VCE Mathematical Methods and Specialist Mathematics 2023-2027 Units 3&4

Suggested approaches to implementing the 2023-2027 study design

Pseudocode

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VCE Mathematics On-demand Videos

To support the implementation of the 2023-2027 study design for Mathematics, we have developed a series of short on-demand videos outlining approaches that teachers may wish to utilise in the classroom.

The information presented in these on-demand videos has been developed by current VCE teachers, in conjunction with the VCAA, and offer suggestions for ways schools could approach the implementation of the 2023-2027 VCE Mathematics study design.

General Outline – Pseudocode

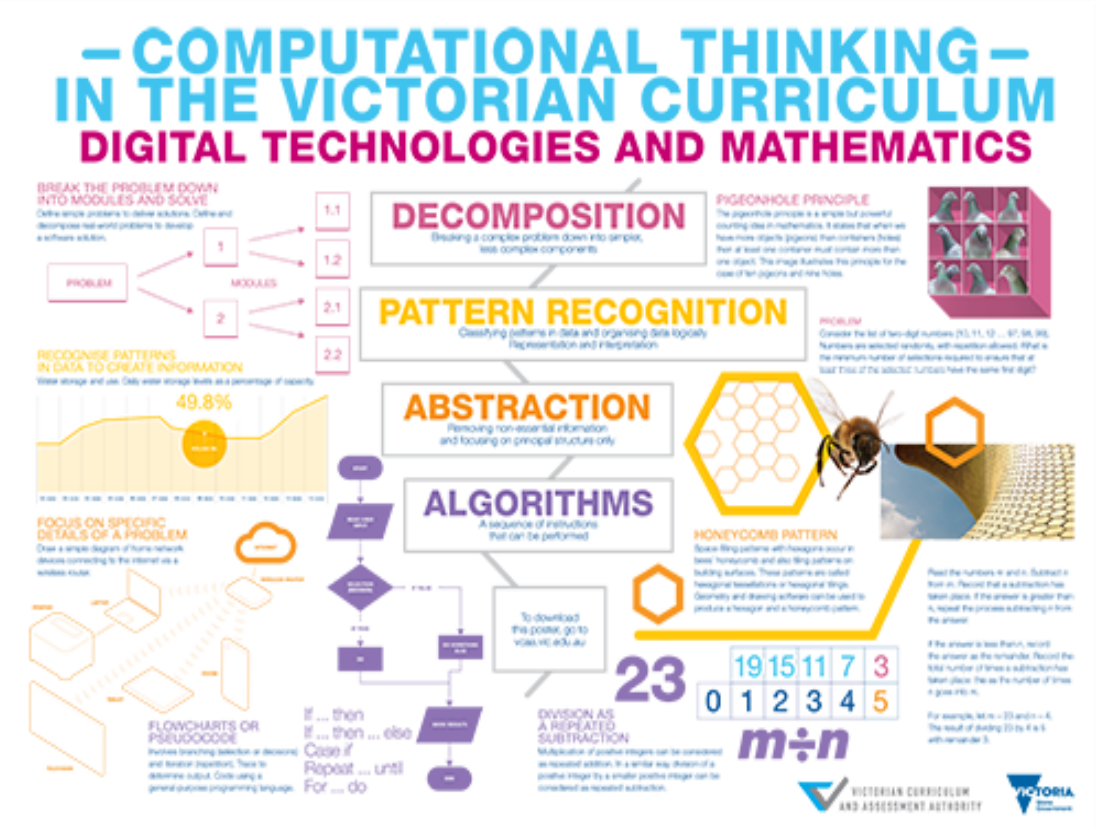
This on demand presentation will briefly discuss:

1. Introduction
2. Computational thinking and algorithms
3. Study design links
4. Reserved and keywords
5. Conventions
6. An example
7. Content conducive for pseudocode
8. VCAA Support material and contact

Topic 1 – Introduction

- Pseudocode provides a bridge between by-hand calculations and coding in a computing language for the purpose of completing a computation.
- It provides a high-level description of an algorithm, with more structure than regular writing, but is less structured than coding in a programming language would require
- It is written in a combination of plain English and **reserved words** to outline the actions required at different steps of a procedure, or algorithm.
- It utilizes common symbols, and describes, in a detailed step-by-step manner, the processes used in the algorithm.
- Pseudocode is a tool for representing algorithms without the use of a particular programming language and related syntax.

Topic 2 – computational thinking and algorithms



- An algorithm is a procedural set of steps that follow a logical sequence, in order to solve a problem in a fixed amount of time, and may be free from syntactical details that may distract a user from the purpose of the algorithm
- Computational thinking is a problem solving approach that utilizes algorithmic thinking as part of solution development

Topic 3 – Study design links

Pseudocode introduction into the 2023 – 2027 study design occurs in the courses of Mathematical Methods and Specialist Mathematics.
References for Pseudocode can be found in

- Unit 1 and 2 Mathematical Methods, Outcome 2
- Unit 1 Specialist Mathematics, AOS 1 - logic and algorithms
- Unit 1 Specialist Mathematics, Outcome 1 – key knowledge and key skills
- Unit 1 and 2 Specialist Mathematics, Outcome 2
- Unit 3 and 4 Specialist Mathematics Unit 3 and 4, Outcome 1
- Unit 3 and 4 Mathematical Methods and Specialist Mathematics, Outcome 2

Topic 4 – Reserved and keywords

In describing statements or actions of the algorithm using pseudocode, the reserved and keywords include:

- **Algorithm**
- **define**
- **input**
- **for….from…to**
- **if.. then…else**
- **while**
- **return**
- **end if *or* end while *or* end for**
- **print**

Topic 5 – Conventions

When constructing an algorithm using pseudocode some of the expected conventions and principles include:

- One statement per line
- Indentations
- backward/reverse arrows
- Bold lettering of constructs or reserved words
- Ending nested processes with end keywords (end if, end for, end while)

Topic 6 – An example

An example for finding the smaller of two numbers *a* and *b*

Algorithm: minimum of two numbers

input *a*, *b*

    if $a \leq b$ **then**

        print *a*

    else

        print *b*

    end if

Words in bold are the reserved words. They indicate acknowledgements the algorithm needs to make (**algorithm**) or actions required (**input, if…then…else, print, endif**)

The indents form part of the writing convention for pseudocode

Topic 7 – Content conducive for pseudocode

Mathematical Methods

- Bisection
- Newton's Method for polynomials and other functions
- Simple simulations in probability
- Numerical integration (e.g. trapezium method)

Specialist Mathematics

- Numerical integration (e.g. Reimann sums)
- Investigation of sequences
- Vector operations (e.g. cross product)
- Sample distributions for means

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