Oide

Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professional Learning of School Leaders and Teachers

Mathematics

2023 – 2024 Core Cluster

Oide

Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professional Learning of School Leaders and Teachers

Welcome to the online cluster day for Mathematics.

You are now logged in.

Before the day commences, you might like to have a pen, a calculator and paper nearby. A cup of tea or coffee might be nice also.

I'm looking forward to working with you today.

The first session will begin at 9:30am.

Padlet for today

@Oide_PPMaths

Introducing Oide

Oide

Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professional Learning of School Leaders and Teachers

Lárionad Ceannaireachta Scoile
CSL
Centre for School Leadership

An tSraith Shóisearach do Mhúinteoirí
JuniorCYCLE for teachers

NIPT
An Clár Náisiúnta Ionduchtaithe do Mhúinteoirí
The National Induction Programme for Teachers

PDST
Professional Development Service for Teachers | An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

Oide Mathematics Support

- Subject CPD Cluster Day
- Electives
- School Support
- Collaboratives
- Communications & Social Media
  - https://oide.ie/post-primary
  - @Oide_PPMaths

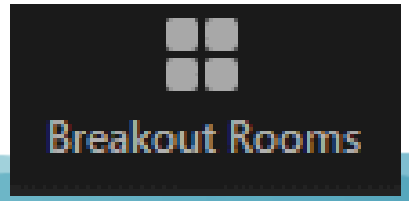
Zoom functions

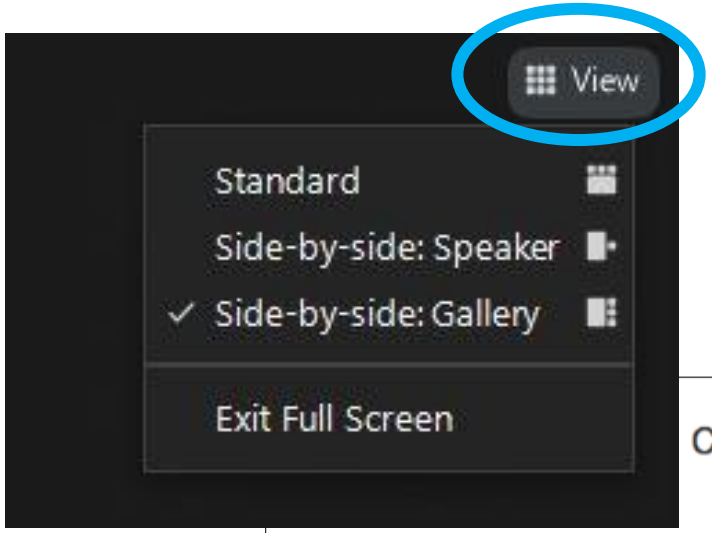
Speaker view

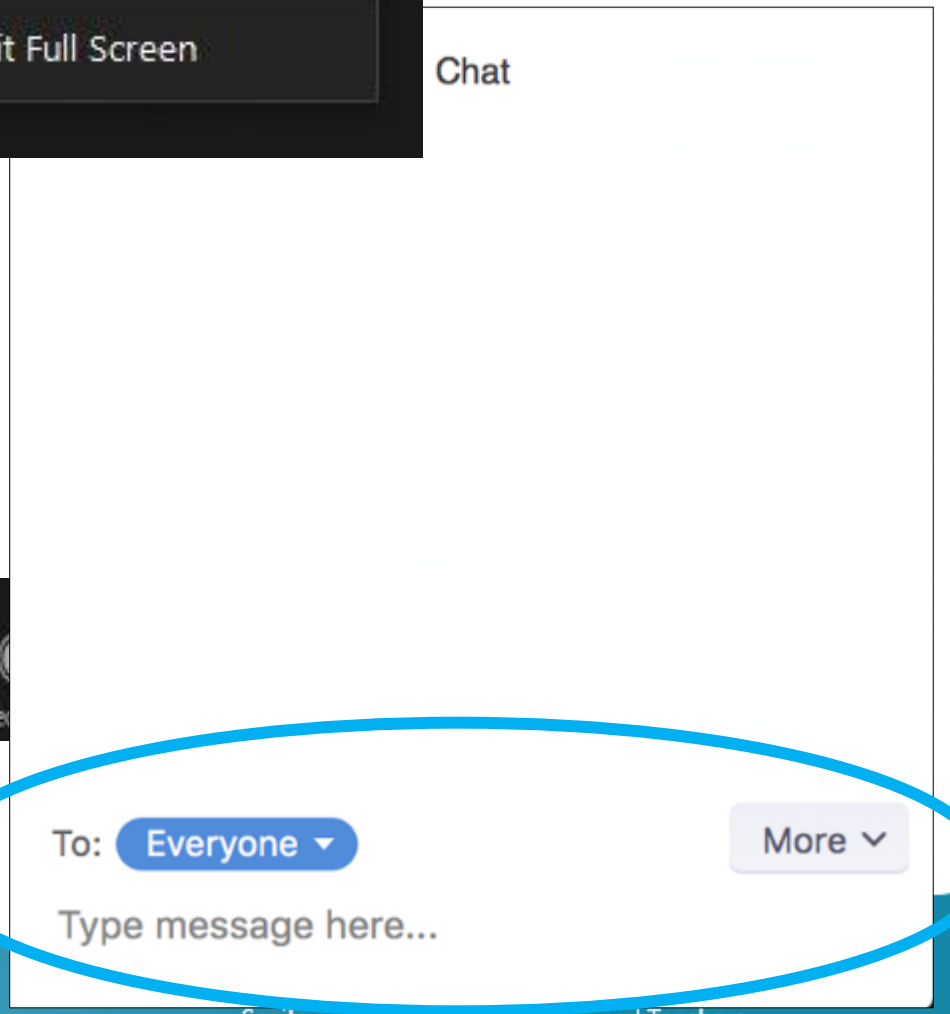
The tool bar

- Mute/Unmute microphones
- Turn cameras on/off
- Use the chat function to ask questions and input into discussions
- Share screen

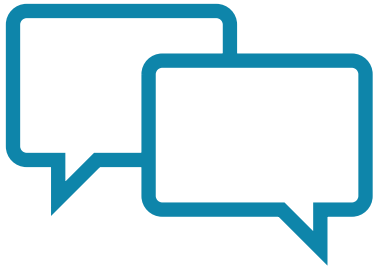
Breakout rooms

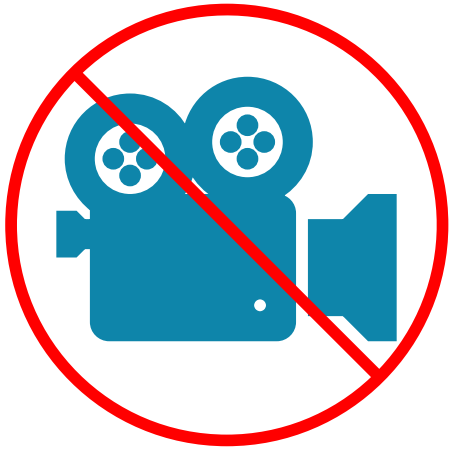






Before we begin…





Outline for the day

Approximate Time	Activity
09:15 – 09:30	Introduction
9:30 – 11:00	Exploring Mathematical Proficiency
11:00 – 11:15	Tea/Coffee
11:15 – 12:00	Exploring Mathematical Actions
12:00 – 13:00	Investigation in the Junior Cycle Mathematics Classroom
13:00 – 14:00	Lunch
14:00 – 15:30	Incorporating Rich Tasks into Classroom Practice

Teacher Professional Learning

Domain 4	Standard	Effective Practice	Highly Effective Practice
Teachers' Collective/ Collaborative Practice.	Teachers value and engage in professional learning and professional collaboration.	Teachers identify and engage in professional learning that develops their own practice and meets the needs of students and the school.	Teachers identify and engage in professional learning that develops their own practice, **meets the needs of students and the school**, and enhances collective practice.

School Context

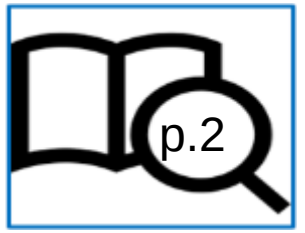
What is our context?

Who/what do we celebrate?

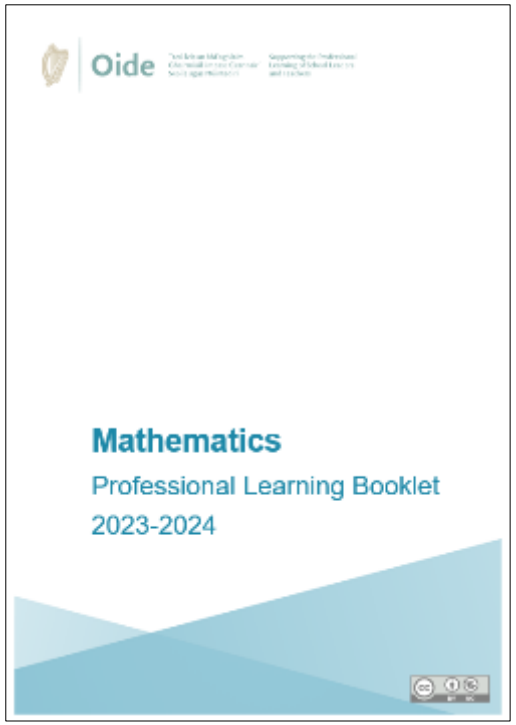
Student Context

Who are my students?

Who am I planning for?

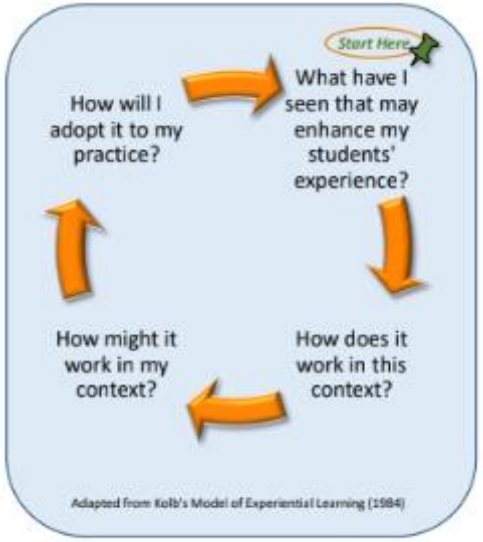


Resources for the day



Digital Booklet

Website Supports



Reflective Log

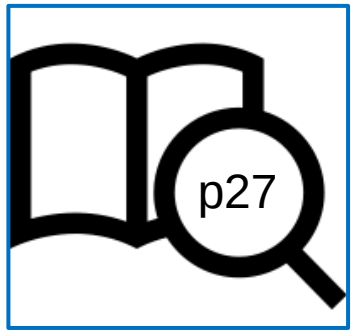
Reflective Log

What have I experienced that may enhance my students' experience?

How does it work in this context?

How might it work in my context?

How will I adapt/modify it for my practice?



Learning Intentions

- To identify and maximise opportunities for developing mathematical proficiency.
- To explore mathematical actions that support the development of mathematical proficiency.
- To discuss and reflect on how we support the incremental development of investigation skills for Junior Cycle Mathematics students.
- To further develop the incorporation of rich tasks into classroom practice.

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Oide

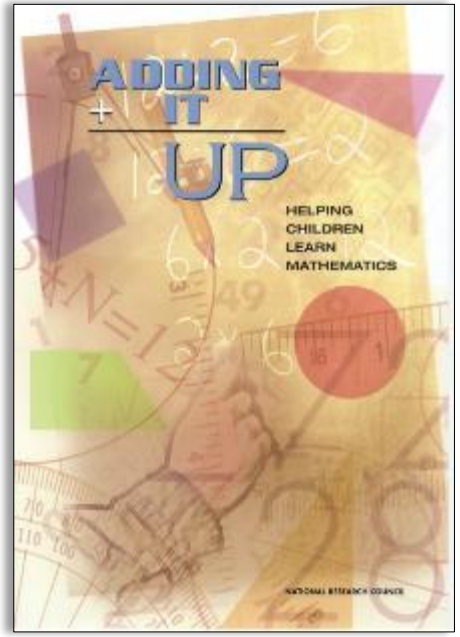
Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professional Learning of School Leaders and Teachers

Exploring Mathematical Proficiency

Learning Intention

To identify and maximise opportunities for developing mathematical proficiency.



‘The development of mathematical proficiency requires thoughtful planning, careful execution, and continual improvement of instruction. It depends critically on teachers who understand mathematics, **how students learn, and the classroom practices that support that learning**. They also need to know their students: who they are, what their backgrounds are, and what they know’

Adding it Up (2001) Kilpatrick et al

Learning Intention:

To identify and maximise opportunities for developing mathematical proficiency.

Success Criteria:

- I can describe how the components of mathematical proficiency are connected.
- I can explain the five components of mathematical proficiency.
- I can identify which components of mathematical proficiency are developed by various tasks.

Activity

Engage with three tasks in the context of a Junior Cycle Maths class

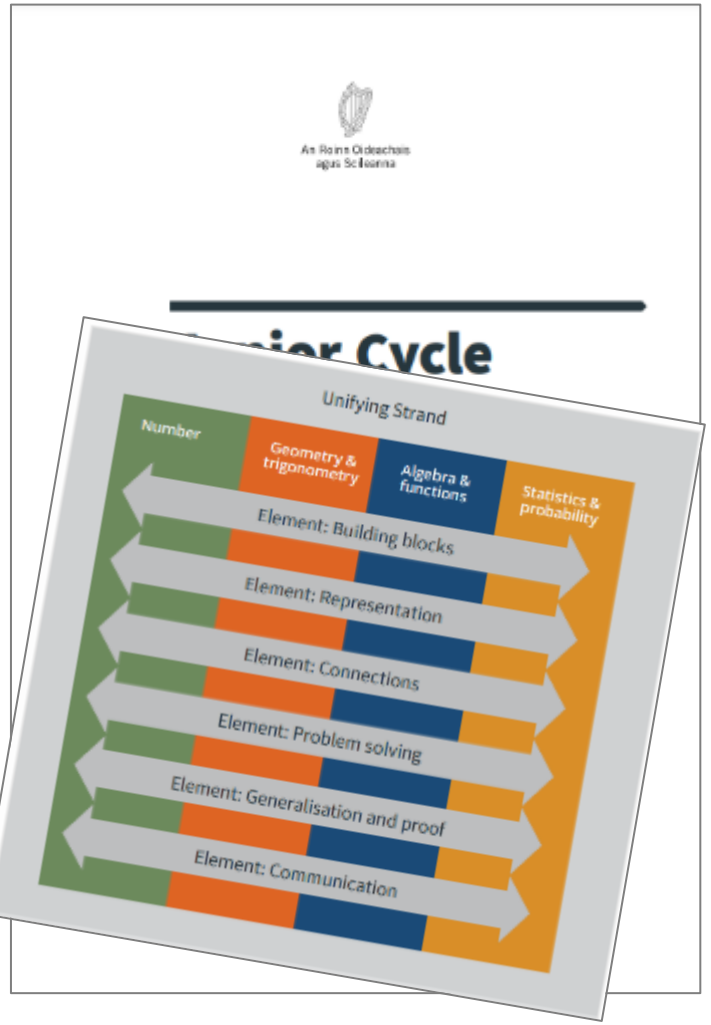
10 mins

Examine the components of mathematical proficiency

Discuss how components of mathematical proficiency can be developed using Tasks

15 mins

Planning Support for a Unit of Learning



GT.3 investigate the concept of proof through their engagement with geometry so that they can:

a. perform constructions 1 to 15 in *Geometry for Post-Primary School Mathematics* **(constructions 3 and 7 at HL only)**

b. recall and use the concepts, axioms, theorems, corollaries and converses, specified in *Geometry for Post-Primary School Mathematics* (section 9 for OL **and section 10 for HL)**

I. axioms 1, 2, 3, 4 and 5

II. theorems 1, 2, 3, 4, 5, 6, 9, 10, 13, 14, 15 **and 11, 12, 19**, and appropriate converses, including relevant operations involving square roots

III. corollaries 3, 4 **and 1, 2, 5** and appropriate converses

c. use **and explain** the terms: theorem, proof, axiom, corollary, converse, and implies

d. create and evaluate proofs of geometrical propositions

e. display understanding of the proofs of theorems 1, 2, 3, 4, 5, 6, 9, 10, 14, 15, **and 13, 19**; and of corollaries 3, 4, **and 1, 2, 5** (full formal proofs are not examinable)

Junior Cycle Mathematics Specification p.13

Learning Outcomes

GT3, GT4, U1, U2, U4, U5, U6, U7, U8. U9, U10, U11, U13

Context

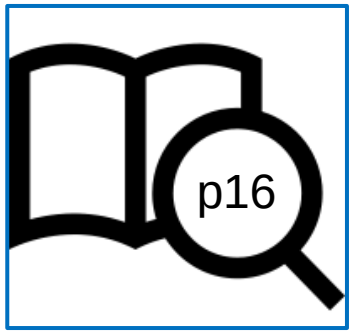
Consider your own context

Key Learning

- Students develop their mathematical arguments about geometric relationships
- Students apply Pythagoras' Theorem to solve right angle triangle problems
- Students analyse and interpret problems involving Pythagoras' Theorem
- Students develop their understanding of the construction of right-angled triangles

Ongoing Assessment

- Can students solve problems using Pythagoras Theorem in familiar and unfamiliar contexts?
- Can students develop a mathematical argument in relation to Pythagoras' Theorem?
- Can students select, justify and apply suitable constructions to solve problems involving right angled triangles?



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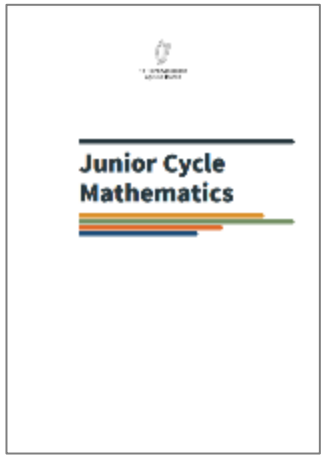
Supporting the Professional Learning of School Leaders and Teachers

Activity

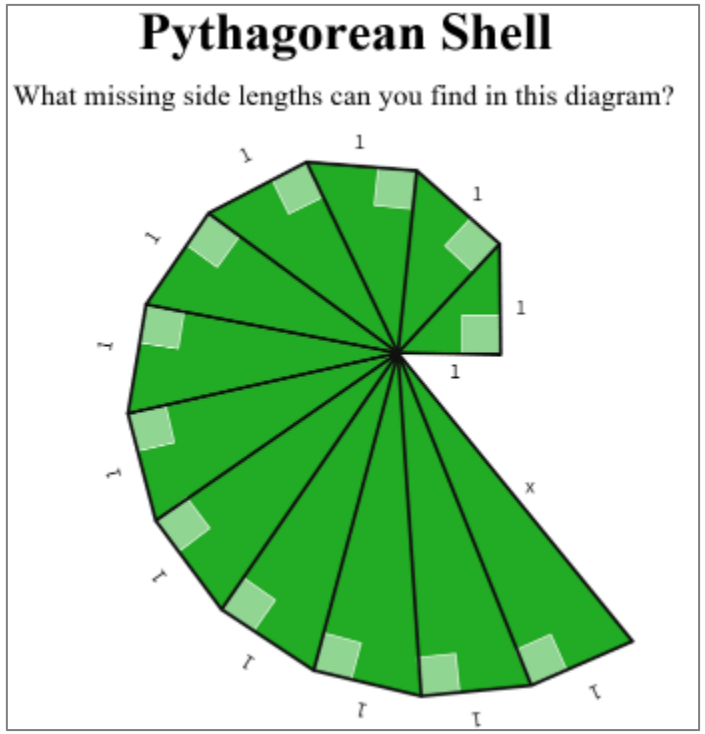
Engage with three tasks in the context of a Junior Cycle Maths class

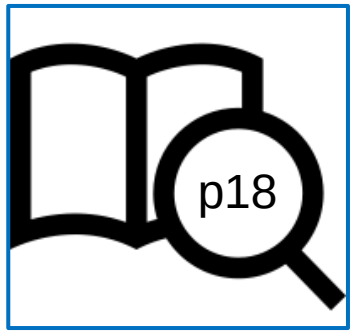


Right Angled Possibilities

If two of the sides of a right-angled triangle are 5cm and 6cm long, how many possibilities are there for the length of the third side?

