



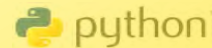
## National Workshop 2



LEAVING CERTIFICATE  
COMPUTER SCIENCE

# Welcome

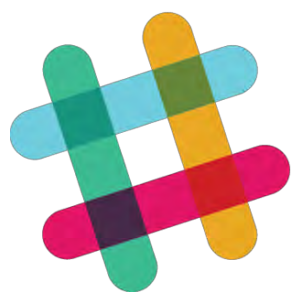
As you come in ... key in and run the above code .... What does it do?



```
1.  from turtle import *
2.
3.  def draw_something(x, y):
4.      up()
5.      goto(x, y)
6.      down()
7.      forward(100)
8.
9.  # Python starts executing from here ...
10. width(2)
11. speed(10)
12. hideturtle()
13. getscreen().onclick(draw_something)
```

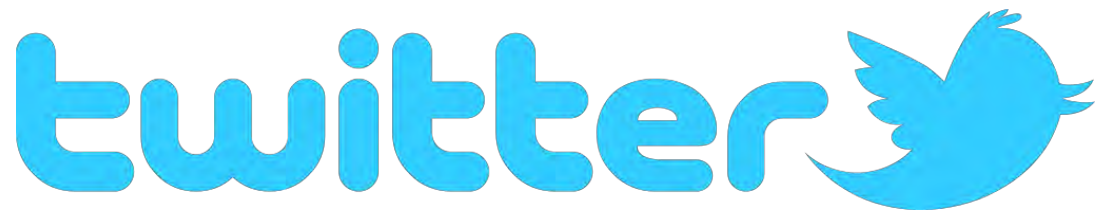
# Schedule

9:30am – 11:00am	<b>Session 1A</b> Introduction, Key Messages and Recap on NW1 Introduction to Computational Thinking through Python
	Break
11:15am – 12 noon	<b>Session 1B</b> Computational Thinking (breakout #2 + research)
12:00 noon – 1:00pm	<b>Session 2</b> Computational Thinking Unplugged
	Lunch
2:00pm – 3:30pm	<b>Session 3</b> Resource Development Curriculum Planning & Assessment Critical Reflection
3:30pm	Conclusion



# slack

Workspace = PDSTCS\_NR2020



@PDSTcs



computerscience@pdst.ie

# Session 1

## Introduction

# Culture and Expectations

Go to **www.menti.com** and use the code **50 89 79**

**What should be the culture in this group? What expectations do you have from each other?**

Mentimeter

Open, collaborative, supportive.

Collaboration and sharing.  
Helpful and supportive.

An open, sharing, collaborative culture. It's not a competition!!

Sharing is caring.  
Nonjudgmental. No inappropriate questions.

Be non judgemental, share your expertise.

Open Source Share and Share alike! PMA - Positive Mental Attitude! Share best practice and what works.

Lots of sharing but even more helpful if shared resources could be linked to Learning Objectives of the LCCS spec

Sharing is caring. Regular communication online. A good atmosphere within the group.

Helpful if we have the answers. Non-judgemental. No stupid questions.

Supporting environment where every mistake leads us a step closer to our ultimate goal of world domination.

Sharing resources/ possible solutions targeted to the specific learning outcomes

An open approach to learning in a collaborative supportive environment. We are all in this

