



Oide

Tacú leis an bhFoghlaim
Ghairmiúil i measc Ceannairí
Scoile agus Múinteoirí

Supporting the Professional
Learning of School Leaders
and Teachers

Mathematics

Professional Learning Booklet 2024-2025





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Introduction

Key Message

Students need exposure to active learning to develop geometric thinking.

Learning Intentions

- To consider how to develop students' geometric thinking
- To increase opportunities for meaningful student engagement with geometrical concepts

Schedule

09:00 – 09:15	Registration
09:15 – 11:00	Session 1: Developing students' geometric thinking
11:00 – 11:30	Break
11:30 – 13:00	Session 2: Student exploration of geometric concepts
13:00 – 14:00	Lunch
14:00 – 15:45	Session 3: Designing learning experiences

Resources

<https://padlet.com/oideppmaths/oidemaths24>

Contact Information

Website: <https://oide.ie/post-primary/home/mathematics/>

Mailing List: <https://tinyurl.com/oidemaillist>

X handle: @Oide_PPMaths

Session 1

Learning Intention:

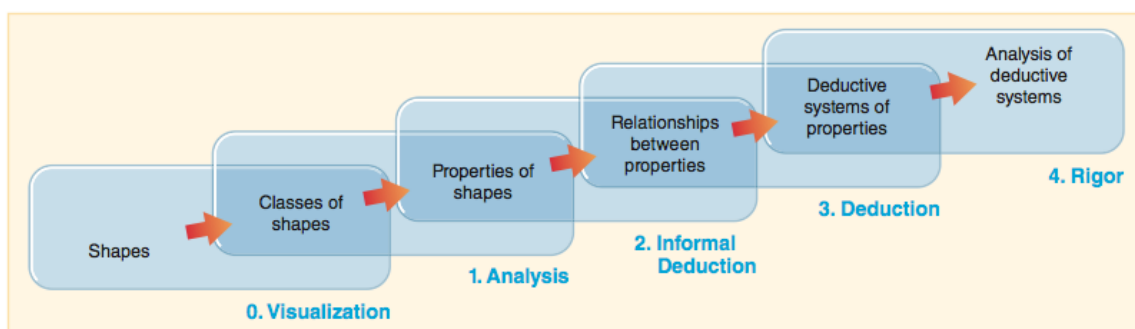
To consider how to develop students' geometric thinking.

Success Criteria:

I have

- reflected on challenges in the learning and teaching of geometry
- been provided with an overview of pedagogical theory
- considered how this theory applies to my classroom practice
- engaged with geometric tasks and considered how these tasks provide access for diverse learners
- explored the role of mathematical language

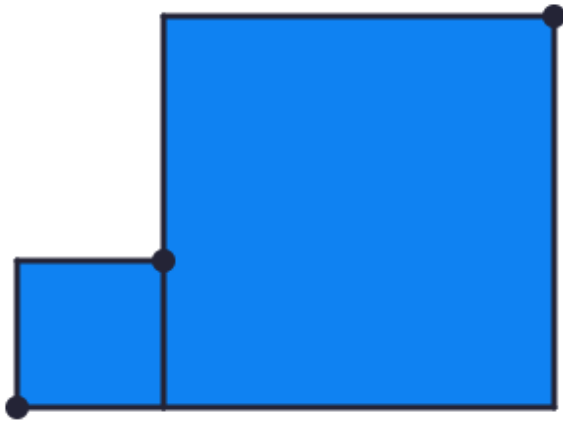
Van Hiele Theory of Geometric Thought



	Students at this level		Supporting Activities
Level 0 (Visualisation)	<ul style="list-style-type: none"> • can distinguish individual shapes • can not identify properties or classes 	'It looks like a square' 'A door is a rectangle'.	Sorting shapes Find a rule Physical manipulatives
Level 1 (Analysis)	<ul style="list-style-type: none"> • Recognise that shapes have different properties • consider shapes within a class 	Identify rectangles regardless of size and orientation. Work with properties of rectangles	Property lists Class lists
Level 2 (Informal Deduction)	<ul style="list-style-type: none"> • see relationships between properties 	If it is a square, it must be a rectangle. A rectangle is a parallelogram with right angles	Informal logical reasoning tasks Digital manipulatives
Level 3 (Deduction)	<ul style="list-style-type: none"> • Analyse informal arguments 	Appreciate the need for proof	Explore abstract statements

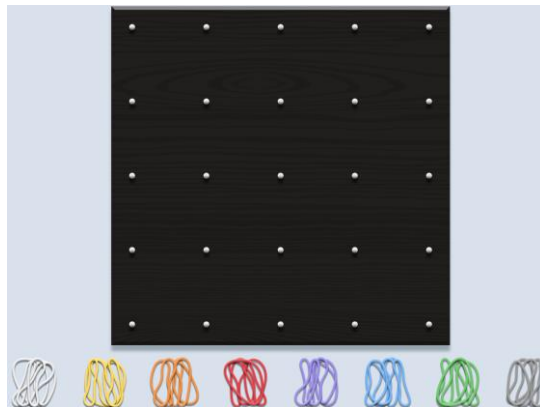
Van de Walle et al. (2020) page 549

Student Activity 1A



What do you notice?

Student Activity 1B



Investigate:

Create two squares on your geoboard

How many ways can you arrange two touching squares so that the dots are collinear?

