Stage 6 Mathematics Life Skills

## MLS – P1 Using Plans, Maps and Networks

### Overview

| MLS-P1 Using Plans, Maps and Networks | Unit Duration |
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| Plans, maps and networks are tools that assist us to understand, model and operate effectively in our world. Developing the skills to use these helps students to work and travel efficiently and independently. |  |

| Subtopic focus | Outcomes |
| --- | --- |
| This subtopic is about interpreting and using plans, maps and simple networks in everyday situations. The knowledge, skills and understanding in this subtopic builds on Life Skills Years 7–10 outcomes and content for Measurement and Geometry. | A student:* Explores mathematical concepts, reasoning and language to solve problems MALS6-1
* Engages with mathematical symbols, diagrams, graphs and tables to represent information accurately MALS6-2
* Engages with appropriate tools, units and levels of accuracy in measurement MALS6-3
* Exploresplans, maps, networks and timetables MALS6-11
* Engages with plans, maps, networks and timetables effectively in a range of everyday contexts and situations MALS6-12
* Engages with mathematical skills and techniques, including technology, to investigate, explain and organise information MALS6-13
* Communicates mathematical ideas and relationships using a variety of strategies MALS6-14
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| Related Mathematics Standard outcomes | ****Related Numeracy CEC outcomes**** |
| MS11-1, MS11-2, MS11-3, MS11-9, MS11-10, MS1-12-1, MS1-12-2, MS1-12-3, MS1-12-8, MS1-12-9, MS1-12-10, MS2-12-1, MS2-12-2, MS2-12-3, MS2-12-8, MS2-12-9, MS2-12-10 | N6-1.1, N6-1.2, N6-1.3, N6-2.5, N6-3.1, N6-3.2 |

All outcomes referred to in this unit come from the [Stage 6 Mathematics Life Skills Syllabus](https://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/stage-6-learning-areas/stage-6-mathematics/mathematics-life-skills-2017)
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### Adjustments

Examples of adjustments can be found on the NESA website under [Adjustments](https://www.educationstandards.nsw.edu.au/wps/portal/nesa/11-12/Diversity-in-learning/stage-6-special-education/adjustments).

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| Student’s name | Adjustments |
| e.g. John Smith | Requires learning material to be printed on blue paper. |
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### Unit of learning

| ContentStudents learn to: | Suggested teaching strategies and resources | Differentiation and modifications | Date and initial |
| --- | --- | --- | --- |
| P1.1: PlansStudents:* recognise and respond to the language of position, for example:
* behind
* inside
* above
* left
* opposite Literacy icon
* use the language of position Literacy icon
* recognise the purpose and functions of plans
 | Recognise and use the language of position* Teacher to introduce the language of position by asking students to identify where other students or features of the classroom are in relation to them. Students can be asked to name something that is behind, above, beside or opposite them.
* The teacher can prepare a plan of where everyone is to sit in the classroom and ask students to collaborate to follow the plan.
* The teacher can give students individual instructions about the seating plan and ask them to collaborate to meet the plan, e.g. give students cards with instructions such as “you sit to the right of Glenn”.
* Teacher to discuss and then define the purpose of a plan to include guiding the smooth construction of something real.
* Students to create a class seating plan based on positional restrictions from the teacher. This can be completed based on their actual class or from the attached general resource.

**Resource -** p1-organising-the-class.DOCX |  |  |
| * recognise that plans represent real things, for example:
* buildings
* identify typical features that are represented on a plan, for example:
* identify doors on a building plan
* use plans to locate positions or gather information, for example:
* interpret a plan of their school
* use a plan of a theatre to locate their allocated seat
* use the floorplan of a shopping centre to find their favourite shop Personal and social capability icon
* construct simple plans, for example:
* complete a floor plan of their bedroom or home using models or drawings
* interpret the key (legend) on a plan Literacy icon
 | Construct, interpret and use plans* Teacher to introduce the basic features of a house-plan to students or allow students to read and interpret before verifying.
* Students to read and interpret basic house-plans, identifying:
* Rooms, giving reasons for how they came to this conclusion
* Features, including doors, windows, wardrobes and appliances.
* Students to use a ticket or given conditions to locate their seat, and make choices about where to sit at the movies or on a flight, such as sitting in a group, near an aisle or towards the front. The DESMOS activities below include selecting and identifying your seat on a flight or at the movies.