Respect

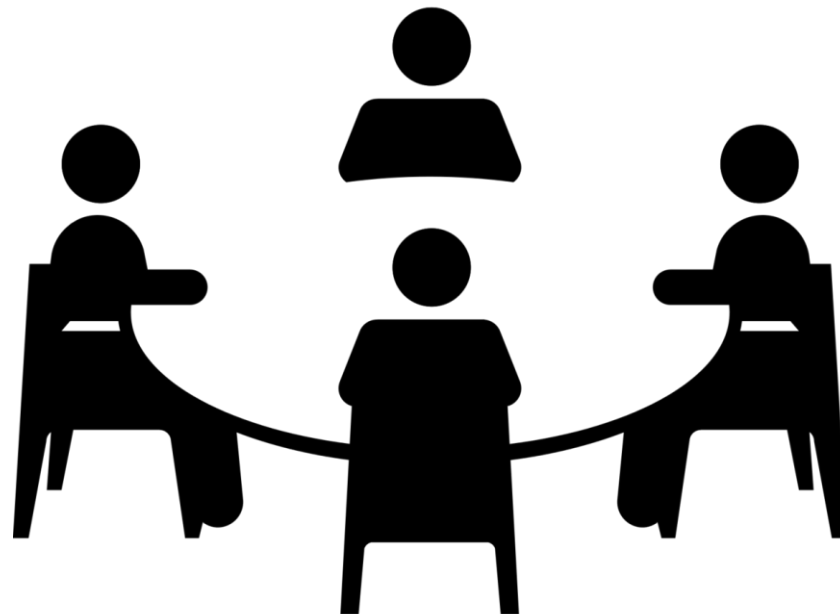
Collaboration

Open-mindedness

Supportive / Community

Positive

# Group Activity / Breakout #1



***Switch video / sound ON***

***Check in – introduce yourselves***

***Looking back at NW1 ... how was your  
thinking in relation to LCCS extended?***

***What were the key messages?***







**15 minute breakout**

# National Workshop 1

## Quick Recap

# Recap on NW1

Culture and Expectations

The Role of the PDST **Growth Mindset**

CPD Programme **Community of Practice**

**LCCS Specification** **Learning Outcomes**

**Learning Challenges (faced by novice programmers)**

Cognitive Load **Teacher challenges and strategies**



**Teachers are Key**

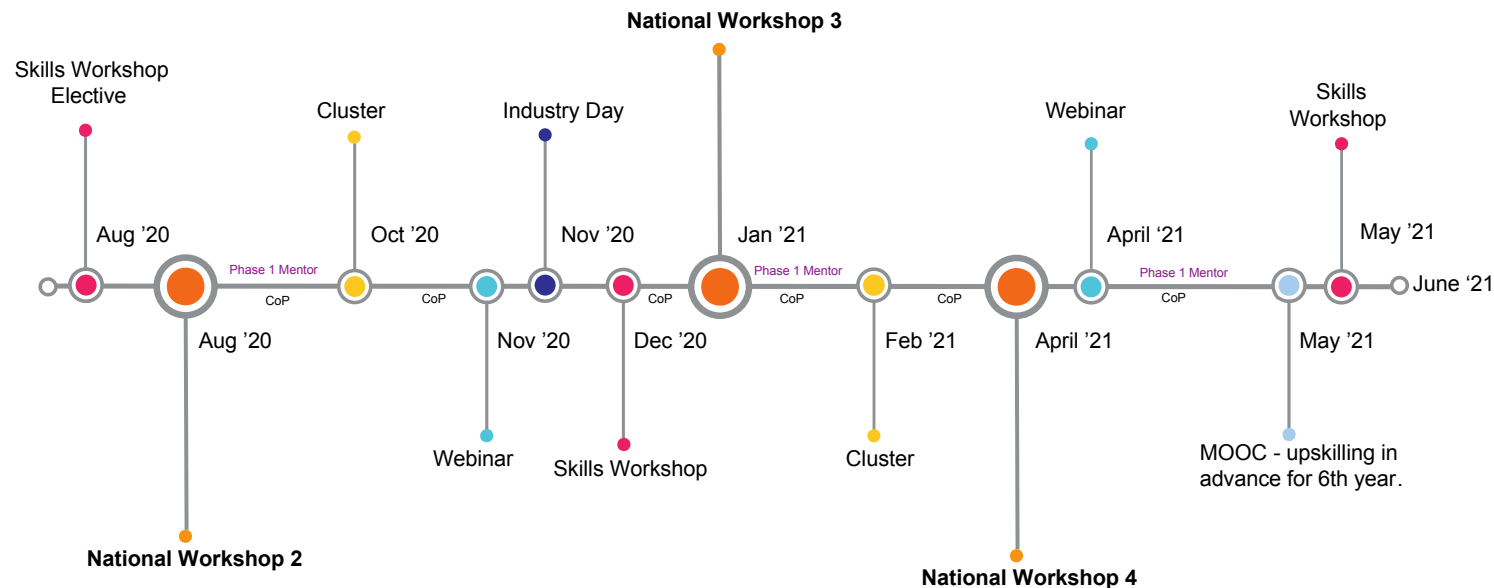
