PDST
**Professional Development Service for Teachers** | An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

An Roinn Oideachais
Department of Education

LEAVING CERTIFICATE
COMPUTER SCIENCE

# National Workshop 3

# Key Messages

Leaving Certificate Computer Science aims to develop and foster the learner's creativity and problem solving, along with their ability to work both independently and collaboratively.

Computing technology presents new ways to address problems and computational thinking is an approach to analyse problems, design, develop and evaluate solutions.

The ALTs provide opportunities for students to develop their theoretical and procedural understanding of the course.

The externally assessed coursework will be based on all learning outcomes, with those of strand 3 being particularly relevant.

Digital technologies can be used to enhance collaboration, learning and reflection.

# Schedule

| | |
|---|---|
| **Session 1** | Computational thinking |
| 11.30 - 12.00 | Tea/Coffee |
| **Session 2** | Algorithms |
| 13.30 – 14.30 | Lunch |
| **Session 3** | Computer systems |

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# Computational Thinking III

National Workshop 3, Session 1

# Overview of the Session

| Part 1 | Warm-up activities |

**Movement Break**

| Part 2 | Computational thinking: thoughts and models |

**Movement Break**

| Part 3 | Further activities |

# Learning Intentions

By the end of the session, participants will be enabled to:

Work in groups on problem solving

Develop their understanding and experience in using some of the pillars of Computational Thinking

Assess and analyse research in the area of CT

# One model of Computational Thinking

Decomposition

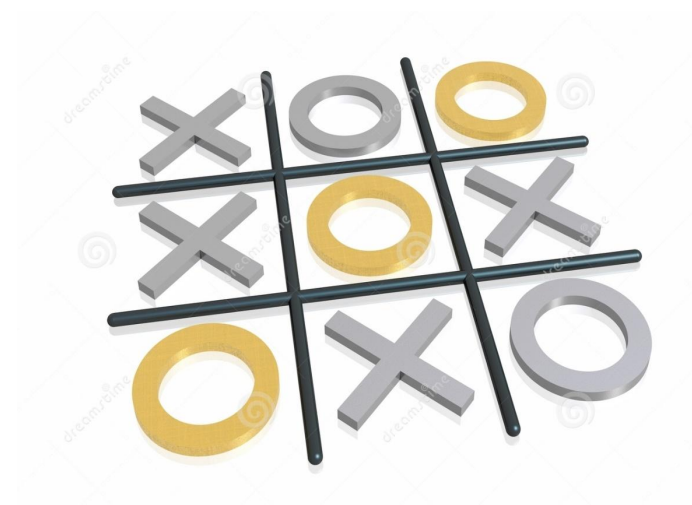Pattern recognition

Abstraction

Algorithm design

Section 1

Warm Up Activities

# Xs and Os: Developing a winning strategy

Which pillars of Computational Thinking are used?

Abstraction? Decomposition? Pattern Recognition? Algorithm formation?
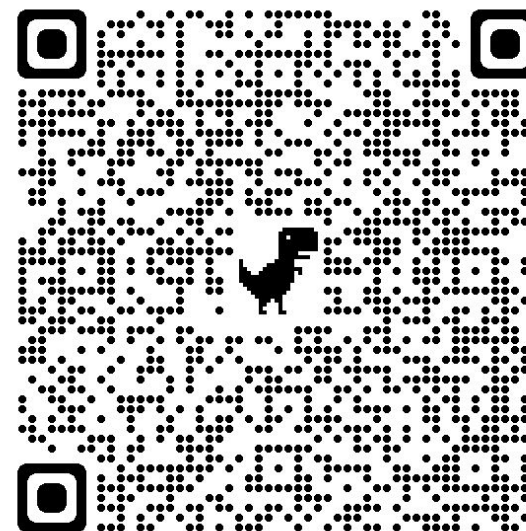
# Xs and Os: Developing a winning strategy

Move 1:      Go in a corner.

Move 2:      IF the other player did not go to opposite corner

THEN go in the opposite corner to move 1.

