# How many people can be seated at 10 tables?

# A Linear Patterns Problem

*Reflections on Practice*
*2016*

**Lesson:** Linear Patterns
**Date:** 9/02/16
**Where:** St. Oliver's Community College, Drogheda, Class 1 Shaw
**Teacher:** Ms O' Callaghan
**Lesson plan developed by:** Shauna Mulligan, Siobhan Creamer, Genna O' Callaghan and Virginia Shanahan-Desmond


## Title of the Lesson:

How many people will be seated at 10 tables?

A Linear Patterns Problem

## 1. Brief description of the lesson
An introduction to patterns where the student aim is to find the $4^{th}$ and $10^{th}$ term of a sequence using as many methods as possible (drawing, graphing etc)

## 2. Aims of the Lesson:

### Long-range/thematic goals:
- I'd like my students to appreciate that mathematics can be used to solve practical problems
- I'd like my students to appreciate that patterns is a tool for making sense of problem solving in algebra
- 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 methodologies
- I'd like my students to experience meaningful mathematics i.e. that they see a need for what they are studying
- I'd like to build my students' enthusiasm for the subject by engaging them with stimulating activities
- I'd like my students to connect and review the concepts that we have studied already

### Short-term goals:
- Find the $4^{th}$ (next) and $10^{th}$ term of this pattern by using a variety of methods including diagrams, pictures, tables and words
- Find the common difference in order to find the nth term
- Explain the patterns and relationship using words and numbers


## 3. Learning Outcomes:

### As a result of studying this topic students will be able to:

- Use tables, diagrams, graphs, words and numbers to find the $4^{th}$ term and the $10^{th}$ term.
- Find the common difference between consecutive patterns in order to determine the next term
- Verbalize their findings.

## 4.  Background and Rationale

*What the students need to learn according to the syllabus;*

- *Patterns and the rules that govern them; students construct an understanding of a relationship as that which involves a set of inputs, a set of outputs and a correspondence from each input to each output.*
- *Relations derived from some kind of context – familiar, everyday situations, imaginary contexts or arrangements of tiles or blocks. Students look at various patterns and make predictions about what comes next.*
- *Ways to express a general relationship arising from a pattern or context.*

*Difficulties students have had in the past with the subject matter:*

- Independent thinking
- Identifying what pattern comes next
- Verbalizing the method of getting to the next term
- Coming up with different methods of finding the solution

*The thematic focus of this lesson study*

- I'd like my students to appreciate that mathematics can be used to solve real world problems
- I'd like my students to visualize
- I'd like my students to appreciate that patterns is a tool for making sense of problem solving in algebra
- 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 methodologies
- I'd like to build my students' enthusiasm for the subject by engaging them with stimulating activities

## 5.  Research

- *www.projectmaths.ie*
- http://www.ncca.ie/en/Curriculum_and_Assessment/Post-Primary_Education/Project_Maths/Syllabuses_and_Assessment/JC_Maths_English_2013.pdf
- www.examinations.ie
- http://maths.qahs.org.uk/files/2014/05/DevelopingFormulae.pdf
- Folens textbook
- Texts and tests textbook

## 6.  About the Unit and the Lesson

- By encouraging the students to represent the next term in the pattern using a variety of methods, we are hoping to address their independent thinking skills by allowing them to discover that there is more than one way to solve a problem.

- By presenting their findings, this allows the students to verbalise their answers, helping to assess understanding and address any misconceptions.

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## 7. Flow of the Unit:

| Lesson | | # of lesson periods |
|---|---|---|
| 1. | What a pattern is.<br>How to find the next term in a pattern<br>Recognise if it is a pattern. | 2 x 35min |
| **2** | **How many people will be seated at 10 tables?**<br><br>**A Linear Patterns Problems** | **1x 45min** |
| 3 | Representing situations using tables, diagrams and graphs | 3 x 35 mins |
| 4 | Finding the general formulae (the nth term) | 2 x 35 mins |
| 5 | Examining algebraic linear relationships | 2 X 35 mins |

## 8. Flow of the Lesson

| Teaching Activity | Points of Consideration | Time |
|---|---|---|
| **1. Introduction**<br>Starting task on white boards:<br>What is the next term in this sequence:<br>2,6,10,14…….<br><br>What is the next term in this sequence:<br>red, blue, green, red, blue, green ……… | | 2 minutes |
| **2. Posing the Task**<br>Given the first three images in the sequence, students are asked to calculate how many people can sit at table 4 and table 10 in as many different ways they can find. | • Students should begin predicting what the fourth table would look like<br>• All students should be able to come up with at least one solution to the problem<br>• We should see students using a range of methods to come up with an answer, even if it is not correct. This will include tables, pictures, graphs, numbers etc | 2 minutes |
| **3. Anticipated Student Responses**<br>*How we want students to respond to the task:*<br>• Students will draw the next term(s)<br>• Students will use the squares and counters to help in predicting the next terms | *Responses if students:*<br>Finish early:<br>• Keep going, there are more ways than that, keep working on it to see if you can find it<br>Get stuck:<br>• "why don't you try using the counters etc"<br>• "if you can't find the 10th, why don't you | 10-15 minutes |