CS For All

Non-linear

Programming  
Pedagogy

Constructivism

# Dates for your Diary for 2020/21



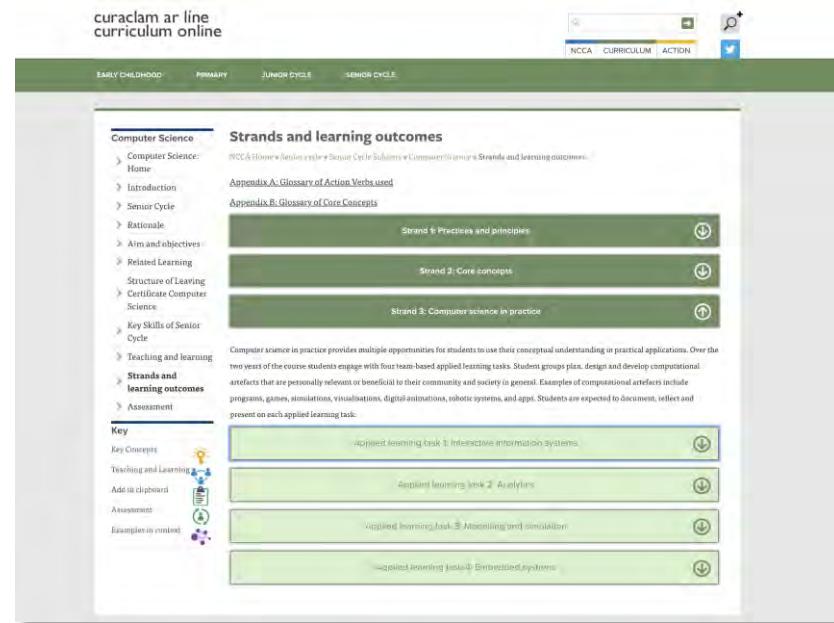
Timeline - Round 1 - 5th Year

Day 2 of NW2 Tuesday 29th September (cohorts 1&3) and Thursday 1st October (cohorts 2&4)

Day 3 of Python to be added in – Oct or Nov

# Computational Thinking

# LCCS Curriculum Specification



<https://www.curriculumonline.ie>

# What does the specification say?

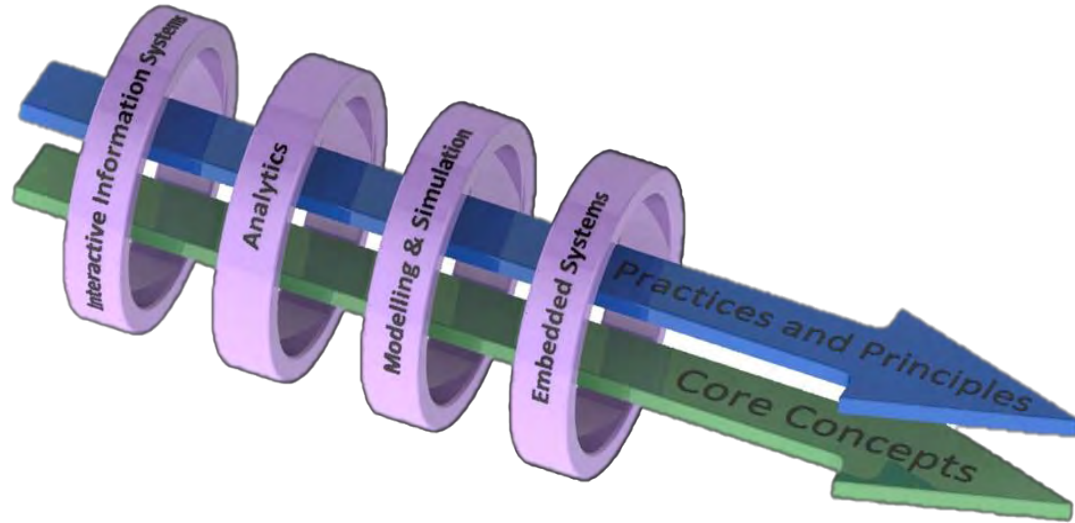
*“Computer science is the study of computers and algorithmic processes. Leaving Certificate Computer Science includes how programming and **computational thinking** can be applied to the solution of problems, and how computing technology impacts the world around us.”*

