SCOPE AND SEQUENCE Mathematics — Years 1 to 9 SPACE DRAFT

Scope and sequence identifies what should be taught and what is important for students to have opportunities to learn. It describes the *knowledge* that students need for ongoing learning in Mathematics.
This knowledge is presented as *Concepts and facts* and *Procedure*s.
The scope and sequence:

- is provided for each year of schooling
- should be used together with the *Essential Learnings*
- provides additional detail in each Organiser
- informs the focus of Mathematics in assessment
- is a key document for school curriculum planning.

Prep	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Concepts and facts ▪ Straight and curved lines in shapes and objects, e.g. curved line on a ball and circle and straight sides on a die and a square	***Concepts and facts*** ▪ 2D shapes: circle, triangle, rectangle (including squares) ▪ 3D objects: cube, rectangular prism, sphere, cone, pyramid, cylinder ▪ Simple properties of 2D shapes – straight and curved lines and surfaces – number of sides – number of corners ▪ Simple properties of 3D objects, e.g. shapes of faces	***Concepts and facts*** ▪ Families of shapes ▪ Geometric properties of shapes – angles in turns – nets of a cube – depth in 3D objects ▪ Symmetry: a line or plane dividing images into two congruent shapes – folded and cut pictures – flips, slides, turns	***Concepts and facts*** ▪ 2D shapes names: square, rectangle, triangle, and circle ▪ 3D objects: prism, pyramid, cone, cylinder and sphere ▪ Geometric properties – angle, line of symmetry	***Concepts and facts*** ▪ Quadrilaterals: – parallelograms – rectangles – trapeziums – rhombuses (including diamonds) ▪ Nets of prisms, pyramids, cylinders, cones ▪ Geometric properties of shapes: – lines (horizontal, vertical, oblique, parallel and non-parallel) – equal sides, faces – angles (straight 180º, right 90º) ▪ Symmetrical, asymmetrical shapes ▪ Tessellating properties of triangles and quadrilaterals ▪ Enlargements and reductions	***Concepts and facts*** ▪ Polygons: a plane figure with three or more sides, non-polygons ▪ Triangles: – right-angled – isosceles – scalene – equilateral ▪ Geometric properties of shapes: – vertex, edge, base – parallel sides, faces, lines – perpendicular sides and lines – angles (acute, obtuse, straight, reflex) ▪ Prediction of shapes from nets using visualisations ▪ Symmetry ▪ Tessellations involving transformations	***Concepts and facts*** ▪ Regular and irregular polygons: – triangles – quadrilaterals – pentagons – hexagons – octagons – dodecagons ▪ Specialised names of prisms and pyramids – by their base shape, e.g. square-based pyramids, hexagonal prism – tetrahedrons ▪ Sphere, hemisphere ▪ Geometric properties: – equal base angles, diagonals of a polygon ▪ Symmetry: – lines – planes – points – rotational and angle of rotation	***Concepts and facts*** ▪ 2D shapes: circles (including concentric, non-polygons, e.g. ellipse) ▪ 3D objects: plans, nets, isometric view ▪ Part of 2D shapes, e.g. semicircle, quadrant ▪ Composite shapes, e.g. 4-, 5-, and 6-pointed stars are made of a number of distinct shapes ▪ Geometric properties: – sum of internal angles – circles (radius, diameter, centre, circumference, chord, tangent) ▪ Symmetry: – lines of – points of – planes of – rotational (including angle of rotation) ▪ Congruent shapes have the same shape and size ▪ Transformations: reflection, rotation and translation ▪ Points ▪ Lines	***Concepts and facts*** ▪ Cross-sections of prisms and pyramids parallel or perpendicular to base ▪ Shapes produced by repeating regular geometric shapes (Platonic solids), e.g. cube, tetrahedron, octahedron, dodecahedron, icosahedron ▪ Shapes embedded within other shapes ▪ Parts of 3D objects, e.g. truncated cone ▪ Composite 3D shapes, e.g. octahedron (two square-based pyramids) ▪ Line segment and midpoint ▪ Angles: – formed by intersecting lines, e.g. opposite, supplementary, complementary angles – external angles: properties of external angles of (triangles, polygons) ▪ Congruence ▪ Similarity ▪ Perspective drawings	***Concepts and facts*** ▪ Complex geometric shapes: – curved surfaces – compound shapes as objects combined to make a single object, e.g. embedded shapes ▪ Cross sections of shapes: – partitions of circles, e.g. sectors, segments, annulus ▪ Specifications: – boundary, angle and scale ▪ Sequences of transformations ▪ Proofs: – angle properties associated with parallel, perpendicular and transverse lines and polygons, e.g. when two straight lines intersect, opposite angles are equal – sum of interior angles
