

TRIAL MATERIAL WORK IN PROGRESS

Differentiated plans for Years 5 to 8

Space

Ian Lowe, MAV Professional Officer, 2007

**IF YOU USE ANY OF THIS
PLEASE PROVIDE FEEDBACK TO IAN AT**

ilowe@mav.vic.edu.au

**THIS WILL QUALIFY YOU
FOR AN IMPROVED VERSION
WHEN AVAILABLE**

Materials are recommendations only; suitable substitutions may be made.

MAV materials may be bought from www.mav.vic.edu.au/shop

Download the Curriculum Corporation catalogue from

http://www.curriculum.edu.au/catalogue/downloads/pc2007_pages39-54.pdf

and look at pages 48 and 49.

**For Learning Federation materials (Learning Objects),
check out 'Digital Learning Resources' on your laptop, or download them from the new education
website www.education.vic.gov.au/studentlearning/teachingresources/elearning/digilearn.htm.**

Differentiated plans for Years 5 to 8 Space

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What do we have here?

Space is a neglected part of the mathematics curriculum, but it has special appeal to students who might be weak in number. So extra effort is required to create a rich learning environment that can help children to understand and to achieve at their own level. This needs to be achieved in just two weeks per semester, at Years 5&6 and three weeks in Years 7&8.

This set of units – one per semester for Years 5 to 8 – could achieve this goal. It matches the specifications for VELs, but recognises that there will be a wide spread of achievement in each class. So children are differentiated into working groups by need, for some of the time only. There may be more than one group at any Standard, or some Standards may need to be combined. Plan a stimulating set of activities for homework review, such as Interactive Learning spreadsheets.

It also balances the *toolbox* requirements – concepts and skills – with the need to learn to apply those tools in *problem solving* situations. Hence there are whole class lessons (often from Maths300 or RIME) punctuating the toolbox development, at regular intervals. These are on the same topic, but do not attempt to mesh with the work done by each 'standard' group. They ensure that *Working Mathematically* is always part of the learning process, integrated into each dimension.

The mix of activities will provide a stimulating and rich learning environment, with students learning from and helping one another. Connections between topics will be made and reinforced, and the variety of learning styles will accommodate learners with different needs.

How does it work?

In Years 5 and 6 it is assumed that children will be working largely in Standard 3 to Standard 4. In Years 7 and 8 the spread will be from Standard 4 and 5.

At regular intervals whole class lessons are taught to 'mixed ability' groups.

Between these are cycles of a fixed pattern of lessons. In Years 5 and 6, the cycle has two parts: teaching and worksheet or games. In Years 7 and 8, the cycle has four parts: teaching, worksheet or games, problem solving (choice from a set of tasks) and computer use (a variety).

On any day all are taking place in the same classroom, so only a fraction of the resources are needed. But the cycle also works for the students: they follow the pattern – teaching, worksheet, (problem solving) and computer. As a consequence, teaching is to a different group each day in a regular pattern. Teaching will be for a concentrated 20 minutes or so, and then the teacher will supervise the rest of the class. Instructions on the board will inform the other groups of what they are to do. Encourage students to help each other.

What resources are needed?

Access to 4 or 5 computers daily is expected. Computer pods or laptop trolleys might be the best solution. Membership of Maths300 is a requirement; many schools have membership – here is how to use it.

The pages in the resources are listed for each day's lesson, but are summarised here. Sources are: MAV (Mathematical Association of Victoria), CC (Curriculum Corporation), LF (Learning Federation).

- *Teaching*: Guidelines in Measurement (MAV), Maths Continuum (DE&T), People count (MAV)
- *Worksheets*: Active Learning 1: Space, Active Learning 2: Space & Logic, Geometry Everywhere (all MAV)
- *Computer*: Interactive Learning (MAV), Learning Objects (LF)
- *Problem solving*: Problem Solving Task Centre (CC), RIME (MAV), Maths300 (CC),

How could it be adapted to different situations?

If your class does not have the range predicted, or you cannot manage three or four groups, you should adapt by ignoring columns. You may substitute other learning tasks at any time. If you run out of time, leave stuff out. In this rich environment you will be surprised how much is learned outside the 'planned' activities.

How do I assess the learning?