Can you explain your reasoning?





10 mins

Activity

Engage with three tasks in the context of a Junior Cycle Maths class

10 mins

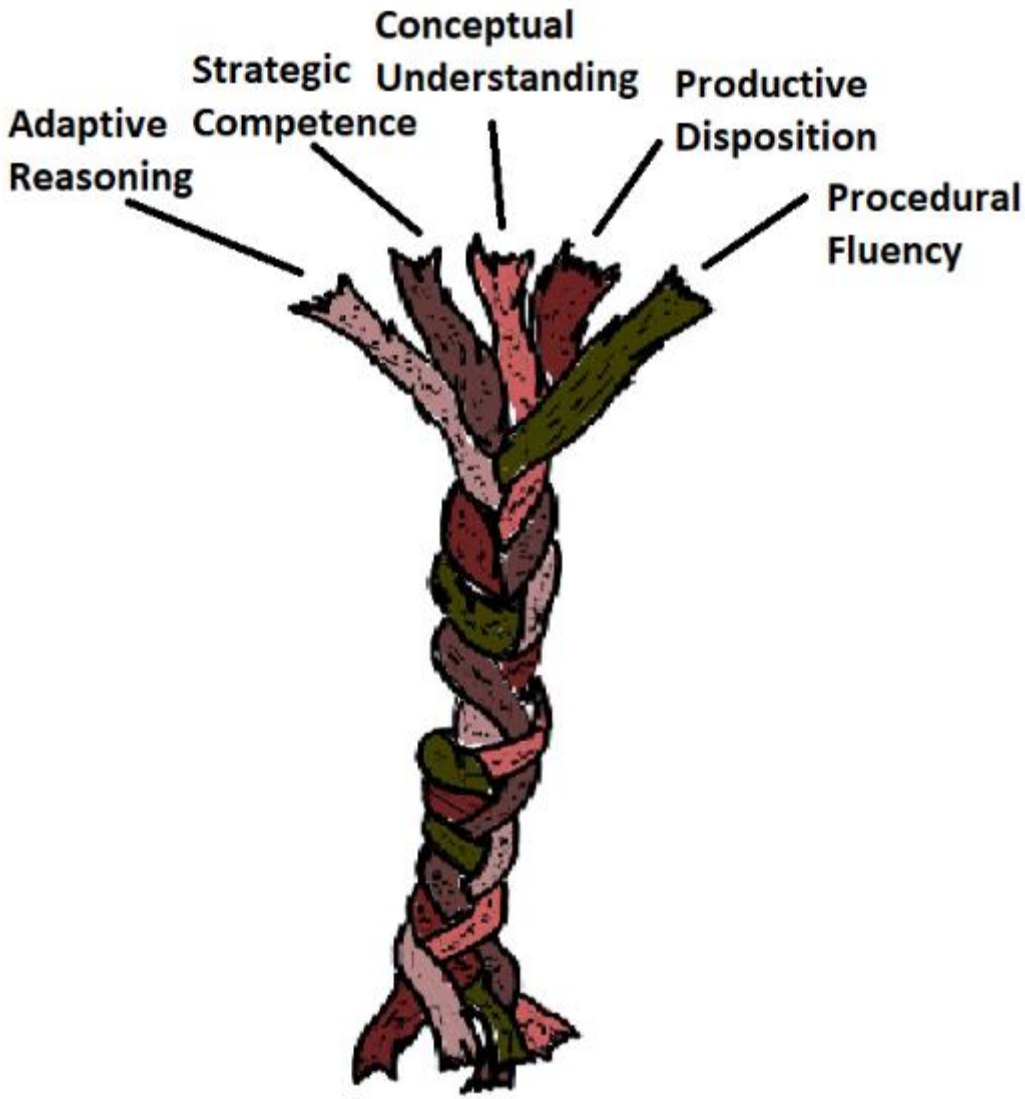
Examine the components of mathematical proficiency

Discuss how the components of mathematical proficiency can be developed using Tasks

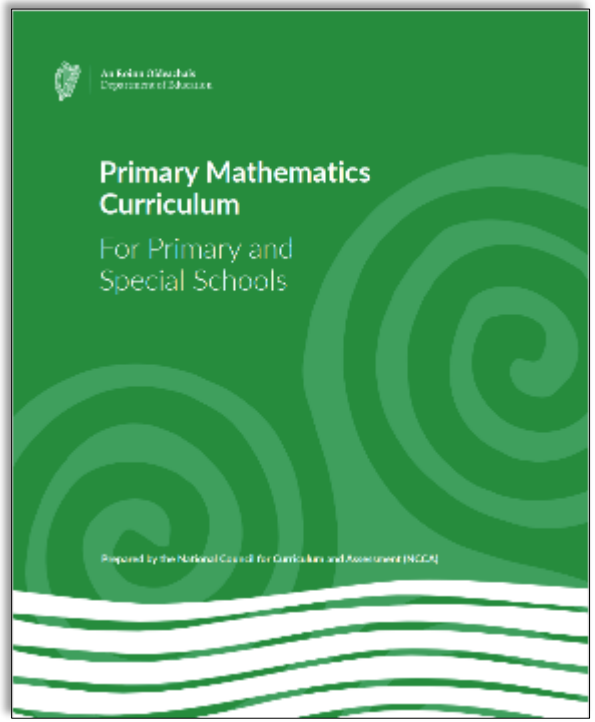
15 mins

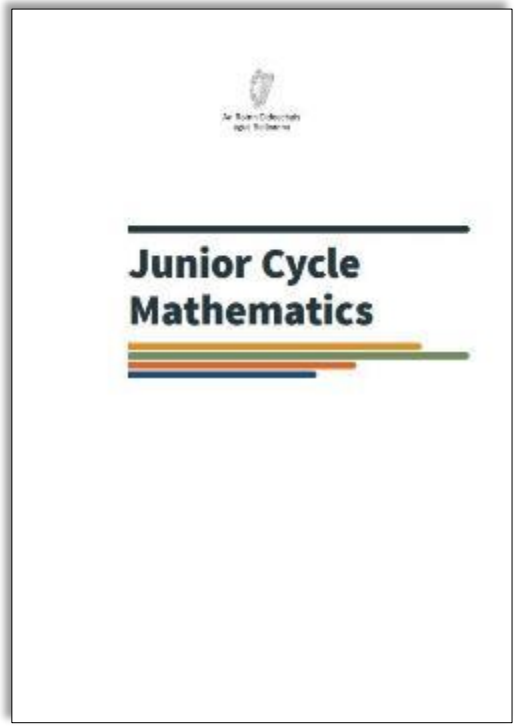
Activity

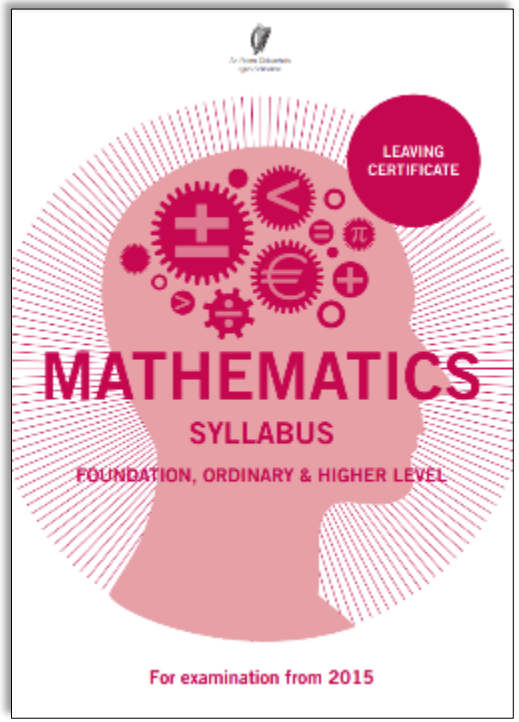
Examine the components of mathematical proficiency



Looking at the continuum

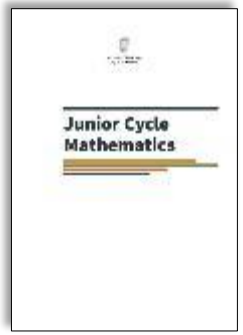


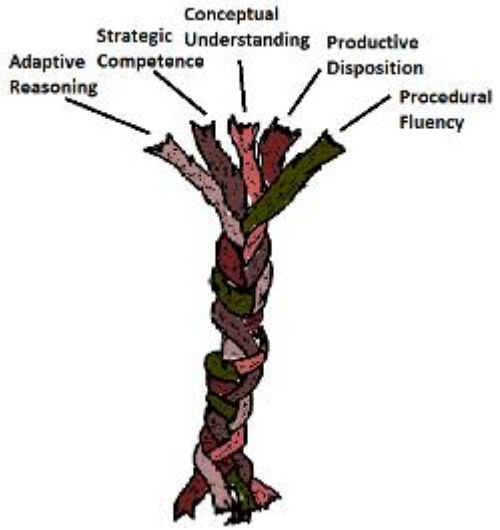


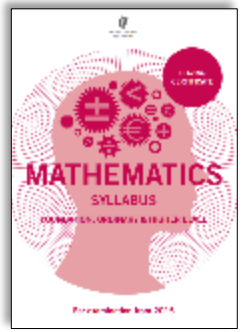


Mathematical Proficiency

Aim



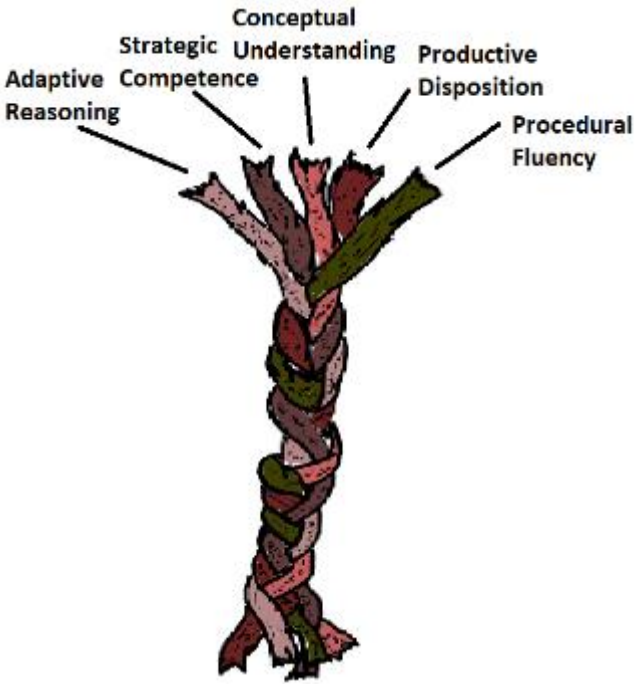




Objectives

Mathematical Proficiency

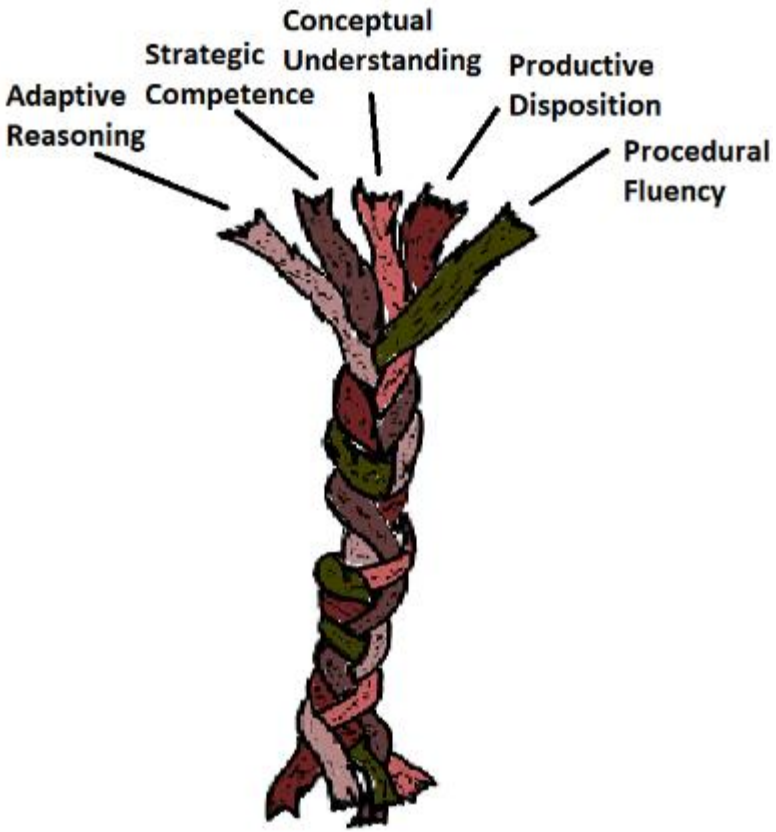
The mathematics that we are engaging in should be relevant for the students. It should be something that they are interested in, something relevant for their lives.



DCU Ollscoil Chathair Bhaile Átha Cliath Dublin City University

Sinead Breen

Mathematical Proficiency



'…mathematical proficiency is conceptualised not as a one-dimensional trait but as having five interconnected and interwoven components.'

Junior Cycle Mathematics Specification p.5

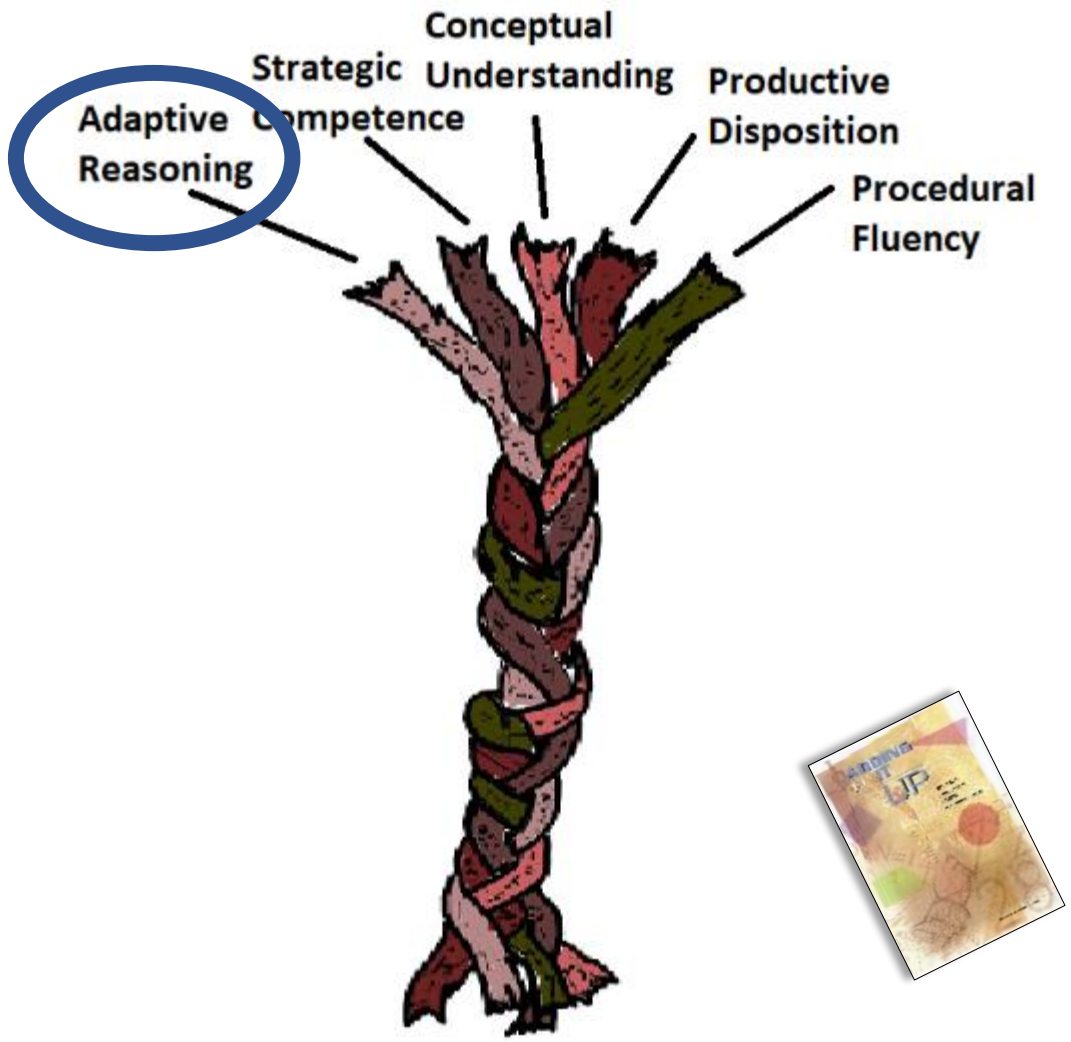
Adaptive Reasoning

‘The capacity to think logically about the relationships among concepts and situations-.

Junior Cycle Mathematics Specification p.5

<u>Students with Adaptive Reasoning can</u>

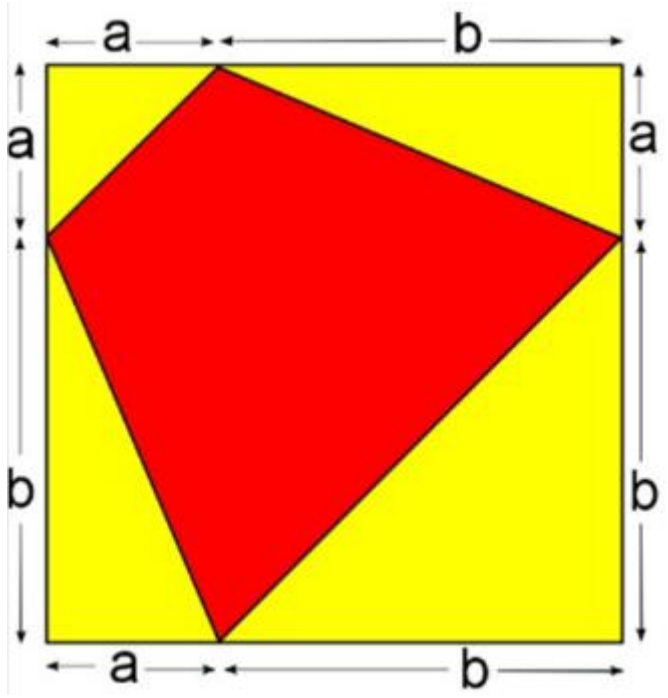
- justify and explain ideas in order to make their reasoning clear

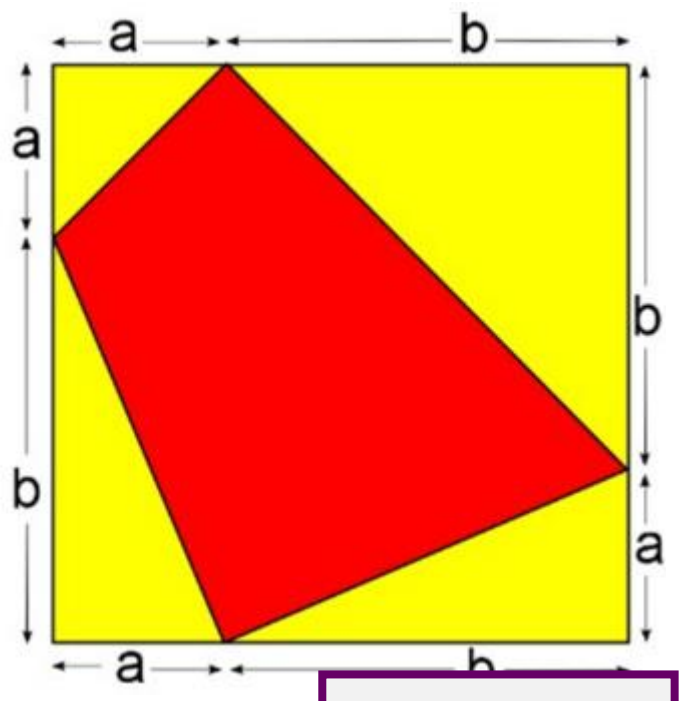


Adaptive Reasoning

Suppose we have a yellow square of side length a+b.

