**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**

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| TERM:  | WEEK: 10-11 | 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 the [point](http://syllabus.bos.nsw.edu.au/glossary/mat/point/?ajax) of intersection of the two axes as the origin, having coordinates (0, 0) \* plot and label points, given coordinates, in all four quadrants of the number plane \* plot a sequence of coordinates to create a picture (Communicating)  |
| ASSESSMENT FOR LEARNING(PRE-ASSESSMENT) | * Simulate a whole class ‘battleships’ game on the whiteboard. Using coordinates, model the ‘battleships’ game and then play out with groups or the whole class. Observations and questioning will indicate the starting point for teaching and learning activities. Students can submit their thoughts on post-it notes with the thing they find the easiest and most difficult. A discussion around these points will provide a good understanding of the students’ learning needs.
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| WARM UP / DRILL |  |
| TENS ACTIVITYNEWMAN’S PROBLEMINVESTIGATION  | Explore some of the examples at: <http://hotmath.com/hotmath_help/topics/word-problems-plotting-points.html>  |
| 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 | *Scootle resources** [M010539](http://www.scootle.edu.au/ec/viewMetadata.action?id=M010539&q=&topic=&start=0&sort=relevance&contentsource=&contentprovider=&resourcetype=&v=text&field=title&field=keyword.text&field=description&field=idCis&field=topics.all.text&learningarea=%22Mathematics%22&contenttype=all&contenttype=%22Interactive%20resource%22&contenttype=%22Collection%22&contenttype=%22Image%22&contenttype=%22Moving%20image%22&contenttype=%22Sound%22&contenttype=%22Assessment%20resource%22&contenttype=%22Teacher%20guide%22&contenttype=%22Dataset%22&userlevel=%286%29&kc=any&lom=true&scot=true&follow=true&topiccounts=true&rows=20&suggestedResources=M010540,M009231,M010539&accContentId=ACMMG143&fromSearch=true) Interactive animation introducing the first quadrant of the Cartesian plane before introducing the other three quadrants
* [M010540](http://www.scootle.edu.au/ec/viewMetadata.action?id=M010540&q=&topic=&start=0&sort=relevance&contentsource=&contentprovider=&resourcetype=&v=text&field=title&field=keyword.text&field=description&field=idCis&field=topics.all.text&learningarea=%22Mathematics%22&contenttype=all&contenttype=%22Interactive%20resource%22&contenttype=%22Collection%22&contenttype=%22Image%22&contenttype=%22Moving%20image%22&contenttype=%22Sound%22&contenttype=%22Assessment%20resource%22&contenttype=%22Teacher%20guide%22&contenttype=%22Dataset%22&userlevel=%286%29&kc=any&lom=true&scot=true&follow=true&topiccounts=true&rows=20&suggestedResources=M010540,M009231,M010539&accContentId=ACMMG143&fromSearch=true) Explanation and short exercises on the first quadrant of the Cartesian plane before extending to the other three quadrants

*Other Resources** Masking tape or chalk
* Labels of the features of a Cartesian plane
* For the teacher: [www.shodor.org/interactivate/discussions/IntroductionToTheCoo/](http://www.shodor.org/interactivate/discussions/IntroductionToTheCoo/)
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**TEACHING AND LEARNING EXPERIENCES**

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| WHOLE CLASS INSTRUCTION MODELLED ACTIVITIES | GUIDED & INDEPENDENT ACTIVITIES |
| * ***Activity: Creating a Colossal Cartesian Plane (as previously done) (review previous lesson).***
* Issue each student with a card marked with the coordinates of a point. The set of points used should include points in each quadrant, the origin, and points on the *x*-axis and *y*-axis, e.g. (2, 5), (7, 4), (–13, 1), (–6, 8), (5, –3), (12, –6), (–8, –10), (–1, –7), (0, 3), (0, –14), (12, 0), (–4, 0), (10, 12), (–10, 12), (–6, –6), (7, –12), (0, 2), (–10, 0), (10, –10), (8, 0),

