DIGITAL TECHNOLOGIES HUB

Australian Curriculum V9.0

Algorithms

The precise sequences of steps and decisions needed to solve a problem, often involving iterative (repeated) processes

ACARA, 2022

Years 7–8

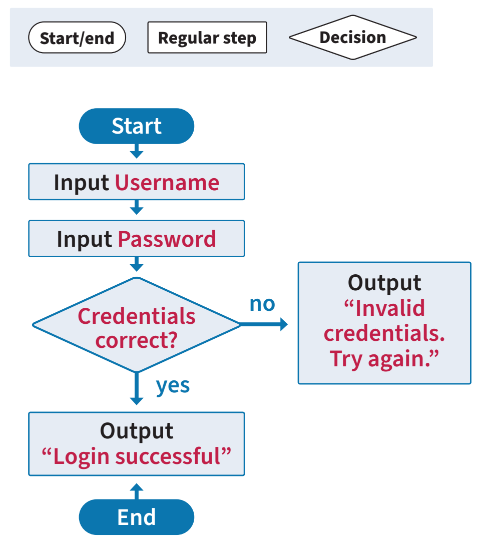
My algorithms involve multiple decisions and are designed using established conventions. I can manually step through them to understand their execution.

An algorithm can describe a sequence of steps and decisions using a flowchart or pseudocode.

For suggested resources

https://bit.ly/AlgorithmsYears7and8

A **flowchart** is a diagram that represents a set of instructions using standard symbols.



Pseudocode isn't a programming language but a less formal text with basic conventions. It includes INPUT for questions and DISPLAY/ OUTPUT for screen messages. It allows nested control structures like IF-THEN-ELSE within a FOR-NEXT loop.

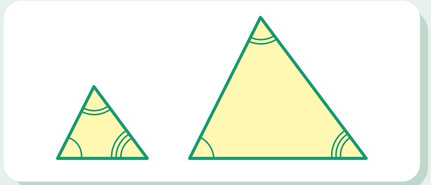
```
success ← false
WHILE NOT success DO
    username ← INPUT('Enter your username:')
    password ← INPUT('Enter your password:')
    IF username = storedUsername AND password = storedPassword THEN
        success ← true
    ELSE
        DISPLAY 'Invalid credentials. Try again.'
    ENDIF
ENDWHILE
DISPLAY 'Login successful.'
```

To **trace an algorithm**, follow each step as if you were a computer or robot running the program. Take note of outputs and variable values as needed.

Achievement standard	Students design and trace algorithms and implement them in a general-purpose programming language.
Content descriptions	Design algorithms involving nested control structures and represent them using flowcharts and pseudocode | Digital Technologies AC9TDI8P05 Trace algorithms to predict output for a given input and to identify errors | Digital Technologies AC9TDI8P06

Related content

Create an algorithm to sort and classify triangles based on congruency.



Mathematics	Design, create and test algorithms involving a sequence of steps and decisions that identify congruency or similarity of shapes, and describe how the algorithm works | Mathematics AC9M8SP04

Years 9–10

The decisions in the algorithms I create are based on more complex and formalised conditions. I can also test them with appropriate inputs.

An algorithm can describe a sequence of steps and decisions using pseudocode or a flowchart and can show complex branching or looping.

For suggested resources

https://bit.ly/AlgorithmsYears9and10

To **validate** an algorithm, test it with varied input data that you have selected *intentionally*. Does the algorithm respond as it should, or does it need to be improved? Typically this is done by classifying ranges of input values and showing that the algorithm produces expected results for boundary values of the range and all values in between.

```
How many books
were bought?
>> 0

Try again.
Minimum is 1.
```

```
How many books
were bought?
>> 1

OK. Total cost is
$39.95.
```

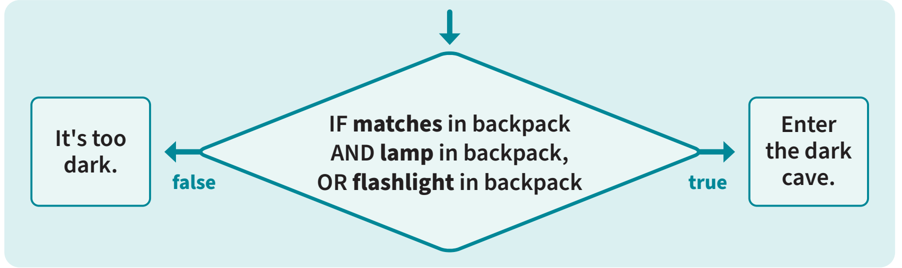
```
How many books
were bought?
>> 2

OK. Total cost is
$79.90.
```

```
How many books
were bought?
>> dog

OK. Total cost is
$FATAL ERR!
```

Sometimes the condition for branching or looping is more complex than a simple comparison check. The **logical operators** AND, OR and NOT allow combined conditions.

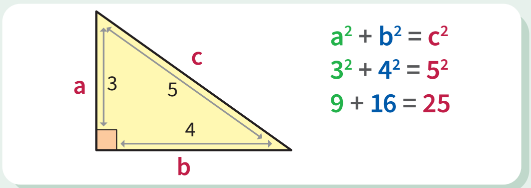


It's too dark.
false
IF matches in backpack AND lamp in backpack, OR flashlight in backpack
true
Enter the dark cave.

Achievement standard	Students design and validate algorithms and implement them, including in an object-oriented programming language.
Content descriptions	Design algorithms involving logical operators and represent them as flowcharts and pseudocode | Digital Technologies AC9TDI10P05 Validate algorithms and programs by comparing their output against a range of test cases | Digital Technologies AC9TDI10P06

Related content

Create an algorithm using pseudocode or flowcharts to generate Pythagorean triples.



$a^2 + b^2 = c^2$
$3^2 + 4^2 = 5^2$
$9 + 16 = 25$

Mathematics	Design, test and refine algorithms involving a sequence of steps and decisions based on geometric constructions and theorems; discuss and evaluate refinements | Mathematics AC9M9SP03

Find more resources at www.dthub.edu.au