At the end of the tables are sets of questions based on *understanding* at each VELs standard that will allow you to place children into groups and monitor progress at selected times. However your observations, digital photographs and copies of children's work will be more useful than any external 'test'.

Year 5 Semester 1 Space

Day	Yr 5 sem 1 'Towards Std 3' A	'Towards Std 3' group B	'Towards Std 4' group C	'Towards Std 4' group D
1	RIME S20 Four-triangle puzzles (1 of 2)			
2	<p>Teach properties of angles, triangles and quadrilaterals</p> <p>Guidelines in Measurement p248-254, 278-281</p> <p>People count #48 Angles, #51 Polygons, #54 Quadrilaterals</p> <p>Continuum From appearance to properties, Angles, Classifying shapes</p>	<p>Problem Solving Task Centre</p> <p>107 McMahon's Triangles 2,148 McMahon's Triangles 1, 166 Sphinx, 196 Cross & Square, 60 Back To Back Building, 67 Making Solids, 73 In The Bag, 105 Soma Cube 1, 121 Farmyard Views, 143 Hearts And Loops, 23 Two Colour Game, 70 Symmetric Shapes, 79 Tangram Teasers, 100 Mirror Patterns 1</p>	<p>Computer</p> <p>Interactive Learning Estimating angles, Compass walks, Hunting quadrilaterals</p> <p>Learning Objects Shape maker</p> <p>Free internet software http://standards.nctm.org/document/eexamples/index.htm 4.1, 4.2, 4.3</p> <p>http://illuminations.nctm.org/ActivitySearch.aspx Shape sorter</p>	<p>Worksheets</p> <p>Active Learning 1: Space S10-15</p> <p>Active Learning 2: Space & Logic Quickmaths Space E-I, S1, S3, S4, Geometry Everywhere p 2, worksheet 3</p>
3	<p>Worksheets</p> <p>Active Learning 1: Space S10-15</p> <p>Active Learning 2: Space & Logic S1, S3, S6</p> <p>Geometry Everywhere p 2, worksheet 3</p>	<p>Teach</p> <p>See group A day 2</p>	<p>Problem Solving Task Centre</p> <p>36 Making Triangles, 40 Diamonds & Rectangles, 66 Pentominoes, 171 Number Discs, 228 Koala Carts, 16 Octaflex, 31 Cube Nets, 77 Tricube A, 78 Which View? 103 Four Cube Houses, 161 Soma Cube 2, 209 Pattern Cube,95 Reflections, 134 Eight Queens, 167 Sliding Tiles</p>	<p>Computer</p> <p>See group C day 2</p>
4	<p>Computer</p> <p>Interactive Learning Estimating angles, Compass walks, Hunting quadrilaterals</p> <p>Learning Objects Shape maker</p> <p>Free internet software http://standards.nctm.org/document/eexamples/index.htm 4.1, 4.2, 4.3</p> <p>http://illuminations.nctm.org/ActivitySearch.aspx Shape sorter</p> <p>www.mathcats.com/expl ore/polygons.html</p>	<p>Worksheets</p> <p>See group A day 3</p>	<p>Teach sorting triangles and quadrilaterals (by side lengths, parallel sides, equal angles)</p> <p>Guidelines in Measurement p248-254, 278-281</p> <p>People count #51 Polygons, #54 Quadrilaterals</p> <p>Continuum See Std 3 day 2</p>	<p>Problem Solving Task Centre</p> <p>See group C day 3</p>
5	<p>Problem Solving Task Centre</p> <p>See Group B day 2</p>	<p>Computer</p> <p>See group A day 4</p>	<p>Worksheets</p> <p>See group D day 2</p>	<p>Teach</p> <p>see group C day 4</p>

