Name: ……………………………..

Year Level: ……… Date: …….

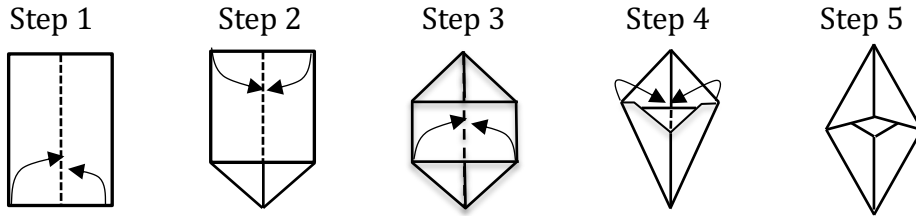# GEOMETRY FORM A

Assessment Booklet

Reframing Mathematical Futures II

An Australian Mathematics & Science Partnership Project (2015-2018)

GEOMETRY FORM A

1.   Angles and Locations

You will need the shape you made in class. The steps and diagrams below show how you made the shape.

| Step 1 | Step 2 | Step 3 | Step 4 | Step 5 |

Step 1   Fold an A4 paper in half lengthwise to make a crease line in the middle of the page.

Step 2   Fold two corners to the middle at the bottom
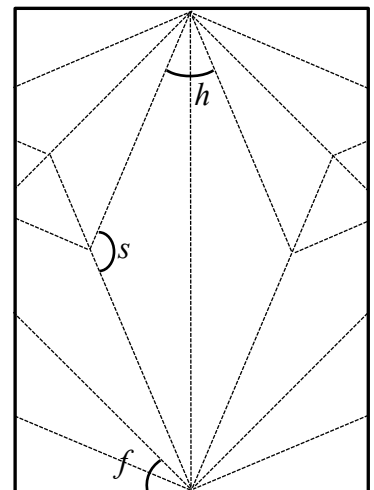
Step 3   Fold two corners to middle at the top

Step 4   Fold the new corners on the sides at the bottom to the middle

Step 5   Do the same with the top

a   [GANG1]

Phoebe made the same shape that you made using A4 paper. She said her shape is a rhombus.

Do you agree? Explain your reasoning.

b   [GANG2]

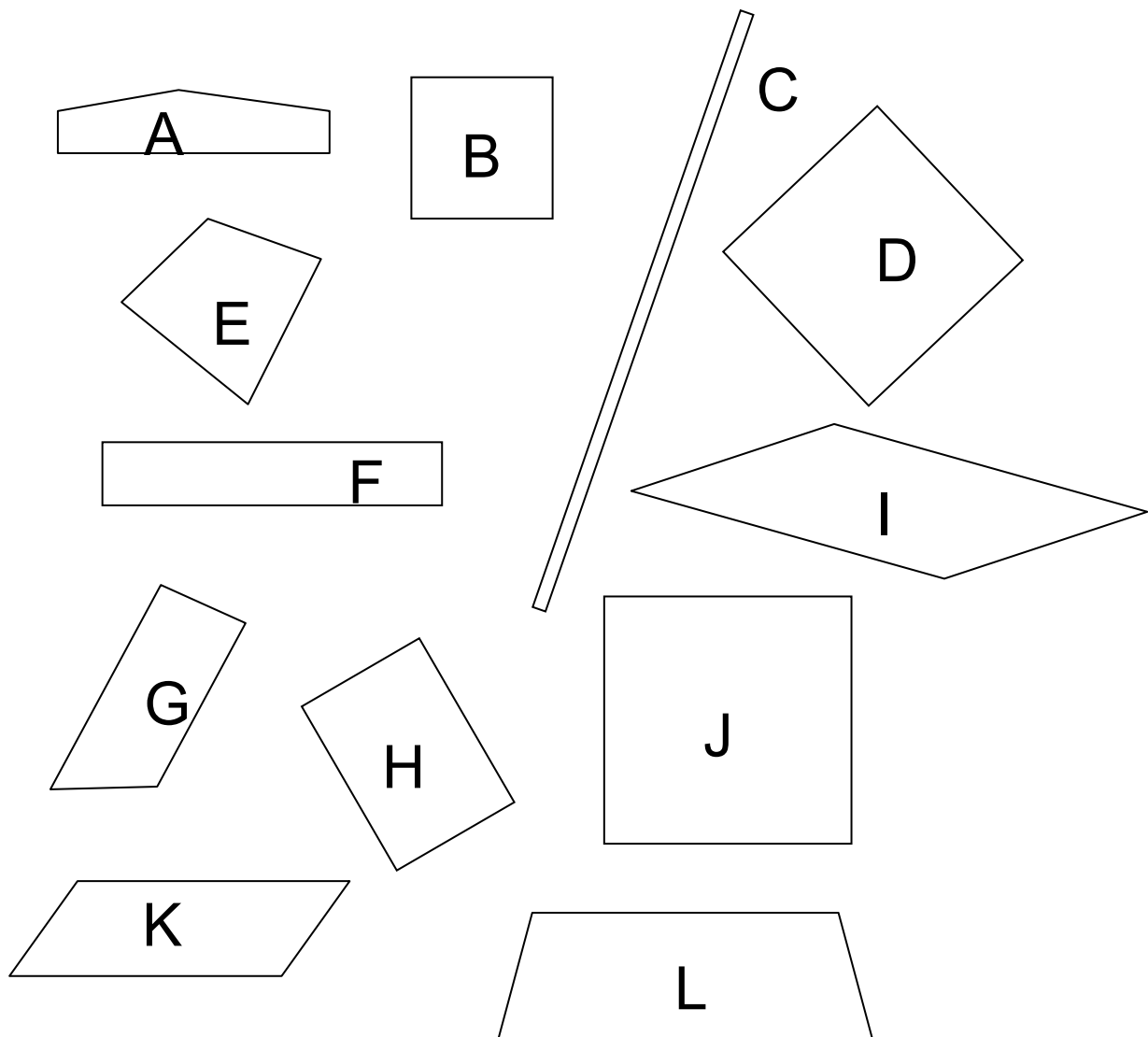When Phoebe unfolds the paper she found a number of crease lines.