We can draw quadrilaterals in this square so that one vertex lies on each side of the square, and cuts each side into one segment of length a and one segment of length b, as below:





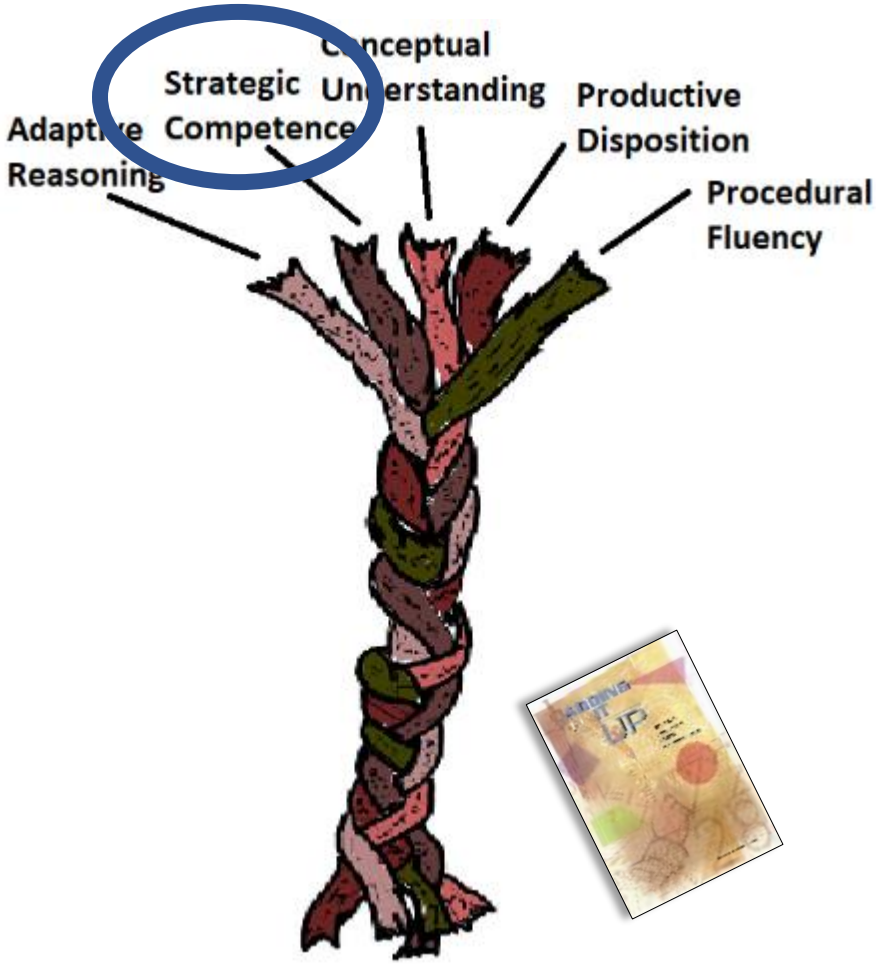
Can you **prove** that in each of these images the area of the red quadrilateral is exactly half the area of the yellow square?

5 mins

Strategic Competence

‘The ability to formulate, represent, and solve mathematical problems in both familiar and unfamiliar contexts’.

Junior Cycle Mathematics Specification p.5



<u>Students with Strategic Competence can:</u>

- formulate mathematical problems
- represent mathematical problems accurately
- develop possible solutions
- evaluate the accuracy of their solutions

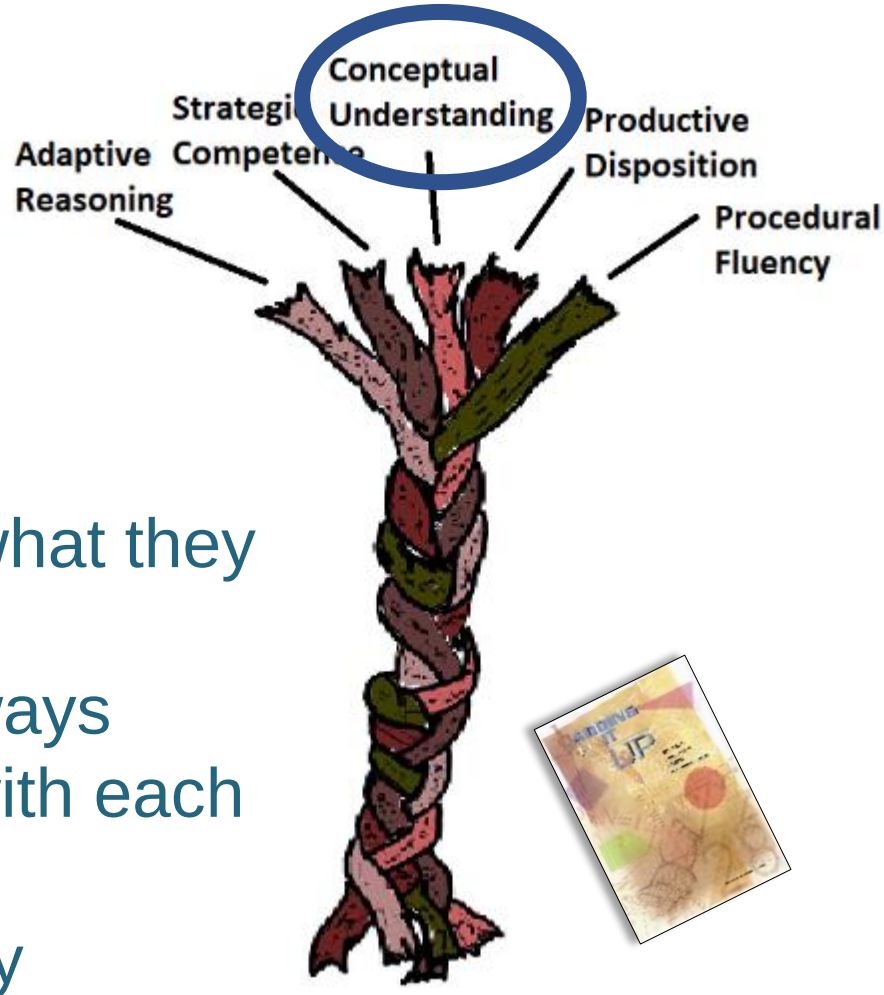
Strategic Competence

Question Posing

Is there something that you would like to research or investigate based on the image?

Conceptual Understanding

‘Comprehension of mathematical concepts, operations, and relations’
Junior Cycle Mathematics Specification p.5



<u>Students with Conceptual Understanding can:</u>

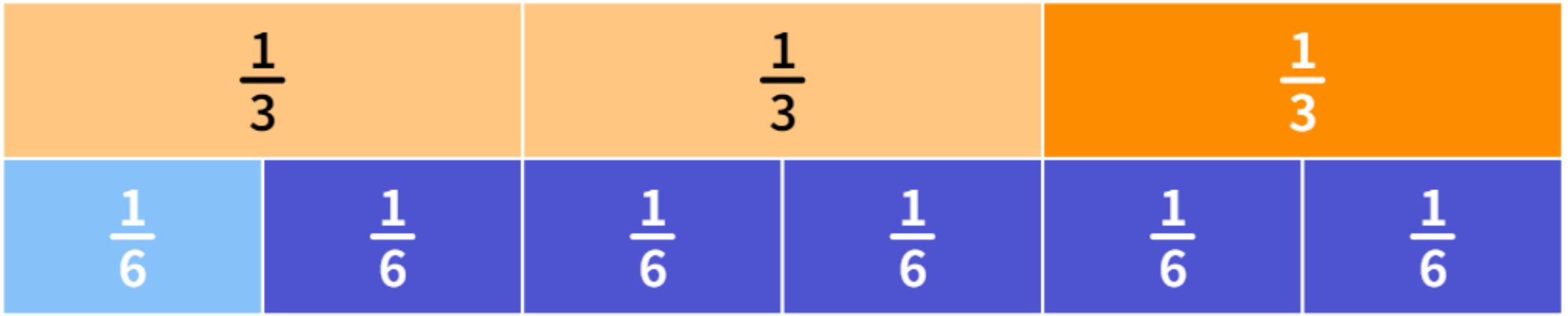
- learn new ideas by connecting those ideas to what they already know
- represent mathematical situations in different ways
- see how the various representations connect with each other
- see the deeper similarities between superficially unrelated situations

Conceptual Understanding

Representing concepts

2/3 divided by 1/6

?



Productive Disposition

‘Habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence, perseverance and one’s own efficacy’.

Junior Cycle Mathematics Specification p.5

<u>Students with Productive Disposition believe:</u>

- mathematics should make sense
- that they can solve mathematical problems through productive struggle
- becoming mathematically proficient is worth the effort.

Productive Disposition

Real Life Connections

https://tinyurl.com/3mb5xyuh

Brian Rushe

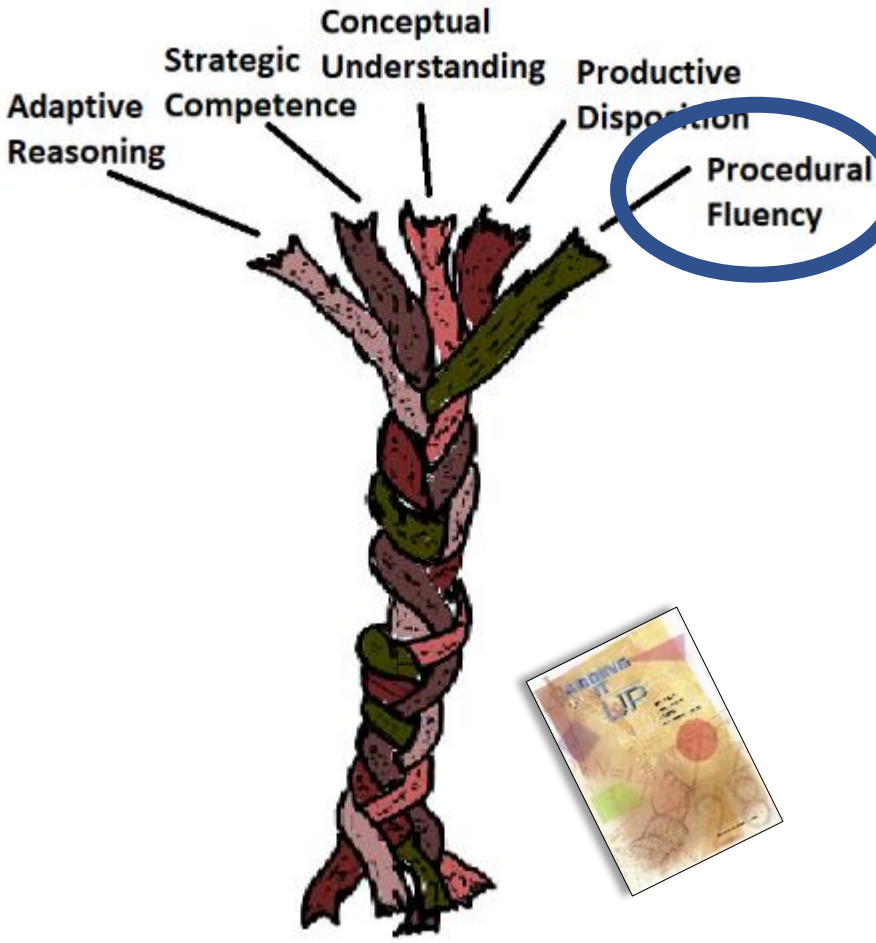
Dairy Farmer

Vice-President IFA

Procedural Fluency

Skill in carrying out procedures flexibly, accurately, efficiently, and appropriately

Junior Cycle Mathematics Specification p.5



<u>Students with Procedural Fluency can:</u>

- estimate the result of a procedure
- practice of the skills they are learning
- apply procedures flexibly
- decide the appropriate tool for a given situation

Procedural Fluency

Practicing Procedures

Can you find every number between 1 and 20 using only 4's and any operation?

5 mins

Activity

Engage with three tasks in the context of a Junior Cycle Maths class

10 mins

Examine the components of mathematical proficiency

Discuss how components of mathematical proficiency can be developed using Tasks

15 mins

Components of Mathematical Proficiency

Adaptive Reasoning

Students with Adaptive Reasoning can:

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Conceptual Understanding

Students with Conceptual Understanding can:

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> '…mathematical proficiency is conceptualised not as a one-dimensional trait but as having five interconnected and interwoven components.'
>
> Junior Cycle Mathematics Specification p.5

Strategic Competence

Students with Strategic Competence can:

- formulate mathematical problems
- represent mathematical problems accurately
- develop possible solutions
- evaluate the accuracy of their solutions

Activity

Discuss how components of mathematical proficiency may be developed within a lesson(s) using the three tasks

Discuss

1. Which component(s) could be developed by engaging with each of these tasks?

Discuss

2. Can you think how these tasks could be adapted to emphasise an alternative component?

15 mins

Share our thinking

Discuss

1. Which component(s) could be developed by engaging with each of these tasks?

Discuss

2. Can you think how these tasks could be adapted to emphasise an alternative component?

Learning Intention:

To identify and maximise opportunities for developing mathematical proficiency.

Success Criteria:

- I can describe how the components of mathematical proficiency are connected.
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Reflective Log

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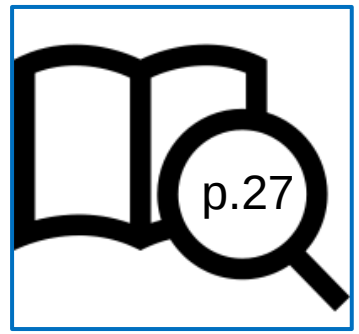
How might it work in my context?

How will I adapt/modify it for my practice?



3 mins

Oide

Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Coffee Break

15 mins

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Oide

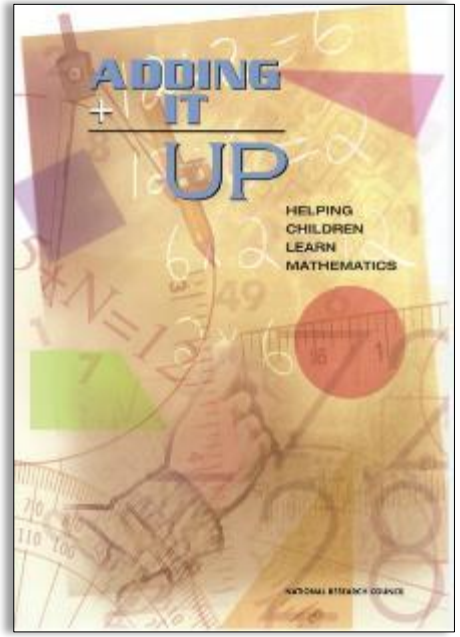
Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professional Learning of School Leaders and Teachers

Exploring Mathematical Actions

Learning Intention

To explore **mathematical actions** that support the development of mathematical proficiency.



‘To develop mathematical proficiency, we believe that students require more than just the demonstration of procedures. **They need experience** in **investigating** mathematical properties, **justifying** solution methods, and **analysing** problem situations.’

Adding it Up (2001) Kilpatrick et al

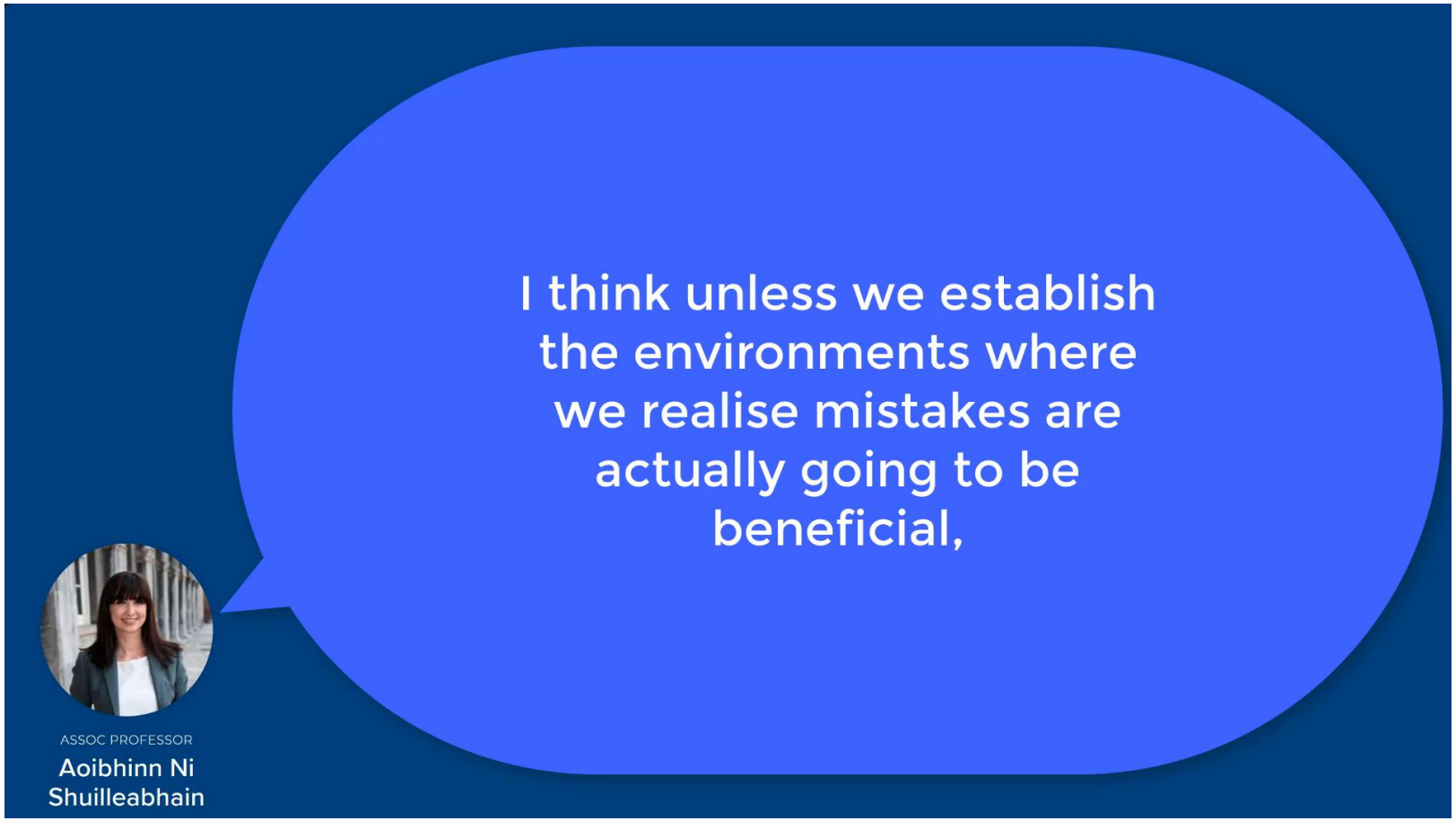
Learning Intention:

To explore **mathematical actions** that support the development of mathematical proficiency.

