

SS1 • Classifying shapes

Mathematical goals

To help learners:

- name and classify polygons according to their properties;
- develop mathematical language to describe the similarities and differences between shapes;
- develop convincing explanations as to why combinations of particular properties are impossible.

These goals may be adapted for learners aiming at lower levels. For example, you may decide to focus on just the first two goals.

Starting points

No prior learning is needed.

Materials required

For each learner you will need:

- mini-whiteboard.

For each small group of learners you will need:

- Card set A – *Shapes*;
- some blank cards;
- Sheet 1 – *Classifying by symmetry*;
- Sheet 2 – *Classifying by regularity*;
- Sheet 3 – *Classifying triangles*;
- Sheet 4 – *Classifying quadrilaterals*;
- Sheet 5 – *Classifying by perimeter and area*.

The whole group discussion will be easier if you make OHTs of Card set A – *Shapes* and of the five sheets.

For learners aiming at lower levels, you may decide to begin by using just one-dimensional classification rather than the two-dimensional grids.

Time needed

Approximately 1 to 2 hours, depending on how many classification grids (sheets) are used.

Suggested approach **Beginning the session**

Learners aiming at lower levels may do only the first sort, with two descriptions.

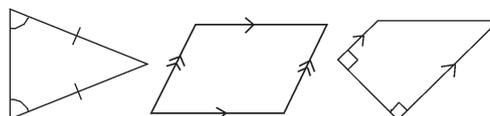
Ask learners to work in pairs. Give each pair of learners Card set A – *Shapes*. Ask them to sort the shapes into two groups using criteria of their own choice. Next, ask them to sort each group into two, using further criteria. Give out blank cards and ask learners to write a description of each of their four groups and also to draw another shape to add to each group.

Whole group discussion: reviewing names and notation

Ask learners to share their criteria for sorting the shapes. Show how their four groups may be displayed using two-way tables. Help them to translate what they say into 'official' mathematical language such as:

- names of polygons (triangle, rhombus, regular etc.);
- names of angles (interior, exterior, acute, obtuse, reflex);
- terms for symmetry (line, rotational);
- terms that relate to lines (adjacent, equal, parallel, perpendicular).

Describe the notations that are commonly used to describe pairs of equal lengths, equal angles, right angles and parallel sides. Ask learners to label some shapes in this way. For example:



Working in groups

Ask learners to work in pairs. Give each pair one of the Sheets 1 to 5. Ask them to place shapes into appropriate cells. Sometimes, several shapes may go in a cell. If learners feel that a cell is impossible to fill, they should explain why this is so.

Learners who struggle may be asked to find shapes corresponding to one criterion at a time (e.g. "Regular or irregular?"). When they have done this, they might then be encouraged to use two-way classifications such as those found on the grids.

Learners who find the task straightforward should be pressed for clear, written explanations as to why certain combinations of criteria are incompatible. This can be very challenging.

Listen to learners' explanations. Note obvious misconceptions that emerge for the final whole group discussion. For example, many learners assume that a parallelogram has a line of symmetry.

Reviewing and extending learning

Using mini-whiteboards, ask learners to show examples of:

- a quadrilateral with two lines of symmetry;
- a triangle with three lines of symmetry;
- a right angled isosceles triangle;
- a triangle with all acute angles;
- a shape whose interior angles add up to 360° ;
- a trapezium with only one right angle (impossible!);
- a quadrilateral with one reflex angle;

... and so on.