(–14, –8), (13, 8), (0, 12), (0, 0), (0, –3), (3, –8), (–11, 5), (–11, –5), (–4, –13), (–6, –2).* Explain the following:
	+ Coordinates of the origin are (0, 0) and all other points are located by starting (**origin**ating) at the origin.
	+ By convention, a ‘point’ on the Cartesian plane is recorded as a pair of numbers, separated by a comma, in parentheses (brackets).
	+ By convention, the first number in parentheses always refers to the ‘*x‑*coordinate’ of the point and indicates the position that is moved to on the *x*-axis to the right (positive) or to the left (negative) of the origin, i.e. the position moved to horizontally starting from the origin.
	+ The second number always refers to the ‘*y*-coordinate’ of the point and indicates the position that is moved to up (positive) or down (negative) from the origin, i.e. the position moved to vertically.

Note: a useful memory aid for the order of the coordinates is that x comes before y in the alphabet, and so the *x*-coordinate comes before the *y*‑coordinate when we locate or record points on the Cartesian plane. | LEARNING SEQUENCERemediationS2 | * *Adjustment:* Some students may be provided with visual aids that include the coordinates of the given point and a description in words of the location of the point (incorporating the mathematical terms), e.g. (2, –4) is ‘2 units to the right of the origin along the *x*-axis and 4 units down from the origin along the *y*-axis’.
* *Adjustment:* Some students may require modelling by the teacher and/or peers first, followed by guided practice with a teacher’s assistant or peer. Some students may prefer to place an object rather than sit on the ground themselves.
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| LEARNING SEQUENCES3 | * One by one, each student finds the point on the ground that corresponds to the point on his or her card and sits at that point. Each student must start at the origin and walk to the number corresponding to the *x‑*coordinate on the *x*-axis BEFORE considering the *y*-coordinate.
* Once students are seated at their given points, the teacher gives instructions that re-affirm the terminology associated with the Cartesian plane, eg Stand up if your point is:
* on an axis
* on the *x*-axis (What do all of these points have in common?)
* on the *y*-axis (What do all of these points have in common?)
* at the origin
* in a quadrant
* a point with a *y*-coordinate of 12
* a point with an *x*-coordinate of 0
* a point with the same value for the *x*-coordinate and the *y*-coordinate
* a point with a positive *y*-coordinate (Where are all of these points in relation to the axes?)
* a point with a negative *x*-coordinate (Where are all of these points in relation to the axes?).

*Adjustment:* Some students may require verbal prompting to ensure inclusivity.* *At the conclusion of the outdoor session or as review prior to Activity*
* Students are given two sets of cards:
* set A – 8 cards with terms that describe the features of the Cartesian plane
* set B – 8 cards with diagrams indicating in colour the corresponding features of the Cartesian
* plane.
* Students work in pairs to match the terms in set A with the corresponding diagrams in set B.
	+ Provide each student with a [list of terms and diagrams](file:///%5C%5CBosw2ksrv2%5Ccnr%5CNational%20Projects%5CTemp%20%E2%80%93%20File%20Sharing%5CFinal%20support%20materials%20for%20December%202012%5CMathematics%5CUnits%20of%20Work%5CK-6%20Math%20S3%20Cartesian%20Plane%20%28UOW%29%5CK-6%20Math%20S3%20Cartesian%20Plane%20-%20Terms%20%26%20Diagrams%20%28resource%29.doc) associated with the Cartesian plane. (This summary could be pasted into their workbooks.)
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| LEARNING SEQUENCEExtension Early S4 | * ***Mystery Picture***
* Students work in pairs. One student is given a pre-plotted image constructed by joining coordinates on a Cartesian plane. The student keeps this hidden from his or her partner. The partner is given an empty Cartesian plane (which includes a grid and scale).
* Using coordinates, the student with the pre-plotted image gives instructions to his or her partner on how to construct the image on the empty Cartesian plane.
* Once completed, the students compare the two images. They discuss and correct any discrepancies.

*Adjustment:* Students could be partnered with peers who are able to instruct and assist the students to complete the activity. The activity could be modelled if required. Images used should be simple and familiar. Some students could be provided with an image drawn wholly within the first quadrant. |
| **EVALUATION & REFLECTION** | Ask students to consider their feelings around their learning of the Cartesian Plane. Use this as a point for reflection on teaching and learning styles for future teaching.  |