For the lesson January 24th 2016
At Loreto Community School, Milford
Transition Year class

Teacher: Lorraine Cunningham
Lesson plan developed by:
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Title of the Lesson: Seeing through the "Dab".

Brief description of the lesson: Students will decide upon the various steps used to find the dimensions and angles of triangles needed in order to find the area of a triangle.

Aims of the Lesson: Develop independent learners, a positive disposition towards problem solving, find the area of a triangular shape after figuring out the various information required to do so.

Long-range/thematic goals:
I'd like my students to appreciate that mathematics can be used to solve real world problems
I'd like my students to appreciate that mathematics can be used to communicate thinking effectively
I'd like to foster my students to become independent learners
I'd like my students to become more creative when devising approaches and methods to solve problems
I'd like to emphasise to students that a problem can have several equally valid solutions
I'd like my students to experience meaningful mathematics i.e. that they see a need for what they are studying
I'd like students to recognise the linkages between the various strands of mathematics on the course.

Students will
- understand the link between the side length of a triangle and the area of a triangle.
- recognise the relationships between the various topics visited in this problem solve.

Learning Outcomes:
As a result of studying this topic students will be able to use:
- Pythagoras' Theorem
- Trigonometric Ratios
- Geometry: Parallel lines, alternate angles etc.
- Coordinate Geometry: distance, slope of a line, rise/run etc.
- Area and Perimeter: area of a triangle, area of the square

Background and Rationale
Students often fail to see the relationship between the various topics within the course. We would hope that students will recognise the connection between the different topics visited within this problem solving question. Furthermore, we often see that students have very little confidence when it comes to attempting problem solving questions, particularly in exam situations. We would hope that students will start developing a positive attitude towards solving

problems and will attempt questions with less apprehension once skills are developed for "dissecting" text-heavy problems. .

Research

YouTube Video about "dabbing", text books; Texts and tests, Active Maths, Project Mathematics Website, investigating student interests for the creation of the "hook" of the lesson.

About the Unit and the Lesson

The mathematics syllabus aims to "develop the mathematical knowledge, skills and understanding needed for continuing education, for life and for work, develop the skills of dealing with mathematical concepts in context and applications, as well as in solving problems, support the development of literacy and numeracy skills, foster a positive attitude to mathematics in the learner." Problem solving caters for the above principles.

The syllabus outlines specific learning outcomes and guidelines relevant to the main topics involved such as trigonometry, coordinate geometry, geometry and area and volume.

Flow of the Unit:

| Lesson		# of lesson periods
1	• Geometry Revision: right angled triangle and pythagoras theorem, constructions of triangles and measurements • Co-ordinate Geometry Revision: the coordinate plane • Trigonometry Revision: Sin, Cos, Tan and using the trigonometric ratios to find missing angles and dimensions.	3 x 30 min.
2	• Area Revision: calculating the area of a triangle using ½ base x perpendicular height	1 x 30 min.
3	• Posing the problem "seeing through the dab".	2 x 30 min. **(research lesson)**
4	• Introducing other methods of calculating the required information of a triangle: ½ ab Sin C, the Sine Rule(trigonometry), Coordinate geometry: the area of the triangle formula	3 x 30 min.
5	• Conclusion of the linkages between all strands and the right-angle triangle.	1 x 30 min.

Flow of the Lesson

Teaching Activity	Points of Consideration
The area of triangle formula Trigonometric Ratios Coordinate geometry: Slope and distance Revision of Constructions Pythagoras Theorem The angles of a triangle	It is important to scaffold students knowledge of the sides of the triangle i.e. the hypotenuse, opposite and adjacent before proceeding to ensure the formulae are followed correctly.
1. Introduction Present a simple right angled triangle and refresh information about finding dimension lengths and angles.	It is important to ensure that all students will achieve some level of success in their answers. Re-activating prior knowledge is paramount however students must not be influenced too much to affirm a substantial problem solving question.