[LCCS Spec. Page 2, paragraph 1]

Strand 1: Practices and principles	Strand 2: Core concepts	Strand 3: Computer science in practice
<ul style="list-style-type: none"> <li>▶ Computers and society</li> <li>▶ Computational thinking</li> <li>▶ Design and development</li> </ul>	<ul style="list-style-type: none"> <li>▶ Abstraction</li> <li>▶ Algorithms</li> <li>▶ Computer systems</li> <li>▶ Data</li> <li>▶ Evaluation/Testing</li> </ul>	<ul style="list-style-type: none"> <li>▶ Applied learning task 1 <ul style="list-style-type: none"> <li>- Interactive information systems</li> </ul> </li> <li>▶ Applied learning task 2 - Analytics</li> <li>▶ Applied learning task 3 <ul style="list-style-type: none"> <li>- Modelling and simulation</li> </ul> </li> <li>▶ Applied learning task 4 <ul style="list-style-type: none"> <li>- Embedded systems</li> </ul> </li> </ul>

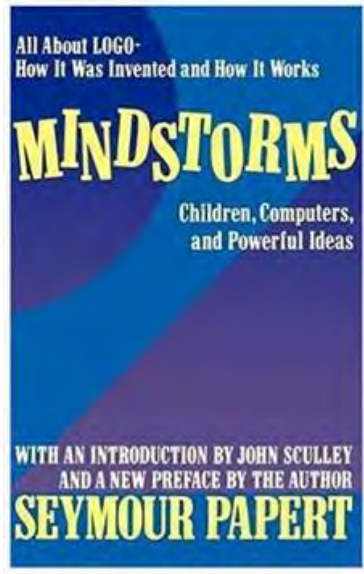
# What does the specification say?

"The role of programming in computer science is like that of practical work in the other subjects—it provides motivation, and a context within which ideas are brought to life. Students learn programming by solving problems through **computational thinking** processes and through practical applications such as applied learning tasks." LCCS specification (2017)

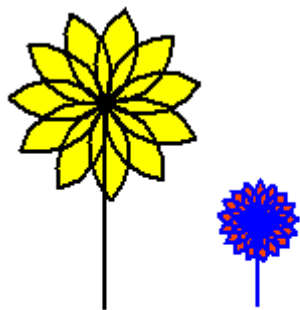




# Papert's Flower Garden



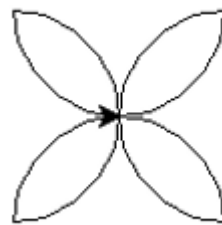
How could we write a Python program for a user to create the above?



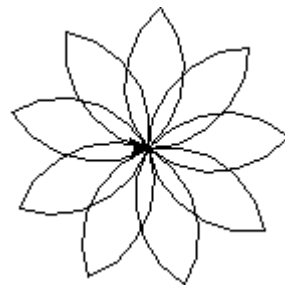
Individual Flowers  
(incl. stem)