Success Criteria:

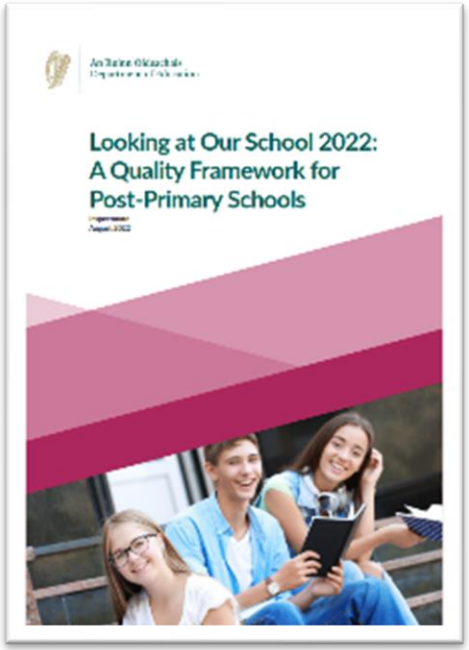
- I can define and use Junior Cycle Mathematics action verbs.
- I can identify appropriate actions to support the development of my students' mathematical proficiency.
- I can write student-centred success criteria, using the action verbs.

Student-Centred Learning



'We need to focus on what is the work that our students are doing…'

Student-Centred Learning



"Students as active agents in their learning:

The quality framework views students as active agents in their learning who **engage purposefully in a wide range of learning activities**, who respond in a variety of ways to different learning opportunities and who are afforded the opportunity to engage in meaningful discussions with teachers to inform learning and teaching."

Looking at Our School 2022

Activity

Consider Action Verbs

10 mins

Select a task and write Success Criteria using Action Verbs

20 mins

Share the Success Criteria for each task

Activity

Take a moment to consider the Junior Cycle Mathematics Action Verbs

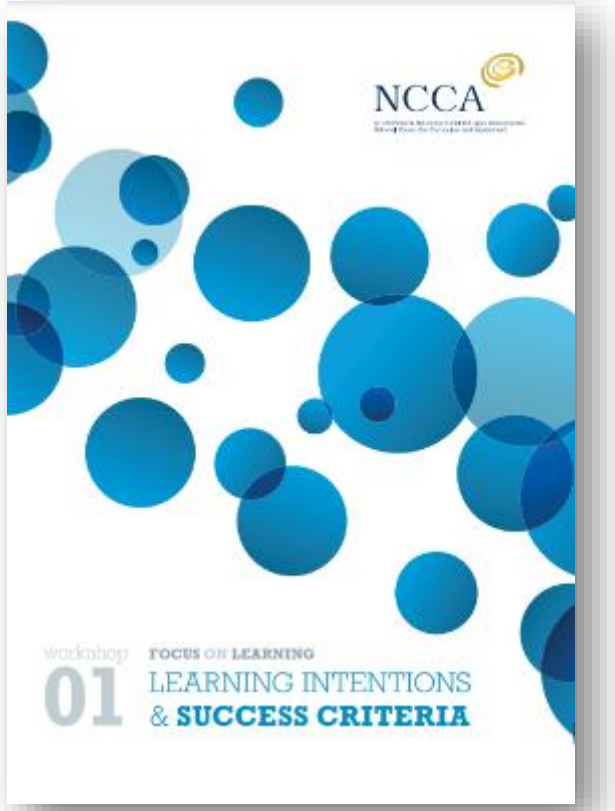
Discuss:

Reflect on the meaning of the Action Verbs in the context of the Junior Cycle Mathematics Learning Outcomes

p.7

10 mins

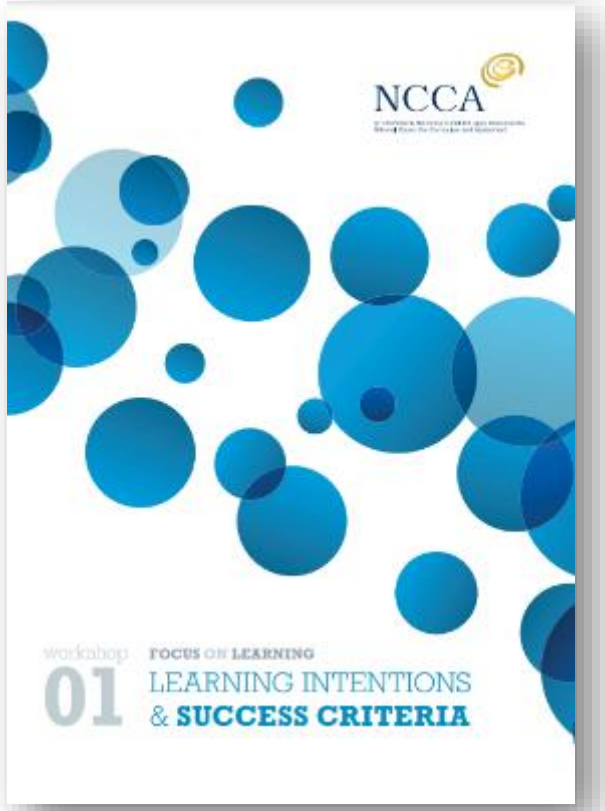
What are Success Criteria?



"Success Criteria are linked to learning intentions.
Success Criteria are developed by the teacher and/or the student
Success Criteria describe what success looks like.

(NCCA, Focus on Learning p.5)

Success Criteria



'They help the teacher and student to make judgements about the quality of student learning'.

'Research shows that students who regularly receive Success Criteria are:

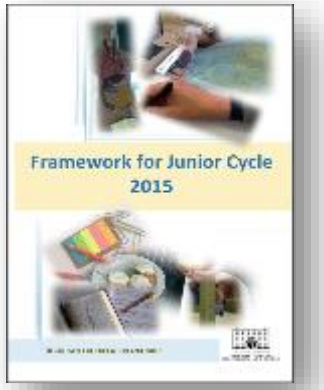
- More focused for longer periods of time
- More motivated and active in the learning
- Better equipped to take ownership of their learning'

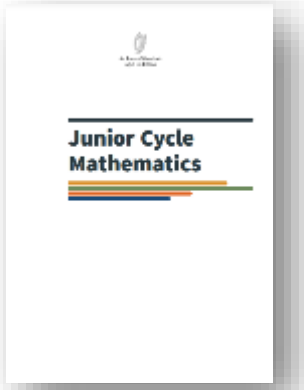
(NCCA, Focus on Learning p.5, 22)

Success Criteria

Domain 3	Standard	Effective Practice	Highly Effective Practice
Teachers' Individual Practice.	The teacher selects and uses planning, preparation and assessment practices that progress students' learning	Teachers **share success criteria** with students so that they can assess their own learning through self-assessment and peer assessment.	Teachers **share and co-create success criteria** with students so that they can assess their own learning through self-assessment and peer assessment, and identify areas for improvement and strategies to achieve improvement

Managing Myself





'This key skill helps learners to understand themselves both as individuals and as learners so that they can develop personal goals and plans. It also helps them develop strategies to make considered decisions, to take action and to reflect on their progress'.

NCCA Key Skills of Junior Cycle p.4

Activity

Consider Action Verbs

10 mins

Select a task and write Success Criteria using Action Verbs

20 mins

Share the Success Criteria for each task

Writing Success Criteria

Sample Learning Intention

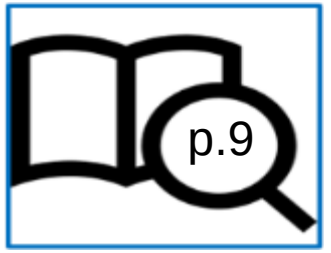
We are learning about the properties of triangles

Sample Success Criteria

- I can **sketch** right angled triangles
- I can **solve** problems involving Pythagoras' Theorem
- I can **explain** my reasoning

Right Angled Possibilities:

If two of the sides of a right-angled triangle are 5cm and 6cm long, how many possibilities are there for the third side?



Activity

Writing Success Criteria using Action Verbs

Using tasks provided and keeping the action verbs in mind, write Success Criteria for one of these tasks

Classroom Context

- Mixed ability
- 24 students
- 2 exceptionally able students
- 1 student with EAL
- 2 students have dyslexia

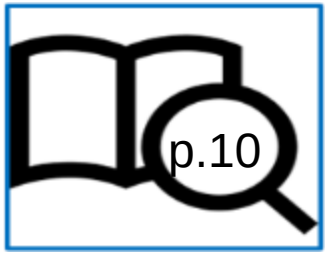
Activity

Writing Success Criteria using Action Verbs

Using tasks provided and keeping the action verbs in mind, write Success Criteria for one of these tasks

Examine the tasks

1. Identify the actions needed to engage with the tasks
2. Write Success Criteria for one of these tasks
3. Can you add an extension to this task to create additional challenge?



20 mins

Activity

Consider Action Verbs

10 mins

Select a task and write Success Criteria using Action Verbs

20 mins

Share the Success Criteria for each task

Share our thinking

Share the Success Criteria for each task

Discuss:

1. Identify the actions needed to engage with the tasks
2. Write Success Criteria for one of these tasks
3. Can you add an extension to this task to create additional challenge?

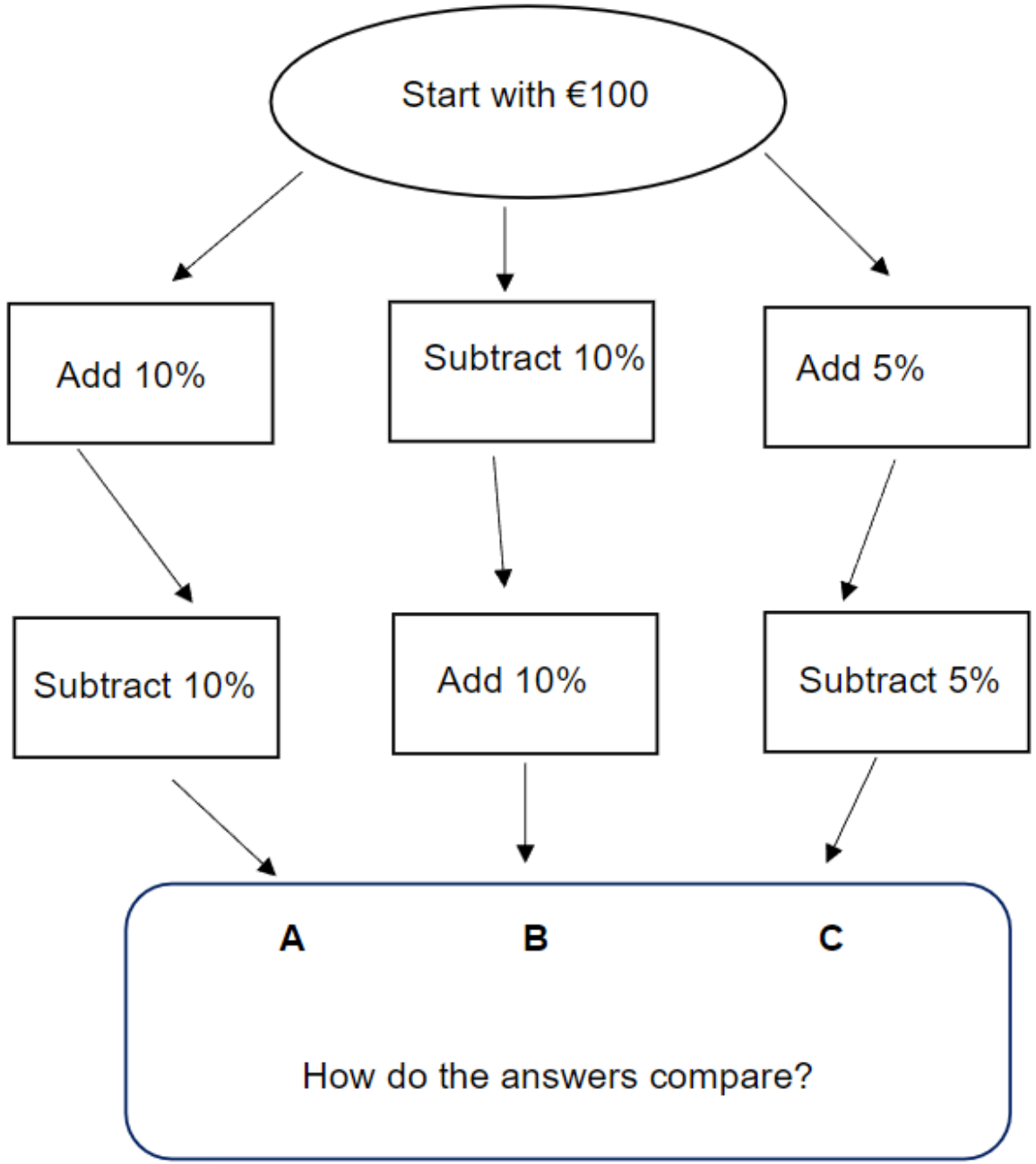
Examine the image below. Can you fill in the boxes to indicate the general term for the following shaded sequences. The first one is already completed.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	$4n$
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	$5n$
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

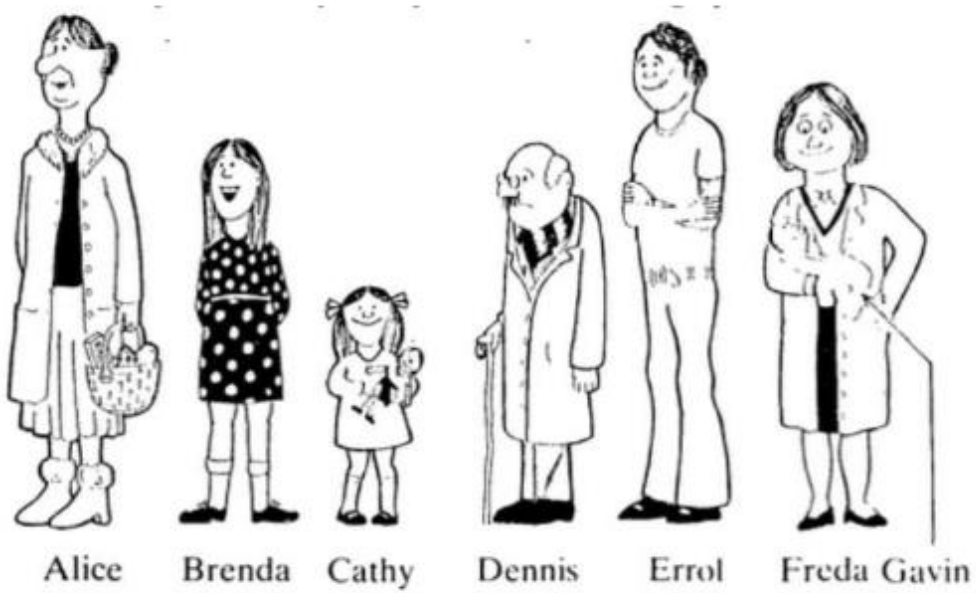
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

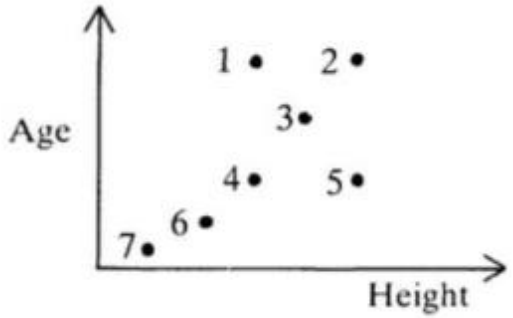
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	$6n - 5$



Who is represented by each point on the scatter graph below?

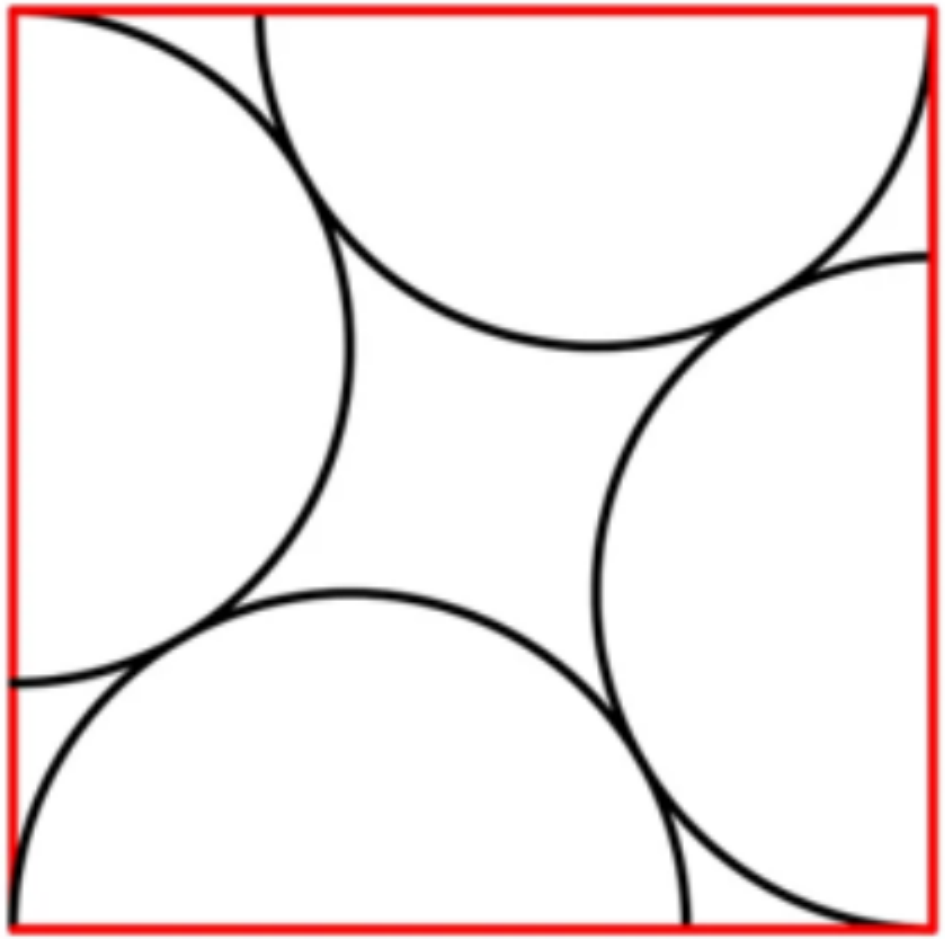
Justify your reasoning.