Procedures ▪ Classification by: – shape name, e.g. circle – single attribute, e.g. things that roll	***Procedures*** ▪ Classification of shapes using one or two defining features ▪ Comparison of shapes: – defining features – common features – different features	***Procedures*** ▪ Classification using geometric names and defining properties ▪ Comparison of: – different nets of a cube – of 2D shapes and 3D objects, connections and differences – folded or cut images ▪ Partition of 2D shapes, e.g. triangles within a square, rectangle	***Procedures*** ▪ Classification using geometric names and defining properties ▪ Comparison of: – shapes for one line of symmetry – angles, e.g. bigger than, smaller than	***Procedures*** ▪ Classification using geometric names and defining properties ▪ Relationship between symmetry and flip ▪ Preservation of symmetry in flips, slides, and turns of objects	***Procedures*** ▪ Classification using geometric properties ▪ Shapes within shapes ▪ Angles within angles	***Procedures*** ▪ Estimation of angles	***Procedures*** ▪ Classification using geometric conventions, e.g. length, angle size, relationships between faces ▪ Comparison of shapes by superimposing them through a sequence of transformations ▪ Connections between transformations, tessellations of suitable shapes in the plane and points, lines and planes of symmetry	***Procedures*** ▪ Constructions using geometric tools for perpendicular lines, 90º angles, 60º angles, and to bisect an angle ▪ Composite constructions based on known properties, e.g. construct a rhombus given lengths of two diagonals ▪ Link symmetry, congruence, similarity of shapes with transformations, tessellations in the planes and on surfaces and informal proofs	***Procedures*** ▪ Construction and manipulation of complex geometric shapes, e.g. soccer ball from net of stitching pattern involving tessellations of hexagons and pentagons ▪ Construction from isometric drawings ▪ Comparison of geometric properties of families of shapes for congruence or similarity
▪ Concrete materials: – computers – manipulative materials (familiar shapes and objects) ▪ Verbal: – everyday language: straight sides, curved lines, straight lines ▪ Written: – straight and curved lines within drawings	▪ Concrete materials: – computers and other electronic devices – manipulative materials – everyday examples of 3D objects, e.g. ice-cream cones, balls, die, – everyday examples of 2D shapes, e.g. a window in a drawing of a house – 3D object constructions – puzzles ▪ Verbal: – descriptions of shapes – mathematical language: names of 2D shapes ▪ Written: – sketches of 2D shapes and 3D objects from different viewpoints – 3D objects have different orientations	▪ Concrete materials: – computers and other electronic devices – manipulative materials (3D objects) – mirrors – ruler for drawing straight lines ▪ Verbal: – defining features of families of 2D shapes and 3D objects – 3D objects: shape and number of faces, function – 2D shapes: number of sides, number of corners – common characteristics of 2D shapes, e.g. length, width – common characteristics of 3D objects, e.g. length, width, depth, height ▪ Written: – drawings and electronic representations of shapes in different orientations and turns	▪ Concrete materials: – computers and other electronic devices – manipulative materials (puzzles) – mirrors – construction of 2D shapes and 3D objects – repeating patterns ▪ Verbal: – mathematical language: angle, line of symmetry – 2D shapes: number of sides, number of angles ▪ Written: – drawings and electronic representations of 2D and 3D objects	▪ Concrete materials: – computers and other electronic devices – manipulative materials (models of 3D objects) – mirrors ▪ Verbal: – descriptions of features using appropriate spatial language and families of shapes ▪ Written: – conventions for labelling shapes and lines – arrows to identify parallel lines – dotted lines to represent hidden lines in 3D objects	▪ Concrete materials: – computers and other electronic devices – manipulative materials – nets of 3D objects ▪ Verbal: – descriptions of features and broad family groups ▪ Written: – symbols for angles – different viewpoints and orientations – conventions for labelling shapes and angles – letters for naming 2D shapes (ABC …) – marks to identify equal sides of shapes, equal angles, and right angles, – patterns – designs – tessellations	▪ Concrete materials: – computers and other electronic devices – manipulative materials – pair of compasses and straightedge protractor ▪ Verbal: – mathematical language: congruence ▪ Written: – symbolic: congruent (≡) – simple compass constructions, e.g. isosceles triangle – conventions for labelling shapes and angles – congruent markings on segments and angles	▪ Concrete materials: – computers and other electronic devices – manipulative materials, e.g. multi-link cubes – mirrors – geometric drawing