**MATHEMATICS STAGE 3**

*2 weeks are an option because the content is new to Stage 3 and it is possible that there will need to be a lot of reinforcement of prior knowledge.*

**TEACHING AND LEARNING OVERVIEW**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| TERM:  | WEEK: 12 | STRAND: Numbers and Algebra | **SUB-STRAND**: Patterns and Algebra 2 | **WORKING MATHEMATICALLY:** MA3-3WM, MA3-2WM, MA3-3WM |
| OUTCOMES:MA3-8NA | Analyses and creates geometric and number patterns, constructs and completes number sentences, and locates points on the Cartesian plane  |
| **CONTENT:**  | **Introduce the**[**Cartesian coordinate system**](http://syllabus.bos.nsw.edu.au/glossary/mat/cartesian-coordinate-system/?ajax) **using all four quadrants (ACMMG143)** \* Identify and record the coordinates of given points in all four quadrants of the number plane\* Recognise that the order of coordinates is important when locating points on the number plane, eg (2, 3) is a location different from (3, 2) (Communicating) |
| ASSESSMENT FOR LEARNING(PRE-ASSESSMENT) | * Students need to create small groups and create their own ‘life-size’ Cartesian Plane using chalk outside on concrete areas. Evaluate their discussion and accuracy. Evaluate their understanding and use this as a starting point for further teaching and learning activities.
 |
| WARM UP / DRILL |  |
| TENS ACTIVITYNEWMAN’S PROBLEMINVESTIGATION  | Explore: <http://au.ixl.com/math/year-7/coordinate-graphs-as-maps>  |
| QUALITY TEACHING ELEMENTS | **INTELLECTUAL QUALITY** | **QUALITY LEARNING ENVIRONMENT** | **SIGNIFICANCE** |
| Deep knowledgeDeep understandingProblematic knowledgeHigher-order thinkingMetalanguageSubstantive communication | Explicit quality criteriaEngagementHigh expectationsSocial supportStudents’ self-regulationStudent direction | Background knowledgeCultural knowledgeKnowledge integrationInclusivityConnectednessNarrative |
| RESOURCES | * Interactive whiteboards usually have Cartesian plane templates readily accessible as drag and drop objects
* [Online Cartesian plane creator](http://illuminations.nctm.org/ActivityDetail.aspx?ID=205): select the ‘graph paper’ option and then ‘rectangular grid’ – this tool allows users to create Cartesian planes to their specifications and save them as pdf or jpeg files
 |

**TEACHING AND LEARNING EXPERIENCES**

|  |  |
| --- | --- |
| WHOLE CLASS INSTRUCTION MODELLED ACTIVITIES | GUIDED & INDEPENDENT ACTIVITIES |
| * ***Activity: Guess the Shape***
* Give all students an empty grid. With teacher guidance, students construct an empty Cartesian plane by drawing the two axes with a ruler and labelling all important features, including the *x*-axis (horizontal axis), *y*-axis (vertical axis) and origin (*O*).
* Students mark equal spaces on each axis from at least –5 to 5 and label each marker. (It does not matter in which quadrant the label *O* is written, but it is generally placed in the third quadrant, as close as possible to the origin.)
* One by one, the teacher calls out the coordinates of a number of points that can be connected to form a shape. Start with a simple shape, such as a rectangle, that includes at least one point in each quadrant. Students plot and label these points with the correct coordinates, being careful to place the *x*- and *y*-coordinates in the correct order inside parentheses (brackets). Avoid using points in which the *x*- and *y‑*coordinates have the same value, as this can cause confusion for students in the early stages of learning about the Cartesian plane.
* Once all the points have been plotted, the teacher calls out the coordinates of the points in the order in which they should be connected, while the students use a ruler to connect them. The students can then name the shape formed.
* Repeat the activity with a new Cartesian plane (which includes a grid and scale) for each shape until proficiency is demonstrated. The shapes used can become progressively more complex by involving more points, including points on the *x*-axis and/or the *y*-axis.
* ***Activity: Buried Treasure***
* Students work in pairs. Each student is given two identical Cartesian planes with axes from –4 to 4 only. Students may benefit from having the teacher model the process before they begin working in pairs.
* Individually, students plot a specified number of ‘buried treasures’ of different sizes on one of the Cartesian planes, e.g. 8 rubies (1 point (*x*, *y*)), 5 gold bars (an interval joining 2 points), 3 boxes of silver (a square 1 unit by 1 unit made by joining 4 points). The treasure must not touch or overlap.
* Students take turns guessing where the treasure is buried on their partner’s Cartesian plane by calling out the coordinates of points:
	+ If the guess is correct, the partner must respond positively and indicate the type of treasure that has been hit, e.g. ‘You’ve struck a gold bar’.
	+ If the guess is incorrect, the partner responds negatively, e.g. ‘You missed’.
* Students record the hits and misses made by their partner on the grid that shows their own treasure, and record the hits and misses they have made to locate their partner’s treasures on their second Cartesian plane.
* The first person to guess the location of all of his or her partner’s treasure wins the game.
 | LEARNING SEQUENCERemediationS2 | * *Adjustment:* Some students may require a larger grid and/or a grid on which the axes and the origin are already drawn and labelled, and/or the option to choose from a list of given labels.
* *Adjustment:* Some students may need to be given scales to complete that have already been started, or they may be asked to fill in missing numbers.
* *Adjustment:* Some students could be provided with a procedural prompts sheet for plotting a point on the Cartesian plane.
* *Adjustment:* Some students might only perform the activity with familiar simple shapes.
 |
| LEARNING SEQUENCES3 | * Review and reinforce the concepts explored in Weeks 5-6 Planning. The Cartesian Plane is a new concept for Stage 3, therefore, revisiting the content in varied ways is necessary.
 |
| LEARNING SEQUENCEExtension Early S4 | * ***Activity 5: Create Your Own Picture***
* Students begin by plotting a picture on an empty Cartesian plane (which includes a grid and scale). Pictures can vary from basic shapes or symmetrical designs to more complex pictures, such as those of animals. Students may benefit from having the teacher model the process before they begin to work independently.
* Students choose a starting point and write down the coordinates of the points in the order in which they must be connected to create the image. If the image has more than one part, students should write appropriate instructions to indicate this, e.g. using the words ‘start at …’ and ‘stop’. If desired, instructions can also be written for how each part is to be coloured.
* *Adjustment:* Some students could be assigned simple familiar shapes with as few points as possible, or be given a picture pre-drawn on a Cartesian plane, and start by drawing a coloured dot on top of the points used to create the picture. Some students could work wholly within the first quadrant.
* Copies of students’ instructions can be made and given to other students to draw pictures on an empty Cartesian plane. This will allow students to check each other’s work.
* The teacher could keep copies of some of these images to use in the future.
 |
| **EVALUATION & REFLECTION** | The output of these activities can be collected and used to inform the teacher of the quality of the learning that has taken place before moving on to subsequent activities. The teacher may determine that some (or all) students require clarification and further practice of the concepts addressed before subsequent activities are attempted. |