**Resource:** Desmos activity – [Booking a great holiday](https://teacher.desmos.com/activitybuilder/custom/5fa67a63d3bac13355812eaa)**Resource:** Desmos activity – [Going to the movies](https://teacher.desmos.com/activitybuilder/custom/5fb750a447377d0d06492087)**Resource:** p1-booking-a-seat.DOCX* Students to review the floorplan of the nearest shopping centre to identify locations and how to get from one shop to another place. Alternatively, students can engage with the general shopping centre resource below. The Desmos activity “Booking a great holiday” includes identifying features of a shopping centre map.

**Resource:** p1-navigating-a-shopping-centre.DOCX* Students to use [Haverty’s room planner app](https://www.havertys.com/furniture/room-planner-app) to construct a plan of the furniture in a room, either in their own house or in the school. Here students can grab and drag simple furniture and design the layout of a room.
* Students to use the Desmos activity Planning the classroom or the cut and paste activity to create a plan for the layout and seating plan for their own classroom.

**Resource:** p1-arranging-the-furniture.DOCX**Resource:** Desmos activity – [Planning the classroom](https://teacher.desmos.com/activitybuilder/custom/5fa5c507a024a60c05a439b2) |  |  |
| * construct items by following plans, for example:
* make a paper plane by copying a template, or put together a flat-pack cupboard by following a construction plan Personal and social capability icon
* recognise the relationship between scaled and actual distances on a plan, for example:
* recognise that if a plan’s scale is ‘1:100’, or '1 cm represents 1 m', then a 3 cm wide room on a building plan is a 3 m wide room in reality
* recognise different elevation views of a building and match elevation drawings to aspects of a building
 | Interpret plans to construct items, and create plans from items* Teacher to introduce the concept of following a plan to construct items using the [Youtube clip](https://www.youtube.com/watch?v=3BNg4fDJC8A&t=22s) from WIRED. This video tells the story of John Collins, who holds the Guinness world record for the longest distance travelled by a paper Aeroplane.
* Students to design their own paper plane using a single sheet of A4 paper, a ruler and a pen or pencil, following the instructions in the resource below. Further designs can also be found at [John Collins’ website](https://www.thepaperairplaneguy.com/) and at the [Guinness world record site](https://www.guinnessworldrecords.com/products/books/science-and-stuff-2018/make-and-break/paper-planes), including planes that travel in loops or return to the thrower.

**Resource:** p1-constructing-a-paper-plane.DOCX* Students to use either the [Smartdraw website](https://cloud.smartdraw.com/signup/) or [Floorplanner.com](https://floorplanner.com/signup) to create a floorplan matching a familiar room from their house or around the school. Both of these apps require a login, and students can be encouraged and supported to sign up for a free account.
* Students to interpret the features of a house floorplan and construct a 3D model of a house from a plan. Students can use popsicle sticks and glue to raise walls to match the features of a basic house plan. The teacher can introduce scale relationships into this process if appropriate for the class.

**Resource:** p1-constructing-a-model-house* Students to view sample elevations at the [Smartdraw website](https://www.smartdraw.com/elevation-plan/examples/) and can create an account at [this site](https://cloud.smartdraw.com/signup/) to create an overhead view of the houses in the sample elevation drawings. Students can also create an account at [Floorplanner.com](https://floorplanner.com/signup).
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| P1.2: MapsStudents:* recognise and respond to the language of maps, for example:
* scale
* direction
* north Literacy icon
* use the language of maps Literacy icon
* recognise the purpose and functions of maps
 | Interpret and use the language of maps* Teacher to introduce the language and features of maps, which could include this very simple video explaining the key components of a map from [Brainpop Jr video](https://www.youtube.com/watch?v=2dDOhSvZE-U).
* Students to construct a map of Australia using the [mapmaker kit](https://www.nationalgeographic.org/maps/australia-oceania-mapmaker-kit/) available at the National Geographic website. This also includes a video of suggested activities students can engage with during this task.
* Students to investigate a map of their school and locate their current position on the map, as well as locations that are North, South, East and West of their location.

**Resource:** p1-following-your-school-map* Teachers to create a treasure hunt around their school, where students use compass directions to follow a path and collect clues.