ELSE go in a free corner.

Move 3:      IF there are 2 Xs and a space in a line

THEN go in that space.

ELSE IF there are 2 Os and a space in a line

THEN go in that space.

ELSE go in a free corner…..

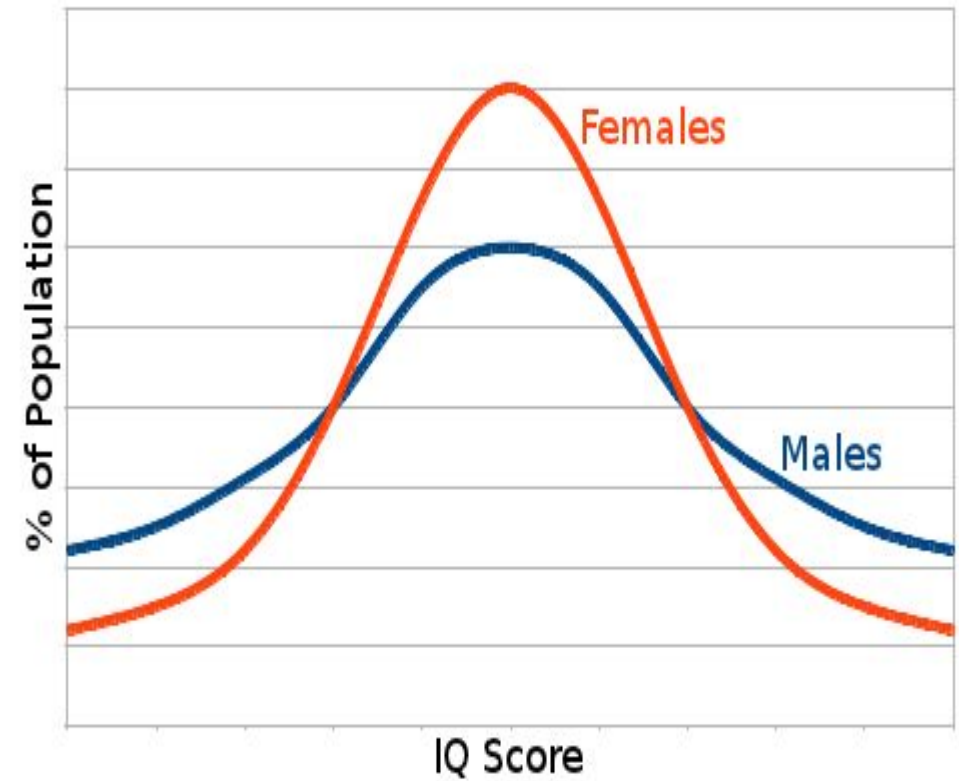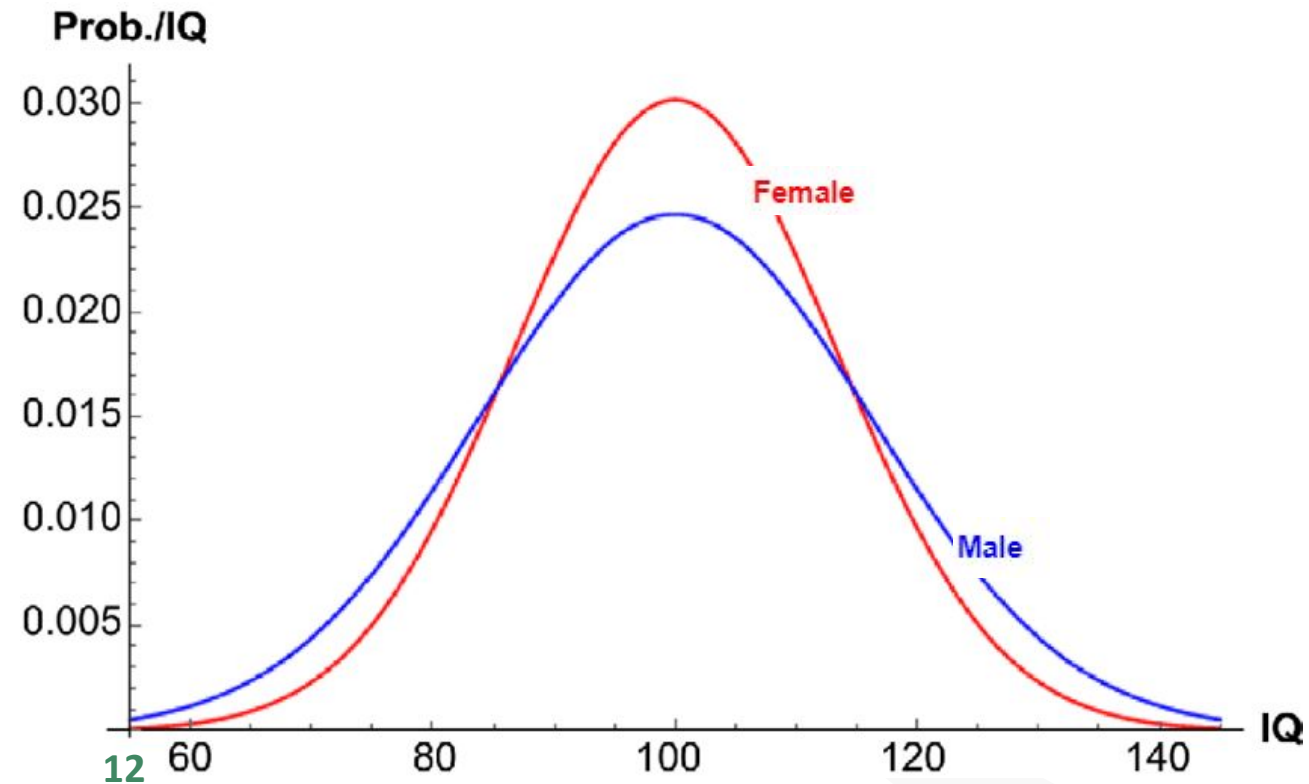http://www.cs4fn.org/teachers/activities/intelligentpaper/intelligentpaper.pdf
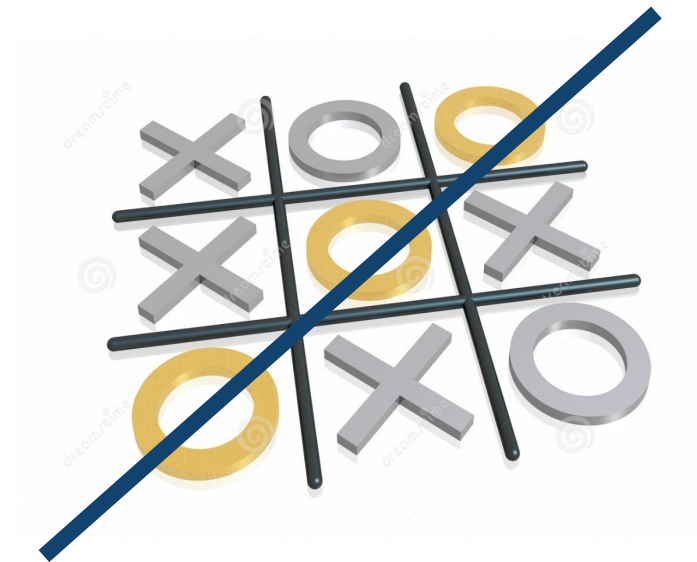
# ALT2 – IQ Tests