Without using a protractor find the marked angles on the crease line:

Angle *f* = _____ Angle *h* = _____ Angle *s* = _____

Explain how you work out the angles.

2. **Shape definitions**
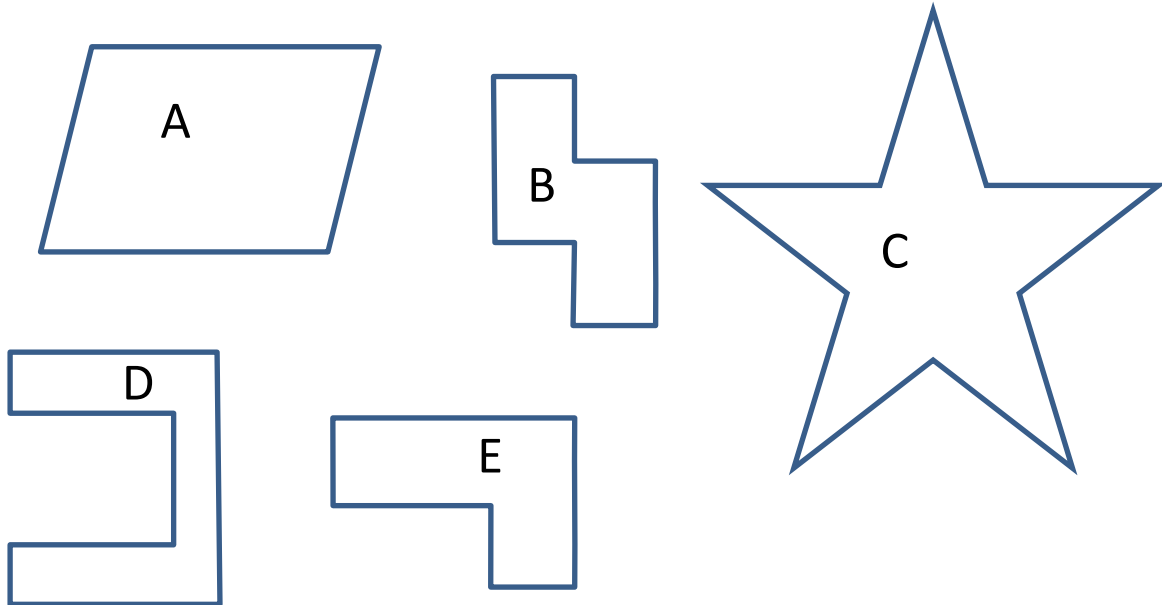
Look at the shapes below.