Success Criteria:

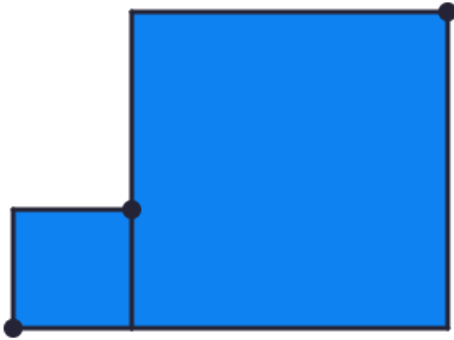
I can

- use my Geoboard to construct a square
- move the small square to find one set of collinear points
- identify an alternative location with collinear points
- find multiple solutions

Extensions

- find a new solution(s) if the squares do not need to be touching
- write a rule to describe how the location of my squares results in collinear points

Student Activity 1C



Investigate:

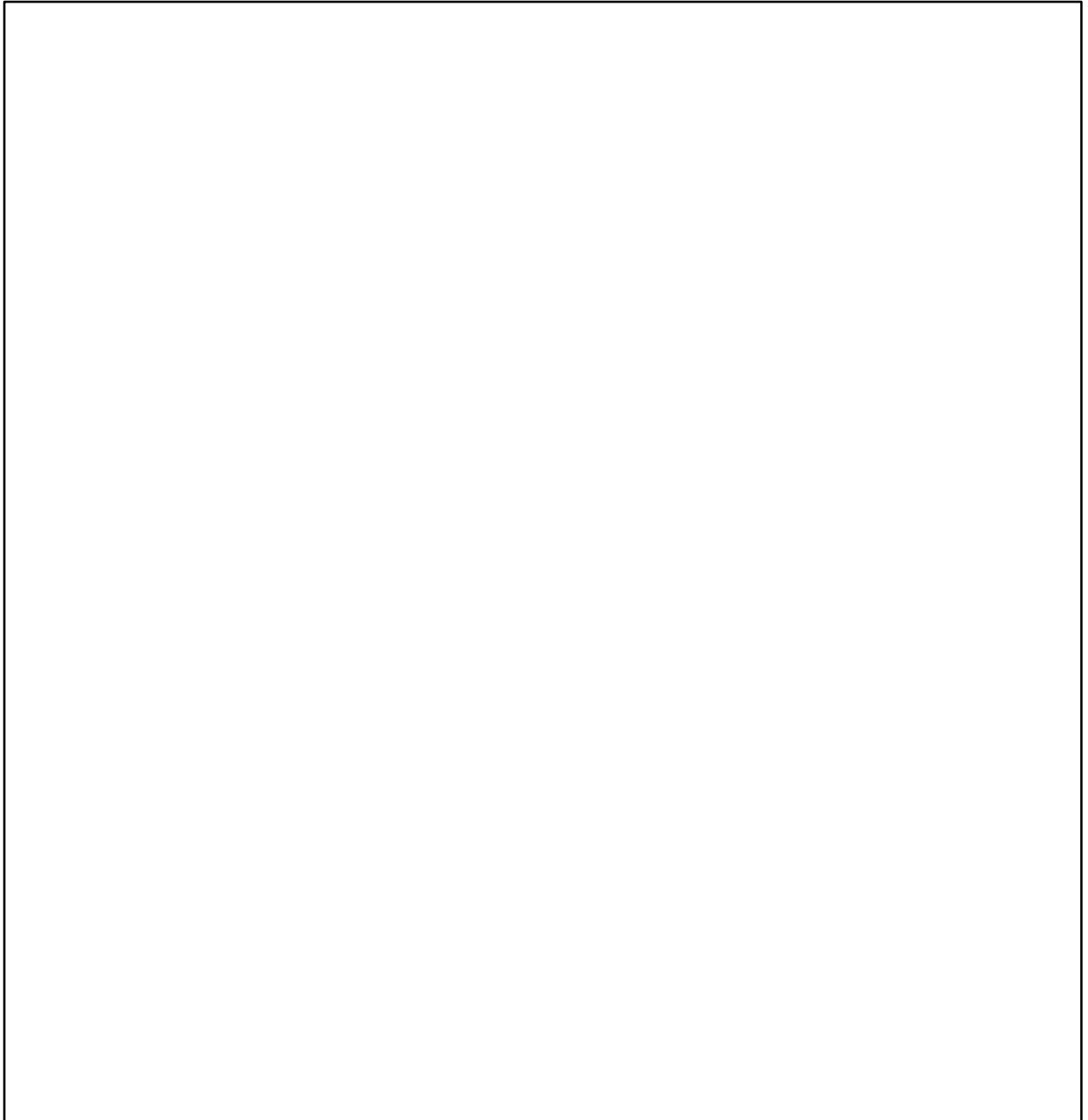
When the squares are side by side as shown in the diagram, is it possible for the dots shown on the vertices to be collinear?

Justify your solution.

Student Activity 1D

What happens if you vary the size of the squares?

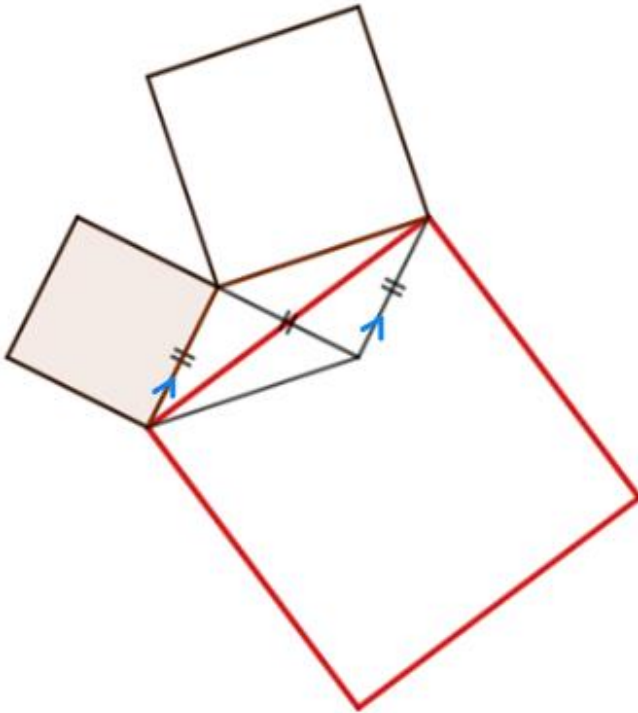
What do you notice?

A large, empty rectangular box with a thin black border, intended for students to write their answers to the questions above.

Unfamiliar Context

Task: Three squares are constructed as shown.

Prove that the area of the red square is five times the area of the shaded square.