What learners might do next

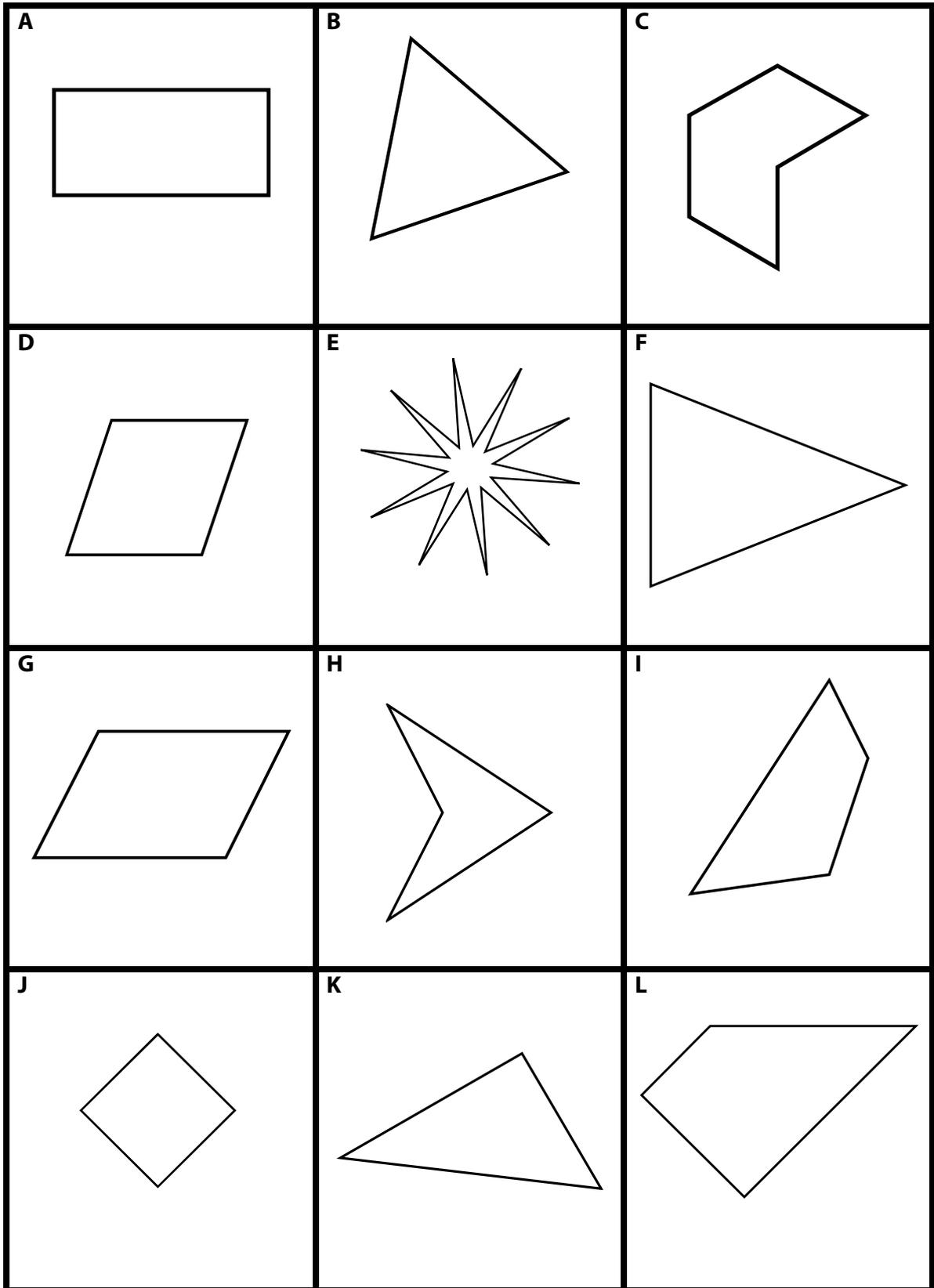
There are of course many other ways of classifying shapes. You may like to suggest that learners invent methods of their own. For example, they could try to draw a table showing 'number of lines of symmetry' against 'order of rotational symmetry'. This is quite hard to fill in, as there are many impossible entries.