A
B
C
D
E
F
I
G
H
J
K
L

a [GRECT1]
Circle each shape that is a rectangle

b [GRECT2]
Explain your reasoning

c [GRECT3]
Explain why shape D **is** OR **is not** a rectangle

3. Symmetry

Look at the shapes below

a [GSYM1]

On each of these shapes draw all lines of symmetry.

A

B

C

D

E

b [GSYM2]

For each of the shapes in part **a**, decide whether there is any reflectional or rotational symmetry and write the letters in the appropriate space in the table below.

	Has rotational symmetry	Does not have rotational symmetry
Has reflectional symmetry		
Does not have reflectional symmetry		

c [GSYM3]

How do you know if a shape has rotational symmetry?

4. Drink bottles

A 1.25 litre bottle of soda water is 285 millimetres high and has a diameter of 85 millimetres.

a [GSODA1]

How many bottles would be needed to fill a 10 litre container with soda water? Explain your reasoning using as much mathematics as you can.

b [GSODA2]

What are the dimensions of a carton that would firmly hold 12 bottles of soda water? Explain your reasoning using as much mathematics as you can.

c [GSODA3]

One millilitre of water weighs 1 gram and each empty bottle weighs 80 grams. The cardboard in the box weighs 750 grams. How heavy would the full carton of 12 bottles of soda water be?

5. Spy squad 1: Giving directions

You have been invited to join the Spy Squad, a group of young people helping their country. There is a meeting at the café for the squad.
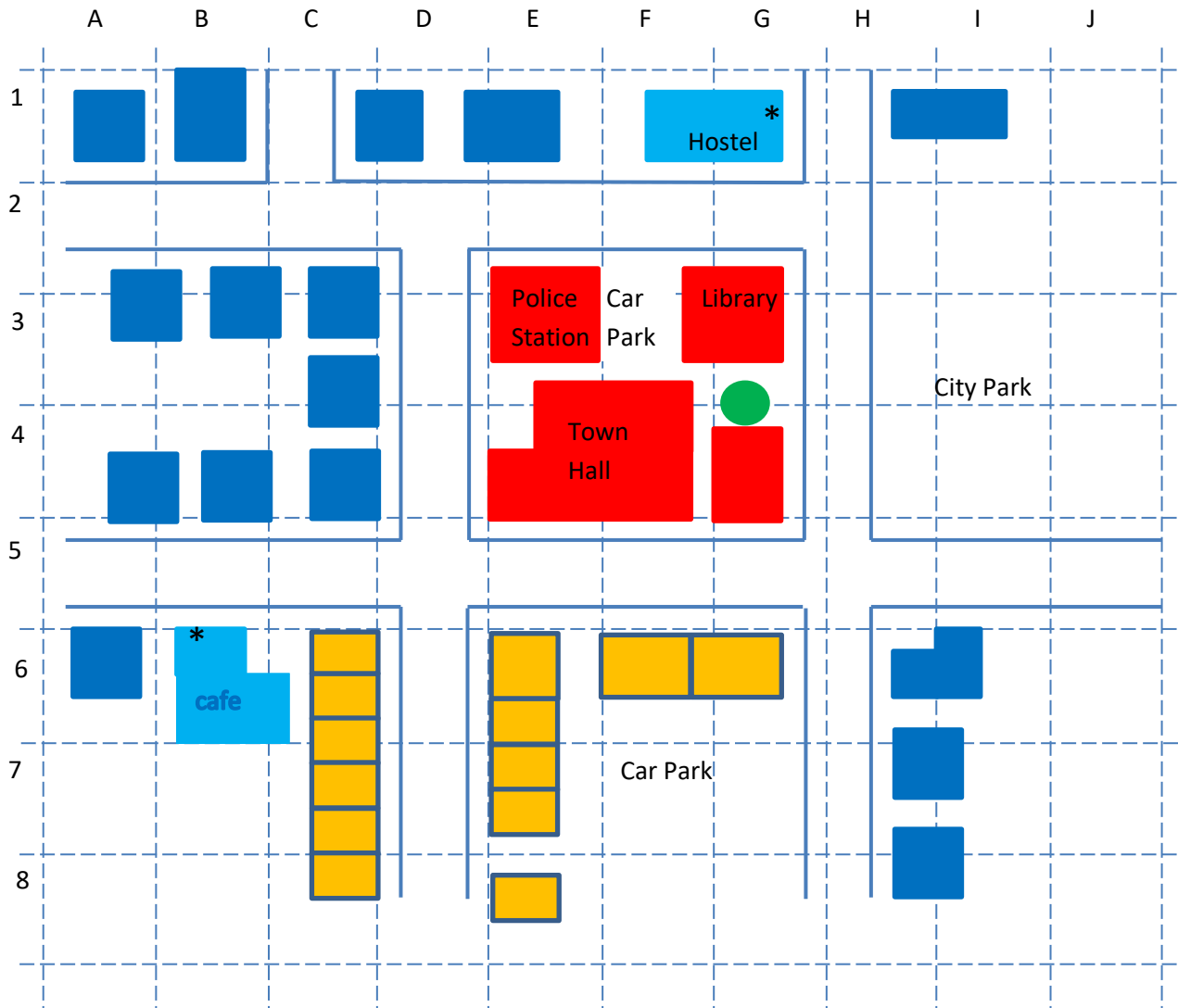
Legend