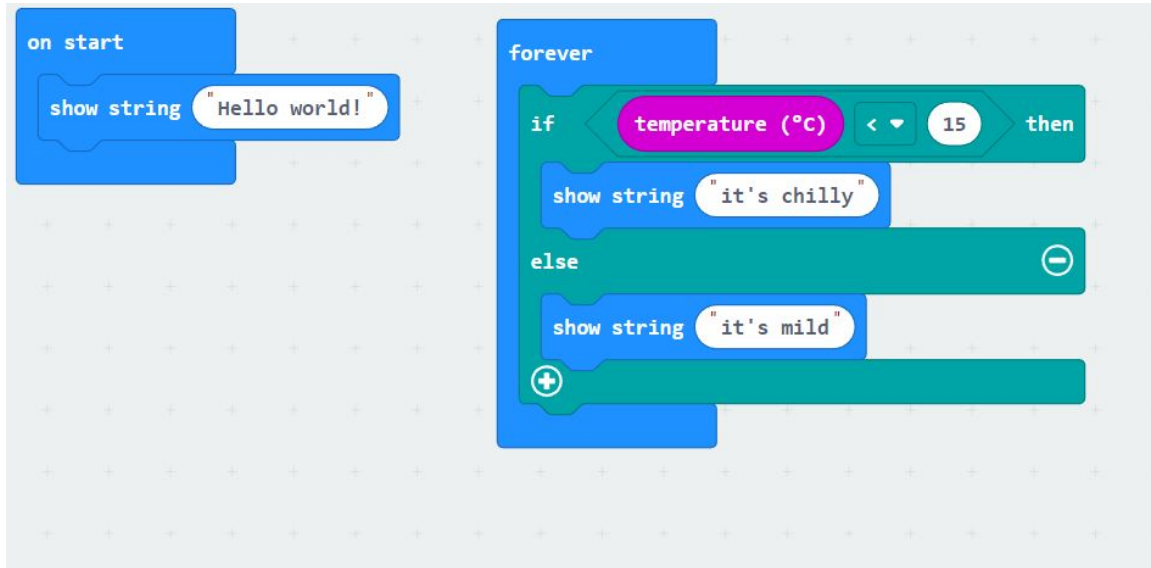IQ scores are normally distributed with a mean of 100 and a standard deviation of 15
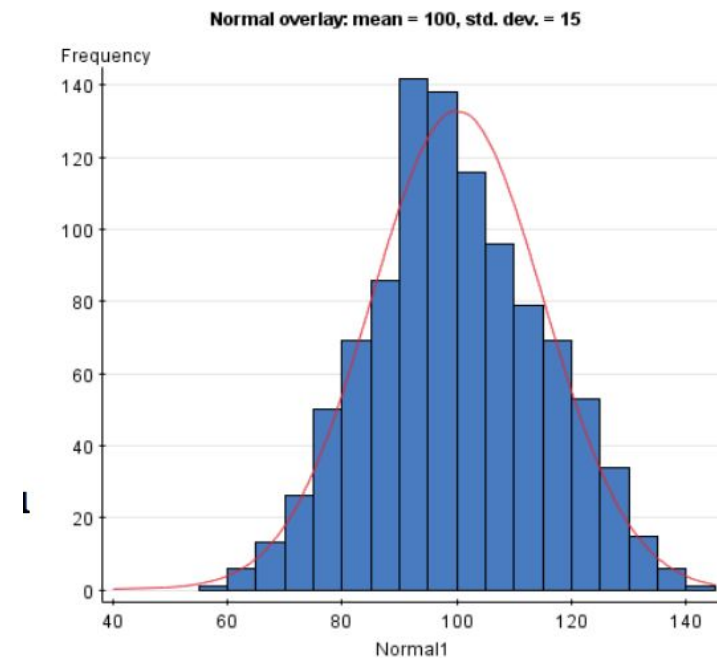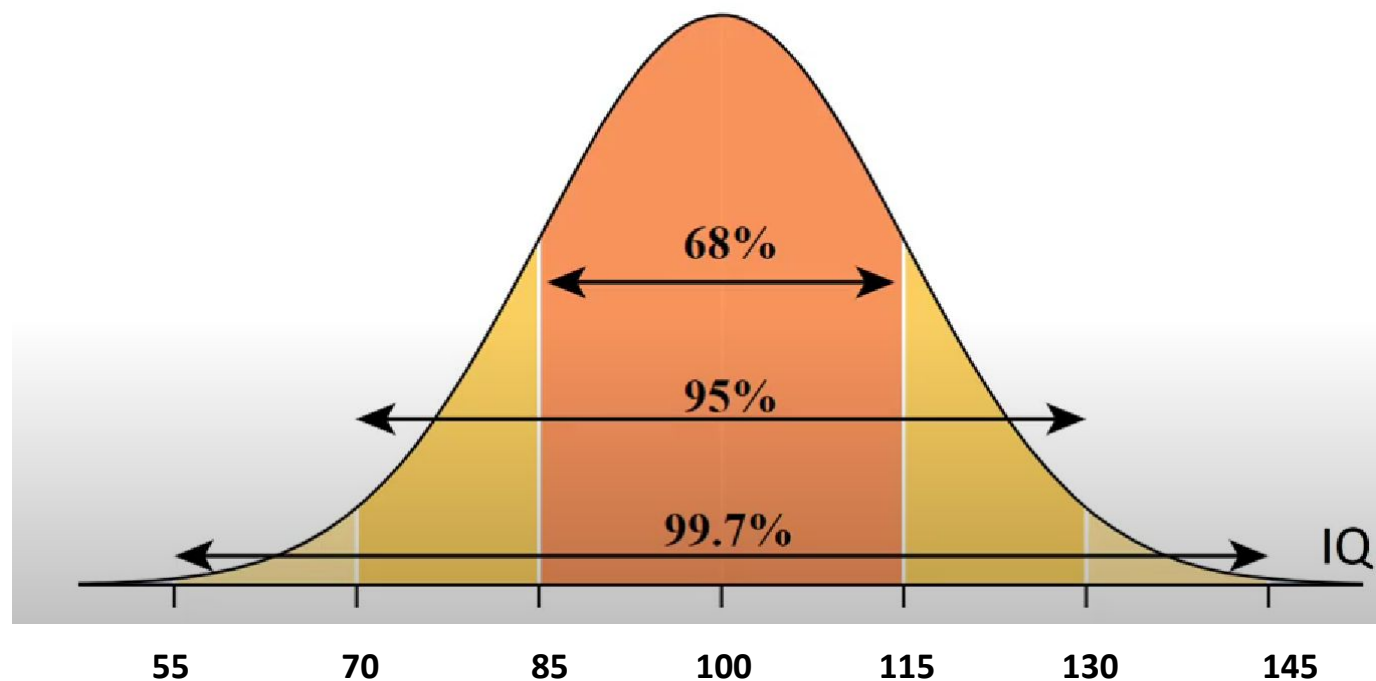
# ALT2 – Mean and Median

