Australian Curriculum: Digital Technologies

Year 3/4 and 5/6 Blockly Turtle Challenge

Tree

Overview

https://groklearning.com/course/aca-dt-mini-34-bk-tree/

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Introduction

Tree is an interactive entry-level Blockly Turtle coding challenge. Students learn to draw and decorate a tree with geometric shapes. The course addresses a number of the content descriptors of the Australian Curriculum: Digital Technologies and is a suitable entry point into teaching Digital Technologies for the year 3/4 and 5/6 cohorts.

Watch the 30-seconds teaser here: https://youtu.be/3g0P18-Bz_Q

Mapping against the Australian Curriculum: Digital Technologies

3/4 Band

Content Descriptor Code	Content Descriptor	Key Concepts	Addressed by Tree through:
ACTDIK008	Recognise different types of data and explore how the same data can be represented in different ways	Representations Types of data	Length and angles represented as Integers
ACTDIP010	Define simple problems, and describe and follow a sequence of steps and decisions (algorithms) needed to solve them.	Defining (Specification) Decompose problem Functional Requirements Constraints	Decomposition of problem into smaller components.
ACTDIP011	Implement simple digital solutions as visual programs with algorithms involving Branching (decisions) and user input	Designing (Algorithms) Tracing	Coding of geometric shapes: triangle, square, star with loops. Sizing of triangle via user input and decisions.
ACTDIP012	Explain how student solutions and existing information systems meet common personal, school or community needs	Evaluate program	User testing Comparison of software artifact against specification
ACTDIP013	Plan, create and communicate ideas and information independently and with others, applying agreed ethical and social protocols	Plan, create and communicate with others Manage projects Safety Social Contexts	Includes decomposition of problem into smaller components (shapes)

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5/6 Band

Content Descriptor Code	Content Descriptor	Key Concepts	Addressed by Tree through:
ACTDIK015	Examine how whole numbers are used to represent all data in digital systems	Representations Types of data	Length and angles represented as Integers
ACTDIP017	Define problems in terms of data and functional requirements drawing on previously solved problems	Defining (Specification) Decompose problem Functional Requirements Constraints	Decomposition of problem into smaller components.
ACTDIP018	Design a user interface for a digital system	Designing (Algorithms) UX	-
ACTDIP019	Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration (repetition)	Designing (Algorithms) Flowcharts Tracing	Loops to manage code repetition, decision to prevent tree exceeding canvas
ACTDIP020	Implement digital solutions as simple visual programs involving branching, iteration (repetition), and user input	Branching Iteration Tracing	Algorithms include branching, iteration, user input
ACTDIP021	Explain how student solutions and existing information systems are sustainable and meet current and future local community needs	Evaluate student / existing systems Sustainability; Current and future Innovation	User testing Comparison of software artifact against specification
ACTDIP022	Plan, create and communicate ideas and information, including collaboratively online, applying agreed ethical, social and technical protocols	Plan, create and communicate with others Manage projects Safety Social Contexts	Includes decomposition of problem into smaller components.

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What are students learning?

In this coding challenge, students learn about programming in Blockly, including data representation, decomposition, design, user input, branching, iteration, variables, tracing and evaluation. That's a broad coverage of the key concepts of the Australian Curriculum: Digital Technologies.

Synopsis

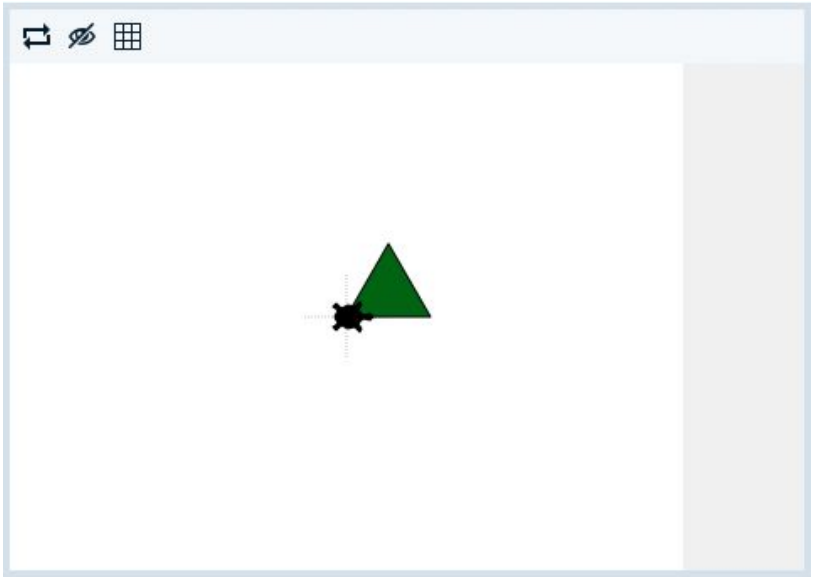
The students learn to draw a tree starting with a simple line. Three lines form a triangle and multiple triangles form the top of the tree. A square is added as the stem of the tree. By adding user input, the size of the tree can be altered. A simple decision ensures that trees only up to a certain size can be drawn.