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2. Posing the Task: You are watching a basketball match and you are sitting behind Rihanna and Drake. Rihanna is dabbing and obstructing your view as there is also a pillar right beside her. Using the information provided, find as many ways as possible that could you calculate the information needed to find the area that you are able to see between her dab and the pillar? Hence, find the area of the court that you are able to see throughout the game.	The area required should be pointed out to ensure students start the problem correctly.
3. Anticipated Student Responses R1. Constructions with measurements R2. Counting the squares on the coordinate plane R3. Measuring with a ruler to find the area R4. Distance formula R5. Pythagoras Theorem R6. Trigonometric Ratios R7. ½ AB SINC R8. Coordinate geometry: formula for the area of a triangle	Possible misconceptions: Incorrect steps in constructions, assuming a sketch without taking the correct angles into consideration Incorrectly identifying the hyp, adj and opp Students will be encouraged throughout the problem solve and guided if necessary. If the stronger students finish early, prompts could be given to keep learning active.
5. Summing up	All ideas will be taken to the board, starting with the least sophisticated to the most complex solution. All workings will be acknowledged and praised to ensure differentiation is taking place.

Evaluation
- Students will be observed using videos and by the other teachers in the room during the lesson.
- Three teachers will be available to do so and tasks will be assigned accordingly: Note-taking, video recording and helping students with their workings. The application "Lesson-Note" may be used.
- Students will be praised for achievement and subtly guided to continue using other methods.

Board Plan
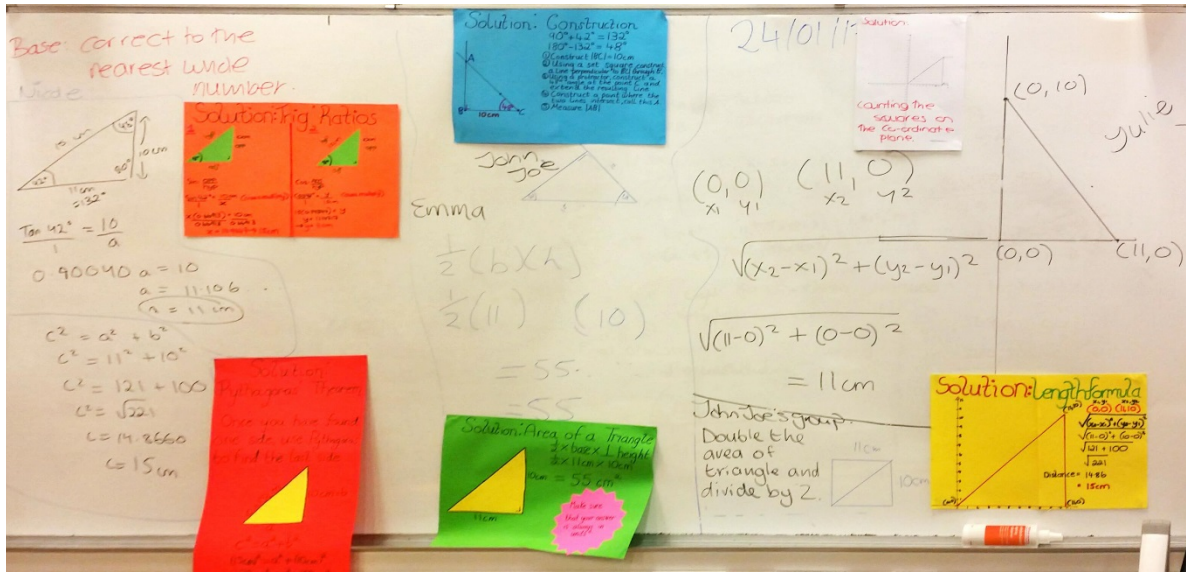
Prior Learning
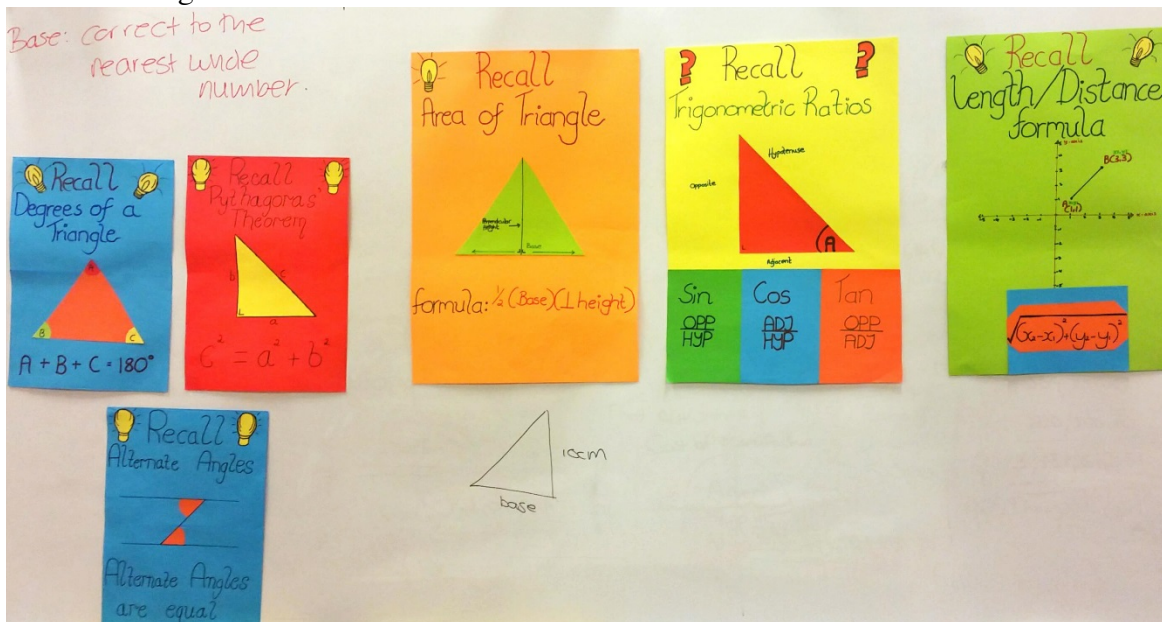
Post-lesson reflection