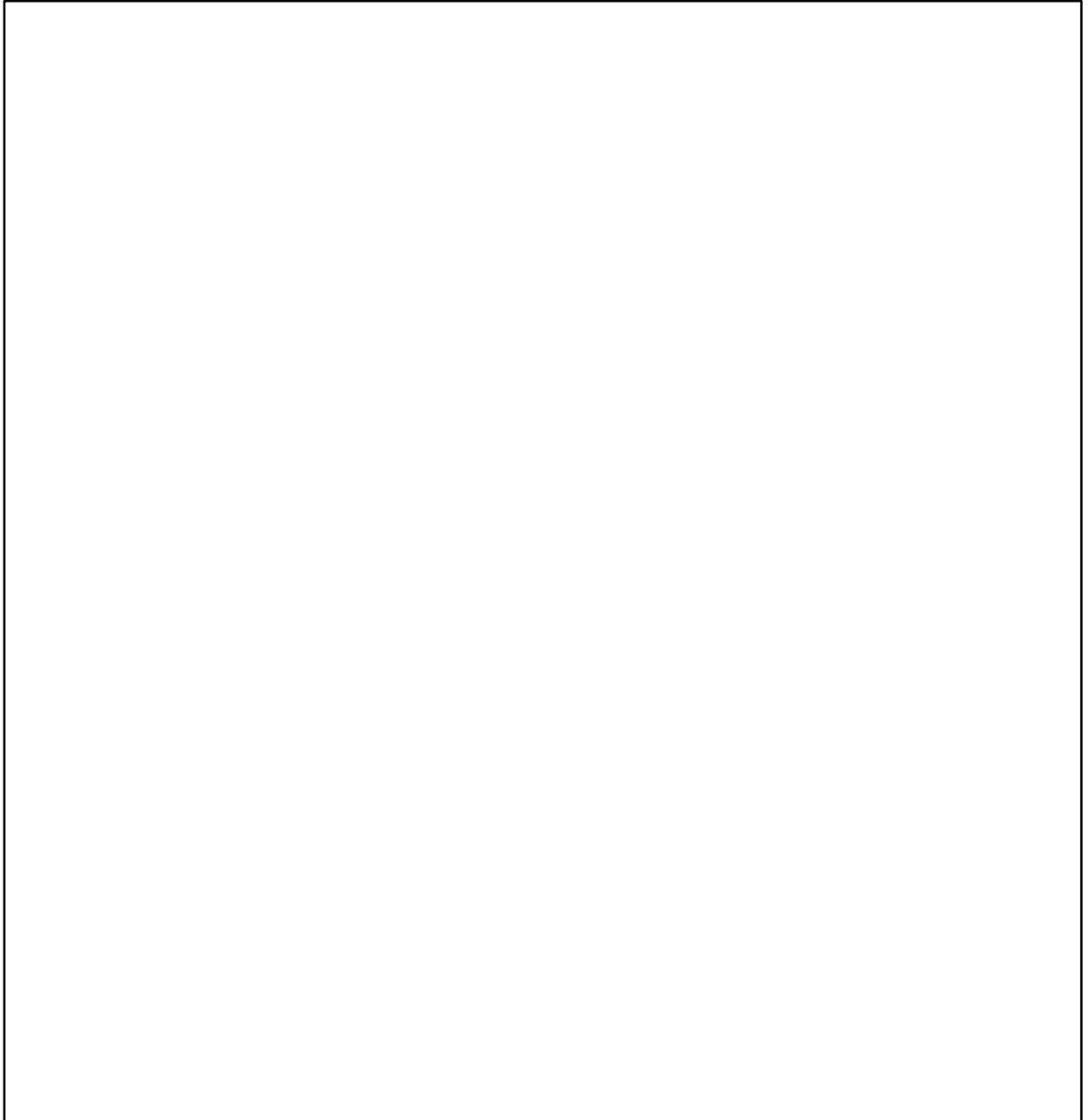
Success Criteria

- I can sketch the diagram
- I can identify all relationships that I see on the diagram
- I can classify each of these relationships
- I can use the relationships to deduce that the area of the red square is five times the area of the shaded square
- I can formalise my proof
- I can generate more than one approach

Reflection

What was the key learning for you from this session?

How can you bring the learning to your classroom?

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Session 2

Learning Intention:

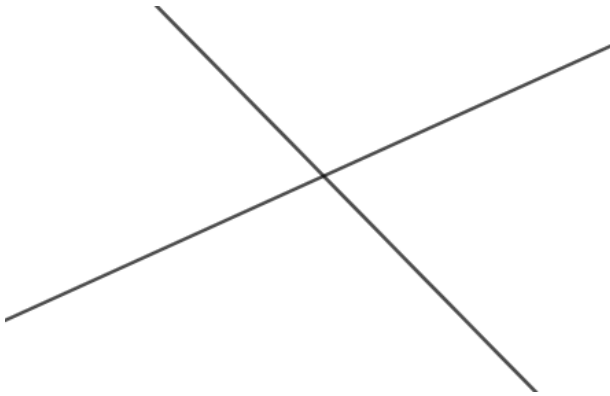
To consider how to develop students' geometric thinking.

Success Criteria:

I have

- collaborated to identify important concepts and activities students need to experience before engaging with formal proof
- explored how to support the development of my students' geometric thinking through choice of activity
- considered how the use of manipulatives supports students' engagement with geometry

Student Activity 2A



What do we notice?

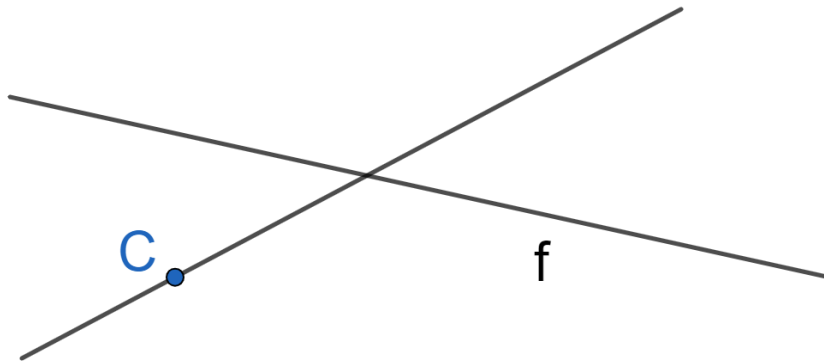
Success Criteria

I have

- measured one angle with my protractor.
- measured all four angles.
- identified a relationship between two angles
- identified another relationship between two angles
- used my GeoStrips to investigate a relationship

Extension: Write a rule to describe a relationship. Is this rule always/sometimes/never true?