| | | |
|---|---|---|
| • Students will count the people at each term and use numbers to predict term 4 and 10<br>• Students will use a table<br>• Students will use a graph<br>• Students will use words | try finding the 5th or 6th for example"<br>Incorrect Response<br>• " I see that you have used a different method, so we will look at that one tomorrow"<br>• Or if a lot of students have the same misconception, it may be necessary to address it there and then, depending on the time. | |
| **4. Comparing and Discussing**<br>*Predicted student solutions:*<br>Titles of the solutions and pictures<br>1. Drawing the next term<br>2. Using counters to find the next pattern<br>3. Using numbers to find the next pattern<br>4. Using tables<br>5. Using graphs<br>6. Using words | *"hands up who had the same solution"* | 10-15 minutes |
| **5. Summing up**<br>Homework task given, similar to the activity presented today in class<br><br>Give students an exit slip requesting the following information:<br>Name<br>• How many solutions they came up with<br>• How confident are you that could find the 10th term of a different problem on a scale of 1-10?<br>• Did you learn something new today?<br>• Did you learn something new from one of your classmates? | | 5-10 minutes |

**9. Evaluation**
- What is your plan for observing students?
Each observer will observe a group of 6-7 students
- Discuss logistical issues such as who will observe, what will be observed, how to record data, etc.
-make sure students know what a pattern is during the starting task

-methods students are coming up with in order to choose the students who will present their findings at the board
-misconceptions
-take photos
-how and when their understanding changes
- What observational strategies will you use (e.g., notes related to lesson plan, questions they ask,)?
-notes
-lesson note
-record students comments/discussions
- What types of student thinking and behaviour will observers focus on?
-how they engage with the materials given to them
-what kinds of questions do they ask which helps us gauge their understanding
-are they paying attention, are they being challenged?
-is there evidence that students are learning?
- What additional kinds of evidence will be collected (e.g., student work and performance related to the learning goal)?
-photos of the work
-samples of their work
-keep the quotes used by the students on the task

## 10. Board Plan
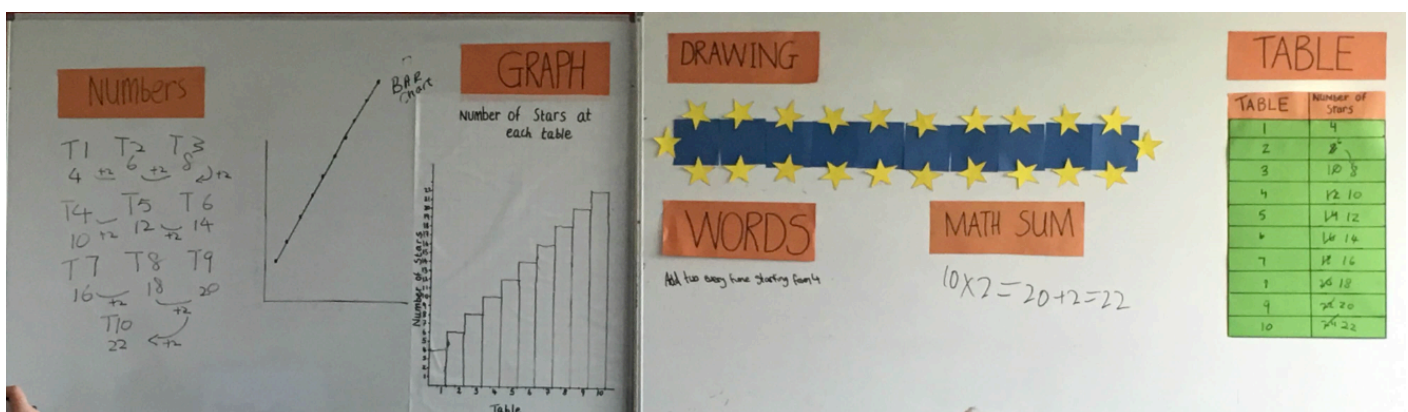
## 11. Post-lesson reflection

- When the problem was given, all students appeared to understand the task and there were no initial questions, however, when the task started, students then began to have questions which could not be addressed due to the problem solving nature of the lesson

- Students looked to their peers for more ideas

- Some students gave up after they had found the answer using the squares and stars

- Some students thought that they had to come up with more than one solution by using the squares and stars and this led to some misconceptions in the ordering of the tables

- Students came up with all of the outcomes we had anticipated and even went beyond our expectations with two students coming up with additional solutions

- The next time we would add the students name to their solutions on the board

- When a student was selected to come to the board with their solutions, we asked students to raise their hands if they too had the same solution.  This was good as all students got to give feedback on their solutions, not just the students chosen

- When all the solutions were displayed on the board, we allowed the students to take a photo of their work.  We also took a photo and emailed it to the students