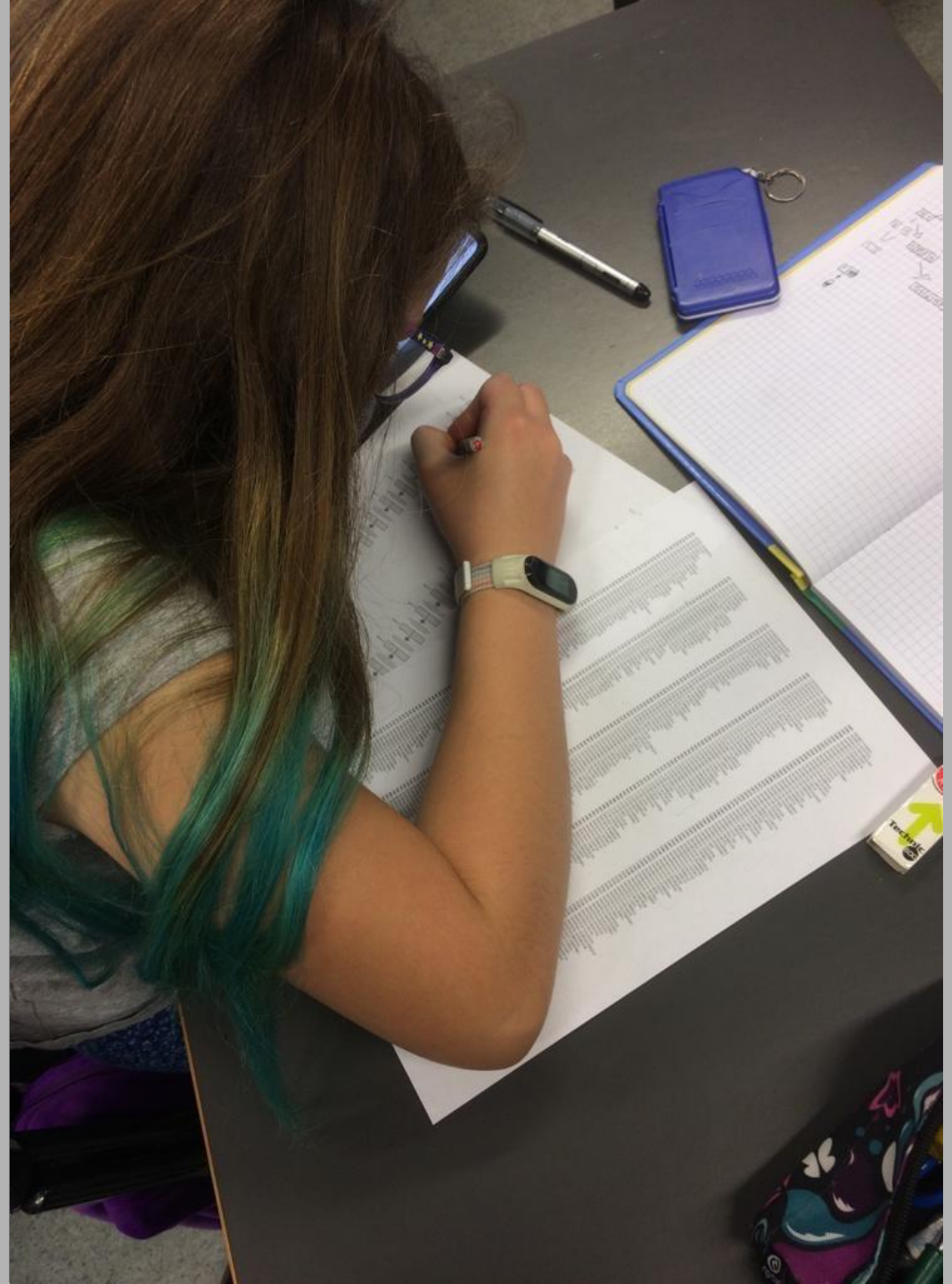
verde	laranja
(1, 1)	(11, 1)
(2, 4)	(10, 4)
(6, 5)	(6, 5)

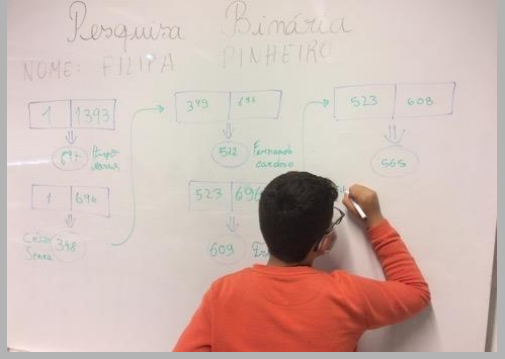
Dica 2: Após efetuar uma reflexão segundo o eixo $x = 6$, em que ponto é transformado um ponto com coordenadas `(x,y)`?