**Resource:** p1-navigating-around-your-school |  |  |
| * recognise that maps represent real things, for example:
* regions
* use maps to locate positions or gather information, for example:
* in their local area
* recognise a variety of maps, for example:
* historical maps
* topological maps
* maps from different cultural traditions
* maps that use digital technology Aboriginal and Torres Strait Islander histories and cultures icon Asia and Australia’s engagement with Asia icon  Information and communication technology capability icon Intercultural understanding icon
 | Recognise and experience reading a variety of maps* Teacher to prepare a map from the [NSW Land Registry Service website](https://hlrv.nswlrs.com.au/) of the local area for students to interpret. Type your suburb name into the search bar. Once you have searched, look for “Town Map” in the search results. It is suggested that teachers search a larger local area, such as the closest major shopping centre, as it is likely that searches of small suburbs will return no results.
* students to identify the date of the map they are reviewing.
* students to locate a shop or utility that was in the same location.
* students to locate a shop or utility that does not exist in the historical map.
* Students to go to the [Australian Institute of Aboriginal and Torres Strait Islander Studies website](https://aiatsis.gov.au/explore/map-indigenous-australia) to identify the traditional owners of the land where they live, and how far this land extends.
* Compare this map to a [map of NSW](https://www.google.com/search?q=map+of+nsw&rlz=1C1GCEA_enAU914AU914&tbm=isch&source=iu&ictx=1&fir=m3DkvyClZ085JM%252Cqdu_tuniJ7HZPM%252C_&vet=1&usg=AI4_-kRRmyAx3wvLur-7ZRsV2I5WevbhSA&sa=X&ved=2ahUKEwi4lfe407ftAhXbyDgGHTTZCYQQ9QF6BAgEEAE&biw=1368&bih=770&dpr=2), and identify locations of interest or places where friends or relatives live that are on the lands of different traditional owners. .
* Students to use the [Toy Box Metropolis website](https://seconddimension.itch.io/toy-box-metropolis) to build a city in a 3D Map View. There are five features being measured, namely appearance, culture, infrastructure, living standards and wealth.
* What is the meaning of each of these features?
* How can you improve each of these features? Do any of the buildings you add take away from any of these features?
* Design a city with the shops all in one location, houses all together with clear streets to get around, and parks for people to play in.
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| * identify typical features of a map, for example:
* key, scale, grid, compass rose Literacy icon
* identify directions on a map in a variety of ways, for example:
* using compass directions and their abbreviations
* using common terms, eg left and right Literacy icon
* create simple maps, for example:
* Sketch a map showing the way from one place in the school to another Critical and creative thinking icon Personal and social capability icon
* develop skills in using maps, for example:
* locate something or describe the location of something on a map using grid references
* read and use a map key (legend) Literacy icon
* read distances directly from the map or from a related table of distances
* use scale to determine distances between places
* give and follow directions using a map Literacy icon
* recognise that the shortest or fastest route is not always the best route and discuss why
* Solve problems involving maps, for example:
* Identify or calculate the distances and travel times between two places and determine if they can get to a given place within a time frame Critical and creative thinking icon
 | Interpret and use maps to plan routes between locations* Students to use [spatial map viewer](https://portal.spatial.nsw.gov.au/portal/apps/webappviewer/index.html?id=44e72c6c7ccf498cb1c822b740c647d3) available at the NSW Government Spatial Service website or [Google Maps](https://google.com/maps/) to map out and measure distances of routes between key locations such as between their home and school, a friends house or the local shops.
* Students can consider the area of a region using this tool, for example the space covered by a local park, or the land area of their home. This builds on their knowledge from MLS-M2 Measuring 2D and 3D shapes.
* This tool could also be used to calculate the time a trip will take using an assumption of driving 60 km/hr.
* By zooming in on the image of the school, students can also examine distances between locations within their school.

**Resource:** p1-measuring-local-pathways.DOCX* Students to evaluate school performance in a key area by constructing a map of a particular service. Suggestions include:
* Locating all first aid kits or general use EpiPen’s on a map, or auditing the school by highlighting rooms where first aid posters are not visible to make suggestions of improvements for safety
* Locating all bins on the map of the school and making suggestions about how we can reduce waste
* Students to complete the Desmos activity to navigate their way around a theme park using a map with grid references.

**Resource:** Desmos activity – [Booking a great holiday](https://teacher.desmos.com/activitybuilder/custom/5fa67a63d3bac13355812eaa)* Students to sketch a rough map of the school using rectangles for buildings and labelling key features. Students then display a path from their current location to their next classroom or another point of interest.
* Students to use this resource to interpret grid references, read and apply a key and calculate measurements using a scale on a map.

