

Name:

Year Level: Date:



GEOMETRY FORM D

Assessment Booklet

Reframing Mathematical Futures II

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

GEOMETRY FORM D

1 Working with Solids

a [GNET1]

The diagram below shows the net of a 3D object. The triangular flaps are then folded up along the dotted lines to make the 3D object.

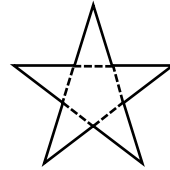
What is the name of this 3D object? _____.

How many faces, edges and vertices does this object have?

Faces: _____

Edges: _____

Vertices: _____



b [GNET2]

Draw what this 3D object would look like when viewed from directly above and when viewed from the front at eye level.

View from above

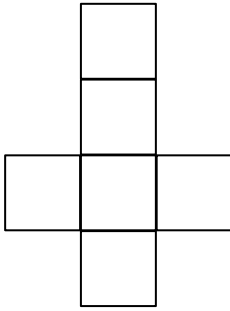
View from the front

c

[GNET3]

The diagram below shows the net of a cube.

Draw a different net for a cube



d

[GNET4]

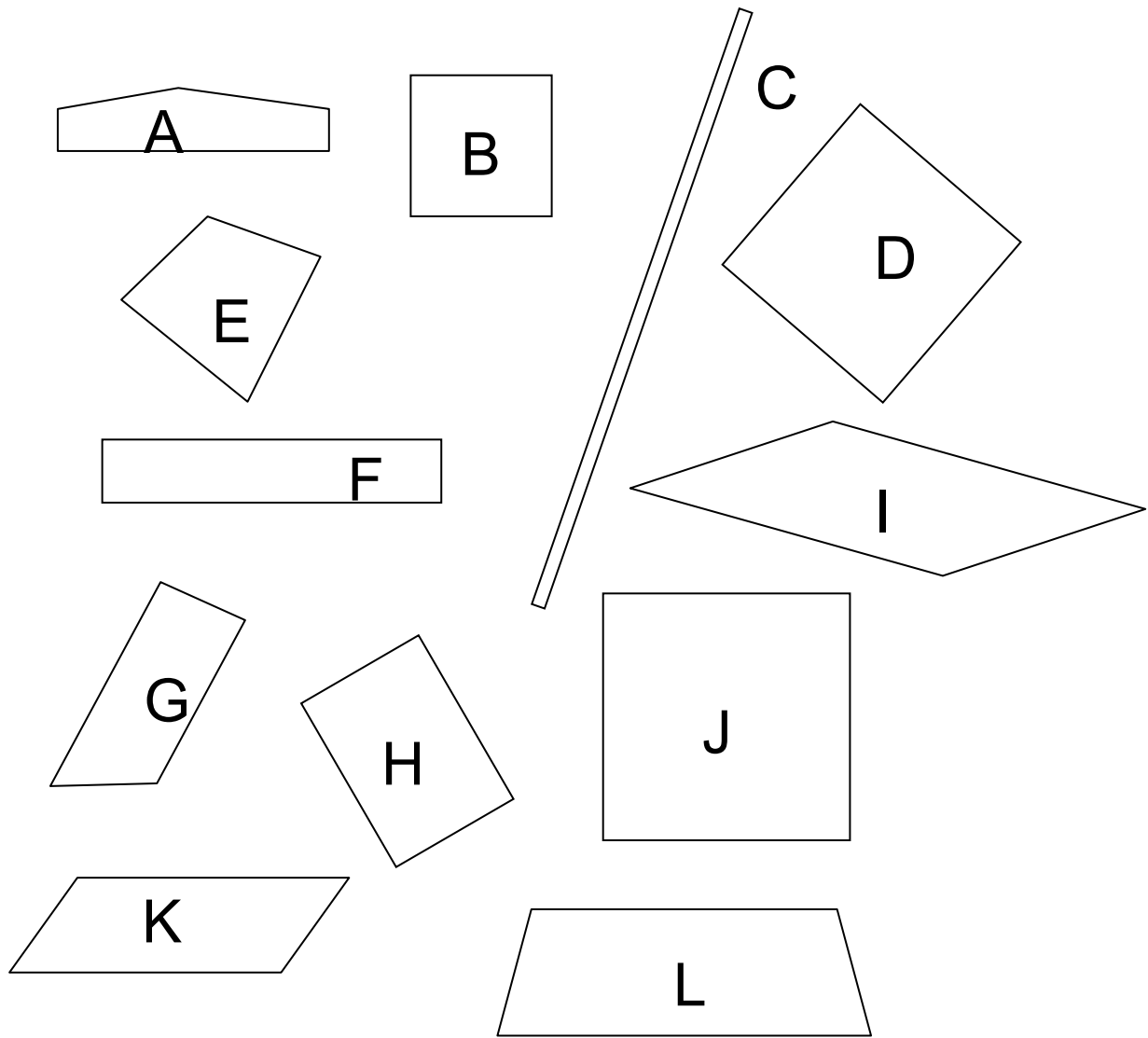
Sam thinks he has drawn a net of a cube using six squares but it **does not** fold up to make a cube.