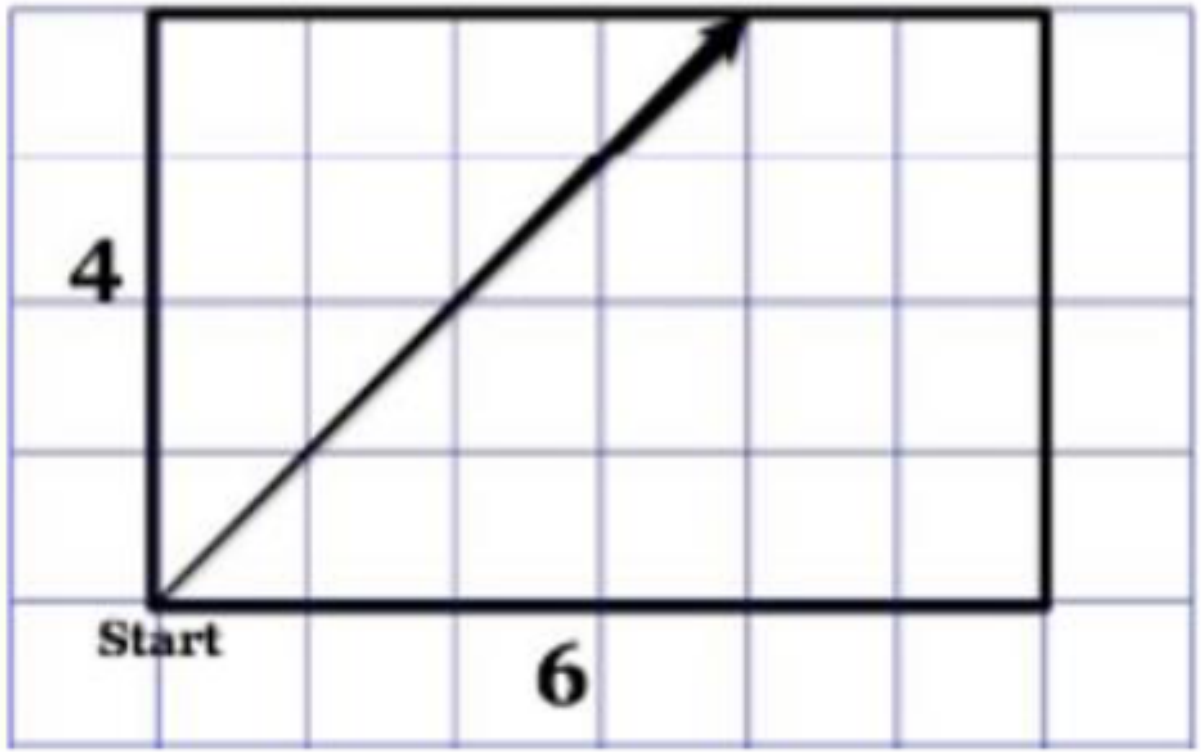


Four semicircles with radius 2 are constructed in the red square below.

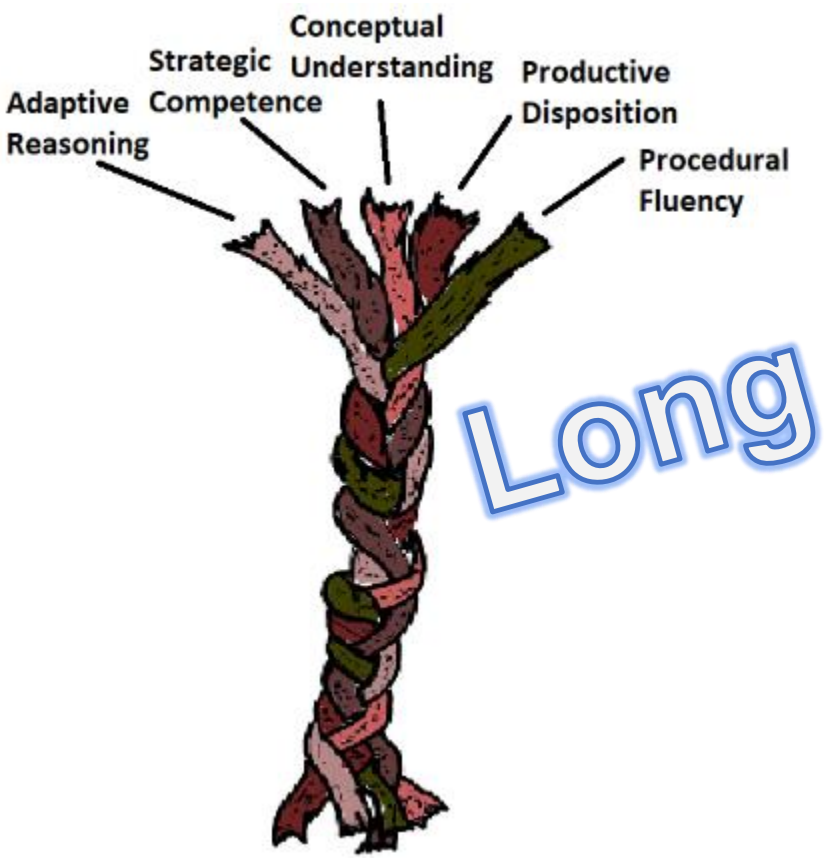
What is the area of the square?



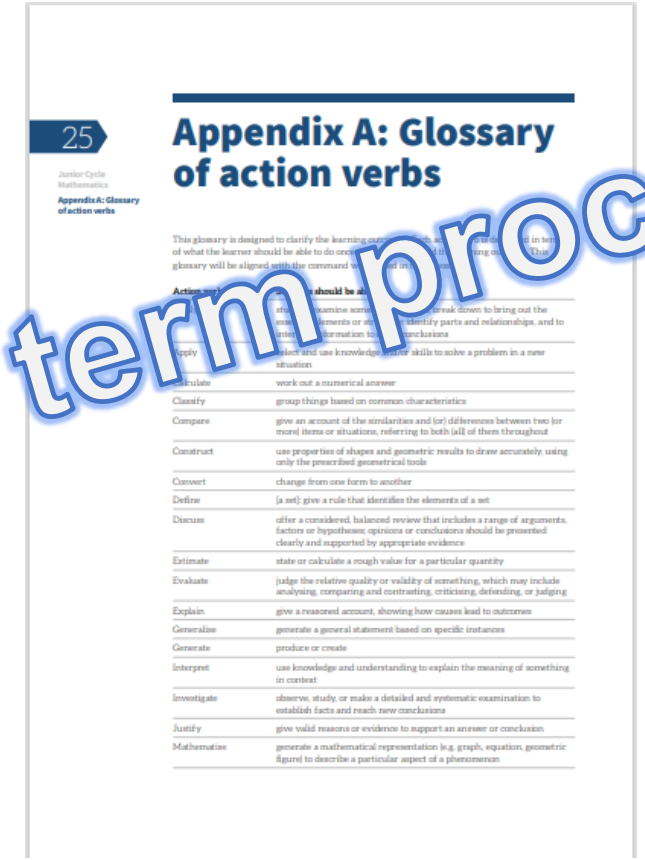
Start with the 4 x 6 pool table below with a pocket in each corner. The ball always launches from the bottom left corner of a rectangular table at 45 degrees, and bounces until it reaches a corner. If the ball continues to roll which pocket will the ball drop into?



Now consider tables of different dimensions. Which pocket will the ball drop into?



Long term process



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Junior Cycle Mathematics

Appendix A: Glossary of action verbs

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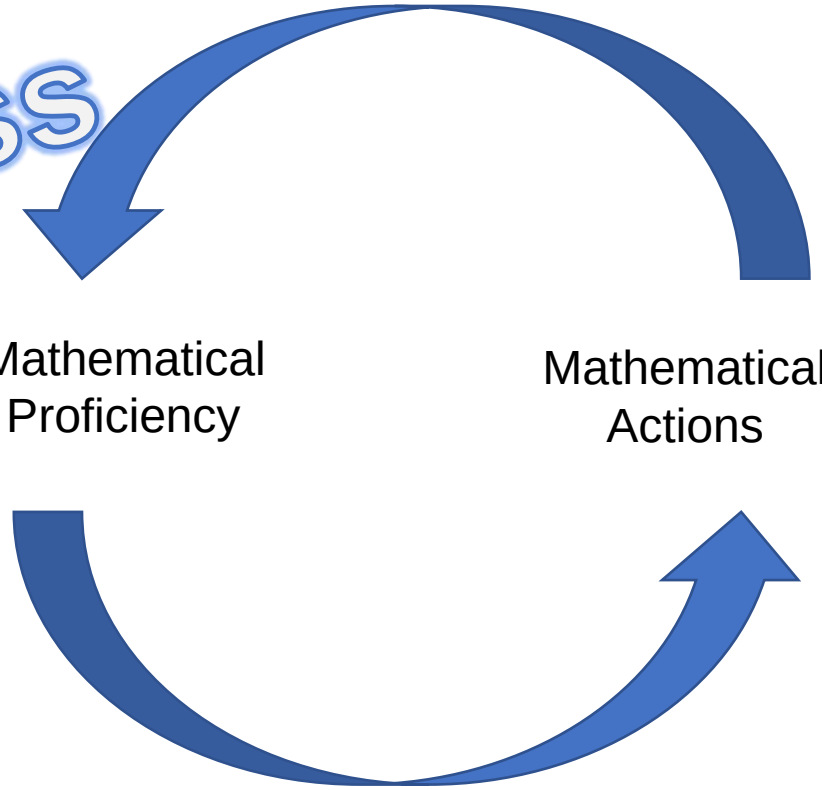
This glossary is designed to clarify the learning outcomes as set out in the specification in terms of what the learner should be able to do once [illegible]. This glossary will be aligned with the command [illegible]

Action verb	[illegible] should be able to
Analyse	examine something in detail, break down to bring out the essential elements or structure, identify parts and relationships, and to interpret information to reach conclusions
Apply	select and use knowledge and/or skills to solve a problem in a new situation
Calculate	work out a numerical answer
Classify	group things based on common characteristics
Compare	give an account of the similarities and (or) differences between two (or more) items or situations, referring to both (all) of them throughout
Construct	use properties of shapes and geometric results to draw accurately, using only the prescribed geometrical tools
Convert	change from one form to another
Define	[a set]: give a rule that identifies the elements of a set
Discuss	offer a considered, balanced review that includes a range of arguments, factors or hypotheses; opinions or conclusions should be presented clearly and supported by appropriate evidence
Estimate	state or calculate a rough value for a particular quantity
Evaluate	judge the relative quality or validity of something, which may include analysing, comparing and contrasting, criticising, defending, or judging
Explain	give a reasoned account, showing how causes lead to outcomes
Generalise	generate a general statement based on specific instances
Generate	produce or create
Interpret	use knowledge and understanding to explain the meaning of something in context
Investigate	observe, study, or make a detailed and systematic examination to establish facts and reach new conclusions
Justify	give valid reasons or evidence to support an answer or conclusion
Mathematise	generate a mathematical representation [e.g. graph, equation, geometric figure] to describe a particular aspect of a phenomenon



Aim for our students

Process

Interdependent

Learning Intention:

To explore **mathematical actions** that support the development of mathematical proficiency.

Success Criteria:

- I can define and use Junior Cycle Mathematics action verbs.
- I can identify appropriate actions to support the development of my students' mathematical proficiency.
- I can write success criteria, using the action verbs, given a particular context.

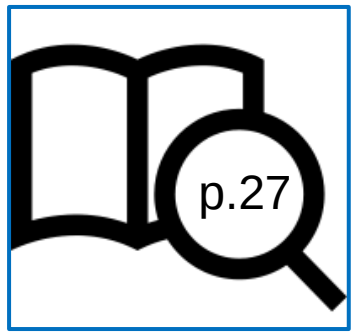
Reflective Log

What have I experienced that may enhance my students' experience?

How does it work in this context?

How might it work in my context?

How will I adapt/modify it for my practice?



3 mins

Oide

Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professional Learning of School Leaders and Teachers

Investigation in the Junior Cycle Mathematics Classroom

Outline for the day

Approximate Time	Activity
09:15 – 09:30	Introduction
9:30 – 11:00	Exploring Mathematical Proficiency
11:00 – 11:15	Tea/Coffee
11:15 – 12:00	Exploring Mathematical Actions
12:00 – 13:00	Investigation in the Junior Cycle Mathematics Classroom
13:00 – 14:00	Lunch
14:00 – 15:30	Incorporating Rich Tasks into Classroom Practice

Learning Intention:

To discuss and reflect on how we support the incremental development of investigation skills for Junior Cycle Mathematics students.

Success Criteria:

- I can explain the elements of investigative tasks.
- I can identify occasions where investigative tasks can benefit development of my student's mathematical proficiency.

Learning Intention

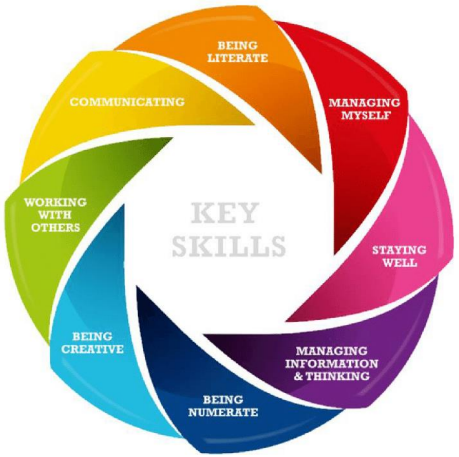
To discuss and reflect on how we support the incremental development of investigation skills for Junior Cycle Mathematics students.

What is our current understanding of investigation for mathematics students?

'Natural numbers can be expressed as the sum of two or more consecutive positive whole numbers'

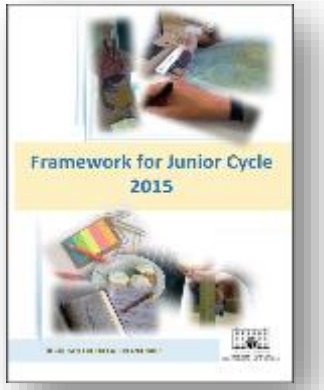
Investigate this statement.
What conclusions can be drawn?
Justify your reasoning.

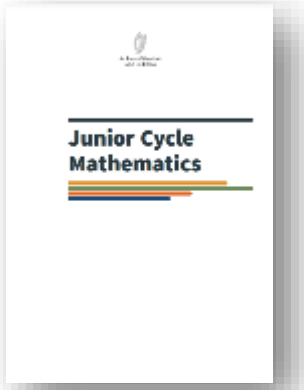
Managing Information and Thinking



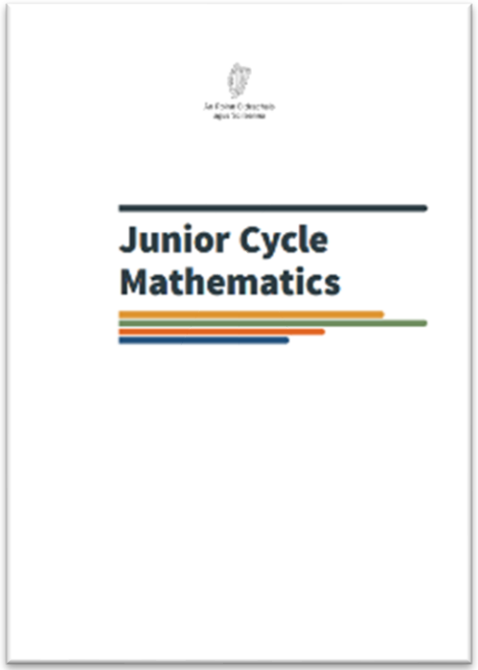
'This skill also develops learners' thinking skills so that they can become more skilled in higher order reasoning and problem-solving'.

NCCA Key Skills of Junior Cycle p.4





What does it mean to investigate?



Investigate - Observe, study, or make a detailed and systematic examination, in order to establish facts and reach new conclusions

Junior Cycle Maths Specification p.25

Investigative Approaches

"In order to make an introduction to a topic more open you can alter your approach so that students may:

- Make decisions en route;
- Construct their own examples;
- Draw their own conclusions."

(Onion et. al) Investigative and Problem-Solving Approaches to Mathematics and their Assessment

Activity

Engage with an investigative task

15 mins

Hear from a teacher and observe students

10 mins

Discussion on investigative tasks

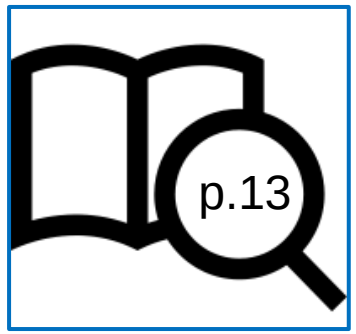
10 mins

Investigative Activity

Engage with an investigative task

While engaging with the following tasks discuss:

- What are the skills are developed by an investigative task?
- Which Components of Mathematical Proficiency can be developed by investigative work?



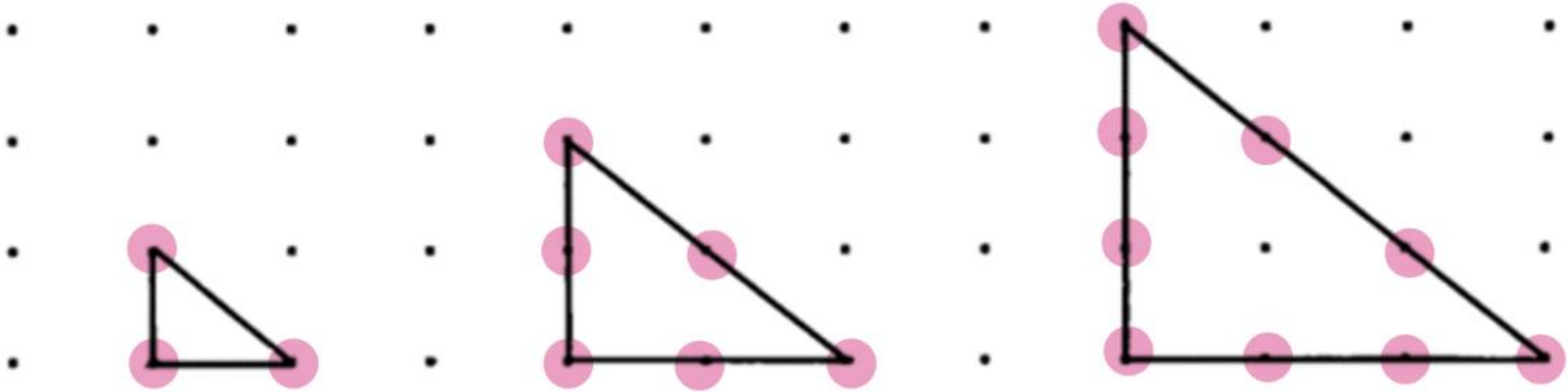
15 mins

Learning Intentions

We are learning to:

- **investigate** numerical patterns

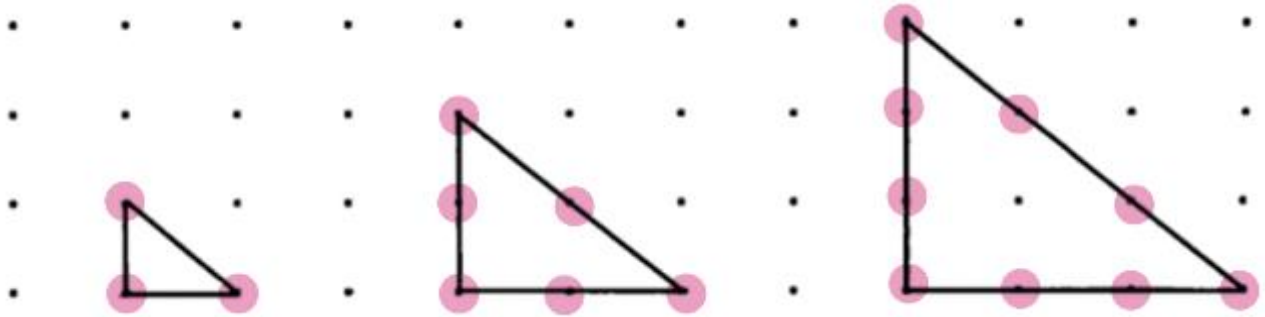
As this sequence of triangles and dots continues, investigate any patterns you can identify.



Success Criteria

- I can count the number of dots on the perimeter of each triangle.
- I can count the number of dots inside each triangle.
- I can **sketch** the next triangle in this sequence.
- I can **classify** numerical patterns.
- I can **generalise** numerical patterns.
- I can **verify** my generalisation.

As this sequence of triangles and dots continues, investigate any patterns you can identify.