house		shop		public building	

a [GSPSQ1]

What is the map grid reference for the café? _____

b [GSPSQ2]

Mara is staying at the hostel. She doesn't know how to find the café and she does not have a map. The doors are marked with *. Give Mara directions so she can find her way.

c [GSPSQ3]

Describe another way Mara could have gone.

6. Parallel lines and right angles

a [GPARA1]

How many pairs of parallel lines can you find in the shape below? _____
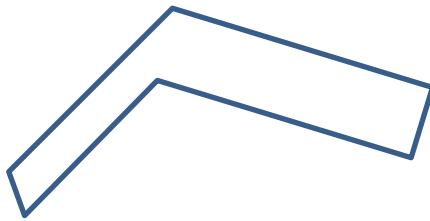
b [GPARA2]

How do you know if a pair of lines is parallel?

c [GPARA3]

What is the name of the shape? _____

d [GPARA4]

How many right angles are there in the shape? _____

7. Shapes

a [GDEFN1]

Jenna has a shape that she claims must be a rectangle. It has four straight sides and opposite sides are the same length. Is she right? Explain your reasoning.

b [GDEFN2]

On his quadrilateral George measured one right angle and found that all four sides were straight and had the same length. George decided his shape must be a square. Do you think George is correct? Explain your reasoning.

GEOMETRY FORM A RUBRIC

1. GANG1

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Disagree it is a rhombus but specify some of its properties correctly
2	Disagree it is a rhombus but claim it is a parallelogram with some properties
3	Agree it is rhombus but insufficient or incorrect properties to define it or claims it is a parallelogram and includes all properties
4	Agree it is rhombus. Explanation needs to include necessary and sufficient properties, that is, it is a parallelogram with one of the following properties • 4 equal straight sides • Opposite angles equal, sides equal • Two lines of symmetry

GANG2

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incorrect angles
2	At least 2 angles correct but no reason
3	Two angles found correctly with sensible reasons or all angles correct with no reasoning
4	All angles correct with clear reasons given relating to the folding and properties. F = 45º; h = 45º; s = 135º (e.g., *Folding corner to centre creates half right angle; All angles around centre of side equal so any 2 make 45º* or *Four angles of quadrilateral add to 360º*)

2. GRECT1

SCORE	DESCRIPTION
0	No response or irrelevant response
1	At least two shapes identified corectly
2	At least four shapes identified corectly
3	All six shapes identified correctly (i.e., B, C, D, F, H and J)

GRECT2

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Any statement suggesting reasoning based on appearance (e.g., *it looks like a rectangle*) but without any properties
2	Reasoning based on one property only which may be partially correct (e.g., two opposite sides parallel) or insufficient (e.g., it has two long and two short sides or 2 sides equal in length)
3	Reasoning refers to properties correctly but excludes squares (e.g., opposite sides same length and right angle properties but two sides are longer than other two) or correct but insufficient (e.g., side properties specified such as opposite sides same length or parallel or Right angle property specified but side properties not given)
4	Necessary and sufficient conditions, that is, right angle specified (or square corner) and opposite sides equal or right angle and opposite sides parallel