tools – geometry software ▪ Verbal: – descriptions of symmetry and transformations in patterns – mathematical language: congruent, non-congruent shapes, properties of shapes ▪ Written: – accurate drawings and using geometric conventions, tools and technologies – mosaic patterns from plans drawn to scale – plans, nets, isometric diagrams and grid drawings – drawings of 3D objects and composite shapes from different viewpoints and orientations	▪ Concrete materials: – computers and other electronic devices – manipulative materials – mirrors – geometric drawing tools – cross-sections ▪ Verbal: – sum of internal angles – informal proofs ▪ Written: – sketches, drawings or electronic images of cross sections – compass construction to bisect a line segment	▪ Concrete materials: – computers and other electronic devices – manipulative materials – geometric drawing tools – plans – nets ▪ Verbal: – descriptions of complex geometric shapes using geometric conventions and properties, e.g. diagonals of a rhombus bisect each other at right angles – deductions supported by proofs, e.g. proof that lines are parallel ▪ Written: – sketches, accurate drawings or electronic images of complex geometric shapes from specifications and with geometric conventions, e.g. symbols to indicate parallel lines, perpendicular lines and congruent lines

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▪ Visual: – photographs and drawings of familiar shapes and objects – "mind pictures" of different shapes ▪ Positions and their opposites in immediate environment ▪ Directions to locate positions or objects	▪ Visual: – shapes within shapes – folding – cutting – joining halves – shapes within pictures – illustrations – "mind pictures"' of different shapes ▪ Turns change direction ▪ Non-verbal information, e.g. gestures and simple treasure maps from familiar board or electronic games	▪ Visual: – paper-folding – different orientations and viewpoints – 'mind pictures' of different viewpoints of shapes, and movement of shapes ▪ Left and right turns change direction ▪ Estimates of informal measurements in movements: – steps – grid spaces	▪ Visual: – partial 2D shapes and 3D objects and different orientations – angles in familiar objects – "mind pictures" of different viewpoints of shapes, and movement of shapes ▪ Relative size within maps ▪ Turns: quarter, half, three-quarter and full, more than or less than a quarter turn, clockwise, anticlockwise ▪ Estimates of informal measurements in movements: – paces – grid spaces	▪ Visual: – enlargements and reductions of shapes – transformations of 2D shapes – paper-folding techniques for symmetry – "mind pictures" of different viewpoints of shapes, and movement of shapes Directional north (↑N) ▪ Mapping conventions: – symbols – legends – alphanumeric grids	▪ Visual: – "mind pictures" of the construction sequence of 3D objects from nets ▪ Four major compass points ▪ Mapping conventions: – symbols – compass points labels and directional arrow for north – scale, e.g. 1 cm represents 10 m – legends – alphanumeric grids	▪ Visual: – tessellations using iterative single transformations – isometric view ▪ Distance between locations ▪ Angle as a change in direction ▪ Mapping conventions: – grid references: poles, key lines of reference on globe and flat map of earth, e.g. equator, prime meridian, international date line – coordinates – compass points: north (N), south (S), east (E), west (W), north-east (NE), south-east (SE), north-west (NW), south-west (SW) – scale ▪ Basic orienteering conventions	▪ Visual: – lines of symmetry, e.g. the plane containing the equator on a globe – origami design, paper-folding ▪ Mapping conventions: – coordinates – compass points – scale ▪ Eight compass points: N, S, E, W, NE, SE, NW, SW	▪ Visual: – 3D objects from different viewpoints (nets, isometric , location of viewer, e.g. top, side, front) – perspective: one-point, two-points ▪ Distance between grid references ▪ Mapping conventions – ratio scale on maps (1:250) ▪ grid references – latitude – longitude	▪ Visual: – isometric and perspective drawings ▪ Bearings in whole degrees ▪ Mapping conventions: – scale – coordinates – bearings – angles – keys – annotations