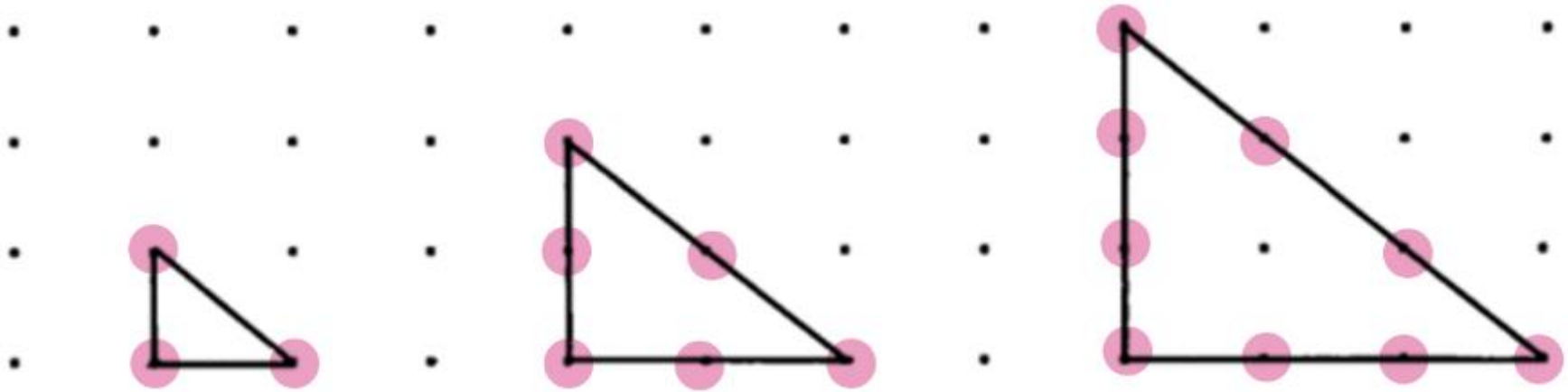
Extension:

Michelle thinks the perimeter increases by 3cm for each successive triangle. Sarah disagrees. Who do you agree with? Explain your reasoning.

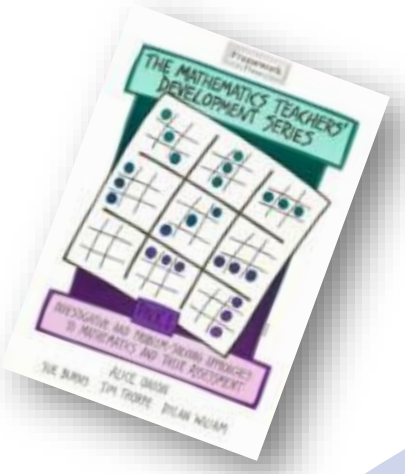
p.13

Investigative Activity

As this sequence of triangles and dots continues, investigate any patterns you can identify.



Investigative Work



Generating Results

Making Observations and Looking for Patterns

Generalising

Justifying

Investigative Work

‘The process of completing the Classroom-Based Assessment should be viewed as part of teaching and learning, and not solely for assessment purposes’.

Guidelines for the Classroom-Based Assessments and Assessment Task p.8

Activity

Engage with an investigative task

15 mins

Hear from a teacher and observe students

10 mins

Discussion on investigative tasks

10 mins

Investigative Work

Can we identify elements of investigative work such as:

- generating results
- looking for patterns
- generalising
- justifying

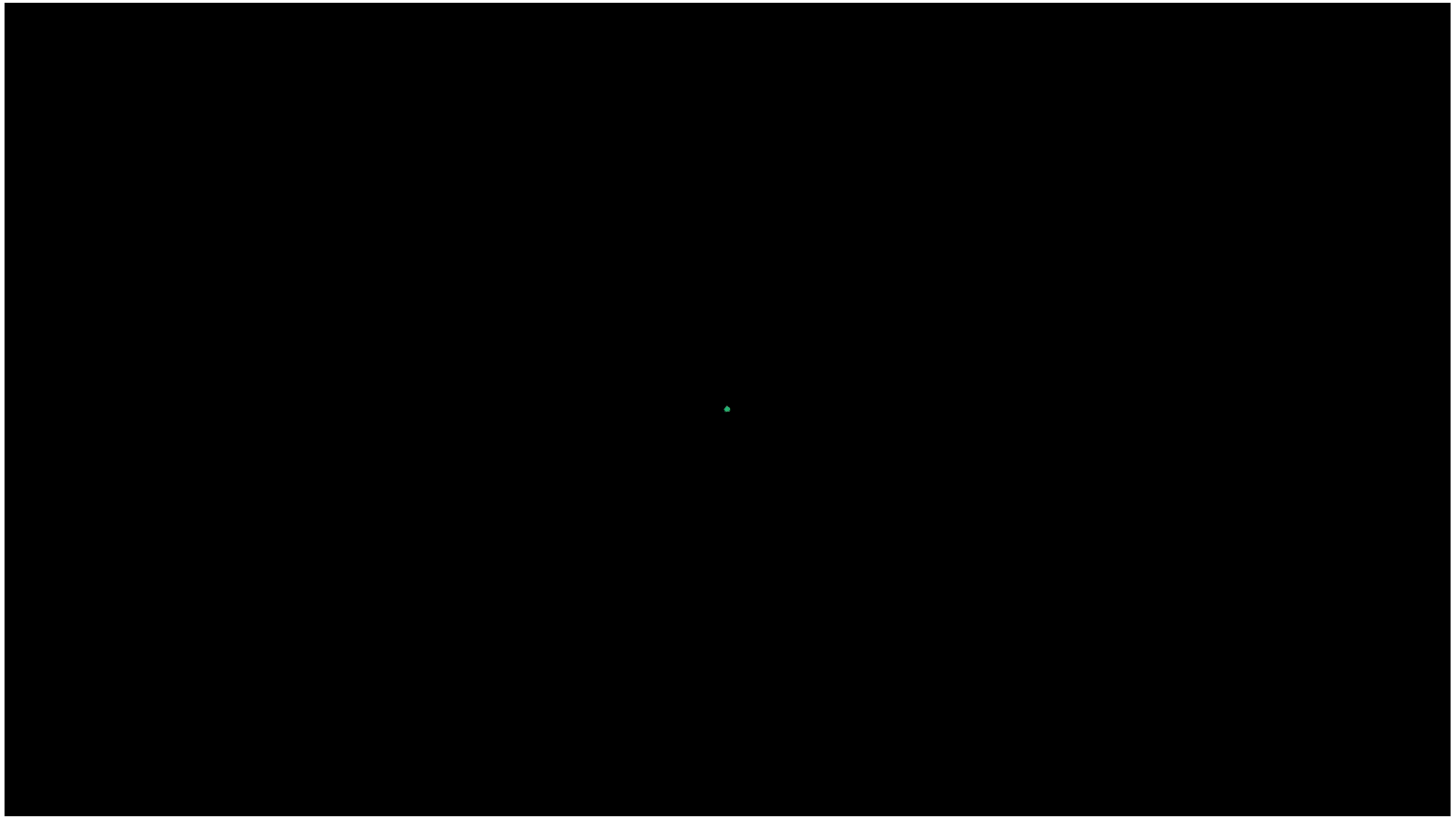
Learning Intentions

We are learning to investigate relationships between the side lengths of triangles.

Success Criteria

- I can create a triangle using the squares (without squares overlapping).
- I can measure the size of an angle.
- I can identify acute, right and obtuse angles.
- I can calculate the side length of a square given its area.
- I can generalise a relationship between side lengths of triangles.
- I can justify my generalisation.

Observing Investigative Task



Success Criteria

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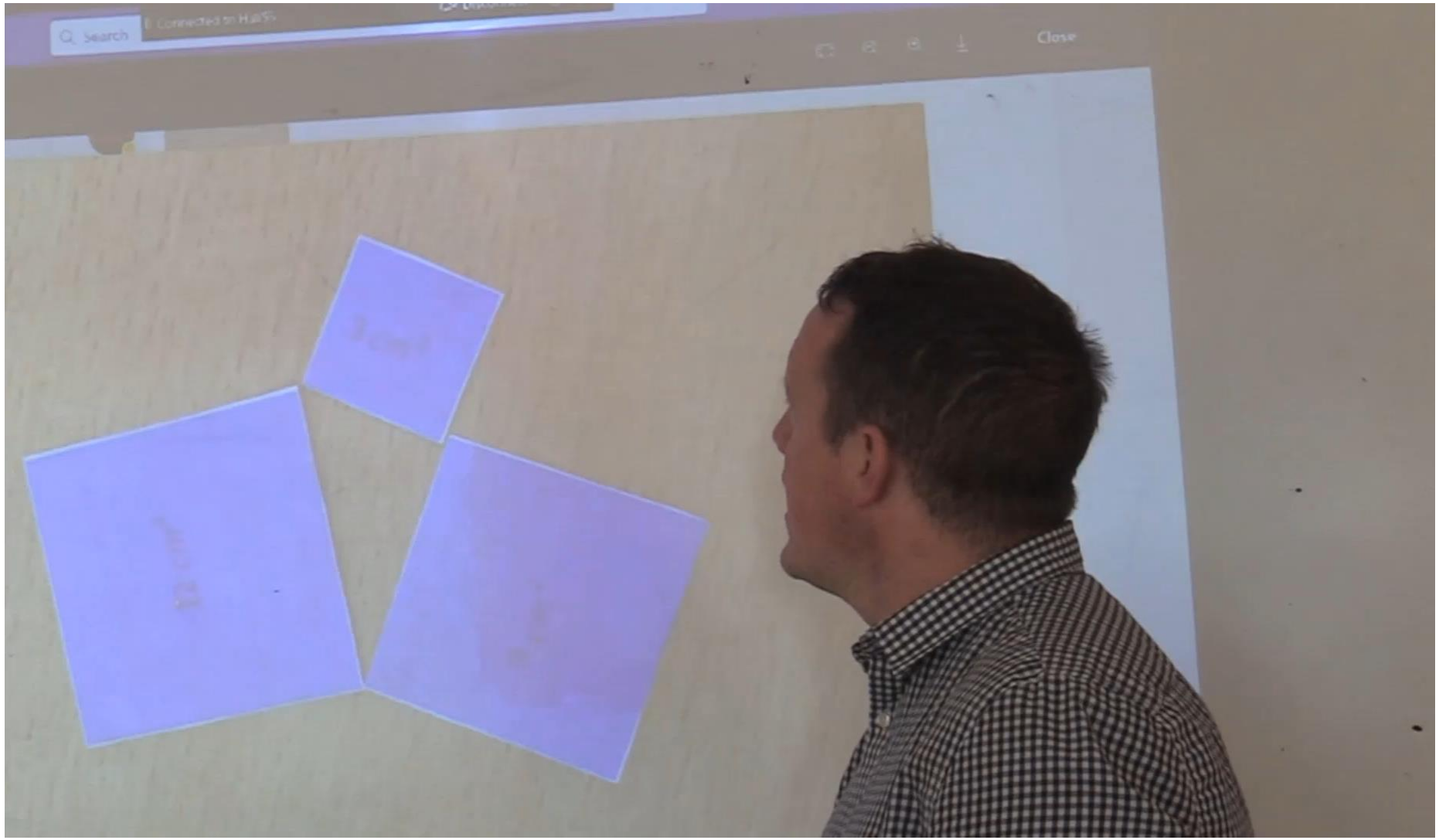
Teacher's Reflection on Lesson



Have we seen any evidence that would inform our planning for future lessons?

p.14

Activity

Engage with an investigative task

10 mins

Hear from a teacher and observe students

10 mins

Discussion on investigative tasks

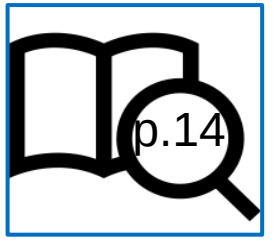
10 mins

Share our thinking

Discussion on investigative tasks

Discuss:

1. Can you select or adapt an investigative task to use in class with your students in the next 2-3 weeks?
2. What Action Verbs might you use in the Success Criteria for this task?



10 mins

Learning Intention:

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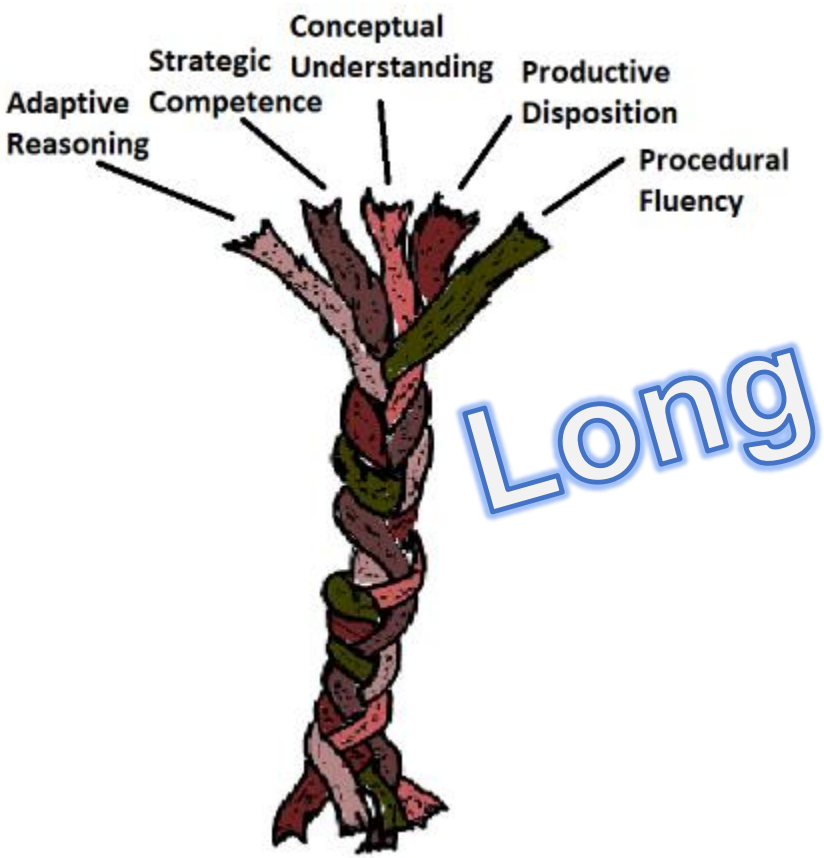
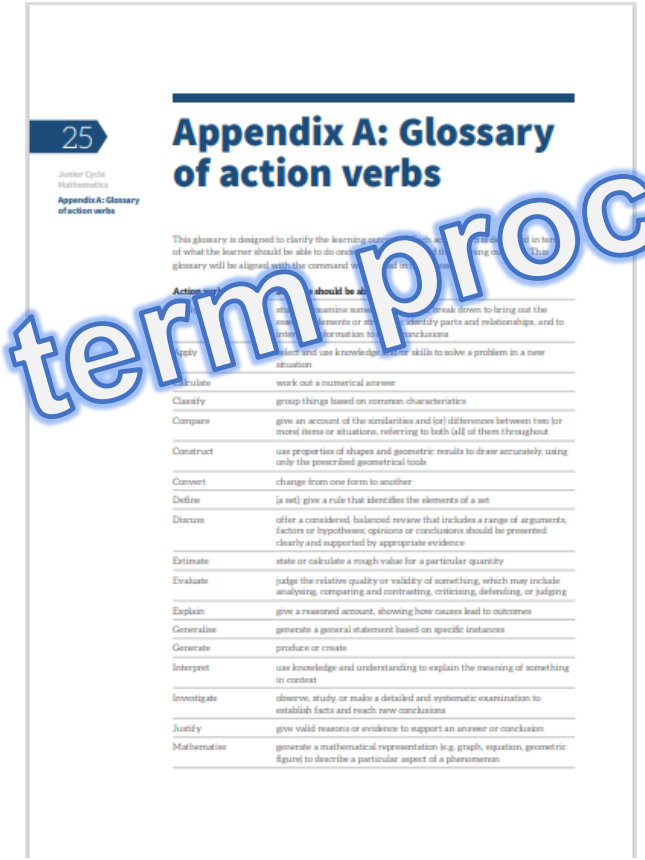


Long term process



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Junior Cycle Mathematics

Appendix A: Glossary of action verbs

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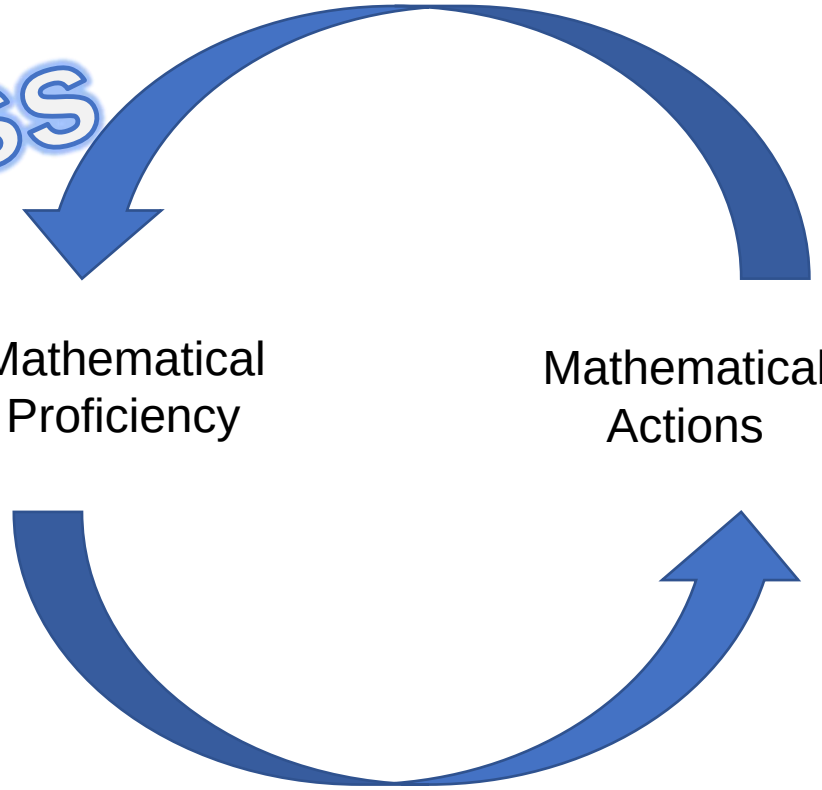
Mathematise	generate a mathematical representation [e.g. graph, equation, geometric figure] to describe a particular aspect of a phenomenon



Aim for our students

Process

Interdependent

Reflective Log

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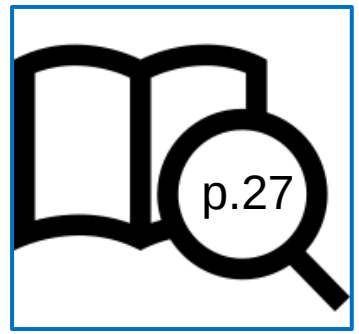
How does it work in this context?

How might it work in my context?

How will I adapt/modify it for my practice?



5 mins

Oide

Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Lunch

1 hour

Outline for the day

Approximate Time	Activity
09:15 – 09:30	Introduction
9:30 – 11:00	Exploring Mathematical Proficiency
11:00 – 11:15	Tea/Coffee
11:15 – 12:00	Exploring Mathematical Actions
12:00 – 13:00	Investigation in the Junior Cycle Mathematics Classroom
13:00 – 14:00	Lunch
14:00 – 15:30	Incorporating Rich Tasks into Classroom Practice

Oide

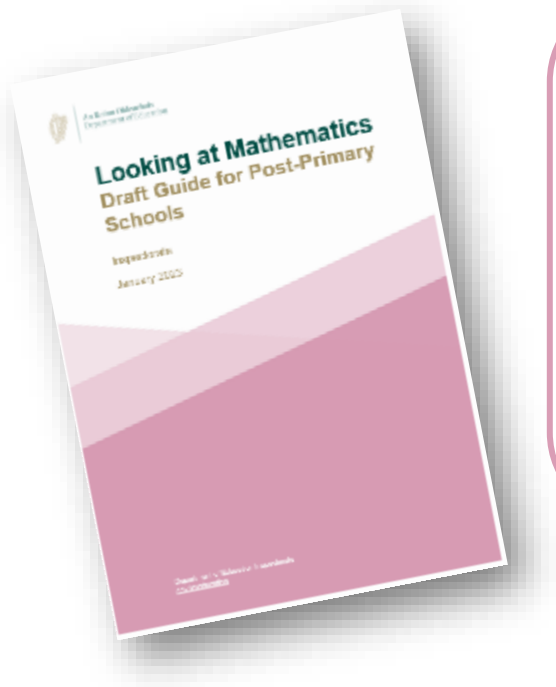
Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professional Learning of School Leaders and Teachers

Incorporating Rich Tasks into Classroom Practice

Learning Intention

To further develop the incorporation of rich tasks into classroom practice.



