Problem solving leading to proof

Year group: 2nd years

Project Maths Tionscadal Mata Development Team

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Class: 2nd yr Higher Level
Teacher: Sharon Mack

Title of the Lesson: Geometry and problem solving leading to formal proof

1. Brief description of the lesson

Review and extend the prior knowledge of the student, using investigative methods leading to formal proof

2. Aims of the Lesson:

- I'd like my students to appreciate the value of a proof, realizing the importance of "never assuming"
- The aim to encourage independent learning
- Promote creativity and imagination
- Build enthusiasm by engaging with stimulating activities
- Encourage students to be comfortable in trying different methods to solve problems, and to realise that there are often numerous valid approaches this.

Learning Outcomes:

- Students will see many approaches to proving the sum of all angles in a triangle equals 180 degrees using prior knowledge, discovery learning and peer teaching
- Student will appreciate the value of proof and the importance of never assuming

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3. Background and Rationale

From past experience we agreed while most students did remember they lacked an understanding why the angles in a triangle add to 180degrees

4. Research

Strand 2: Geometry and Trigonometry, Theorem 4: The angles in a triangle add up to 180^{o}

5. About the Unit and the Lesson

Discovery learning is used throughout the flow of the lesson to ensure a deeper understanding of the theorem which also ensures the students retain the information better since they discovered it themselves.

6. Flow of the Unit:

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Lesson		# of lesson periods
	• Place students in groups being mindful of ability levels (1min)	

	• Recap on previous lesson (5mins) • Pose the question - What does the sum of the angles inside a triangle equal? Discuss (2mins)	
	• One member of each group holds up their triangle and gives their decision. Students then see their triangles are different yet they have all made the same decision. (1min) • Students are then asked how can this be true since all the triangles are different and asked could they prove their decision. (5mins)	
	• Ask students to prove this in as many ways as possible (15mins)	
	• Hand out triangle worksheet, scissors, protractor and let them work (5mins) • Hand out second worksheet with parallel lines and a transversal (10mins) • Circulate and observe while the students work, taking notes of different methods used keeping interaction with students to a minimum. • Choose which students to call to the board	
	• Conclusions, discussion and plenary of lesson • Call students to the board starting with most basic answer to most sophisticated • Each student puts their name on the board with their solution (10mins) • Recap on learning outcomes set out, emphasizing it was all their work and give ownership linking to proof (5mins) • Photo taken of the board	

7. Flow of the Lesson

Teaching Activity	Points of Consideration
1. Introduction ➢ *Students were reminded of the prior knowledge required in order to proceed with this lesson.* ➢ *During the previous week we had studied*	

angles, in particular, alternate angles and straight line angles.	
2. Posing the Task ➢ What does the sum of the angles inside a triangle equal? Discuss ➢ Students are then asked how can this be true since all the triangles are different and asked could they prove their decision	*How do we know if students understand the task?*
3. Anticipated Student Responses • Using a protractor to measure the angles inside the triangle • Fold the corners f triangle sin to form a straight line angle • Cut the corners off the triangle and line the together to form one straight line angle • Line up the angles using three corresponding triangles, to form a straight line • Line up the angles using three right triangles, to form a straight line	*Here the plan might describe how the teacher will handle the different student responses, especially incorrect solutions, students who get stuck, or students who finish early.*
4. Comparing and Discussing Our plan was: • To have all possible solutions physically ready to show. • Talk through each one, starting with the simplest or most obvious • Have students explain their methods • Discuss any unexpected solutions • Discuss any errors or misconceptions	*What are the ideas to focus on during the discussion? What will indicate that students are benefiting from the discussion?*
5. Summing up ➢ It was 10 minutes before students began to fold the triangles ➢ Initially there was confusion about which way to fold the triangle ➢ All anticipated answers were solved by the class ➢ Different approaches to the same solution	

8. Evaluation

- Teachers circled the room observing and taking notes relating to the question posed and also asking students to explain their methods
- Pictures will be taken of students work
- Students will be picked to display and explain their work on the board

9. Board Plan

- To have all possible solutions physically ready to show.
- Talk through each one, starting with the simplest or most obvious
- Have students explain their methods
- Discuss any unexpected solutions
- Discuss any errors or misconceptions

10. Post-lesson reflection

The most common approach by the students was the use of the protractor to measure angles.
Other students began by cutting out triangles without fully knowing why
Some students cut the corners off the triangles
- some tried to put the corners in a circle
- some eventually lined the angles along a ruler

It was 10 minutes before students began to fold the triangles

Initially there was confusion about which way to fold the triangle
- One student cut triangles in half not knowing why he was doing so.
- Other students cut out angles and made a circle
- Misconceptions led to findings in some cases