Procedures ▪ Position of self in relation to other objects, e.g. on the chair, under the roof, behind Lachlan and in front of the teacher ▪ Concrete materials: – computers – manipulative materials – familiar environments ▪ Verbal: – directions using position language – everyday language: here, there, on, off, forward, backward, on, under, in front of, behind, inside, outside, in, out ▪ Written: – simple line drawings representing a map ▪ Visual: – photographic of familiar environments	***Procedures*** ▪ "Mind pictures" to assist plans for movement ▪ Concrete materials: – computers and other electronic devices – manipulative materials – community environments ▪ Verbal: – feedback on and improvement of directions – everyday language: - over, under - up, down - left, right - forwards, backwards - sideways - on below - between - beside - near - before, after - full, half and quarter turns ▪ Written: – signs and symbols – simple line drawings representing a map ▪ Visual: – electronic maps and plans	***Procedures*** ▪ Position relative to known landmarks ▪ "Mind pictures" to assist plans for movement ▪ Concrete materials: – computers and other electronic devices – manipulative materials – grids ▪ Verbal: – explanations of the construction and interpretation of directions – everyday language: left/right of, long way from, close to ▪ Written: – simple sketches of maps and plans on grids ▪ Visual: – electronic maps including grids and plans	***Procedures*** ▪ Comparison of sketched maps and commercial maps of the same environment ▪ Concrete materials: – computers and other electronic devices – manipulative materials – maps of familiar environments – grids ▪ Verbal: – informal distances in directions – descriptive directions – factors assisting precision and interpretation of directions ▪ Written: – sketches of simple maps and plans on grids ▪ Visual: – electronic maps including grids and plans	***Procedures*** ▪ Connection between the amount of turn and change in direction from north, e.g. half a turn from facing north is facing south ▪ Concrete materials: – computers and other electronic devices – manipulative materials – treasure map – room plan ▪ Verbal: – turns in directions ▪ Written: – drawings and electronic of maps from different viewpoints, e.g. from above as in "bird's-eye-view" with mapping conventions ▪ Visual: – electronic maps and plans	***Procedures*** ▪ Connection between four compass points and the amount of turn or angle ▪ Estimation of distances in relation to scale ▪ Concrete materials: – computers and other electronic devices – manipulative materials – maps and plans of schools and local area for interpretation ▪ Verbal: – spatial language to specify directions ▪ Written: – manual or electronic maps and plans with conventions and straightforward scale, e.g. legend and symbols for direction ▪ Visual: – electronic maps and plans	***Procedures*** ▪ Connection between eight compass points and the amount of turn or angle ▪ Estimation of distances ▪ Concrete materials: – computers and other electronic devices – manipulative materials – commercial maps and plans – globe ▪ Verbal: – directions to specific locations – calculation of distance between grid reference points ▪ Written: – manual or electronic maps and plans with conventions ▪ Visual: – simple orienteering maps and directions	***Procedures*** ▪ Connection between eight compass points and the amount of turn ▪ Estimation of distances ▪ Concrete materials: – computers and other electronic devices – manipulative materials – commercial maps and globe – shopping centre plans ▪ Verbal: – directions for specific locations and movement from one location to another using flat maps and the globe ▪ Written: – calculation of distance between locations – manual or electronic maps and plans with conventions and scale ▪ Visual: – other people's maps and plans	***Procedures*** ▪ Interpretations of maps using scale, coordinates, features distance and orientations ▪ Comparison of alternative pathways between locations ▪ Estimation of distances ▪ Concrete materials: – computers and other electronic devices – manipulative materials – flat maps, topographical maps and globes ▪ Verbal: – precise directions for specific locations and movement from one location to another – critical analysis of alternative pathways and distances between locations ▪ Written: – calculation of enlargement, reductions using scale – manual or electronic maps and plans with conventions and scale, e.g. floor plans with scale – calculations of distances between locations ▪ Visual: – commercial floor plans	***Procedures*** ▪ Relationship between flat maps and globe ▪ Measurement of bearings measured clockwise from north ▪ Estimation of bearings in degrees ▪ Calculations of distances using scale ▪ Concrete materials: – computers and other electronic devices – manipulative materials – flat maps including world, atlas, street directory and orthophoto – amusement park maps and location guides ▪ Verbal: – specify locations and descriptions of spatial relationships ▪ Written: – manual/electronic maps and plans with conventions to represent location – distance and orientation on grids – plans and elevations with scale ▪ Visual: – orienteering maps and directions

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