Day	Yr 5 sem 1 'Towards Std 3' A	'Towards Std 3' group B	'Towards Std 4' group C	'Towards Std 4' group D
6	RIME S20 Four-triangle puzzles (2 of 2)			
7	<p>Teach properties of common solids (spheres, prisms, pyramids) inc. edges, faces, vertices</p> <p>People count #57 Solid shapes</p> <p>Continuum Visualisation in 2D and 3D</p> <p>Use Geoshapes</p>	<p>Problem Solving Task Centre See group B day 2</p>	<p>Computer</p> <p>Interactive Learning Open box nets, Cube nets</p> <p>Learning Objects Shape maker, Building site, Photo hunt</p> <p>Free internet software http://illuminations.nctm.org/WebLinks.aspx</p> <p>Geometric Solids</p> <p>http://www.cs.mcgill.ca/~sqrt/unfold/unfolding.html</p> <p>From net to solid and back</p> <p>http://www.learner.org/teacherslab/math/geometry/space/</p> <p>http://www.mathsnet.net/geometry/solid/index.html</p>	<p>Worksheets</p> <p>Active Learning 1: Space S21, S22</p> <p>Active Learning 2: Space & Logic S1, S2</p> <p>Geometry Everywhere worksheets 4, 5, 6</p>
8	<p>Worksheets Use Geoshapes</p> <p>Hands-on Space cards for use with Geofix/Geoshapes</p> <p>Geometry Everywhere worksheet 5</p>	<p>Teach see group A day 7</p>	<p>Problem Solving Task Centre See group C day 3</p>	<p>Computer See group C day 2</p>
9	<p>Computer See group C day 7</p>	<p>Worksheets See group A day 8</p>	<p>Teach sorting solids (by numbers and lengths of edges, numbers and shapes of faces, numbers and angles at vertices)</p> <p>People count #57 Solid shapes</p> <p>Continuum Visualisation in 2D and 3D</p>	<p>Problem Solving Task Centre See group C day 3</p>
10	<p>Problem Solving Task Centre See Group B day 2</p>	<p>Computer See group A day 9</p>	<p>Worksheets See group D day 7</p>	<p>Teach See group C day 9</p>

Year 5 Semester 2 Space

Day	Yr 5 sem 2 'Towards Std 3' A	'Towards Std 3' group B	'Towards Std 4' group C	'Towards Std 4' group D
1	Maths300 #107 Newspaper shapes (1 of 2)			
2	<p>Teach making tessellations with regular polygons</p> <p>Use Geoshapes</p> <p>People count #52 Tessellations</p> <p>Continuum Line symmetry</p>	<p>Problem Solving Task Centre</p> <p>107 McMahon's Triangles 2,148 McMahon's Triangles 1, 166 Sphinx, 196 Cross & Square, 60 Back To Back Building, 67 Making Solids, 73 In The Bag, 105 Soma Cube 1, 121 Farmyard Views, 143 Hearts And Loops, 23 Two Colour Game, 70 Symmetric Shapes, 79 Tangram Teasers, 100 Mirror Patterns 1</p>	<p>Computer</p> <p>Interactive Learning Spirograph, Spirolateral, Reflection symmetry, Turn symmetry</p> <p>Learning Objects Shapemaker</p> <p>Free internet software http://illuminations.nctm.org/WebLinks.aspx</p> <p>Mirror Tool Isometric drawing tool Shape cutter</p>	<p>Worksheets</p> <p>Active Learning 1: Space S55, 56</p> <p>Active Learning 2: Space & Logic Quickmaths Space Q-X S7, S10, S19, S20</p> <p>Geometry Everywhere worksheets 10, 12-17</p>
3	<p>Worksheets</p> <p>Hands-on Space cards for use with Geofix/Geoshapes</p> <p>Active Learning 1: Space S8, 19, 20</p> <p>Active Learning 2: Space & Logic S7, S10</p> <p>Geometry Everywhere p 31, worksheet 51</p>	<p>Teach</p> <p>See group A day 2</p>	<p>Problem Solving Task Centre</p> <p>36 Making Triangles, 40 Diamonds & Rectangles, 66 Pentominoes, 171 Number Discs, 228 Koala Carts, 16 Octaflex, 31 Cube Nets, 77 Tricube A, 78 Which View? 103 Four Cube Houses, 161 Soma Cube 2, 209 Pattern Cube, 95 Reflections, 134 Eight Queens, 167 Sliding Tiles</p>	<p>Computer</p> <p>See group C day 2</p>
4	<p>Computer</p> <p>Interactive Learning Spirograph, Spirolateral, Reflection symmetry, Turn symmetry</p> <p>Learning Objects Shapemaker</p> <p>Free internet software http://illuminations.nctm.org/WebLinks.aspx http://www.arcytech.org/java/patterns/patterns.i.shtml</p> <p>Create tessellations on screen</p>	<p>Worksheets</p> <p>See group A day 3</p>	<p>Teach transformations (reflection and rotation) and related symmetry</p> <p>People count #49 Mirror symmetry & reflection, #50 Turn symmetry & rotation</p> <p>Continuum Congruence from rotations and reflections</p>	<p>Problem Solving Task Centre</p> <p>See group C day 3</p>
5	<p>Problem Solving Task Centre</p> <p>See group B day 2</p>	<p>Computer</p> <p>See group A day 4</p>	<p>Worksheets</p> <p>See group D day 2</p>	<p>Teach</p> <p>See group C day 4</p>
6	Maths300 #107 Newspaper shapes (2 of 2)			

