

Lesson Details	Lesson Study Group
<p><b>Name of lesson:</b> Looks Different, Same Value</p> <p><b>Topic:</b> Algebraic Fractions</p> <p><b>Year group:</b> 2nd year</p> <p><b>Level:</b> Higher</p>	<p><b>School Name &amp; address:</b> Rockwell College, Cashel, Co. Tipperary</p> <p><b>Advisor:</b> Enda Donnelly</p> <p><b>Teachers:</b> Henry Flynn, James Keating, Paul Maguire and Sean Ryan</p>

Research Theme
<p>Wellbeing and student engagement is the school's SSE topic.</p> <p>We would like our maths students to have a productive disposition—habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence, perseverance and one's own efficacy.</p> <p>Equivalence in fractions is the maths topic.</p>

Background & Rationale
<p>The group's experience is that students sometimes rely too much on procedure rather than understanding in this area. This leads to recurring problems right through post-primary Maths. A greater understanding of the basics of fractions along with a consistency of approach across related topics would help students understand how to work with fractions in other applications. The mathematical language can be an issue for students.</p>

Relationship of the Unit to the Syllabus		
Prior Learning	Current Learning	Future Learning
Multiples, LCM Fractions	N.1 b. perform the operations of addition, subtraction, multiplication	Equations with algebraic fractions

	<p>and division and understand the relationship between these operations and the properties: commutative, associative and distributive in <math>\mathbb{N}</math>, <math>\mathbb{Z}</math>, and <math>\mathbb{Q}</math> and in <math>\mathbb{R}\setminus\mathbb{Q}</math>, including operating on surds</p> <p>Adding and subtracting algebraic fractions with a numerical denominator</p>	<p>Complex Numbers Irrational numbers Limits and calculus</p> <p>AF.3 apply the properties of arithmetic operations and factorisation to generate equivalent expressions so that they can develop and use appropriate strategies to:</p> <p>a. add, subtract and simplify III. expressions of the form <math>a</math>, where <math>a, b, c \in \mathbb{Z}</math></p> <p>c. divide quadratic and cubic expressions by linear expressions, where all coefficients are integers and there is no remainder</p>
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**Goals of the Unit**

To develop a deeper understanding of equivalence and of fractions.

**Unit Plan**

Lesson	Brief overview of lessons in the unit
1	Multiplying numeric fractions
2	Multiples, LCM
3	Changing appearance of fractions (equivalence)
4	Adding and subtracting numeric fractions

5 research lesson	Adding and subtracting algebraic fractions (numerical denominator)
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3 and 4 might happen in one lesson

### Goals of the Lesson

Students will be able to:

Express algebraic fractions in equivalent forms

Add and subtract algebraic fractions (numeric denominator)

### Flow of the Lesson

Timing, activities, steps, resources, problems	Teacher support, activity	Assessment, questions, comments, strategies
40 min lesson Introduction: Key words: Equivalent Equal value...  Students will be asked to express the answer in its simplest form each time  1. On the board: $x/2 + x/4 =$ (~2 mins student work, ~ 5 mins board work)  2. On the board: $x/3 + x/5 =$ (~3 mins student work, ~ 3 mins	How can we get a common denominator?  If students use a denominator other than the LCM	Is the denominator the same for both fractions? Teacher works through and explains. Teacher will work through what happens if you work with a different denominator e.g. 8

<p>board work)</p> <p>3. <math>2x/3 - x/7</math>        (~3 mins student work, ~ 4 mins board work)</p> <p>4. <math>2x/9 + (x+1)/6</math>        (~3 mins student work, ~ 4 mins board work)</p> <p>If they could do with another Q of a similar level:  <math>3x/5 + (x+2)/4</math></p> <p>If there was time left in the lesson....</p> <p>5. <math>2x/9 + (x-1)/6</math></p> <p>Homework: Pg 481, 482        Q 5,7,9,14,15</p> <ul style="list-style-type: none"> <li>● <math>3x/4 + 5x/2</math></li> <li>● <math>x/4 - x/6</math></li> <li>● <math>7x/5 - x/2</math></li> <li>● <math>(2x-1)/6 + (x-3)/4</math></li> <li>● <math>(5x-1)/4 - (2x-4)/5</math></li> </ul>	<p>Check students are handling <math>3(x+1)</math> correctly</p>	
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### Board Plan

Neat boardwork left on board as lesson develops

### Evaluation of Lesson

The research lesson was a great opportunity to see things from the student perspective and look closely at how students' learning progresses through a lesson. We also got to identify where and when difficulties can arise in this topic. We observed that a significant number of students made transposition errors when dealing with fractions with a numerator of more than a single variable, so this will need further attention in class.

The mathematical language needed here can be an issue for students. We want our Maths department to be consistent in the language we use and the methods we promote as effective in working with fractions. We observed that students generally transferred their knowledge from numerical fractions very well and handled the earlier questions impressively. Students showed very good use of mathematical language “equivalent”, “algebraic”, “multiplication is commutative”...

### Summary of Key Learning

<b>Meeting 1</b>	<p>Discussed the issues for teaching and learning around equivalence - language, misconceptions, reliance on procedures (cross multiplying!), issues from primary school</p> <p>Discussed the many places this comes into the Maths curriculum</p> <p>Looked at examples (e.g. <math>x/2 + (x-1)/3</math>), considered different approaches, key points, role of equivalence, appropriate language and explanations of the teacher. Began to map out a unit of approximately 5 x 40 min lessons for second years</p>
<b>Meeting 2</b>	<p>Looked at JCT learning outcomes poster:  <a href="https://www.jct.ie/perch/resources/maths/learning-outcomes-poster-pdf.pdf">https://www.jct.ie/perch/resources/maths/learning-outcomes-poster-pdf.pdf</a> and links to the unit</p> <p>Jimmy's 6/11 probability puzzle and other applications in probability</p> <p>Might work on this earlier in 2nd year from next year?</p>

	<p>Might move CBAs earlier (into mid/late Feb) to teach unit in late March - provisional research lesson date of Tue 28th March</p> <p>Lesson 3 or 4 for research lesson</p> <p>Provisional meeting 3 date: Thursday Feb 9th, 4pm</p>
<b>Meeting 3</b>	Considered student agency and ownership
<b>Meeting 4</b>	Ran through lesson including homework. Possible student difficulties. Fine tuned questions. Considered timing of activities and s made a rough draft of an observation plan.
<b>Meeting 5</b>	

### Final Reflection

We feel that getting involved in lesson study was a great opportunity for us to collaborate on a common and coherent approach to working with fractions. Being able to choose the area of Maths that we wanted to work on ourselves in Rockwell College made this form of CPD ideal for us.

During the last few months we have found ourselves chatting more regularly about teaching and learning of Maths. The support we received from school management during the lesson study cycle was much appreciated. We plan to present our work to our whole staff in the near future.