Students engage in **purposeful tasks** that link to their **real-world experiences**; students participate in **classroom discussions** and place value on listening and contributing.

(Looking at Mathematics, p.5)

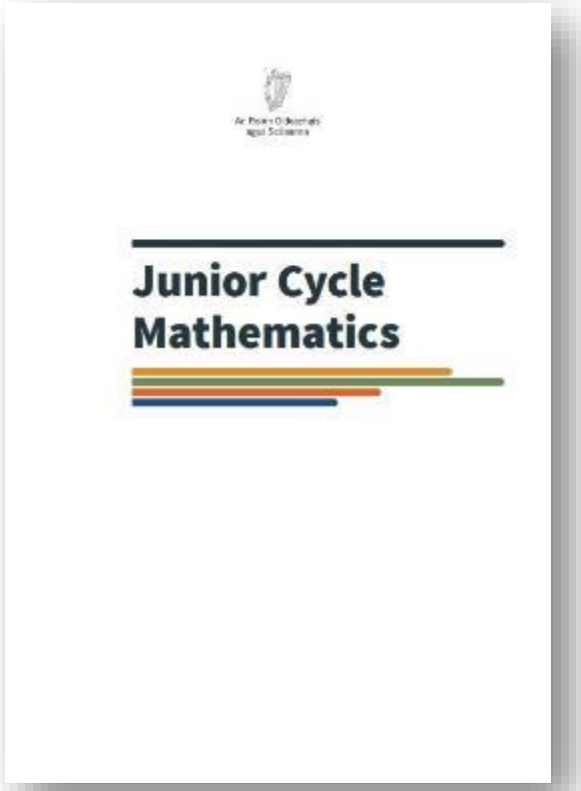
Learning Intention:

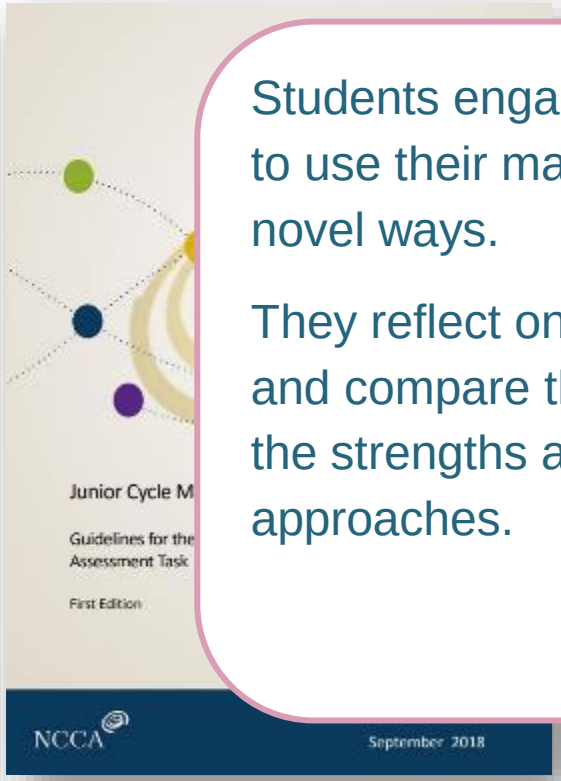
To further develop the incorporation of rich tasks into classroom practice.

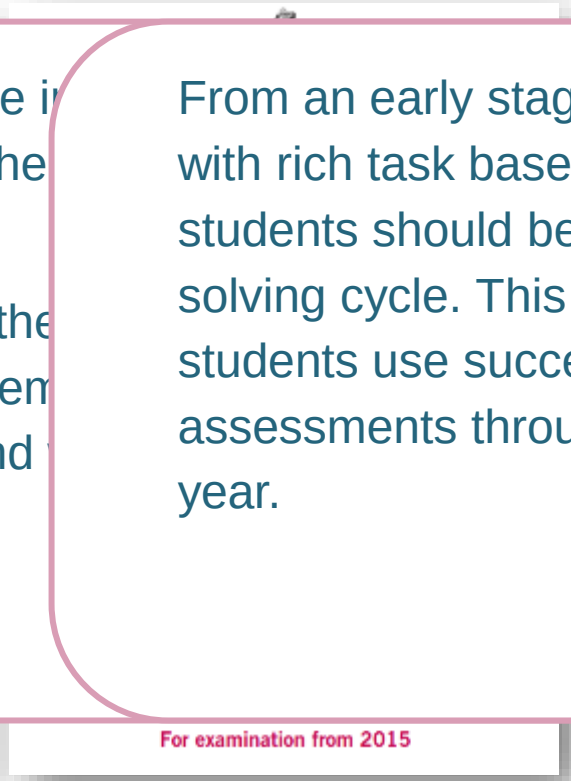
Success Criteria:

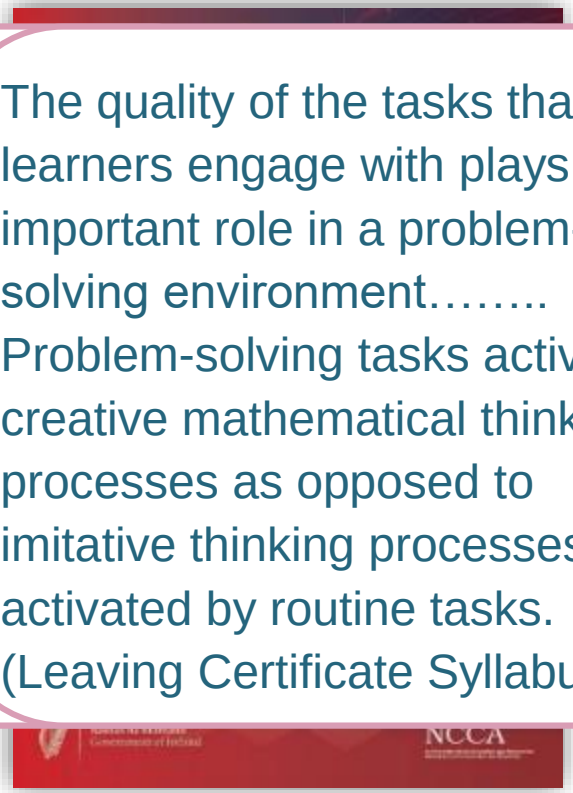
- I can identify what is important in a task.
- I have reflected on my use of tasks
- I have created/selected resources to further develop my use of tasks
- I can sequence tasks with the student at the centre of the learning to develop understanding.

Rationale









Students engage i
to use their mathe
novel ways.

They reflect on the
and compare them
the strengths and
approaches.

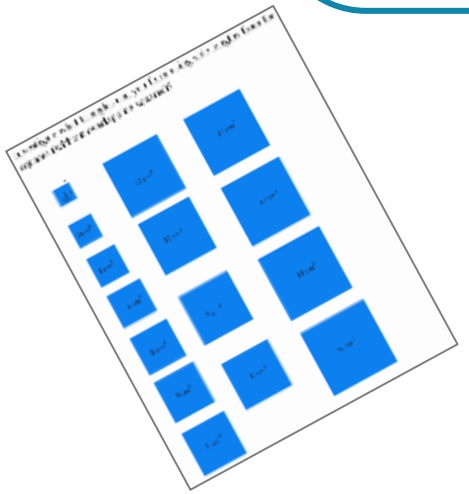
From an early stag
with rich task base
students should be
solving cycle. This
students use succe
assessments throu
year.

The quality of the tasks that learners engage with plays an important role in a problem-solving environment…….. Problem-solving tasks activate creative mathematical thinking processes as opposed to imitative thinking processes activated by routine tasks. (Leaving Certificate Syllabus)

What is a rich task?

"….much of what it takes to make a rich task "rich" is the environment in which it is presented, which includes the support and questions that are used by the teacher and the roles that learners are encouraged to adopt."

Jennifer Piggott, Rich Tasks and Contexts (http://nrich.maths.org/5662)



Right Angled Possibilities

If two of the sides of a right-angled triangle are 5cm and 6cm long, how many possibilities are there for the length of the third side?

Can you explain your reasoning?

'Natural numbers can be expressed as the sum of consecutive positive whole numbers.'

Is this statement *always, sometimes or never* true?

What are the characteristics of a rich task?

Characteristics of a rich task

Engaging

Provides access and challenge

Reasoning and generalisation

Discussion and communication

Decision making

Connecting strands

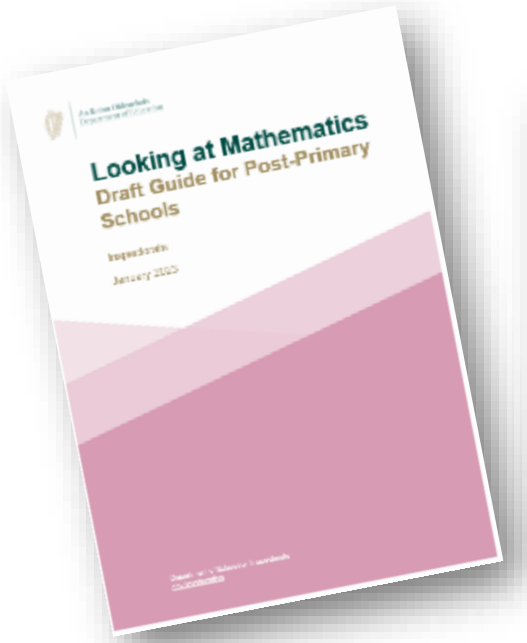
Creative

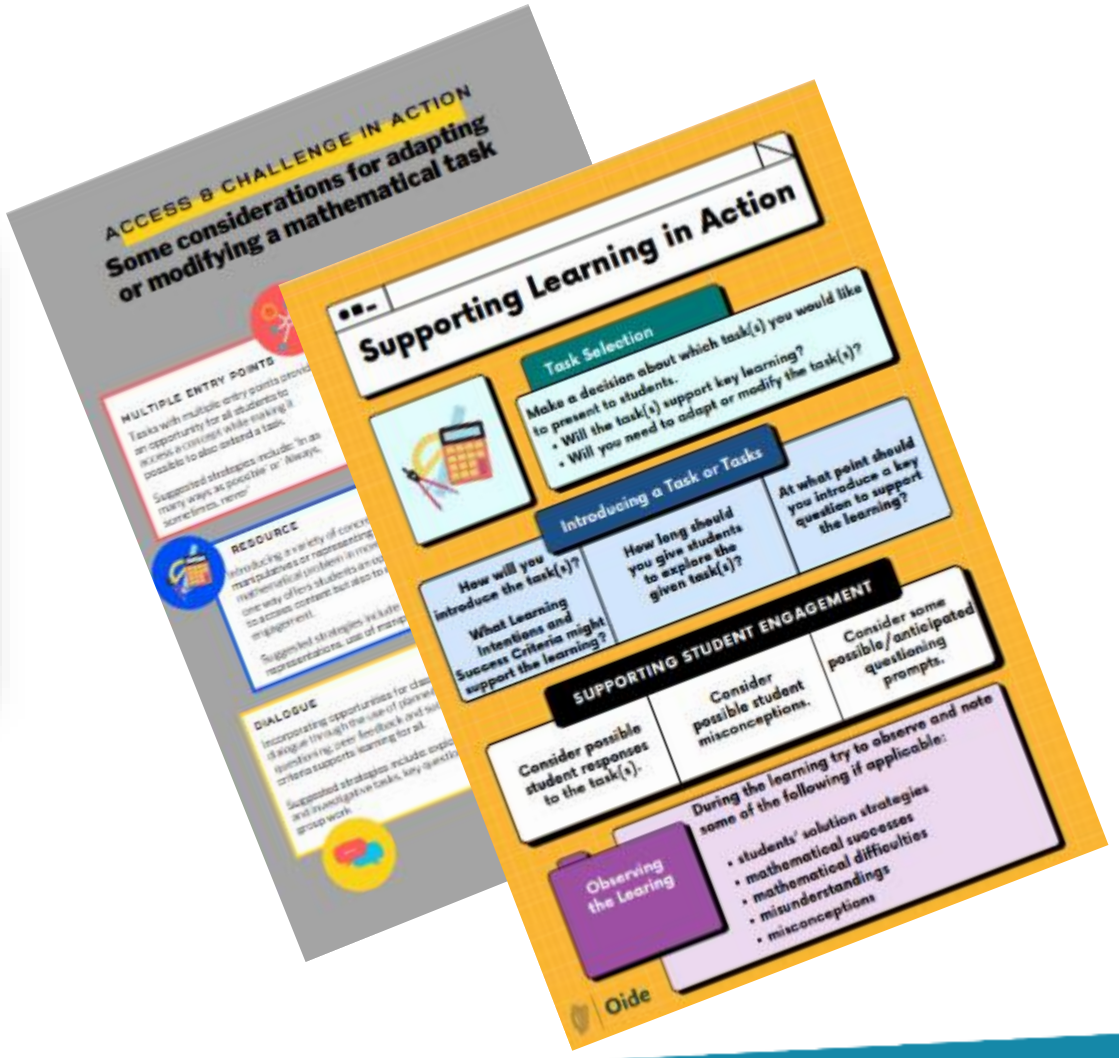
Multiple entry points

Teacher Voice

"they can see that the tools ..they are building up in their toolbox can then be used …in different scenarios and in different problems

Factors to consider when choosing a rich task





Right Angled Possibilities

If two of the sides of a right-angled triangle are 5cm and 6cm long, how many possibilities are there for the length of the third side?

Can you explain your reasoning?

Activity

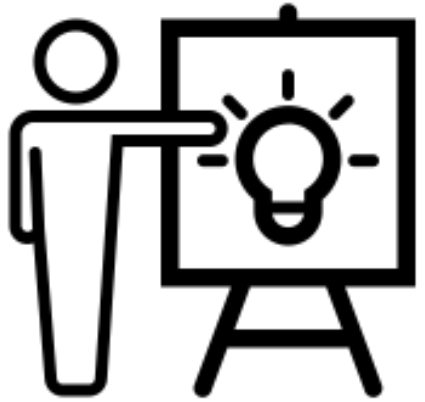
Engage in self-reflection

10 mins

Looking at sequencing

35 mins

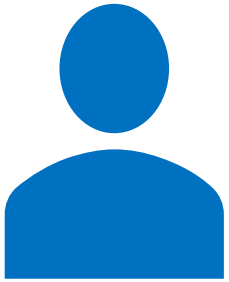
Sharing our thinking



10 mins

Self-Reflection

Engage in self-reflection



Getting Started

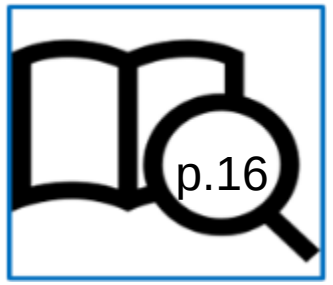
- I select, adapt and use tasks which support the key learning for all students
- I use tasks throughout a unit of learning

Up and Running

- I select a balance of tasks to build a range of mathematical skills and develop each of the components of mathematical proficiency
- I use learning intentions and success criteria to support student learning

Moving Forward

- I sequence tasks to teach for understanding
- I use tasks that develop student's prior knowledge to move them to new understandings



10 mins

Resources


Getting Started
Recourses Padlet
Example pdf
Scoilnet
NCCA Formative Assessment Boklet
Up and Running
scoilnet
Moving forward

Activity

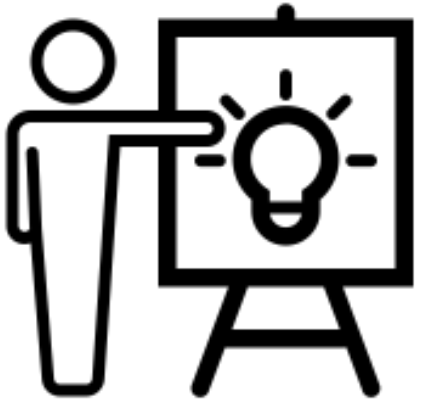
Engage in self-reflection

10 mins

Looking at sequencing

35 mins

Sharing our thinking

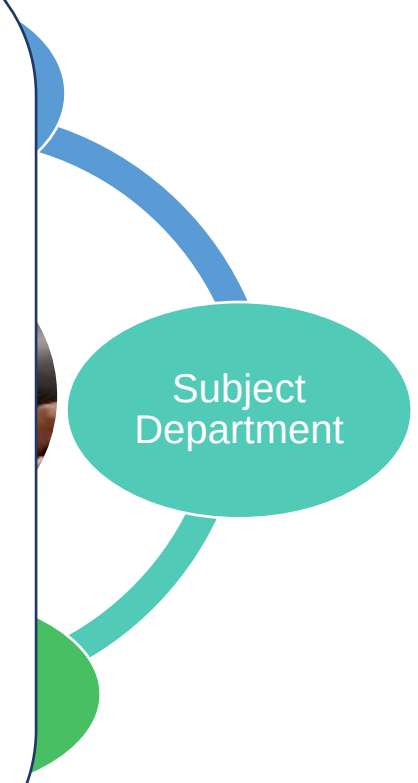


10 mins

Considerations for Sequencing

Assessment Practices:

- Is task-based learning included in your department assessment policies?
- Can you align your assessment of tasks to learning intentions and success criteria?
- Can you apply some of the language and the features of quality from the Junior Cycle Assessment guidelines to your assessment of rich tasks?



Setting the Context

Learning Outcomes

GT3, GT4, U1, U2, U4, U5, U6, U7, U8. U9, U10, U11, U13

Context

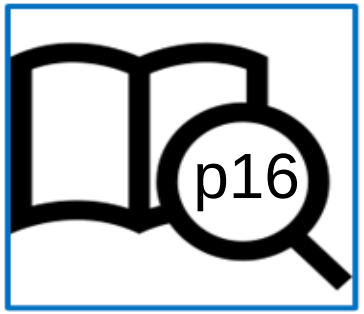
Consider your own context

Key Learning

- Students develop their mathematical arguments about geometric relationships
- Students apply Pythagoras' Theorem to solve right angle triangle problems
- Students analyse and interpret problems involving Pythagoras' Theorem
- Students develop their understanding of the construction of right-angled triangles

Ongoing Assessment

- Can students solve problems using Pythagoras Theorem in familiar and unfamiliar contexts?
- Can students develop a mathematical argument in relation to Pythagoras' Theorem?
- Can students select, justify and apply suitable constructions to solve problems involving right angled triangles?



Choose and sequence appropriate tasks

Incorporating Tasks

"we are looking at whether we are using a task at the beginning of the unit of learning to introduce a topic, ….using multiple tasks within the unit it's something we are developing

Possible talking points

How can we start this unit with a task that fosters student engagement?

Can we select a range of tasks that incorporate a balance of the components of Mathematical Proficiency?

Do we have tasks that develop student's prior knowledge to move them to new understandings?