Student Activity 2B



Draw a line parallel to the line f through the point C . What do you notice?

Success Criteria

I can

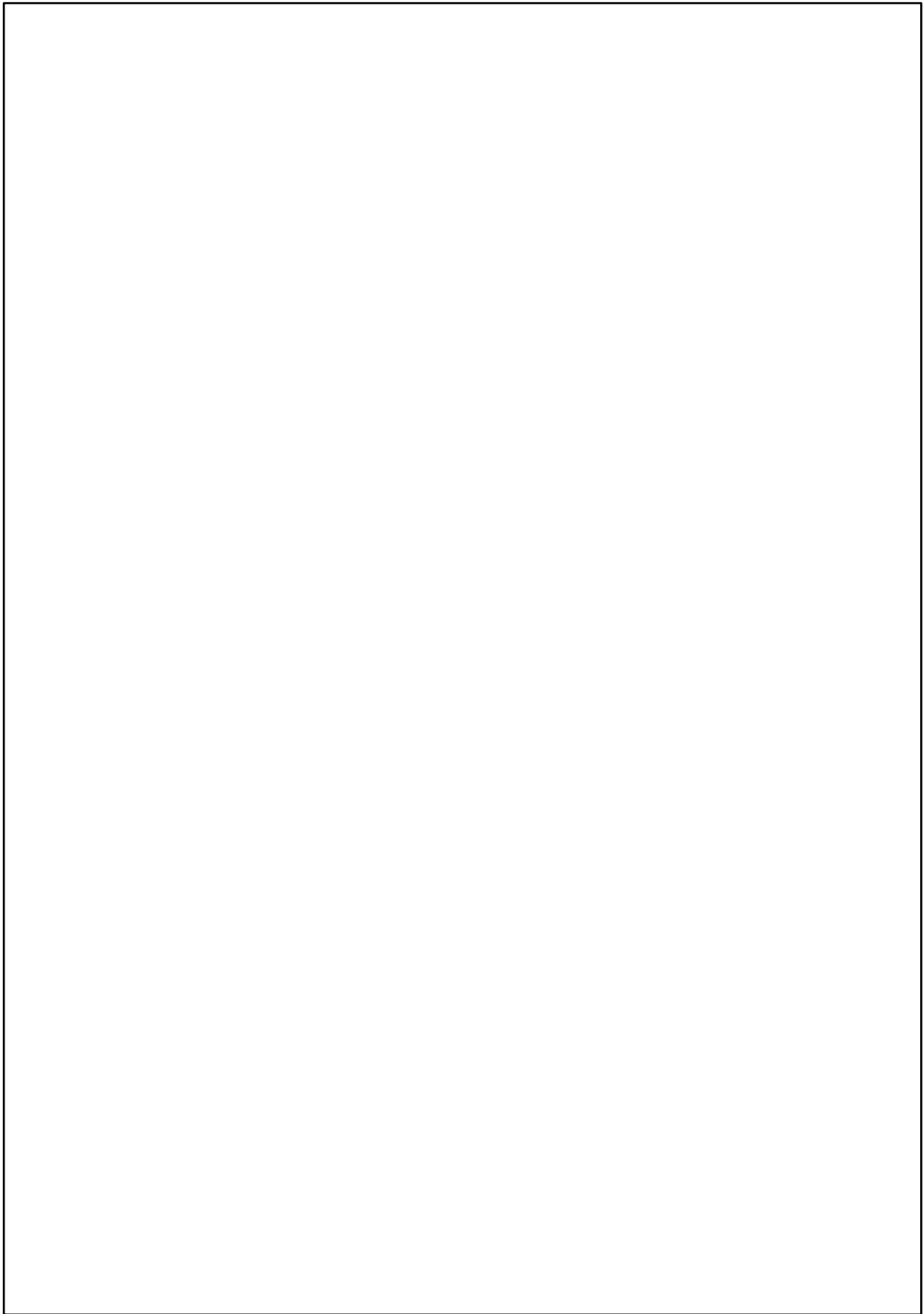
- draw a line through the point C
- explain why my line is parallel to f
- identify angles on my diagram
- make a conjecture about two angles
- identify a new relationship to investigate

I have

- used my protractor to investigate
- discussed my thinking with my group
- summarised my findings

Extension: Write a rule to describe a relationship.

- Is this rule always/sometimes/never true?



Student Activity 3



Draw a triangle and measure all the dimensions.