Module overview

The challenge consists of five modules, which are summarised below.

Module 1: Triangle

This module sets the foundation of the coding challenge. Students learn how to draw lines and how to turn the turtle using angles in order to draw a single triangle. They simplify the triangle with the help of a loop and then fill it with colour.



Log on to Grok and start module 1, problem 0
https://groklearning.com/learn/aca-dt-mini-34-bk-tree/1/0/

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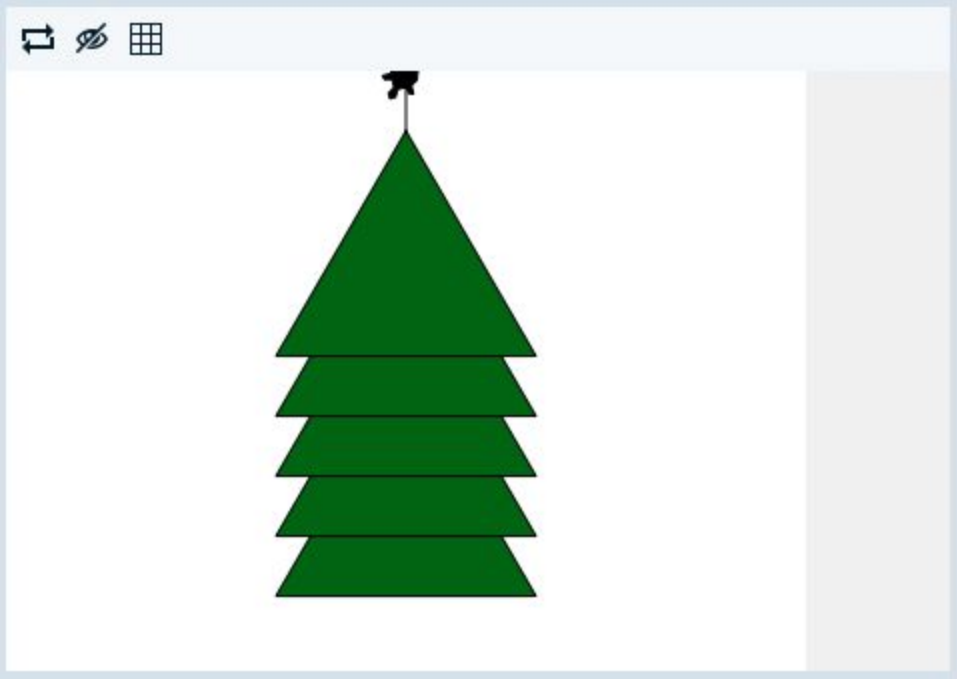
Module 2: Drawing a tree

This module is about the growth of the tree. Students apply their knowledge from the previous module to make two triangles and then tree. They then reflect on the length of their code and realise that making three triangles involves code repetition. This realisation serves as the rationale for the introduction of a loop. This module makes the point of avoiding code repetition through loops. By the end of this module, students will have coded five tree segments.

