Title: Cutting Shapes Task

Purpose: To develop students' ability to generate and evaluate mathematical arguments

> ## 'If a piece is cut off a two-dimensional shape it reduces both the area and the perimeter'
> Investigate this statement.
> What conclusions can be drawn?
> Justify your reasoning.

This task can be used to develops students' understanding of the generation and evaluation of mathematical arguments. It is suggested that this should be a focus of the plenary. Please note, this task is not an example of a Classroom-Based Assessment.

Students should be encouraged to explain and justify their reasoning in relation to the generalisation or mathematical argument they generate. Reasoning is often done verbally, and accurate use of mathematical language should be developed. Students should also be encouraged to use the *Problem-Solving Toolkit* from CPD day 2018-19 to identify and note the tools and skills they are using and learning about. Where appropriate, students should be alerted to the difference between reasoned justification and formal proof.

The task is aligned to many of the Unifying strand's learning outcomes from the Junior Cycle Mathematics specification. For example, the teacher may choose to focus on:

- U4 Represent a mathematical situation in a variety of different ways, including numerically, algebraically, graphically, physically, in words; and to interpret, analyse, and compare such representations
- U8 apply their knowledge and skills to solve a problem, including decomposing it into manageable parts and/or simplifying it using appropriate assumptions
- U11 generate general mathematical statements or conjectures based on specific instances

The task is linked to the following contextual strand learning outcomes from the Junior Cycle Mathematics specification:

- GT2 investigate 2D shapes so that they can:
  c) find the perimeter and area of plane figures made from combinations of discs, triangles, and rectangles, including relevant operations involving pi
- AF1 investigate patterns and relationships so that they can:
  a) represent these patterns and relationships in tables and graphs
- AF2 investigate situations in which letters stand for quantities that are variable

It may be necessary to reduce the difficulty level of the task. Planned questioning may be useful to guide students towards a generalisation or mathematical argument. It is recommended, however, that scaffolding be kept to a minimum to allow students to apply their knowledge in unfamiliar situations and create a need for the construction of new knowledge. If the task is scaffolded students may engage with the task multiple times over the three years of Junior Cycle.