Day	Yr 5 sem 2 'Towards Std 3' A	'Towards Std 3' group B	'Towards Std 4' group C	'Towards Std 4' group D
7	<p>Teach use of maps and diagrams to identify places</p> <p>Guidelines in Measurement p290-295</p> <p>People count #44 Scale: effect on lengths</p> <p>Active Learning 2: Space & Logic Quickmaths Space O</p>	<p>Problem Solving Task Centre</p> <p>See group B day 2</p>	<p>Computer</p> <p>Interactive Learning Spirograph, Spirolateral, Reflection symmetry, Turn symmetry, Size change</p> <p>Learning Objects Direct a robot, Journey planner</p> <p>Free internet software http://illuminations.nctm.org/WebLinks.aspx http://www.learner.org/teacherslab/math/geometry/space/</p>	<p>Worksheets</p> <p>Active Learning 1: Space S34, 35</p> <p>Active Learning 2: Space & Logic Quickmaths Space O, P, Y</p> <p>Geometry Everywhere p5, 8, worksheet 10, 12</p>
8	<p>Worksheets</p> <p>Geometry Everywhere worksheet 18</p>	<p>Teach</p> <p>see group A day 7</p>	<p>Problem Solving Task Centre</p> <p>See group C day 3</p>	<p>Computer</p> <p>See group C day 7</p>
9	<p>Computer</p> <p>See group A day 4 plus Size change</p> <p>Free internet software http://illuminations.nctm.org/WebLinks.aspx http://www.learner.org/teacherslab/math/geometry/space/</p>	<p>Worksheets</p> <p>See group A day 8</p>	<p>Teach use of scale (distance) and directions on maps</p> <p>Guidelines in Measurement p290-295</p> <p>People count #44 Scale: effect on lengths</p> <p>Continuum Scales on maps</p>	<p>Problem Solving Task Centre</p> <p>See group C day 3</p>
10	<p>Problem Solving Task Centre</p> <p>See group B day 1</p>	<p>Computer</p> <p>See group A day 9</p>	<p>Worksheets</p> <p>See group D day 7</p>	<p>Teach</p> <p>See group C day 9</p>