**Resource:** p1-using-a-grid-on-a-map.DOCX* Students use the [transportnsw trip planner](https://transportnsw.info/trip#/trip), entering in their current location and a chosen destination to find a map of public transport routes to get to a key location such as the shops.
* How long will it take you to get to your destination
* What time do you need to arrive at the train station or bus stop?
* To arrive at your destination by a specific time, what is the latest you can begin your journey?
* Students to calculate real world measurements from a given map with a simple scale. In addition, students can take real world measurements from around the school using a trundle wheel or around their home using a tape measure, select an appropriate scale, and construct a scale map using a ruler.
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| P1.3: NetworksStudents:* recognise and respond to the language of networks, for example:
* via
* detour
* connect Literacy icon
* use the language of networks Literacy icon
* recognise the purpose and functions of networks
* recognise that networks represent real things, for example:
* transport systems
* use networks to gather information, for example:
* the journey the bus takes between its first and last stop
* recognise what is represented by a diagram of a network, for example:
* recognise that a diagram of a bus network is showing how the bus routes are linked
* recognise a range of types of networks, for example:
* train or bus networks, road networks, social networks
* identify how different parts of a network are linked, either directly or indirectly, for example:
* identify a road between two towns from a road network, or describe the relationship between two people from a social network Literacy icon Personal and social capability icon
 | Recognise and interpret network diagrams* For each network diagram that students have the opportunity to construct throughout this program, it is recommended that students engage with network technology using [Lucidchart](https://lucid.app/users/login#/login). This site requires a login, and teachers and students can [sign up for free](https://lucid.app/users/register/free) to build flexible network diagrams.
* Teacher to introduce network language via a bus route diagram. Networks are useful because they allow us to observe connections and pathways between objects without superfluous information. In a transport diagram, we can examine the intersections between routes to find the connections needed to get to our destination.

**Resource:** p1-network-terminology.PPTX* Students to review the train networks at the [transportnsw](https://transportnsw.info/routes/train) website to see which is nearest and most relevant to them. Students in Sydney should click on lines under the heading “Sydney Trains”, while students from outside of Sydney can review lines under the “Intercity” or “Regional” headings. Clicking on a train line gives students a network diagram of this train line.
* Which line is the train line you would be most likely to use?
* How many vertices are in the network of your train line? What do the vertices represent?
* How many edges are in the network of your train line? What do the edges represent?
* How many vertices and edges do you usually travel along if you catch the train?
* Students to investigate diagrams of local bus and train networks and identify their features. Students can access network maps of [buses](https://transportnsw.info/travel-info/ways-to-get-around/bus/bus-operator-maps), [trains](https://transportnsw.info/travel-info/ways-to-get-around/train#/) or [ferries](https://transportnsw.info/travel-info/ways-to-get-around/ferry#/) at the Transport NSW website. The map for Sydney ferries is the most accessible for students to interpret and analyse.
* What are the vertices in this network?
* What are the edges in this network?
* Describe how you would get from one location to another.
* Students to examine a simple, general network from multiple perspectives. Students can add the meaning of either the edges or vertices and consider the impact this has on the other feature.
* If the vertices are people, what do the edges represent?
* If the vertices are locations, what do the edges represent?
* Why are some vertices not connected with an edge? Can y5ou identify any? Do you need to add any edges for connections in your network?

**Resource:** p1-the-meaning-of-a-network |  |  |
| * identify a number of possible paths to get from one place in a network to another, for example:
* identify possible travel routes between two places  Information and communication technology capability icon
* use personal networks to solve simple problems, for example:
* using a network diagram of undercover routes between buildings
* plot a route to walk from one place to another without getting wet on a rainy day Critical and creative thinking icon Personal and social capability icon
 | Identify and describe the features of a network diagram* Students to construct a network diagram with the blocks of the school as vertices, and edges representing the undercover walkways around the school.
* Are there any two places in the school that you go to regularly, where there is no undercover walkway to travel between?
* Is your school fully connected via undercover walkways?
* You can extend this investigation to include using the [spatial map viewer](https://portal.spatial.nsw.gov.au/portal/apps/webappviewer/index.html?id=44e72c6c7ccf498cb1c822b740c647d3) to calculate the area of your school playground that is undercover. Is this sufficient for all students at your school?
* Teachers can investigate Gurrutu via the Teacher Magazine article by Professor Chris Matthews [Indigenous Perspectives in Mathematics: Understanding Gurrutu](https://www.teachermagazine.com/au_en/articles/indigenous-perspectives-in-maths-understanding-gurruu). Students can be presented with the concept of Gurrutu, translated somewhat inaccurately in English to mean Kinship, and can investigate the possibilities that arise out of the network diagrams in this article.
* Is it possible for a parent and a child to have the same Moiety or Malk?
* Is it possible for a parent and child to have a different Moiety or Malk?
 |  |  |
| * investigate and solve problems in given networks, for example:
* how to visit each point in a network without retracing any paths (eg the Königsberg Bridge Problem)
* finding the most efficient route around a paper delivery run Critical and creative thinking icon
* recognise the differences between a network diagram and a map
* construct a simple network, for example:
* represent their family network using photos or draw a road network given a map of their area Personal and social capability icon Civics and citizenship icon
* solve problems involving networks, for example:
* plan the route for a walking tour to visit the major landmarks in a city without retracing paths
* use airline, train, bus or road network diagrams to identify the best route, eg ‘which train line should I take if I want to get from A to B’ Critical and creative thinking icon Personal and social capability icon
 | Construct, investigate and solve problems with networks* Teacher to introduce the Kӧnigsberg Bridge Problem using the powerpoint file. Students can then investigate the problem and seek a solution, with the teacher leading students to the conclusion that there is no path that crosses all 7 bridges.
* Students to consider which perspective of the Konigsberg Bridge problem is easiest to analyse, the map, the simplified map or a network