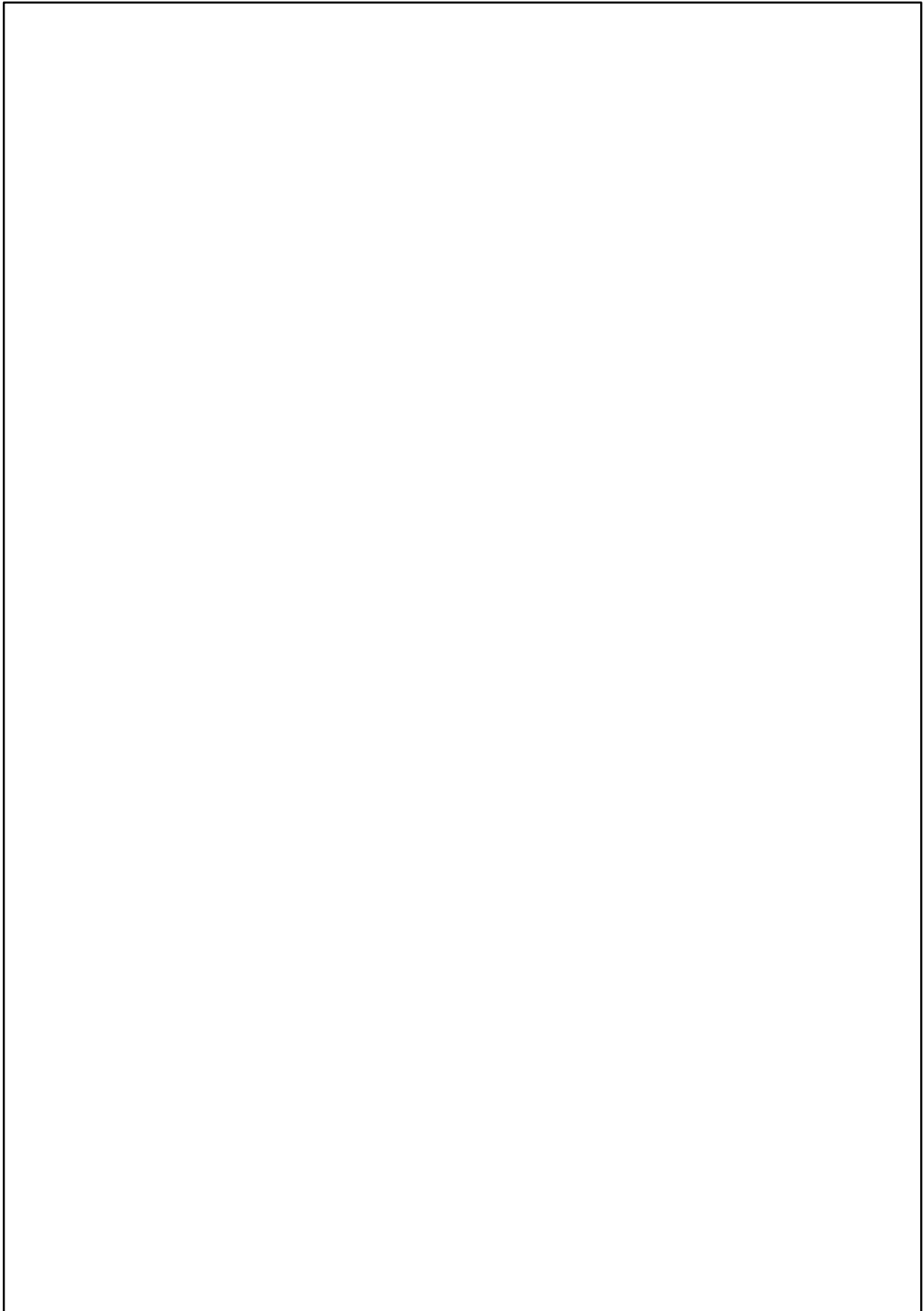
Give your partner the minimum number of measurements needed to construct the same triangle?

Success Criteria

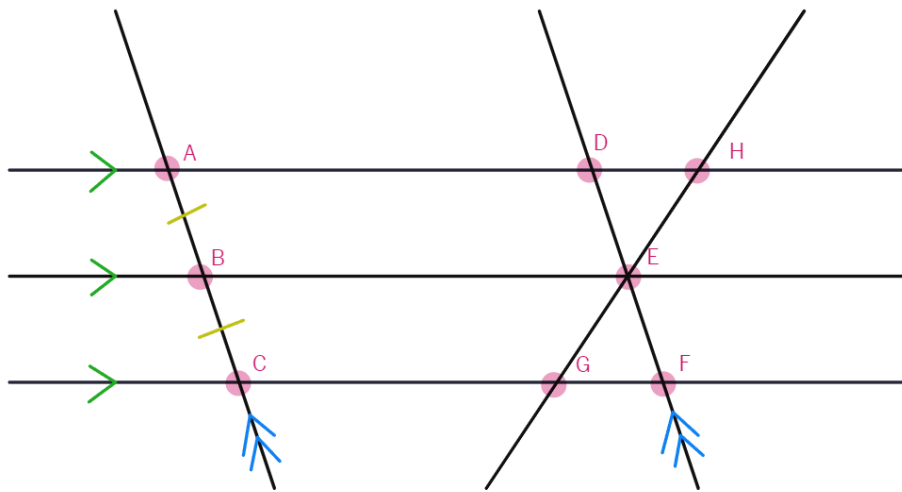
I have

- used a straight edge to draw a triangle
- measured and labelled the dimensions
- generated a list of instructions
- constructed my partners triangle
- verified my partners triangle is identical
- discussed with my partner why my solution has the minimum number of instructions
- investigated with my partner if there is an alternative list of instructions for my triangle

Extension: Write a rule to describe the minimum numbers of instructions needed to create any triangle.



Student Activity 4



Investigate:

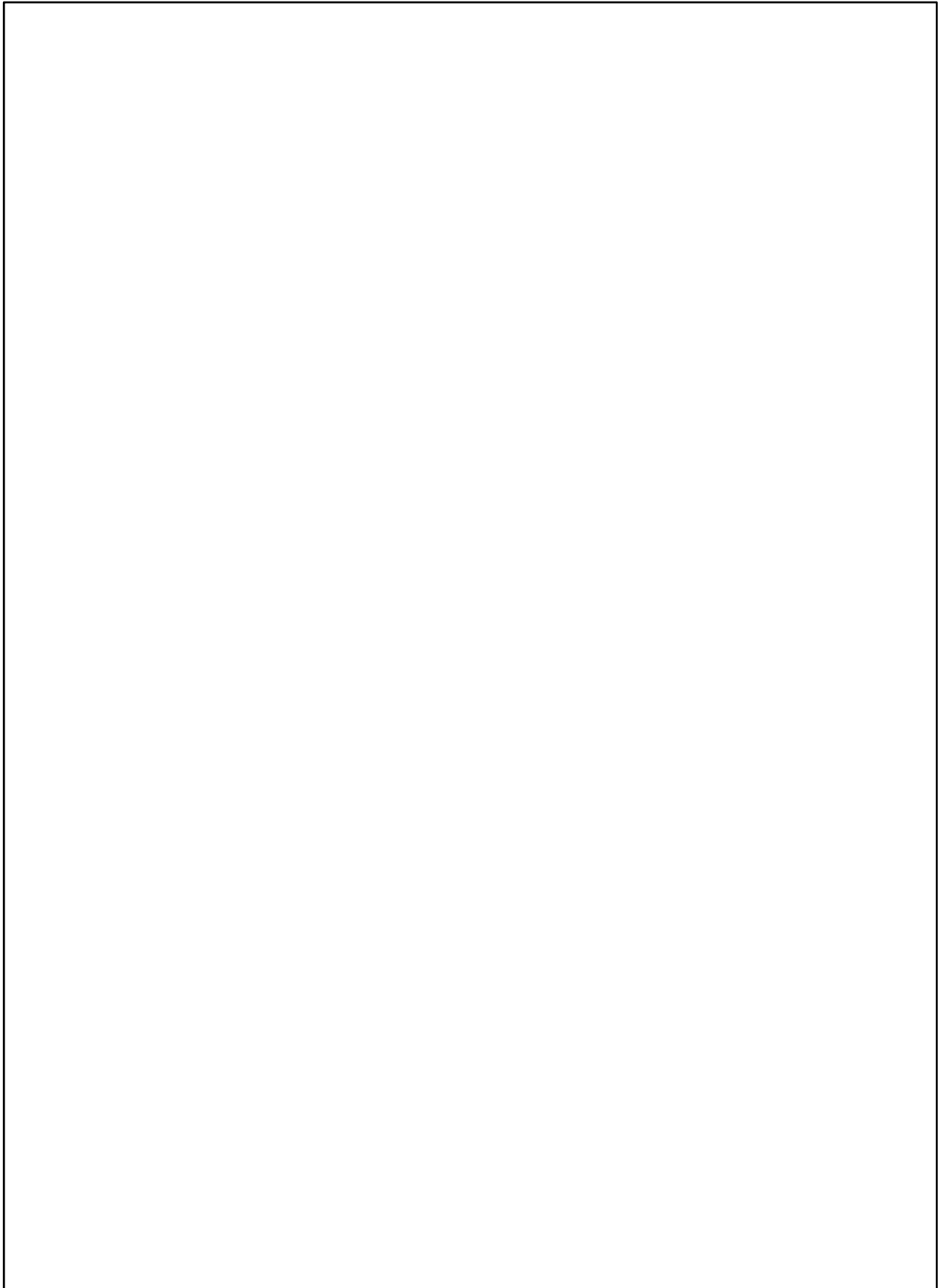
Are the other two sides equal?

Success Criteria

I have

- identified relationships on the diagram
- justified each of these relationships
- discussed my thinking with my partner
- provided a convincing argument to answer the question posed

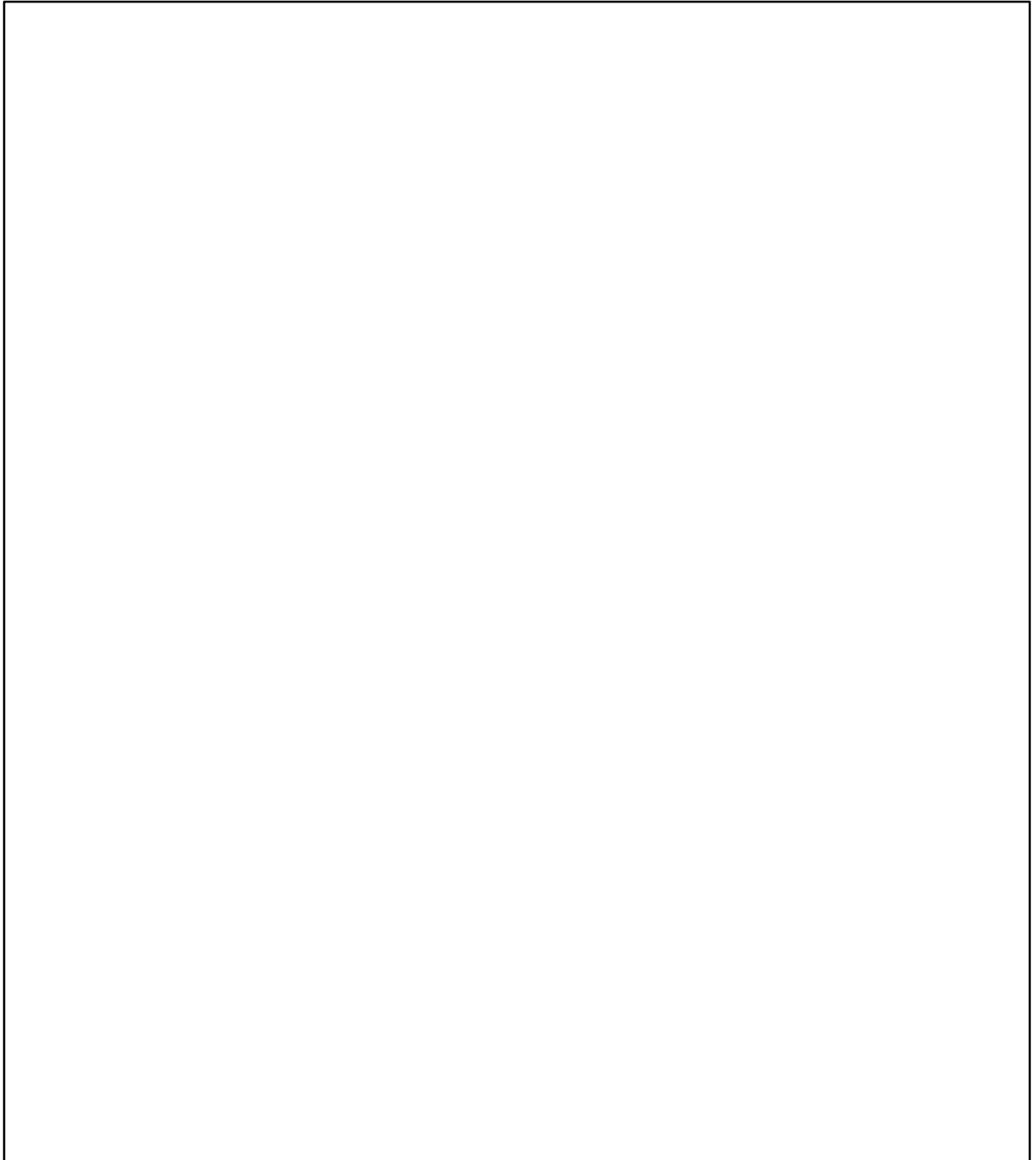
Extension: Write a proof to support your investigation



Reflection

What was the key learning for you from this session?