Year 6 Semester 1 Space

Day	Yr 6 sem 1 'Towards Std 3' A	'Towards Std 3' group B	'Towards Std 4' group C	'Towards Std 4' group D
1	RIME S21 Tangrams (1 of 2)			
2	<p>Teach properties of polygons, inc. regular ones</p> <p>Use Geoshapes</p> <p>Guidelines in Measurement p278-281</p> <p>People count #51 Polygons</p> <p>Continuum From appearance to properties</p>	<p>Problem Solving Task Centre</p> <p>107 McMahon's Triangles 2, 148 McMahon's Triangles 1, 166 Sphinx, 196 Cross & Square, 60 Back To Back Building, 67 Making Solids, 73 In The Bag, 105 Soma Cube 1, 121 Farmyard Views, 143 Hearts And Loops, 23 Two Colour Game, 70 Symmetric Shapes, 79 Tangram Teasers, 100 Mirror Patterns 1</p>	<p>Computer</p> <p>Interactive Learning Open box nets, Cube nets</p> <p>Learning Objects Shape maker, Building site, Photo hunt</p> <p>Free internet software http://illuminations.nctm.org/WebLinks.aspx http://www.learner.org/teacherslab/math/geometry/space/</p>	<p>Worksheets</p> <p>Active Learning 1: Space S24, use Geoshapes</p> <p>Active Learning 2: Space & Logic Quickmaths Space J-N, S26, S28, S29</p> <p>Hands-on Space cards for use with Geofix/Geoshapes</p> <p>Geometry Everywhere worksheet 5, 6, 11, 30</p>
3	<p>Worksheets</p> <p>Active Learning 1: Space S16. 17. 18</p> <p>Geometry Everywhere worksheets 26, 27</p> <p>Hands-on Space cards for use with Geofix/Geoshapes</p>	<p>Teach</p> <p>See group A day 2</p>	<p>Problem Solving Task Centre</p> <p>36 Making Triangles, 40 Diamonds & Rectangles, 66 Pentominoes, 171 Number Discs, 228 Koala Carts, 16 Octaflex, 31 Cube Nets, 77 Tricube A, 78 Which View? 103 Four Cube Houses, 161 Soma Cube 2, 209 Pattern Cube, 95 Reflections, 134 Eight Queens, 167 Sliding Tiles</p>	<p>ICT Computer</p> <p>See group C day 2</p>
4	<p>Computer</p> <p>Interactive Learning Hunting quadrilaterals</p> <p>Free internet software http://illuminations.nctm.org/ActivitySearch.aspx 4.2, 5.3 http://standards.nctm.org/document/eexamples/index.htm Shape sorter http://www.arcytech.org/java/patterns/patterns_j.shtml Create tessellations on screen http://www.boxermath.com/plp/modules/online/workshop/toolbox/mosaic_tool.html http://mathforum.org/pubs/boxer/tess.html</p>	<p>Worksheets</p> <p>See group A day 3</p>	<p>Teach making solids using nets and drawing the solids</p> <p>People count #57 Solid shapes, #58 Nets and skeletons of solids</p> <p>Continuum Visualisation in 2D and 3D</p> <p>Active Learning 2: Space & Logic Quickmaths Space J-N, S26, S29</p>	<p>Problem Solving Task Centre</p> <p>See group C day 3</p>

Day	Yr 6 sem 1 'Towards Std 3' A	'Towards Std 3' group B	'Towards Std 4' group C	'Towards Std 4' group D
5	Problem Solving Task Centre See group B day 2	Computer See group A day 4	Worksheets See group D day 2	Teach See group C day 4
6	RIME S21 Tangrams (2 of 2)			
7	Teach making solids from nets, and drawing the solids People count #57 Solid shapes, #58 Nets and skeletons of solids Continuum Visualisation in 2D and 3D	Problem Solving Task Centre See group B day 2	Computer Interactive Learning Open box nets, Cube nets Size change Learning Objects Direct a robot, Journey planner http://illuminations.nctm.org/ActivitySearch.aspx 6.4 http://www.mathsnet.net/geometry/solid/index.html	Worksheets Active Learning 2: Space & Logic Quickmaths Space Z-BB, S2, S5, S9 Geometry Everywhere p15
8	Worksheets Use Geoshapes Hands-on Space cards for use with Geofix/Geoshapes Active Learning 2: Space & Logic S2, S5, S9 Geometry Everywhere worksheet 8	Teach See group A day 7	Problem Solving Task Centre See group C day 3	Computer See group C day 7
9	Computer Interactive Learning Open box nets, Cube nets Learning Objects Building site http://illuminations.nctm.org/WebLinks.aspx Geometric Solids http://www.cs.mcgill.ca/~sqr/unfold/unfolding.html from net to solid and back http://www.learner.org/teacherslab/math/geometry/space/ http://www.mathsnet.net/geometry/solid/index.html	Worksheets See group A day 8	Teach the effects on area and volume of enlarging or reducing a shape or solid People count #44 Scale: effect on lengths, #45 Scale: areas and volumes Continuum Visualisation in 2D and 3D Active Learning 2: Space & Logic Quickmaths Space Z-BB	Problem Solving Task Centre See group C day 3
10	Problem Solving Task Centre See group B day 2	Computer See group A day 4	Worksheets See group D day 7	Teach See group C day 9