What are the major patterns and tendencies in the evidence? Discuss
- Students are fearful and reluctant to attempt anything in case it was wrong
- Teacher chose to extend Meitheal Machneamh time in order to ensure students engaged
- In general the lesson went to plan and the learning goals were achieved
- Once students found one method, they had little interest in looking at others
- Few students really excelled in finding solutions, encouraged by peer observation
- Male students were more engaged than female students

- Many students used the trigonometric ratios (most recently covered topic)

What are the key observations or representative examples of student learning and thinking?
- Once students got over initial shyness, they did become more engaged and actively learned.
- Encouragement was required, to ensure confidence in engagement
- Having the geometry sets present encouraged thinking that there might be other solutions
- During Ceardaíocht, students really engaged in active learning.

What does the evidence suggest about student thinking such as their misconceptions, difficulties, confusion, insights, surprising ideas, etc.?
- Trigonometric ratios caused much confusion. Students were aware of them but couldn't apply them correctly.
- Students did not use the coordinate plane
- Only two students attempted constructions
- All students were able to figure out the angles

In what ways did students achieve or not achieve the learning goals?
- They learned the many links between geometry, coordinate geometry, trigonometry and algebra through the problem solve (various strands of mathematics).
- They learned how to find the area of a triangle in many ways. Students realised that a problem can have several equally valid solutions
- They learned that mathematics can be used to solve real world problems be used to communicate thinking effectively.
- They became independent learners
- Some students developed creative approaches and methods to solve problems
- Students experienced meaningful mathematics by identifying a need for what they are studying

Based on your analysis, how would you change or revise the lesson?

- Highlight the use of perimeter in finding the area of a triangle; ½.b.h
- The measurement of problem solve were not realistic e.g. 10cm, would make them so.
- Stress to students that they have choice to work independently or in groups
- We would encourage groups if desired to be 3 students or less

What are the implications for teaching in your field?
Lesson Study has:
- improved our teaching
- encouraged us to facilitate active learning and independent thinkers
- reduced the "spoon feeding" culture
- created an awareness of the importance and benefit of student accountability during an entire lesson
- identified how well students can find solutions
- show us that while Structured Problem Solve requires preparation, it is worthwhile

During Lesson:

- Students will be observed by the other teachers and recorded in photos
- Three te... workings
- Students ... methods

You are watching a football match and you are sitting behind Rihanna and Drake. Rihanna is dabbing and obstructing your view as there is a pillar right beside her. Using the information provided, find as many ways as possible that could you calculate the information needed to find the area that you are able to see between her dab and the pillar. Hence, find the area of the pitch that you are able to see at this stage of the game (your answer will be an approximation).

10cm

42°