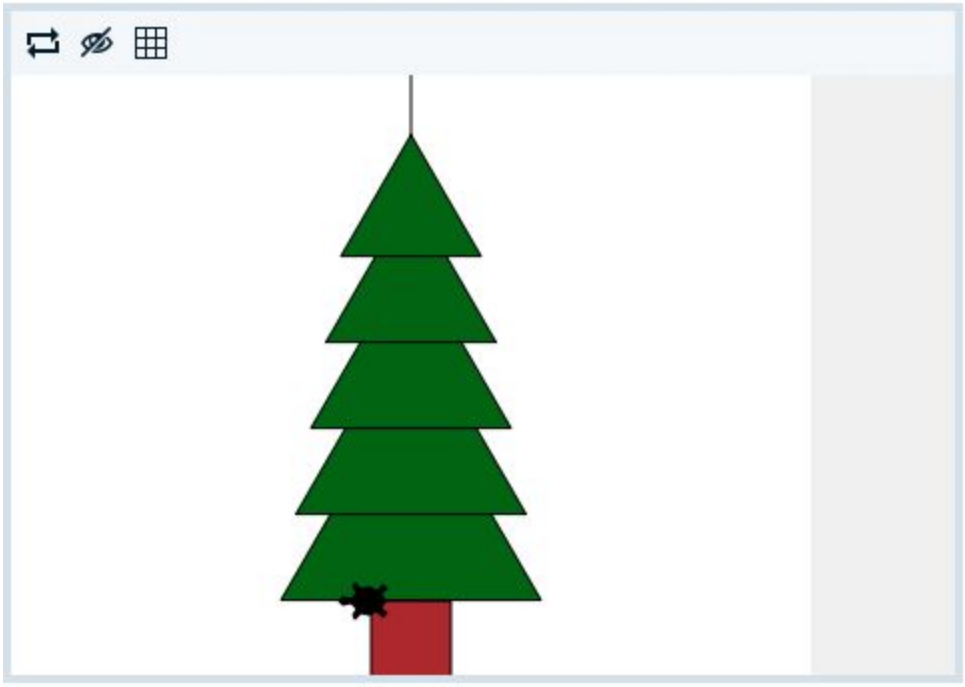


Log on to Grok and start module 2, problem 0
https://groklearning.com/learn/aca-dt-mini-34-bk-tree/2/0/

Module 3: Shaping the tree

In this module, students learn how to draw a tree that is wide at the base, but narrow at the top. This module introduces a variable that stores the side length of the triangle. In each iteration of the loop, the variable is reduced by 15 turtle steps.
Students further learn how to move the turtle without drawing a line (pen up and pen down)

At the end of the module, students apply their previous knowledge of how to draw a triangle to draw a square, which serves as the stem of the tree.



Log on to Grok and start module 3, problem 0
https://groklearning.com/learn/aca-dt-mini-34-bk-tree/3/0/

Module 4: Decorating the tree

The fourth module introduces two additional geometric shapes (circle and star). Students learn how to draw, colour, and position them on the screen. In the final playground task of this module, students can unleash their creativity to draw a Christmas tree of their own choosing.
This module only introduces two new block (positioning the turtle and setting the background colour). It otherwise re-uses concepts learned in the previous modules.

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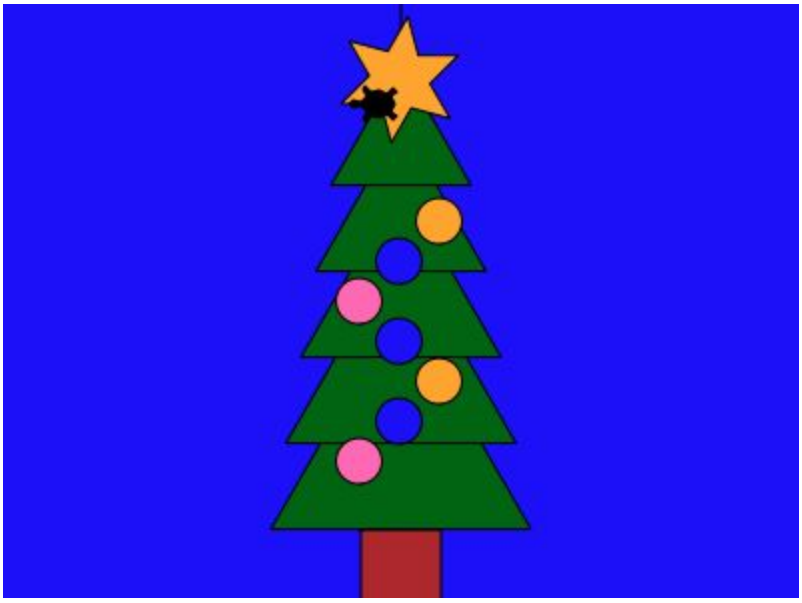
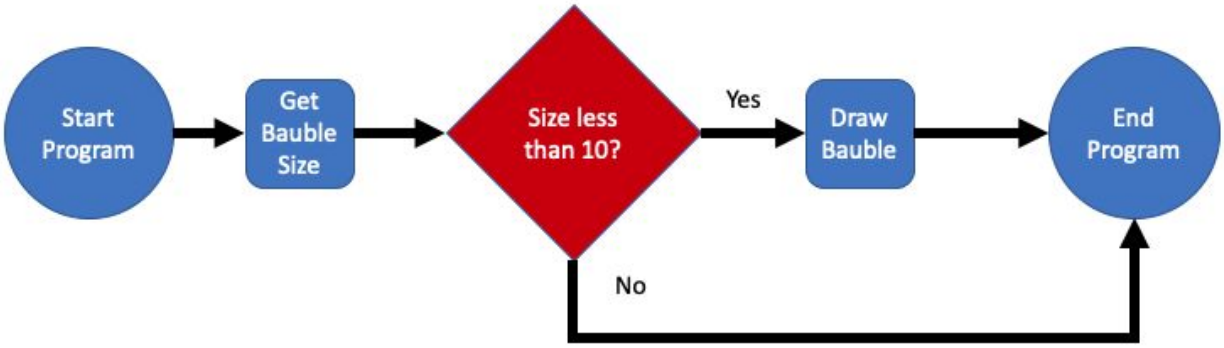