A petal



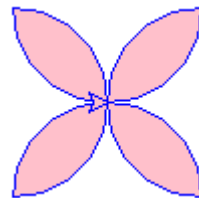
4 petals



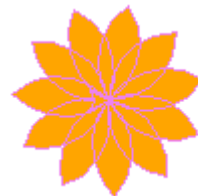
Uncoloured flower



Coloured petal



4 petals - coloured



Coloured flower

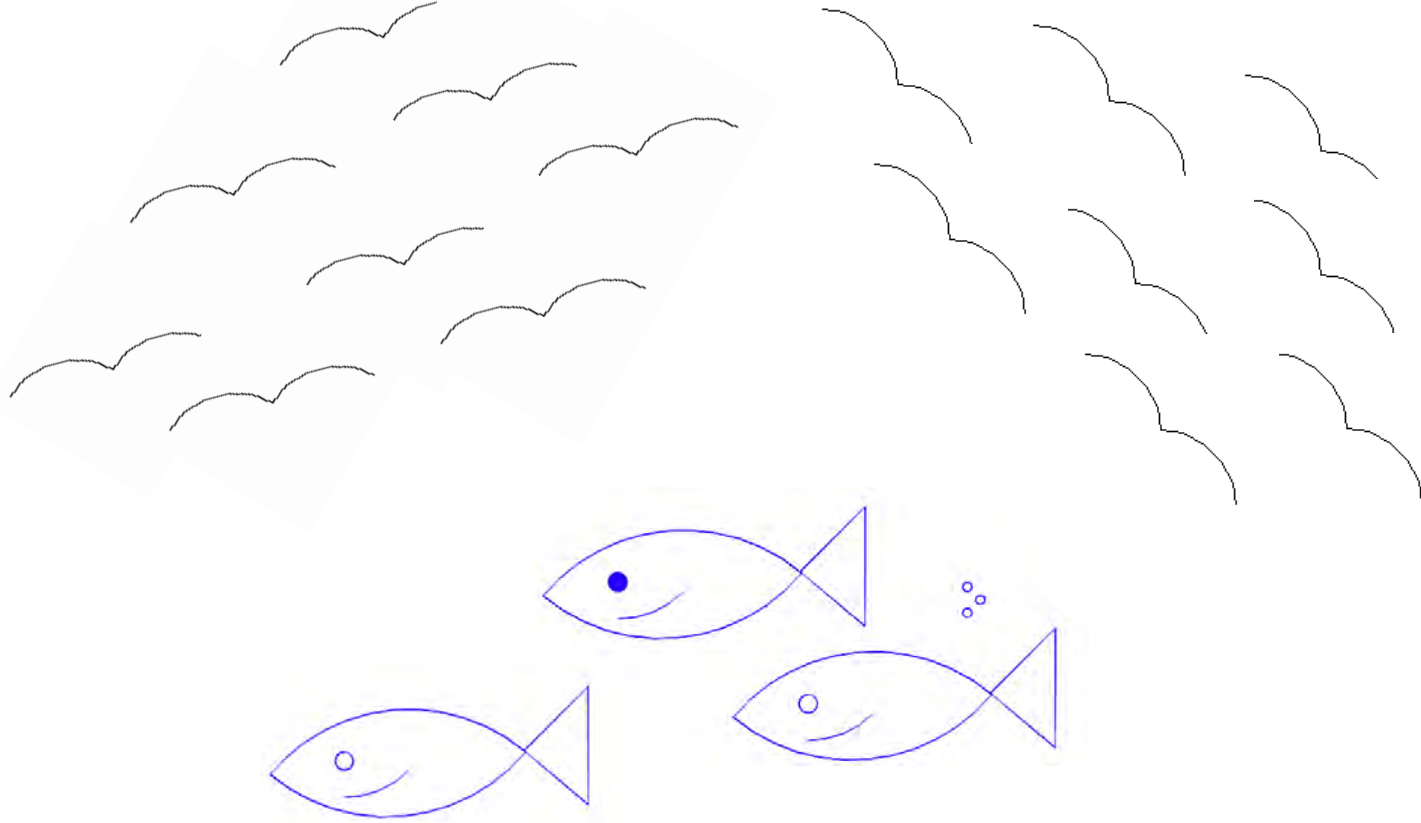


**Facilitation in Progress!**



**15 minute break - start**

# Let your imagination guide you!

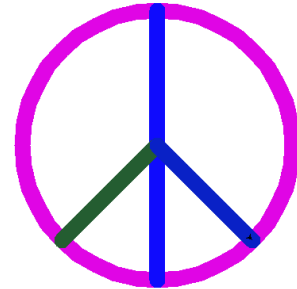
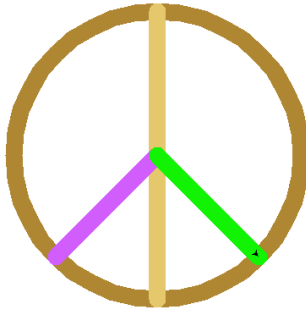
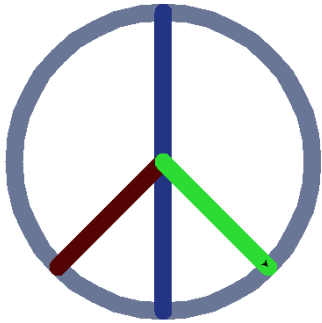