Year 6 Semester 2 Space

Day	Yr 6 sem 2 'Towards Std 3' A	'Towards Std 3' group B	'Towards Std 4' group C	'Towards Std 4' group D
1	Maths300 #118 Four-cube houses (1 of 2)			
2	<p>Teach making and solving tangram puzzles</p> <p>People count #51 Polygons</p> <p>Active Learning 1: Space S16</p>	<p>Problem Solving Task Centre</p> <p>107 McMahon's Triangles 2,148 McMahon's Triangles 1, 166 Sphinx, 196 Cross & Square, 60 Back To Back Building, 67 Making Solids, 73 In The Bag, 105 Soma Cube 1, 121 Farmacyard Views, 143 Hearts And Loops, 23 Two Colour Game, 70 Symmetric Shapes, 79 Tangram Teasers, 100 Mirror Patterns 1</p>	<p>Computer</p> <p>Learning Objects Shapemaker</p> <p>Free internet software http://nlvm.usu.edu/en/n/av/vlibrary.html</p> <p>http://library.thinkquest.org/16661/ try the Totally Tessellated Gallery</p> <p>http://britton.disted.com/osun.bc.ca/jbsymteslk.htm</p> <p>A rich collection of links</p>	<p>Worksheets</p> <p>Active Learning 1: Space S8, S19, S20</p> <p>Active Learning 2: Space & Logic Quickmaths Space W-X, S7, S10, S15, S16, S17, S20, S21, S22</p> <p>Geometry Everywhere p17-20, worksheets 22-27</p>
3	<p>Worksheets</p> <p>Active Learning 1: Space S4, S6</p> <p>Active Learning 2: Space & Logic S4</p> <p>Geometry Everywhere p2, worksheet 3</p>	<p>Teach</p> <p>See group A day 2</p>	<p>Problem Solving Task Centre</p> <p>36 Making Triangles, 40 Diamonds & Rectangles, 66 Pentominoes, 171 Number Discs, 228 Koala Carts, 16 Octaflex, 31 Cube Nets, 77 Tricube A, 78 Which View? 103 Four Cube Houses, 161 Soma Cube 2, 209 Pattern Cube, 95 Reflections, 134 Eight Queens, 167 Sliding Tiles</p>	<p>Computer</p> <p>See group C day 2</p>
4	<p>Computer</p> <p>Learning Objects Shapemaker</p> <p>Free internet software http://www.tygh.co.uk/index.html</p> <p>Tangram movie http://standards.nctm.org/document/examples/index.htm</p> <p>Isometric drawing tool http://nlvm.usu.edu/en/n/av/vlibrary.html</p> <p>http://www.kidscom.com/games/tangram/tangram.html</p> <p>http://britton.disted.com/osun.bc.ca/jbsymteslk.htm</p> <p>A rich collection of links</p>	<p>Worksheets</p> <p>See group A day 3</p>	<p>Teach creating complex tessellations using regular polygons</p> <p>People count #52 Tessellations</p> <p>Use Geoshapes</p> <p>Hands-on Space cards for use with Geofix/Geoshapes</p>	<p>Problem Solving Task Centre</p> <p>See group C day 3</p>

Day	Yr 6 sem 2 'Towards Std 3' A	'Towards Std 3' group B	'Towards Std 4' group C	'Towards Std 4' group D
5	Problem Solving Task Centre See group B day 2	Computer See group A day 4	Worksheets See group D day 2	Teach See group C day 4
6	Maths300 #118 Four-cube houses (2 of 2)			
7	Teach using a street directory, inc simple compass directions Use local directory Guidelines in Measurement p290-295	Problem Solving Task Centre See group B day 2	Computer See group C day 2	Worksheets Decision Maths
8	Worksheet Geometry Everywhere worksheet 19	Teach See group A day 7	Problem Solving Task Centre See group C day 3	Computer See group C day 1
9	Computer See group A day 4; also http://illuminations.nctm.org/WebLinks.aspx	Worksheets See group A day 8	Teach networks (e.g. family trees, road maps) People count #62 Networks	Problem Solving Task Centre See group C day 3
10	Problem Solving Task Centre See group B day 1	Computer See group A day 4	Worksheets See group D day 7	Teach See group C day 9