GRECT3

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incorrect (D is not a rectangle), reasoning based on appearance rather than properties (e.g., *it doesn't look like a rectangle; it is a diamond)*
2	Incorrect (D is not a rectangle, it's a square), reasoning relies on single property of a square which is insufficient(e.g., it has opposite sides parallel)
3	Correct (D is a rectangle) with only one side property given so not necessary and sufficient or incorrect (D is not a rectangle) with necessary and sufficient conditions for a square (e.g., *it has right angle and four sides same length so a square*)
4	D is a rectangle with necessary and sufficient conditions for a rectangle, that is, It has four straight sides with opposite sides parallel and a right angle or It has opposite sides the same length and it has a right angle or It has four right angles

3. GSYM1

SCORE	DESCRIPTION
0	No response or irrelevant response
1	No shapes having all lines drawn correctly
2	All symmetry line(s) drawn correctly on one shape (others may be incorrect)
3	Correct lines drawn on C and D but incorrect lines drawn on at least one other shape
4	D: one line correctly drawn horizontally through centre C: five lines drawn from each point to opposite reflex angled corner No lines drawn on A, B or E

GSYM2

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Only one shape (letter) correctly placed
2	At least 2 correctly placed
3	At least 4 correctly placed
4	C has both rotational and symmetrical symmetry A, B have rotational symmetry but no reflectional symmetry D has reflectional symmetry but no rotational symmetry E has no symmetry

GSYM3

SCORE	DESCRIPTION
0	No response or irrelevant response
1	An attempt at an explanation but lacking clarity
2	Some explanation about turning shape part way around circle and it looking the same – perhaps around a pin

4. GSODA1

SCORE	DESCRIPTION
0	No response or irrelevant response
1	incorrect with no clear reasoning or working
2	Incorrect but with clear attempt to calculate, may use addition and make an error
3	Correct (8 or 8 bottles) but no reasoning or calculations shown
4	Correct, reasoning or working to justify (e.g., 8 X 1.25 = 10 litres)

GSODA2

SCORE	DESCRIPTION
0	No response or irrelevant response
1	All dimensions incorrect
2	Height dimensions correct, others not correct
3	Dimensions recognised for array chosen (eg., 3 x 4, 2 x 6 or 1 x 12) but calculation error in one dimension (e.g., for a 3 x 4 array correctly calculates 4 x 85 mm but incorrectly calculates 3 by 85 mm
4	Correct for array chosen (e.g., 340 mm by 255 mm by 285 mm for a 3 by 4 array). Also correct if a small amount added for width of cardboard

GSODA3

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Partially correct working with at least one correct component
2	Error in calculating liquid mass or one component missing
3	Correct (16.71 kg or 16710 gm), that is 12 X 1250 g + 12 X 80 g + 750 g = 16710g or 16.71 kg

5. GSPSQ1

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incorrect grid reference provided (e.g., C6 or other) or inappropriately referenced (e.g., 6B)
2	Correct (B6)

GSPSQ2

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incorrect attempt at directions, may use simple directional language but incorrect or insufficient or landmarks but insufficient (e.g., *Go to library then to town hall*)
2	Uses directions not adjusted for walker, may use *left* meaning the map's left hand side and *up* and *down* for the other dimension or uses these in conjunction with landmarks
3	Clear directions given using appropriate language from the walker's perspective (e.g., turn right on leaving the hostel,…). References to right and left must be from walker's perspective. If using North, East, West etc then the walker would need to be told where North is first.

GSPSQ3

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incorrect attempt at directions, may use simple directional language but incorrect or insufficient or landmarks but insufficient (e.g., *Go to library then to town hall*)
2	Uses directions not adjusted for walker, may use *left* meaning the map's left hand side and *up* and *down* for the other dimension or uses these in conjunction with landmarks
3	Clear directions given using appropriate language from the walker's perspective (e.g., turn right on leaving the hostel,…). References to right and left must be from walker's perspective. If using North, East, West etc then the walker would need to be told where North is first.