What might Sam's drawing look like?

Explain how you know.

2 Shape definitions

Look at the shapes below.



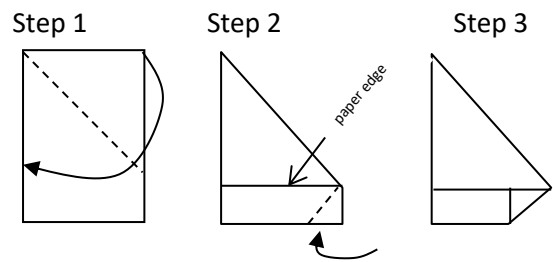
a [GREC1]
Circle each shape that is a rectangle

b [GREC2]
Explain your reasoning

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

3 Paper folding

A four-sided shape is folded from a sheet of A4 paper using the following instructions.



- a** [GANG3]
 What is the name of this shape that you made?

Fold bottom right corner to paper edge

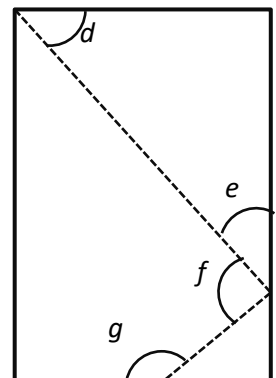
Explain your reasoning.

- b** [GANG4]
 Unfold the paper. Without using a protractor find the size of each marked angle.

Angle d = _____ Angle e = _____

Angle f = _____ Angle g = _____

Explain your reasoning.



4 Packing

[GPACK]

Chas is packing smaller boxes into cartons.

The boxes he has to put in the cartons are 30 centimetres long, 15 centimetres wide, and 10 centimetres high.

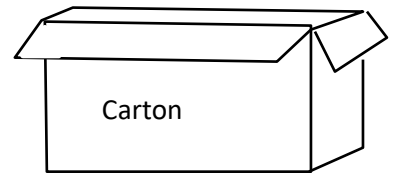
The carton he is packing them in is 50 centimetres long, 40 centimetres wide and 30 centimetres high.

What is the maximum number of boxes he can fit in the carton? (Drawing not to scale)

Explain your reasoning
(You may use diagrams if you wish).