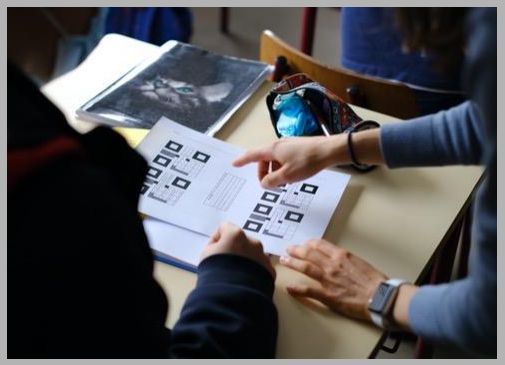
```
[ ]: triangulo'' = Apaga isto e escreve aqui a tua resposta, executando a célula no final.
```

0 3 Haskell | Idle Mem: 3.19 / 4.00 GB Mode: Command Ln 1, Col 1

CS Classes




Pesquisa Binária
NOME: FILIPA PINHEIRO



SEQUÊNCIA DE FIBONACCI
1,1,2,3,5,8,13,21,...
Cada termo é a soma dos dois anteriores
joca(1)= 1
joca(2)= 1
joca(i)= joca(i-1)+joca(i-2)
joca
TEORIA DOS INDIANOS
MAS EEES MATAM HUMANO

CS@Youtube

HOME VIDEOS PLAYLISTS COMMUNITY CHANNELS ABOUT

TEOREMA DAS QUATRO CORES

2.4K views • 2 months ago

PROVAS DE CONHECIMENTO ZERO

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GRACE HOPPER - A ALMIRANTE DA...

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O JOGO DA VIDA

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2.4K views • 4 months ago

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2.5K views • 4 months ago

SEIS GRAUS DE SEPARAÇÃO

2.5K views • 5 months ago

AS HEROÍNAS DO ENIAC

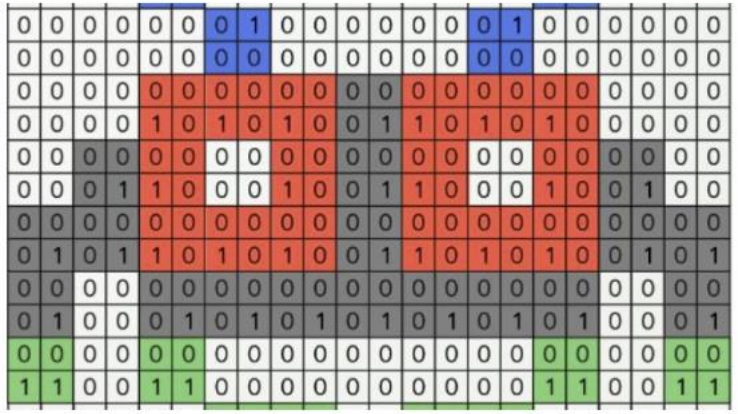
1.7K views • 5 months ago

O PROBLEMA DO CAIXEIRO VIAJANTE

ADA LOVELACE — PROGRAMAÇÃO POÉTICA

PORTAS LÓGICAS E MINECRAFT

BITS, BYTES E TRANSÍSTORES



COMPUTAÇÃO NA ESCOLA

Computadores a "cores"

COMPUTAÇÃO NA ESCOLA

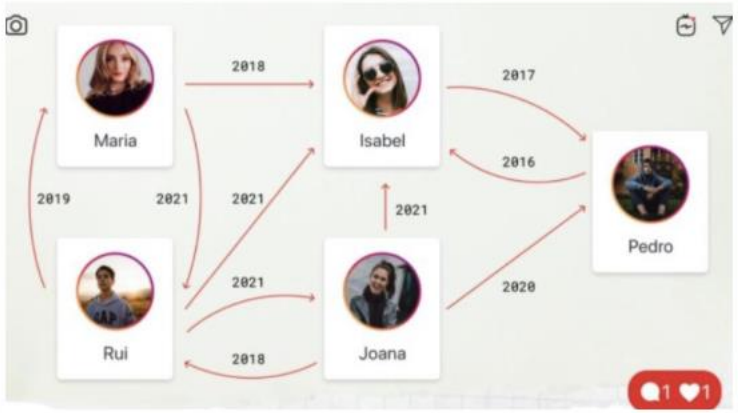
Sistemas de numeração. Como são representados os números num computador?

COMPUTAÇÃO NA ESCOLA

Bits, Bytes e Basic. Viagem ao início dos “anos loucos” da programação

COMPUTAÇÃO NA ESCOLA

Autómatos. Quem foi o espertinho que se lembrou de designar todas estas coisas pelo mesmo nome?



COMPUTAÇÃO NA ESCOLA

Grafos. E como sem eles o mundo não seria o mesmo

COMPUTAÇÃO NA ESCOLA

Códigos QR. Que segredos se esconderão no emaranhado de pontos e quadradinhos?

CS@TEDx

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From Porto to Portugal and to the World.

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