6. GPARA1

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incorrect answer with some reasoning, some attempt to justify.
2	Correct (2 or 2 pairs) with little or no reasoning
3	Correct with clear explanation to support response

GPARA2

SCORE	DESCRIPTION
0	No response or irrelevant response
1	An attempt at explaining which is not clear
2	Clear description relating to the lines being the same distance apart OR a statement to the effect that the lines will never meet if extended

GPARA3

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incorrect (any thing other than a hexagon) or partially correct (Polygon)
2	Correct (Hexagon)

GPARA4

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incorrect (anything other than 2 right angles)
2	Correct (2 or 2 right angles)

7. GDEFN1

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incorrect (Yes, Jenna is right) or correct (No, Jenna is wrong) but no explanation provided
2	Correct (No) but explanation relies on counter example(s) (e.g., *it could be a parallelogram* or diagram of counter example provided)
3	Correct (No), explanation refers to necessary properties (e.g., equal diagonals or right angles to exclude parallelograms)

GDEFN2

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incorrect (No) (e.g., may say it could be a quadrilateral) or correct (Yes) but little/no explanation provided
2	Correct (Yes) explanation largely tautological (e.g., *squares have 4 equal sides*)
3	Correct (Yes) explanation recognises necessary and sufficient conditions in some way

STUDENT SCORE SHEET GEOMETRY FORM A

Student Name:	Year Level:

		Score	Comments
1	GANG1		
	GANG2		
2	GRECT1		
	GRECT2		
	GRECT3		
3	GSYM1		
	GSYM2		
	GSYM3		
4	GSODA1		
	GSODA2		
	GSODA3		
5	GSPSQ1		
	GSPSQ2		
	GSPSQ3		
6	GPARA1		
	GPARA2		
	GPARA3		
	GPARA4		
7	GDEFN1		
	GDEFN2		
Total Raw Score			

RAW SCORE TRANSLATOR FOR GEOMETRY FORM A

The following table locates students on the **Learning Progression for Geometric Reasoning** based on their total score for Geometry Form A. Total scores are obtained by adding the rubric scores assigned to each item on the form. Where a total score is very close to the beginning or end of a score range, teachers are advised to use their knowledge of the student to make a decision about the most appropriate Zone.

Students need to have had an opportunity to attempt all tasks for this process to be meaningful.

Total Score	Zone	Zone Description
58-64	8	Constructs arguments based on multiple properties of 2D shapes and 3D objects, using the necessary and sufficient conditions to reason about geometric and measurement situations, conjectures and propositions (theorems). Demonstrates an understanding of both reflectional and rotational symmetry.
49-57	7	Works analytically with properties of rectangles. Beginning to recognise necessary and sufficient conditions for square and rectangle. Uses sound reasoning in argument/explanations, though examples are often procedurally based. Able to recognise the relationship between length, area, and volume.
39-48	6	Uses properties accurately when reasoning about spatial situations but lacks knowledge of geometric hierarchy. Understands properties of 2D shapes but not special cases (e.g., regular). Geometric and measurement arguments rely on examples/counter examples. Provides accurate directions from a map using appropriate language and able to describe directions from walker's perspective. Understands the impact of doubling dimensions on volume, is able to visualise volume and calculate when numbers are small. Omits one step when calculating multi-step measurement problems. Is able to make deductions about angle situations with limited explanations. Beginning to reason deductively.
28-38	5	Is able to visualise and represent 3D objects using 2D platforms (Nets) and recognises properties in non-standard orientations. Beginning to use, but not recognise, sufficient conditions. Uses either properties or orientations to reason in geometric situations and accesses relevant geometric language. Demonstrates knowledge of dilation and coordinate systems and recognises some rotational symmetry. Uses landmarks but retains personal orientations when providing direction. Can provide partial solutions and explanations when calculating measurement situations.

16-27	4	Knows some geometric language, can name some 3D objects, and is able to visualise objects from a different perspective but shows incomplete reasoning in geometric and measurement situations. Performs measurement calculations but attends to only one attribute. Gives directions from a map from personal rather than other viewer's perspective.
10-15	3	Uses one or two properties or attributes (insufficient) to explain their reasoning about shapes and measurement but often do not recognise properties in non-standard representations. Demonstrates a beginning understanding of measurement attributes. Able to visualise some objects from different perspectives and to use coordinates.
3-9	2	Identifies simple shapes in situ and on simple solids. Recognises some reflective symmetry, nets of simple solids, and simple shapes and shows emerging representation of 3D objects. Is able to make use of geometric language and understanding of measurement concepts but does not coordinate information or justify thinking.
1-2	1	Recognises simple shapes by appearance and common orientation. Shows emerging recognition of objects from different perspective, a coordinate system, and reflectional symmetry of objects and shapes. Can name some common 3D objects and identify some standard nets. Is able to identify location using simple referencing systems.