<https://repl.it/@Mikiedoodle05/Fish#main.py>

# Let your imagination guide you!



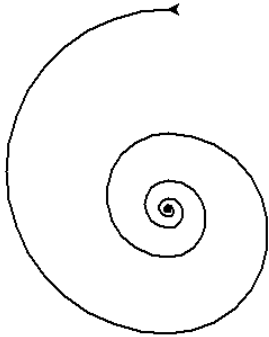
```
redAmount = randint(0,255)
greenAmount = randint(0,255)
blueAmount = randint(0,255)
colormode(255) # so we can use RGB
pencolor(redAmount,greenAmount,blueAmount)
```



# Let your imagination guide you!

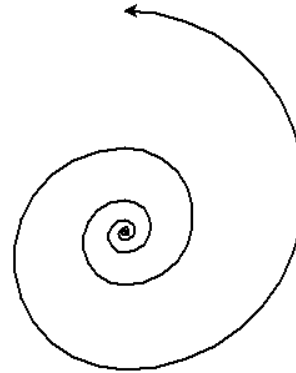


Newgrange Tri-Spiral  
circa 3100 BC



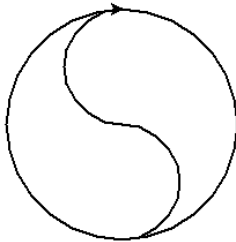
extent = -180

```
circle(1,extent)  
circle(2,extent)  
circle(3,extent)  
circle(5,extent)  
circle(8,extent)  
circle(13,extent)  
circle(21,extent)  
circle(34,extent)  
circle(55,extent)  
circle(89,extent)  
circle(144,extent)
```

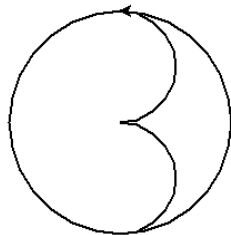


extent = 180

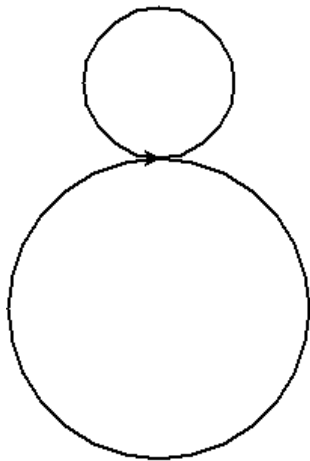
# Let your imagination guide you!



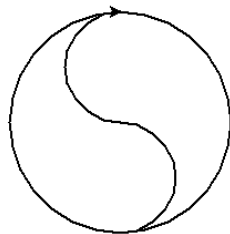
```
circle(100, 180)  
circle(50, 180)  
circle(-50, 180)  
circle(-100, 180)
```



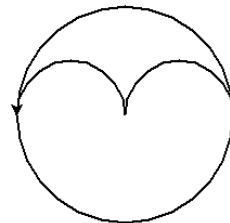
```
circle(100)  
circle(50, 180)  
left(180)  
circle(50, 180)
```



```
circle(-100)  
circle(50)
```



```
circle(100)  
circle(50, 180)  
circle(-50, 180)
```