Boxes

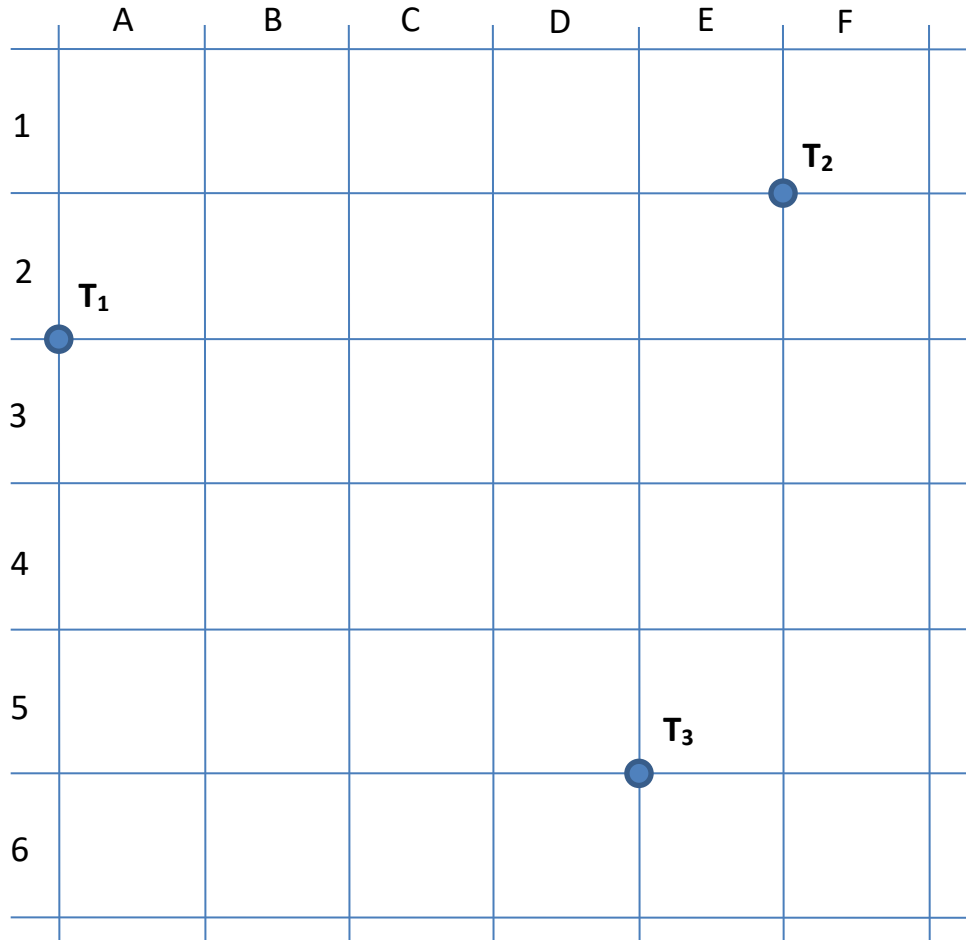


Carton

5 Spy Squad: Find a phone

a [GPHON1]

The phone towers for a telecommunications company can locate a telephone up to 1.5 kilometres away. The lines on the map are 0.5 kilometres apart. All three towers, T_1 , T_2 and T_3 are detecting the same phone. What map reference best describes the location of the phone?



Locate the map reference for the phone. _____

b [GPHON2]

Explain using your drawings on the map and words how you located the phone.

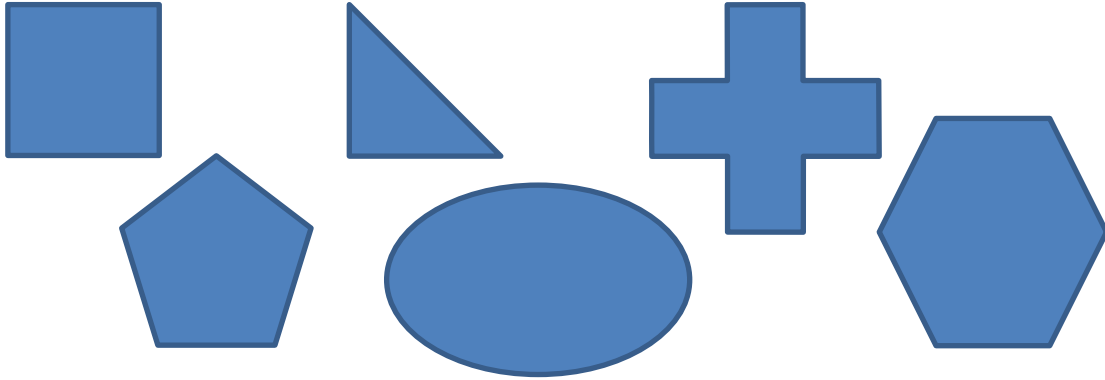
6 Tiling

[GTESS]

Jo is using a shape of tile to completely cover his bathroom floor (no gaps).

Circle the tile shapes shown here that he cannot use.

Explain your reasoning for the shapes you have chosen.