**Resource:** p1-konigsberg-bridges-problem.PPTX**Resource:** Desmos activity – [Konigsberg Bridges Problem](https://teacher.desmos.com/activitybuilder/custom/5fac8a19ee8def4d22940f73?collections=5fa5c4d2080d830d048140d3)* Students examine a street map and determine the most efficient route for a paper delivery run or a garbage bin collection drive.
* Is there any path I can travel where I don’t go down any street twice?

**Resource:** p1-planning-a-garbage-collection-route.DOCX* Students to determine the most efficient route to deliver a message to multiple locations around the school. The teacher can make this an authentic challenge by sending students for a specific task, including collecting information for a survey as part of their learning in MLS-S1 Statistics.
* Students to construct a social network between their classmates based on social media connections. Students can interview a group of students from their class and make a network diagram either using this resource activity or using the desmos online activity.

**Resource:** p1-creating-a-social-network**Resource:** Desmos activity – [Social Networks](https://teacher.desmos.com/activitybuilder/custom/5fac2eedfdab180ce536a7b7?collections=5fa5c4d2080d830d048140d3)* Students to construct a family tree where family members are vertices and parent-child relationships are edges. Students can be encouraged to source photos and to create their family tree, or use the [Myheritage website](https://www.myheritage.com/). This website is a free resource that requires users to sign up for an account. Students will be prompted to enter family members’ names and will then be presented with a network diagram of their family.
* Students plan a walking tour of either their local town or a regular holiday spot. Students should construct a network of all possible paths between main points of interest, and then describe the most efficient route to visit these locations without retracing your steps.

**Resource:** p1-a-tour-of-sydney.DOCX * Students use the [transportnsw trip planner](https://transportnsw.info/trip#/trip), entering a destination of interest to them that is across multiple train lines and finding a suggested route. Students to examine the [trains](https://transportnsw.info/travel-info/ways-to-get-around/train#/) network diagram and determine whether there are alternative routes that could be preferable.
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### Evaluation

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### Glossary

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| Term | Description |
| Directed Network (Not explicitly mentioned) | A directed network is a network whose edges have arrows and travel is only possible in the direction of the arrows.  |
| Edge | In a network diagram, an edge refers to a line which joins vertices to each other. Also called an arc. |
| Elevation views | Scale drawings showing what a building looks like from the front, back and sides |
| Map | A representation of an area of land or sea showing physical features such as cities or roads.  |
| Network | A network is a group or system of interconnecting objects which can be represented as a diagram of connected lines (called edges) and points (called vertices). For example a rail network. |
| Network diagram | A representation of a group of objects called vertices that are connected together by lines called edges |
| Path | A walk in which all of the edges and all the vertices are different. A path that starts and finishes at different vertices is said to be open, while a path that starts and finishes at the same vertex is said to be closed. There may be multiple paths between the same two vertices. |
| Plan | A detailed proposal or instructions for making or doing something |
| Shortest Path | A shortest path in a network diagram is a path between two vertices in a network where the sum of the weights of its edges are minimised |
| Weighted Edge (Not explicitly mentioned) | A weighted edge is an edge of a network diagram that has a number assigned to it which implies some numerical value such as cost, distance or time |
| Vertex | A vertex is a point in a network at which lines of pathways (called edges) intersect or branch. Also called a node.  |

### Supplementary resources