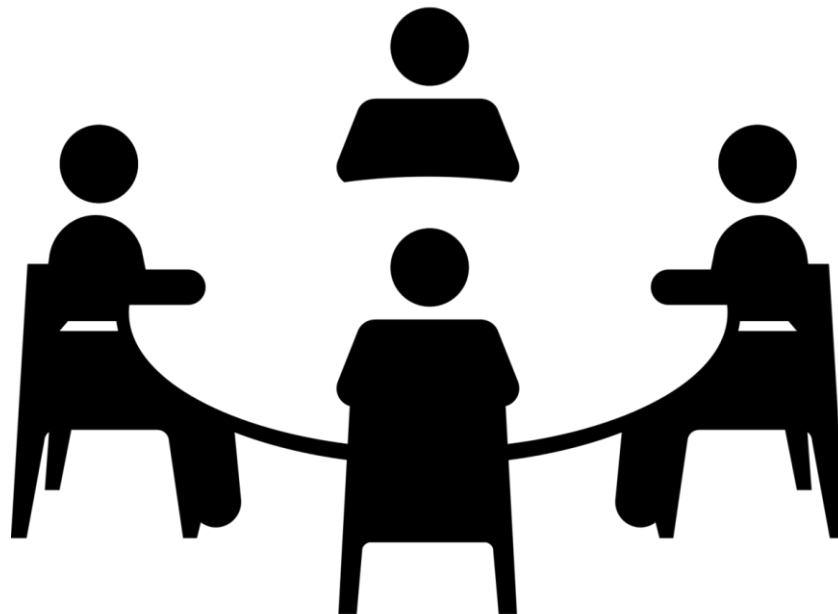
```
circle(100)  
circle(100, 90)  
circle(50, 180)  
left(180)  
circle(50, 180)
```





**15 minute break - end**

## Group Activity / Breakout #2



*Switch video / sound ON*

*Q1. What is Computational Thinking?*

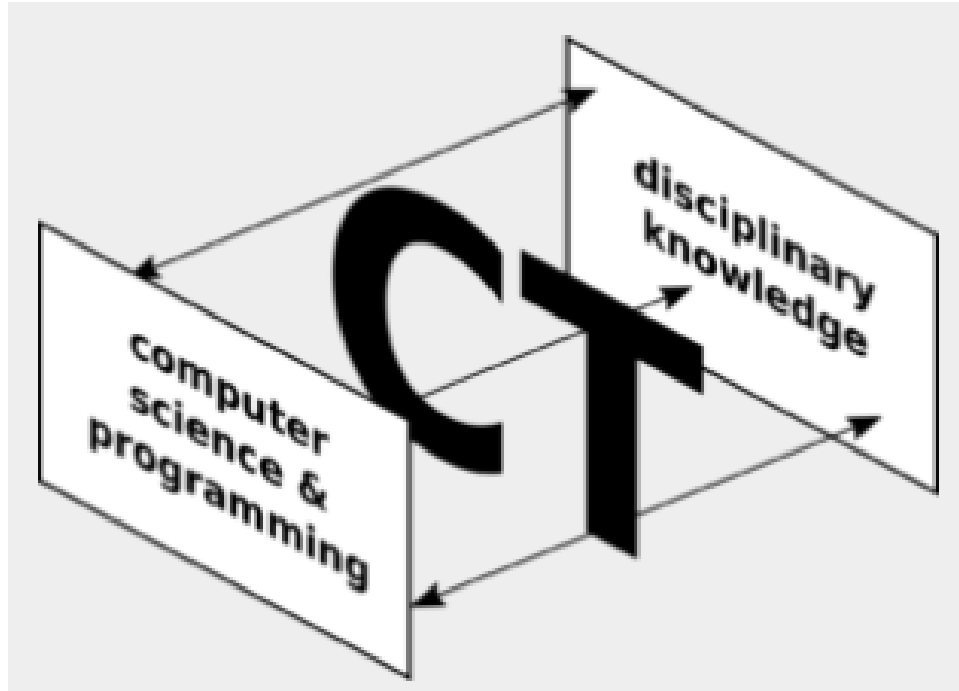
*Q2. How do you intend to approach  
Computational Thinking in the  
classroom?*