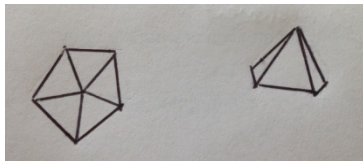
GEOMETRY FORM D RUBRIC

1. GNET1

SCORE	DESCRIPTION
0	No response or irrelevant response
1	At least one of the four responses correct
2	At least 3 of the 4 responses correct
3	All responses correct (pentagonal pyramid, 6 faces, 10 edges, 6 vertices)

GNET2

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Neither drawing satisfies the requirements
2	An attempt at the views with some recognisable components (eg. A triangle and a pentagon drawn)
3	One of the two views correct (see below)
4	Both views correctly drawn (i.e., a pentagon with lines drawn from the vertices to the centre of the pentagon and an irregular pentagon with lines drawn from the apex to the two opposite vertices as shown below)



GNET3

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incorrect net drawn
2	Correct net drawn but not different to one shown, that is, a rotation of this one
3	Different correct net drawn

GNET4

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Draws a six square arrangement that is a net of a cube
2	Draws a six square arrangement that is not a net of a cube but little/no explanation
3	Draws a six square arrangement that is not a net of a cube with reasonable explanation of why specific arrangement does not work (e.g., draws six squares in a line and states that it could only be folded up to make a 6 sided box with no base and no top)

2. GRECT1

SCORE	DESCRIPTION
0	No response or irrelevant response
1	At least two shapes (2D) identified correctly
2	At least four shapes (2D) identified correctly
3	All six shapes (2D) 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., <i>it looks like a rectangle</i>) 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., <i>it doesn't look like a rectangle; it is a diamond</i>)
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., <i>it has right angle and four sides same length so a square</i>)
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. GANG3

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Diamond or other incorrect shape
2	Quadrilateral because it has 4 sides
3	Kite because it looks like one OR Unable to name but gives side and/or angle properties of a kite
4	Kite because two pairs of adjacent equal sides are equal OR because opposite angles equal and some sides same length OR because it has a line of symmetry

GANG4

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incorrect with little/no reasoning, may include one correct angle
2	At least two angles correct with an attempt at explaining reasoning
3	Angles correct ($d = e = 45^\circ$, $f = 90^\circ$ or right angle, $g = 135^\circ$) but reasoning sparse and incomplete
4	Angles correct. Reasoning includes justifies d as half of the right angle in corner or as angles in an isosceles triangle, and g on the basis that the four angles of the kite shape have to add to 360°

4. GPACK

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incorrect answer but an attempt at either the volume calculation or a diagrammatic solution
2	13 - but no clear reason given (reason does not have to be calculation)
3	13 - reasoning shown in diagram in some way or as a calculation (e.g., vol carton/vol box = 13.33)

5. GPON1

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Any other answer
2	C3

GPON2

SCORE	DESCRIPTION
0	No response or irrelevant response
1	Incomplete or ambiguous drawing, may suggest the use of angle bisectors with little/no reasoning
2	Drawing shows intersecting arcs may not be particularly accurate or supported by clear reasoning OR drawing unclear but reasoning recognises that phone lies in the intersection of the arcs
3	Drawing shows intersecting arcs from each of the phone towers based on a radius of 1.5 km with reasoning that supports conclusion

6. GTESS

SCORE	DESCRIPTION
0	No response or irrelevant response
1	All shapes (2D) circled incorrect or just an ellipse circled
2	Ellipse and/or pentagon circled and at least one other shape (2D) circled with little/no reasoning given
3	Correct (ellipse and pentagon circled only) with some attempt to provide an explanation or drawing provided for one
4	Correct (ellipse and pentagon circled only) with reasons given for each shape (e.g., no angles for oval, three angles will not fit for pentagon), clear drawings may be provided for both shapes

STUDENT SCORE SHEET GEOMETRY FORM D

Student Name:	Year Level:
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		Score	Comments
1	GNET1		
	GNET2		
	GNET3		
	GNET4		
2	GRECT1		
	GRECT2		
	GRECT3		
3	GANG3		
	GANG4		
4	GPACK		
5	GPHON1		
	GPHON2		
6	GTESS		
Total Raw Score			

RAW SCORE TRANSLATOR FOR GEOMETRY FORM D

The following table locates students on the **Learning Progression for Geometric Reasoning** based on their total score for Geometry Form D. 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
37-40	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.
32-36	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.
27-31	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.
22-26	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.

15-21	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.
10-14	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.