Test the assertion (hypothesis) "Females are more intelligent than males", by considering median, mean, mode and spread in the graph shown.
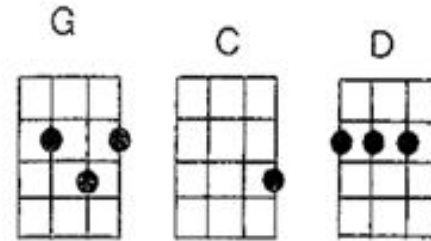
# Microbit



```
1  basic.showString("Hello world!")
2  basic.forever(function () {
3      if (input.temperature() < 15) {
4          basic.showString("it's chilly")
5      } else {
6          basic.showString("it's mild")
7      }
8  })
```

# Music: 3-chord trick

Robert Zimmerman



| G | C | G | | C | G | D |
|---|---|---|---|---|---|---|
| How many | roads must a | man walk down, before he is | | called a | man? | * |

| G | C | G | C | D |
|---|---|---|---|---|
| How many | seas must the | White Dove sail, before she | sleeps in the | sand? * |

| D | G | C | G | | C | D |
|---|---|---|---|---|---|---|
| And | how many | times must a | cannonball fly, before they are | | forever | banned? |

| | D | C | D | G | C |
|---|---|---|---|---|---|
| | The | answer my | friend, is | blowin' in the | wind, |

| | C | D | G |
|---|---|---|---|
| | The answer is | blowin' in the | wind. |

# Changing key and the 3-chord trick

| A | B | C | D | E | F | G | | |
|---|---|---|---|---|---|---|---|---|

A B C D E F G

3-chord trick – pick a letter (no 1 ) – choose no 4, 5
So for A, the other two are D, E

What are the other 2 chords for C?
And for G?