Use the spec. for this activity

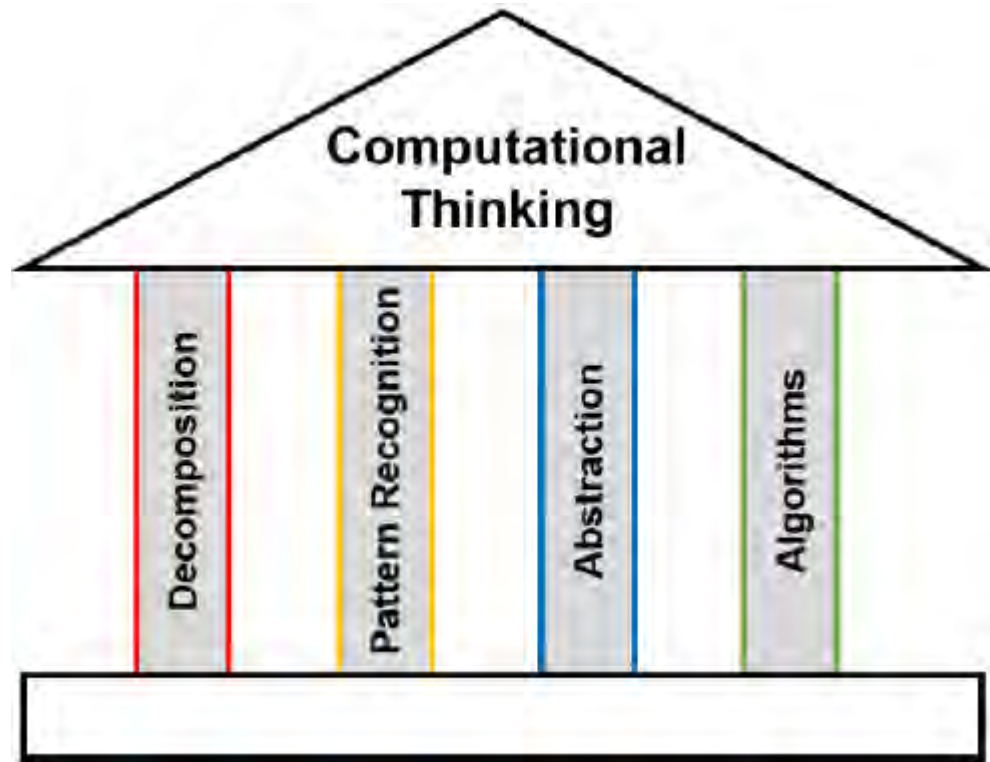


*“Computational Thinking is about connecting computing to things in the real world”* (Martin, 2018)



Source: <http://advocate.csteachers.org/2018/02/17/rethinking-computational-thinking/>

# Pillars of Computational Thinking



*Decomposition* – breaking down problems into more manageable sub-problems.

*Patterns recognition* involves looking for parts of a problem/solution that are similar to something that has been solved before .... This leads to a generalised solution – transforming problems and re-using solutions

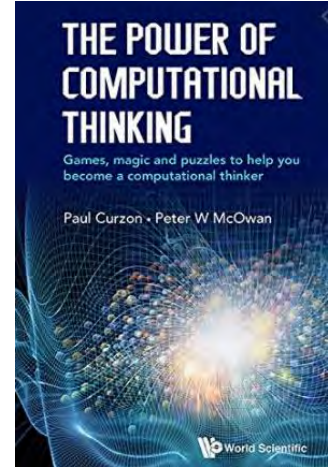
*Abstraction* – the process of extracting the important details and hiding unnecessary detail.

*Algorithmic thinking* refers to how solutions can be expressed as a set of instructions (as opposed to a specific, single answer).

*“What are effective ways for teaching computational thinking?”*

# How to Teach Computational Thinking

- ❑ Increase your own CT knowledge
- ❑ Integrate CT concepts into everyday instruction
- ❑ Use CT terms for everyday tasks  
e.g. “Let’s create an algorithm for ...”
- ❑ Encourage students to formulate and test their own hypotheses e.g. Google Public Data
- ❑ Provide opportunities for students to transfer their learning to other situations





# Successful CT Pedagogies

- ❑ Analogy / Storytelling
- ❑ CS Unplugged
  - Kinaesthetic
  - Role Playing
  - Puzzles
  - Art
  - Games
  - Magic
- ❑ Enquiry Based Learning (TEMI)



(Python) Programming Practice



**5 minute stretch break**



**An Roinn Oideachais  
agus Scileanna**  
Department of  
Education and Skills



© PDST 2019