The task allows for the reinforcement of students' knowledge and understanding from the relevant aspects of the Shape and Space strand of the primary school curriculum, while simultaneously providing an opportunity for extension and enrichment for students who may have fully grasped these concepts before commencing first year in post-primary. A Quick Reference Guide to the Links between the Primary and Post-Primary Curricula can be found here.
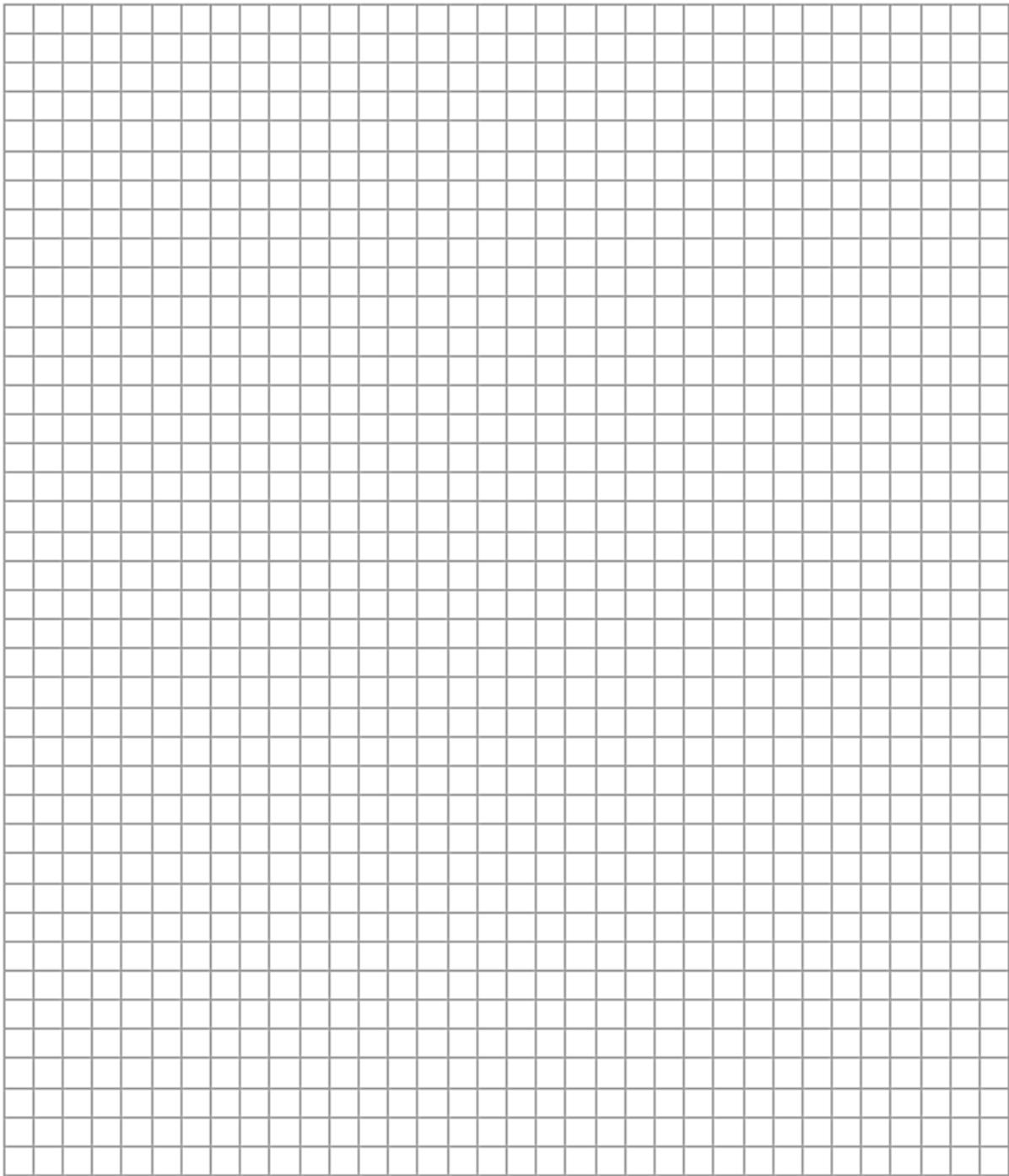
Please see below for possible extension questions/tasks that may provide an opportunity for deeper learning for students.
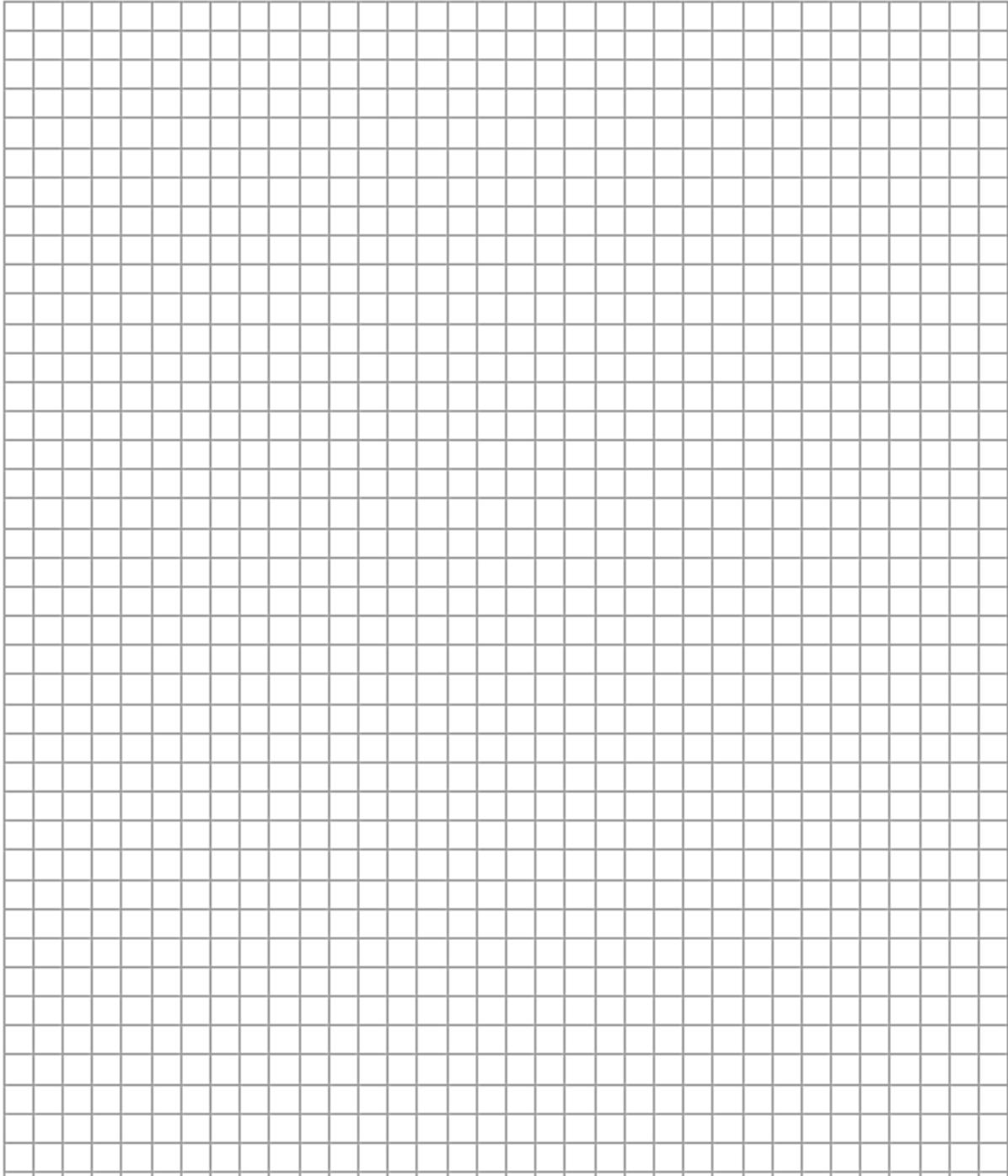
'If a piece is cut off a two-dimensional shape it reduces both the area and the perimeter'
Investigate this statement.
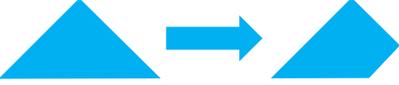What conclusions can be drawn?
Justify your reasoning.

Possible prompts or extension tasks / questions for student

Please note: Measurements not included – prompts only

Possible prompts for triangles	Further questions
	When a piece is cut off this shape (perpendicular to the base) you: a) Reduce its area b) Reduce its perimeter Investigate this statement. What conclusions can be drawn? Justify your reasoning.
	When a piece is cut off this shape (parallel to a side) you: a) Reduce its area b) Reduce its perimeter Investigate this statement. What conclusions can be drawn? Justify your reasoning.
Possible prompts for quadrilaterals	**Further questions**
Square	What happens to the area and perimeter of a square when a piece is cut off the shape? Can your observations be generalised? What happens to the area and perimeter when a section is cut from inside the square?
Rectangle	What happens to the area and perimeter if a triangle is cut off a rectangle?
Rectangle	What happens to the area and perimeter if a rounded section is cut from a rectangle? What happens to the area and perimeter if a series of rounded sections are cut from the rectangle's edges?