Further ideas

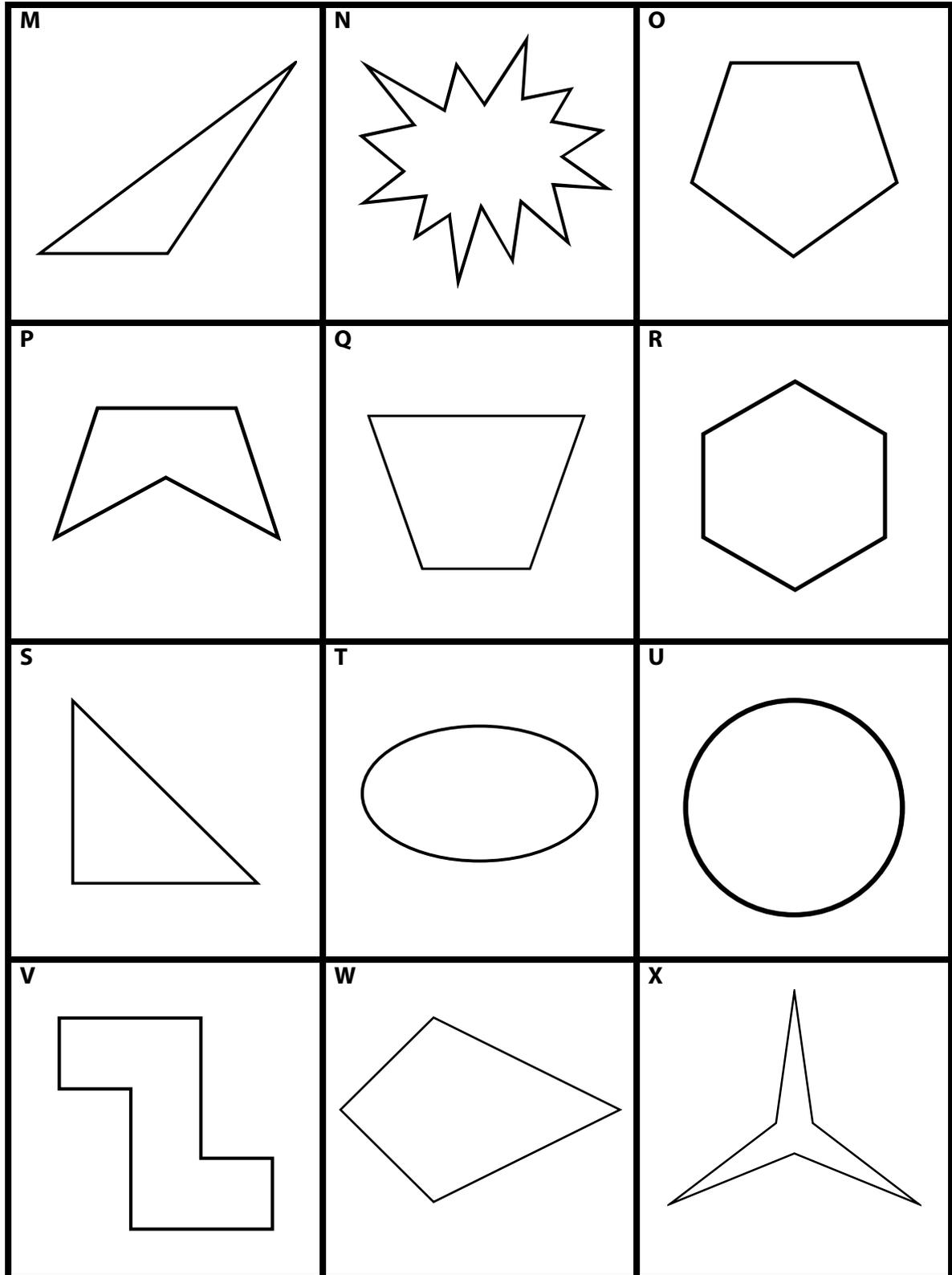
Classification activities are very powerful and can be used across the curriculum. For example, you could ask learners to classify and name sets of numbers, graphs, equations and so on.

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SS1 Card set A – Shapes (page 1)



SS1 Card set A – Shapes (page 2)



SS1 Sheet 1 – *Classifying by symmetry*

	No rotational symmetry	Rotational symmetry
No lines of symmetry		
One or two lines of symmetry		
More than two lines of symmetry		

SS1 Sheet 2 – *Classifying by regularity*

	Regular	Irregular
Triangle		
Quadrilateral		
Pentagon		
Hexagon		

SS1 Sheet 3 – *Classifying triangles*

	No right angles	One right angle
No sides equal		
Two sides equal		
Three sides equal		

SS1 Sheet 4 – *Classifying quadrilaterals*

	No parallel sides	Two parallel sides	Two pairs of parallel sides
No equal sides			
Two equal sides			
Two pairs of equal sides			

SS1 Sheet 5 – *Classifying by area and perimeter*

	Small area	Large area
Small perimeter		
Large perimeter		