Log on to Grok and start module 4, problem 0.
https://groklearning.com/learn/aca-dt-mini-34-bk-tree/4/0/

Module 5: Interactive Baubles

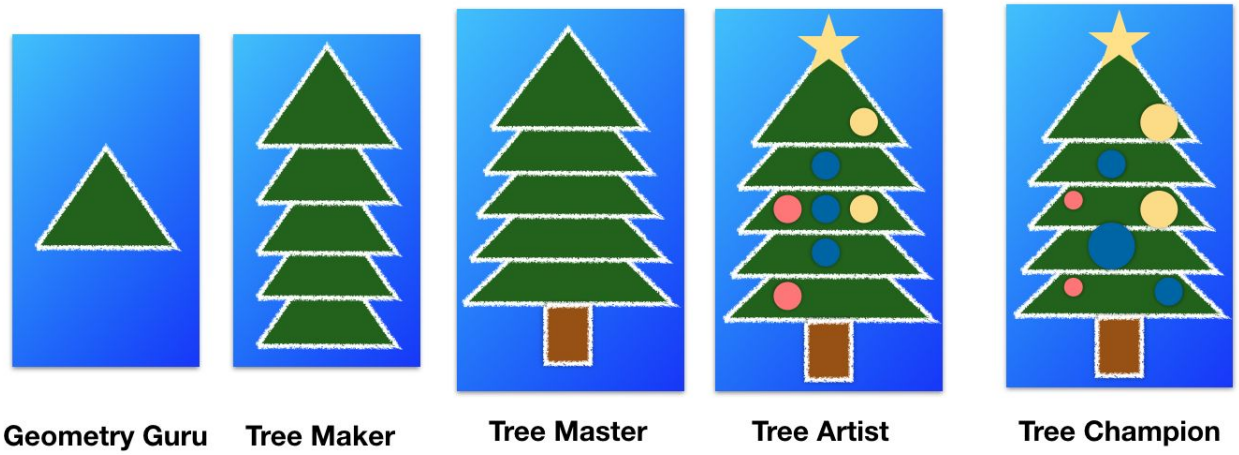
The final module introduces user input and decisions. Students add an input block, which reads user input and which sets the size of a bauble. In a second step, students add a decision block, so that the bauble is only drawn if its size is less than a set value (10 turtle steps). The algorithm is illustrated with a simple flowchart.



Log on to Grok and start module 5, problem 0.
https://groklearning.com/learn/aca-dt-mini-34-bk-tree/5/0/

Badges

At the end of the modules, students receive a badge in the following order:



Related topics

Whilst the topic of drawing a tree is of course engaging and entertaining for the young minds, we invite and encourage teachers to explore with their students the more general role that trees play:

Nature and the Environment

- What is the role of trees and forests in our ecosystem?
- What different types of trees do we have in our area/state/Australia?
- What happens to the environment when trees are missing?
- What products do tree make? (wood, fruit, oils, juices, e.g. maple syrup)

Culture

- Why do people decorate trees at Christmas?
- What other cultural uses of trees do you know?

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