How can you bring the learning to your classroom?

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Session 3

Learning Intention:

To increase opportunities for meaningful student engagement with geometrical concepts

Success Criteria:

I have

- worked with a group to choose/create an activity
- created supporting activities for diverse learners
- reflected on the learning from this event

I can

- create learning experiences that will support the development of my students' geometric thinking

Design a Learner Experience (1)

Identify a concept to explore involving quadrilaterals

Success Criteria

I have

- discussed the concepts within the quadrilaterals section located within the appendix
- identified one concept to explore within this topic
- chosen a student group and identified the context

Design a Learner Experience (2)

Create a learner experience to explore quadrilaterals.

Success Criteria

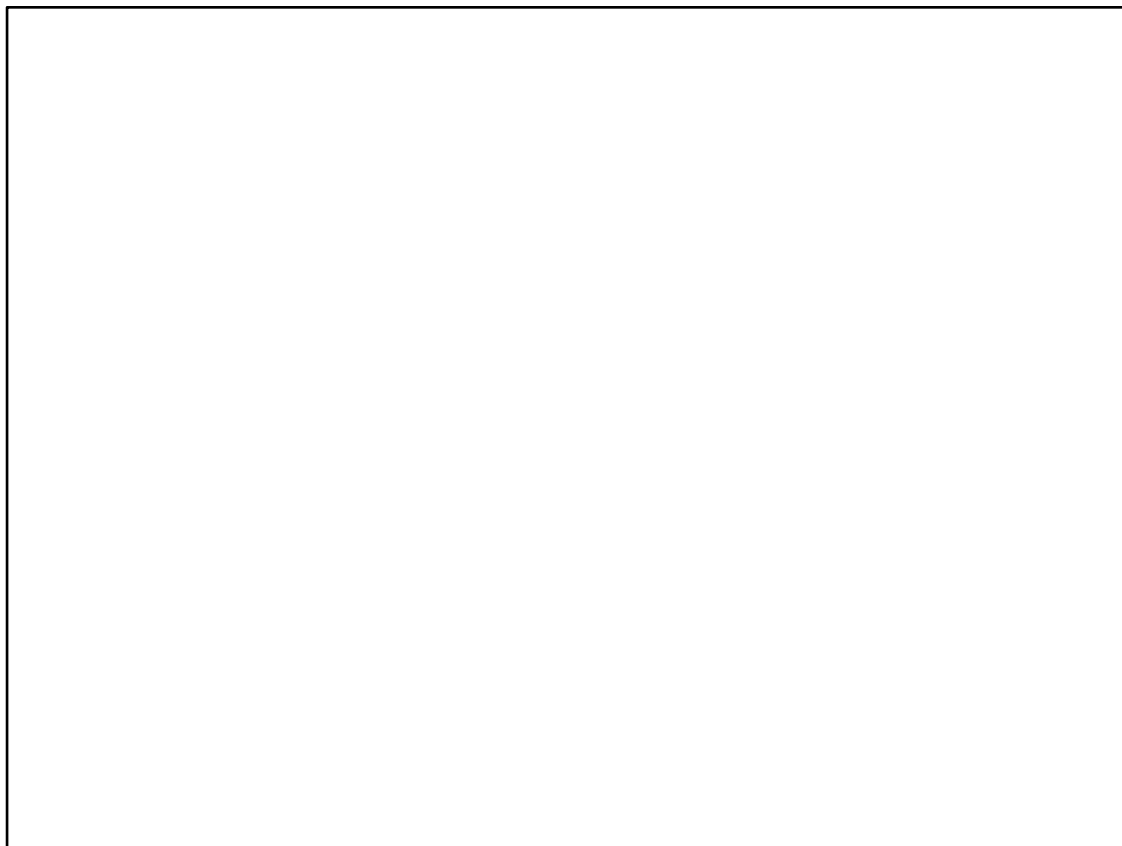
I have

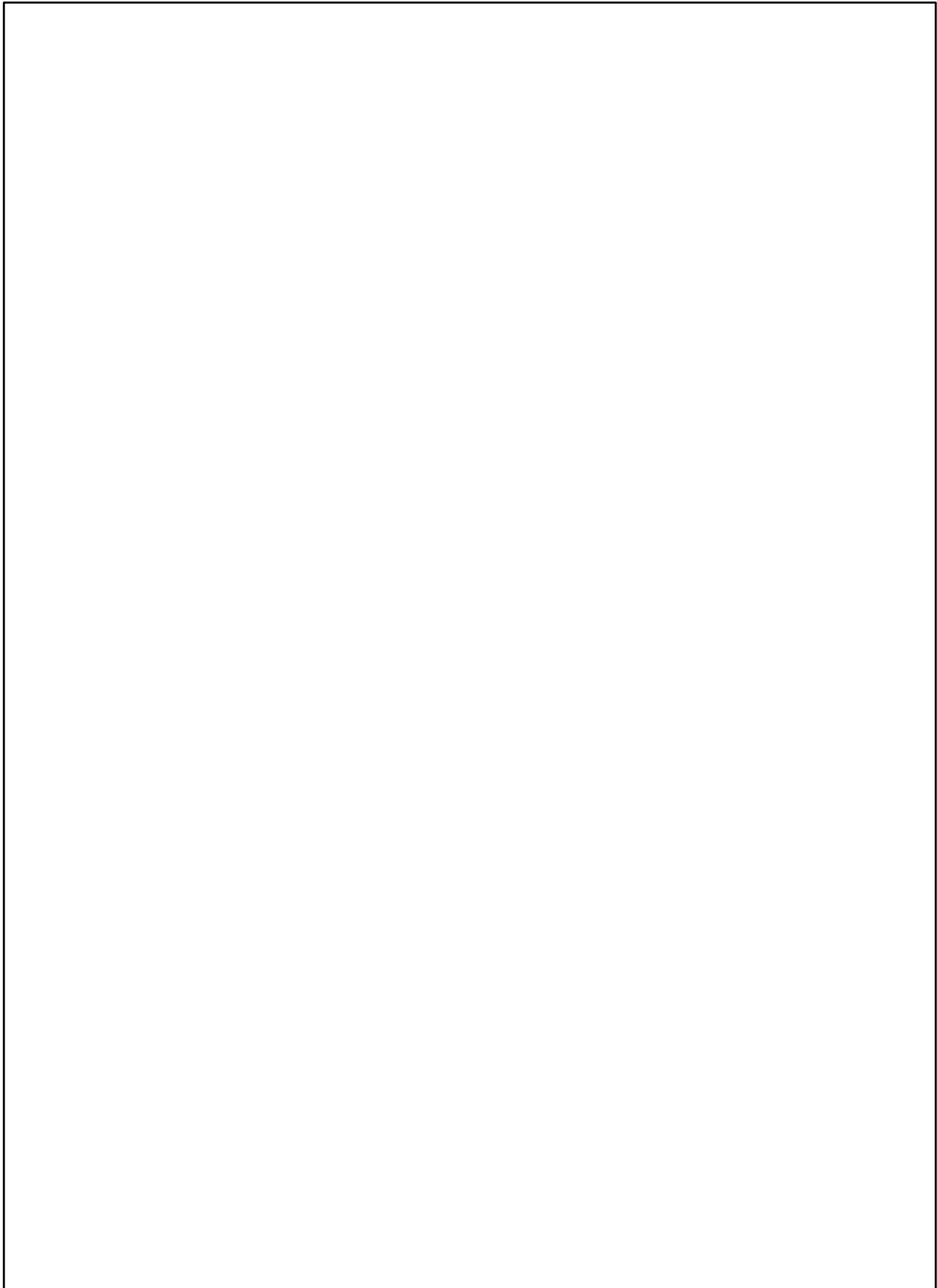
- designed an activity to support engaging with our chosen concept
- produced supporting activities to support our diverse learners
- included the use of digital and physical manipulatives
- created a presentation describing my learner experience