Looking at sequencing

Examine the key learning and ongoing assessment from the unit of learning

Take time to have a look at the rich tasks associated with the unit of learning

Take the tasks provided and sequence them, keeping in mind your own school context

Planning Support for a Unit of Learning

Learning Outcomes

GT3, GT4, U1, U2, U4, U5, U6, U7, U8. U9, U10, U11, U13

Context

Consider your own context

Key Learning

- Students develop their mathematical arguments about geometric relationships
- Students apply Pythagoras' Theorem to solve right angle triangle problems
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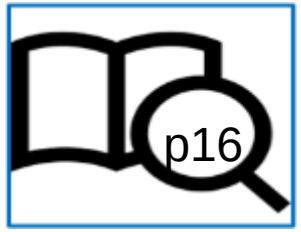
5 mins



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Supporting the Professional Learning of School Leaders and Teachers

Supporting Tasks

Task C

Investigating Triangles

Investigate what triangles can you form using side lengths from the squares (without overlapping squares)?

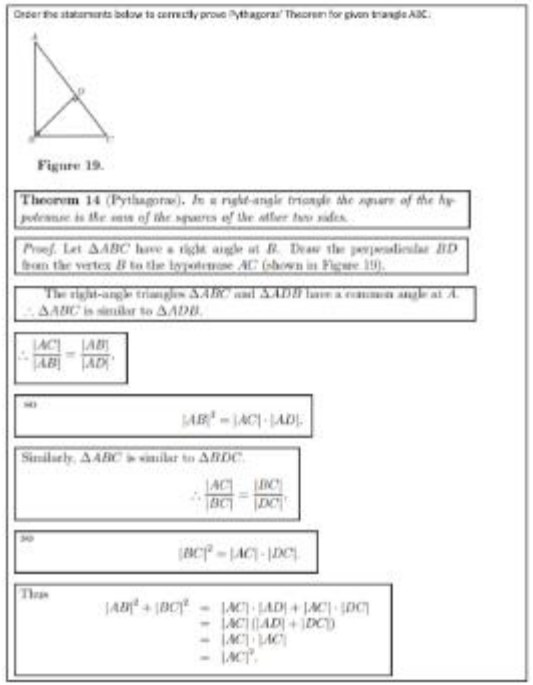
Task B

Right Angled Possibilities

If two of the sides of a right-angled triangle are 5cm and 6cm long, how many possibilities are there for the length of the third side?

Can you explain your reasoning?

Task K



Order the statements below to correctly prove Pythagoras' Theorem for given triangle ABC.

Figure 19.

Theorem 14 (Pythagoras). *In a right-angle triangle the square of the hypotenuse is the sum of the squares of the other two sides.*

Proof. Let ΔABC have a right angle at B. Draw the perpendicular BD from the vertex B to the hypotenuse AC (shown in Figure 19).

The right-angle triangles ΔABC and ΔADB have a common angle at A.
$\therefore \Delta ABC$ is similar to ΔADB.

$$\therefore \frac{|AC|}{|AB|} = \frac{|AB|}{|AD|}.$$

$$|AB|^2 = |AC| \cdot |AD|.$$

Similarly, ΔABC is similar to ΔBDC.

$$\therefore \frac{|AC|}{|BC|} = \frac{|BC|}{|DC|}.$$

$$|BC|^2 = |AC| \cdot |DC|.$$

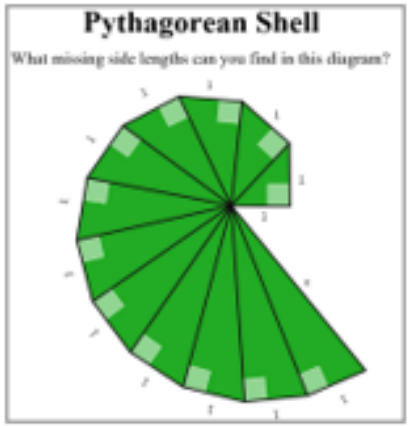
Thus

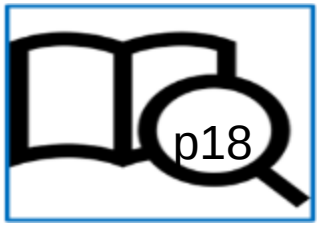
$$\begin{aligned} |AB|^2 + |BC|^2 &= |AC| \cdot |AD| + |AC| \cdot |DC| \\ &= |AC|\,(|AD| + |DC|) \\ &= |AC| \cdot |AC| \\ &= |AC|^2. \end{aligned}$$

Task A

Pythagorean Shell

What missing side lengths can you find in this diagram?





10 mins

Activity

- Examine the tasks while reviewing the key learning
- Consider your own student context
- **Sequence the tasks in a way that makes most sense for your students**

While sequencing the tasks discuss:

- Which tasks are you choosing?
- How have you decided to sequence the tasks?
- What other learning is needed between tasks?
- How do mathematical ideas from the unit develop in this lesson sequence?

p.20

Supporting Tasks

Task C

Investigating Triangles

Investigate what triangles can you form using side lengths from the squares (without overlapping squares)?

Task B

Right Angled Possibilities

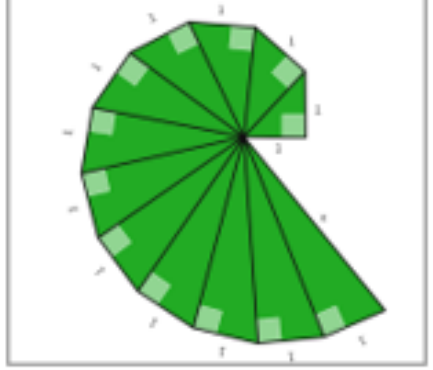
If two of the sides of a right-angled triangle are 5cm and 6cm long, how many possibilities are there for the length of the third side?

Can you explain your reasoning?

Task A

Pythagorean Shell

What missing side lengths can you find in this diagram?



Task K

Order the statements below to correctly prove Pythagoras' Theorem for given triangle ABC.

Figure 19.

Theorem 14 (Pythagoras). *In a right-angle triangle the square of the hypotenuse is the sum of the squares of the other two sides.*

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Sequencing

Which tasks are you choosing?

How have you decided to sequence the tasks?

What other learning is needed between tasks?

How do mathematical ideas from the unit develop in this lesson sequence?

Learning Outcomes
GT3, GT4, U1, U2, U4, U5, U6, U7, U8. U9, U10, U11, U13

Context
Consider your own context

Key Learning
- Students develop their mathematical arguments about geometric relationships
- Students apply Pythagoras' Theorem to solve right angle triangle problems
- Students analyse and interpret problems involving Pythagoras' Theorem
- Students develop their understanding of the construction of right-angled triangles

Ongoing Assessment
- Can students solve problems using Pythagoras Theorem in familiar and unfamiliar contexts?
- Can students develop a mathematical argument in relation to Pythagoras' Theorem?
- Can students select, justify and apply suitable constructions to solve problems involving right angled triangles?

20 mins

Activity

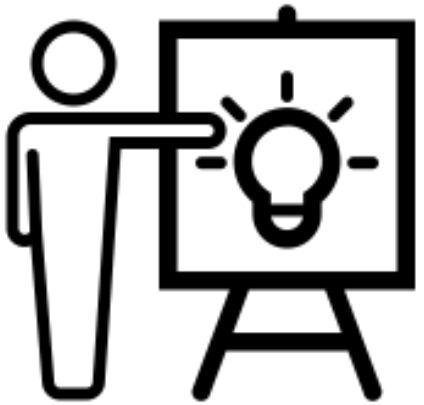
Engage in self-reflection

10 mins

Looking at sequencing

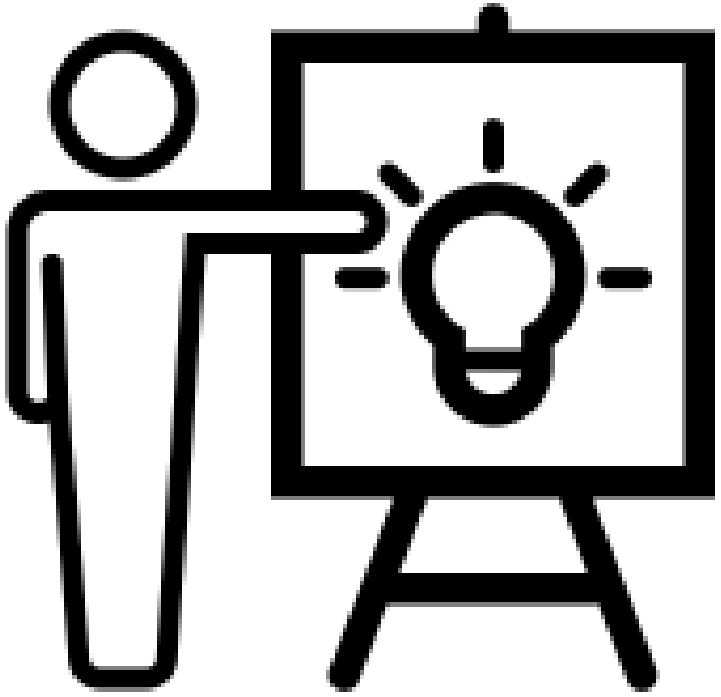
35 mins

Sharing our thinking



10 mins

Sharing our thinking



Which tasks are you choosing?

How have you decided to sequence the tasks?

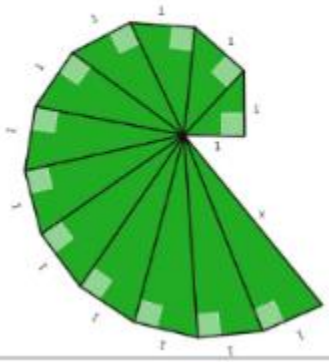
What other learning is needed between tasks?

How do mathematical ideas from the unit develop in this lesson sequence?

Task A

Pythagorean Shell

What missing side lengths can you find in this diagram?



Task B

Right Angled Possibilities

If two of the sides of a right-angled triangle are 5cm and 6cm long, how many possibilities are there for the length of the third side?

Can you explain your reasoning?

Task C

Investigating Triangles

Investigate what triangles can you form using side lengths from the squares (without overlapping squares)?

Task D

Order the statements below to correctly prove Pythagoras' Theorem for given triangle ABC.

Figure 19.

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Proof. Let $\triangle ABC$ have a right angle at B. Draw the perpendicular BD from the vertex B to the hypotenuse AC (shown in Figure 19).

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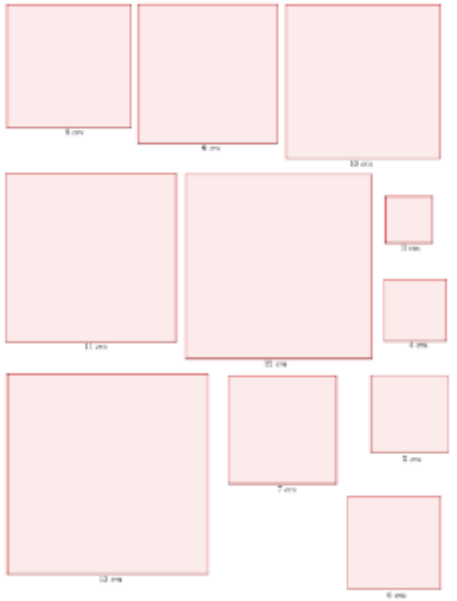
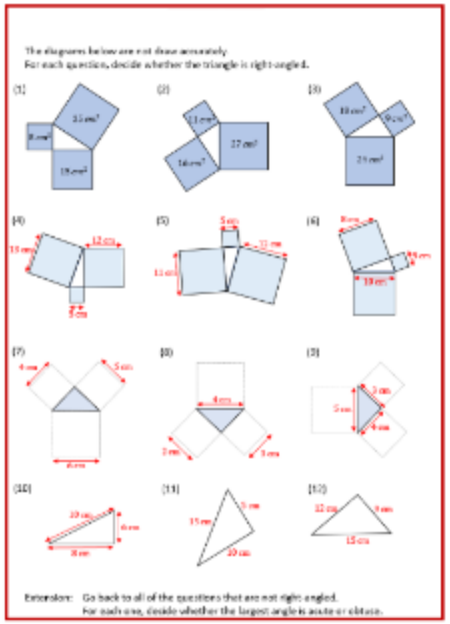
Task E

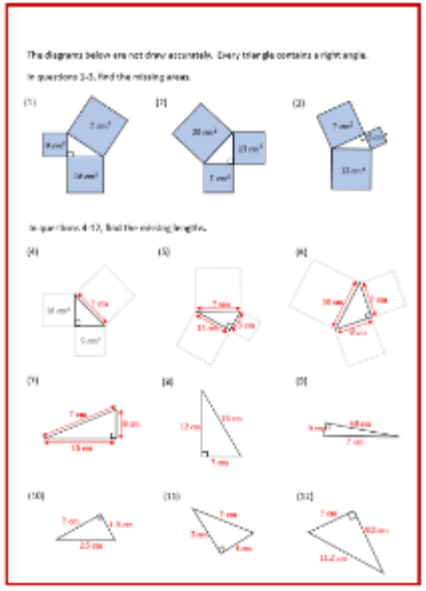
Which of the squares below will form a right-angled triangle if joined together at the vertices?



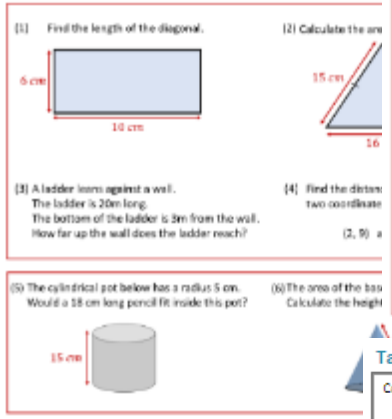
Task F



Task G

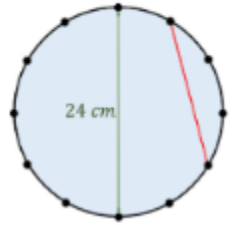


Task H



Task I

The spots are spaced equally around the circumference of the circle.
Find the length of the red line.



Task J

Construct the following shapes accurately:

(a) A right-angled triangle with one angle 60° and the longest side being 9cm.

(b) A square with a diagonal of length 8cm.

Task K

Prove that the perpendiculars from a point on an angle bisector to the arms of the angle have equal length.

Learning Intention:

To further develop the incorporation of rich tasks into classroom practice.

Success Criteria:

- I can identify what is important in a task.
- I have reflected on my use of tasks
- I have created/selected resources to further develop my use of tasks
- I can sequence tasks with the student at the centre of the learning to develop understanding.

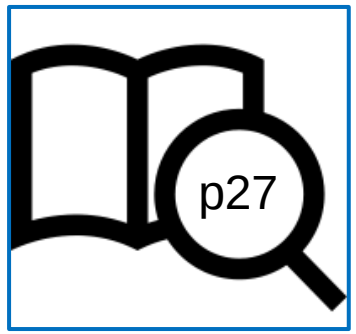
Reflective Log

What have I experienced that may enhance my students' experience?

How does it work in this context?

How might it work in my context?

How will I adapt/modify it for my practice?



3 mins

Oide

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Supporting the Professional Learning of School Leaders and Teachers

Conclusion

Learning Intentions

- To identify and maximise opportunities for developing mathematical proficiency.
- To explore mathematical actions that support the development of mathematical proficiency.
- To discuss and reflect on how we support the incremental development of investigation skills for Junior Cycle Mathematics students.
- To further develop the incorporation of rich tasks into classroom practice.

Feedback

https://registration.oide.ie/feedback

Oide Mathematics Support

https://dms.oide.ie/support/

Principal can apply using

school roll number

password: schoolsupport2023

Oide

Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professional Learning of School Leaders and Teachers

Assessment Update

Assessment Information (2023/2024)

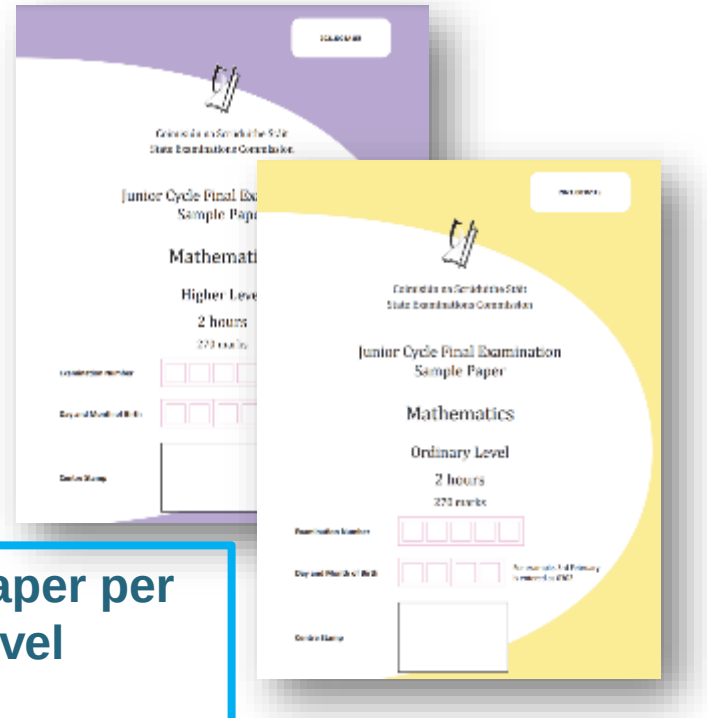
1.2 Key updates for the school year 2023/2024

Circular Number: 0028/2023

- It has been decided that the adjustments made to assessment arrangements for the 2022/2023 academic year will be maintained for one further year. As a result of these assessment adjustments, students entering third year in the school year 2023/2024 will be required to complete a minimum of one Classroom-Based Assessment rather than the usual two. Further detail is at section 3.5.

- This also means that students in third year in the school year 2023/24 will not be required to complete Assessment Tasks (ATs) in the relevant subjects.

The AT element will not be examined in 2024



One paper per level

Two hours duration

CBA - Third Year 2023/24

NCCA

Revised arrangements for the completion of Classroom-Based Assessments

June 2023

Student cohort 2021 - 2024 (students in 3rd year in 2023/2024)

- Each student must complete a minimum of one CBA in each subject and one CBA in each short course. Students from this cohort will not be required to complete Assessment Tasks.
- Schools have autonomy to decide whether to complete one or two CBAs in each subject.

Please note that the latest date for completion of CBA1 in all subjects, with the exception of Gaeilge, was May 2023 and has now passed.

Key Dates

Current Third Years

The information on this slide is taken from the NCCA release of June, 2023, please check www.curriculumonline.ie for updated information

Classroom-Based Assessment 2 in English, Science, Business Studies, Modern-Foreign Languages, Mathematics, History, Geography, Classics, Religious Education, Jewish Studies

Latest date for completion	Thurs 14th March 2024
Latest date for award of provisional descriptors by the teacher	Mon 25th March 2024
Latest date for completion of Subject Learning and Assessment Review and for award of final descriptors by the teacher	Fri 29th March 2024

CBA - Second Year 23/24

NCCA

Revised arrangements for the completion of Classroom-Based Assessments

June 2023

Student cohort 2021 - 2024 (students in 3rd year in 2023/2024)

Student Cohort 2022– 2025 (2nd years in 2023/2024)

Arrangements for this cohort remain as per the *Framework for Junior Cycle* (2015).

Key Dates

Current Second Years

The information on this slide is taken from the NCCA release of June 2023, please check www.curriculumonline.ie for updated information

Student Cohort 2022– 2025 (2nd years in 2023/2024)

Arrangements for this cohort remain as per the *Framework for Junior Cycle* (2015).

Classroom-Based Assessment 1 in all subjects

Window for completion	Monday 30th October 2023 – Friday 10h May 2024
Latest date for award of provisional descriptors by the teacher	Wednesday 15th May 2024
Latest date for completion of Subject Learning and Assessment Review and for award of final descriptors by the teacher	Wednesday 22nd May 2024


Thank
You!

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