Unplugged activity – give the general solution to change key

**Section 2**
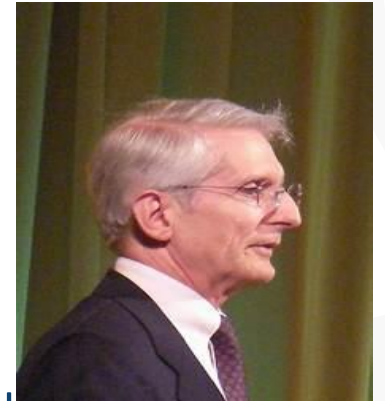
**Computational Thinking: Thoughts and Models**

# Wing V Denning

Read both viewpoints and consider the following questions

- What is computational thinking?

- Is Computational Thinking good for everyone?

- How does Computational Thinking relate to programming

- How does Computational Thinking relate to other subjects?

- How can Computational Thinking be assessed?

- How might you approach this aspect of the course with your students / do you think

  Computational Thinking is best taught or learned?

## Jeanette Wing



"Computational thinking is the thought processes involved in formulating problems

their solutions so that the solutions are represented in a form that can be effectively

*carried out by an information-processing agent*."

## Peter Denning

Computational thinking (CT) is a popular phrase that refers to a collection of computational ideas and habits of mind that people in computing disciplines **acquire through their work** in designing programs, software, simulations, and computations performed by machinery.

# One model of Computational Thinking:

- Decomposition.

- Pattern recognition

- Abstraction

- Algorithm design

Section 3

Further CT Activities

# Sieve of Eratosthenes

List the prime numbers between 1 and 100





Prime numbers

https://www.w3resource.com/w3r_images/Sieve_of_Eratosthenes_animation.gif

# Mining Cryptocurrencies –
# Factors of Semi-Primes



Semi –prime number only has two other factors, apart from itself and 1  ( eg 35)

Finding the factors of (really big) semi-primes was one way to harvest cryptocurrencies

323 is a semiprime – what are the factors

Develop a general solution (English and/or pseudocode and/or coding) to semi-prime
   problems

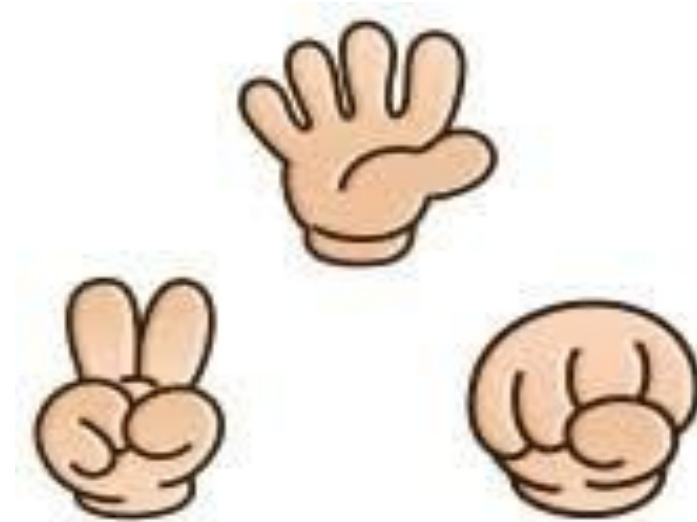Use Computational Think to enhance your solution

(Remember the semi-primes are huge – hundreds of digits so efficiency is important)

Write code / pseudocode to determine the winner

Make the code more efficient

Develop a winning strategy

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