Extension:

I have

- made links to a construction(s)
- made connections with other concepts within the syllabus/specification
- included a real-world situation to explore

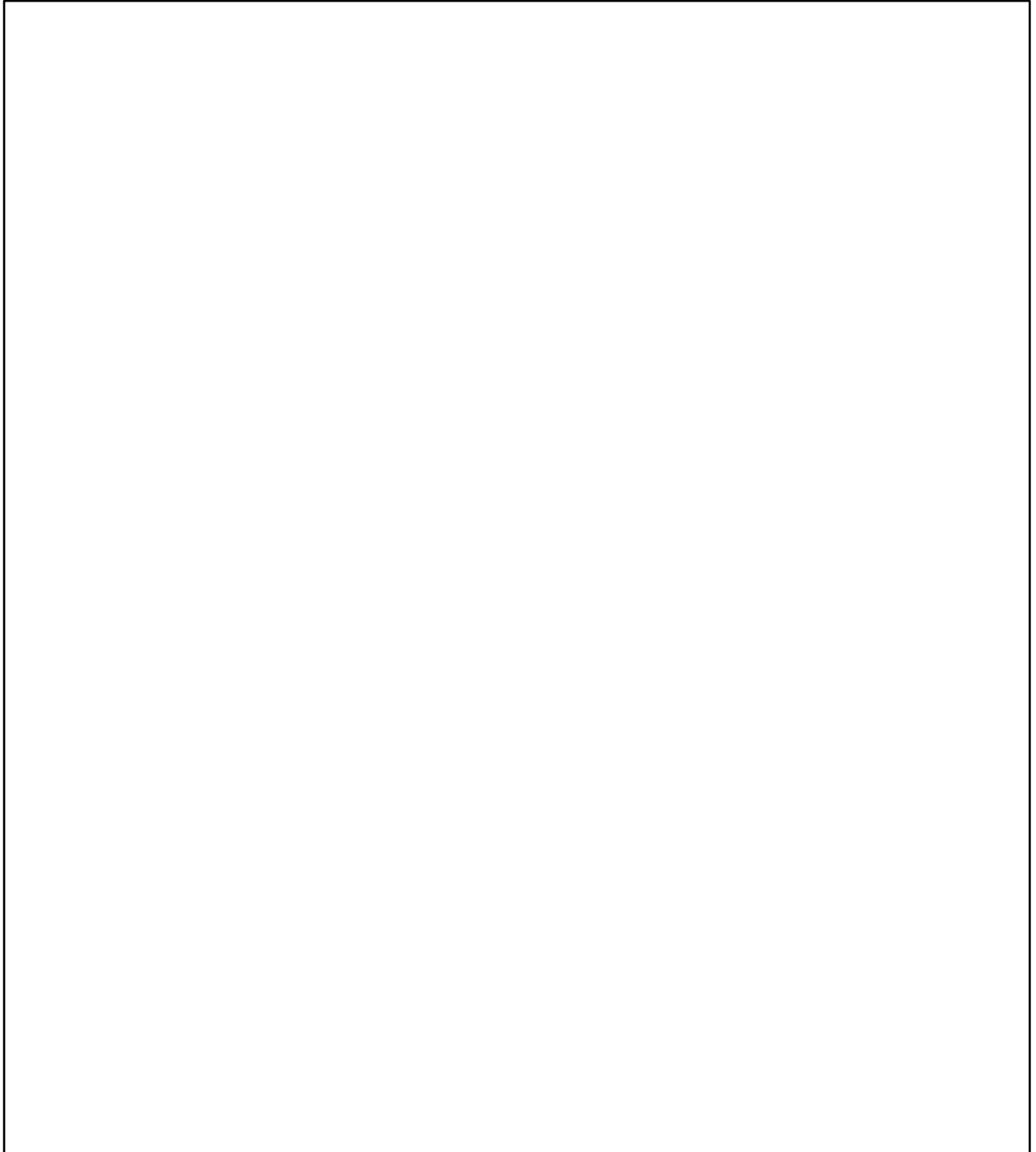




Reflection

What was the key learning for you from this session?

How can you bring the learning to your classroom?

A large, empty rectangular box with a thin black border, intended for the user to write their reflections in response to the questions above.

References

- DES. (2023) Looking at Mathematics: Draft Guide for Post-Primary Schools.
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- Van der Walle et al (2020) Elementary and Middle School Mathematics 10th Edition. UK