Teacher support materials

Concept focus: Symmetry

CAMBRIDGE Mathematics

Children's ideas about symmetry develop from their lived experiences of building, drawing, moving and perceiving. So from their earliest experiences, learners need to be immersed in geometry, to be encouraged to explore concepts for themselves and given the motivation to want to explain or prove them.

Some of the M.A.T.H. Mummy Mayhem game content which is linked to the concept of symmetry can be found in parts of the game illustrated below.

Puzzle 2 – Symmetry spotter

Puzzle 5 – Symmetry grid

Puzzle 6 – Rotational symmetry

These parts of the game form the basis for the following ideas and jumping-off points, which you are invited to adopt and/or adapt according to your context.

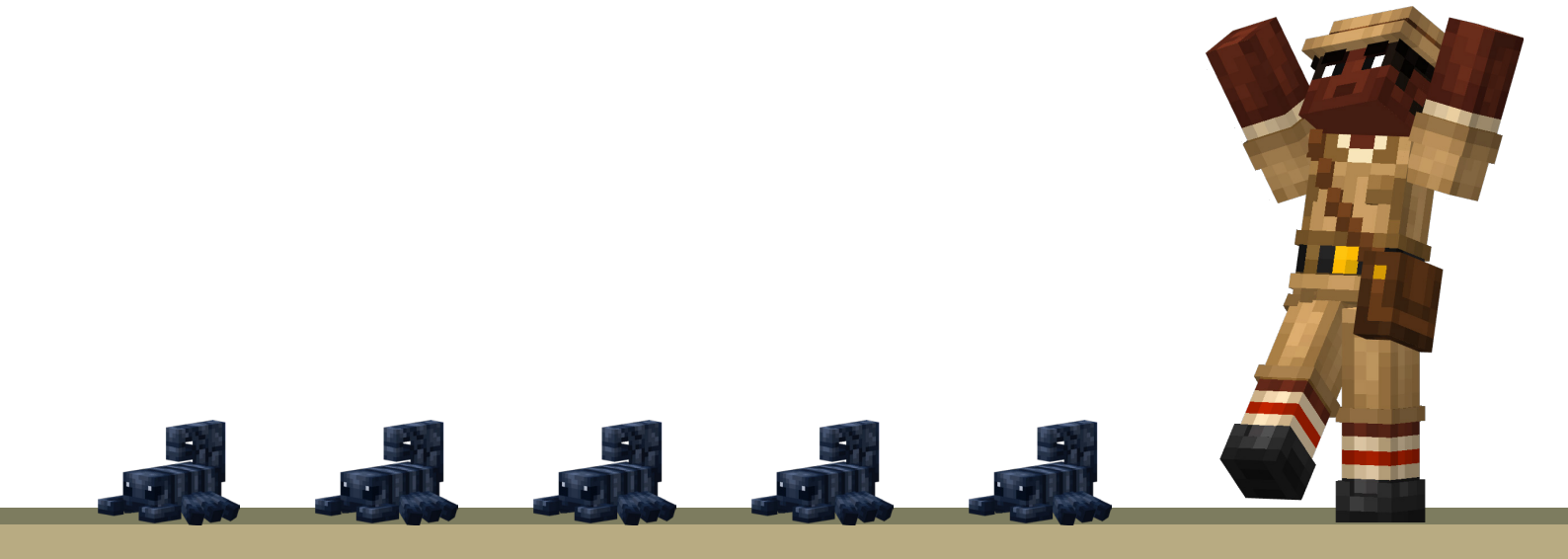
After/before/in between playing M.A.T.H. Mummy Mayhem, you might like to:

- Display the illustrations of the game shown above and ask students to write down as many words describing the mathematical challenge as possible.
- Share examples of these with the class (e.g., using post-it notes or a visualiser, etc.) and invite students to talk about the words with a partner. Pairs can then share their explorations as part of a class discussion. Conversations might arise about specific mathematical vocabulary and other more generic words. These categories should be recorded, and time allowed to consider connections and for consolidation of understanding.
- Encourage students to pick three mathematical words to describe and three more that they are unsure about (either they don't know them or would find it challenging to explain them).
- Set up 'musical chairs' (half the class remain seated, and the other half move around to find someone new to talk to) in order to try out their explanations on someone else (e.g., can their partner guess the word if only told what it means?) and to talk about the meanings of the words that they are less sure about. Play for multiple rounds.
- Take feedback about what was learned from their exchanges. Particular words might arise as being challenging to explain, as might feelings about why it is important to try and be as clear as possible, and how helpful the right word is in order to communicate what you notice/think/wonder.

The vocabulary generated by your students will be wide-ranging (particularly given the range of ages who might play the game), but some examples are given in the table below of words that students might generate having considered these puzzles (this is not an exhaustive list nor intended as a checklist).

Example symmetry vocabulary

line of symmetry	diagonal	mirror line	rotational symmetry	flip	symmetry	
reflection	rotation	orientation	turn	horizontal	fold	equidistant
footprint	twist	vertical	symmetrical	rotation	outline	match



To provide an opportunity to explore students' understanding further and uncover misconceptions within the concept of symmetry, you could share the following statements and ask students to think about whether the statements are always true, sometimes true or never true.

1. A quadrilateral has 4 lines of reflective symmetry.
2. The order of rotational symmetry of a 2D shape is the same as the number of corners it has.
3. Any 2D shape can be used to create a new symmetrical shape by reflecting it in one of its sides.
4. The words "symmetrical" and "reflection" mean the same thing.
5. Triangles have one line of symmetry.
6. Regular polygons are symmetrical.

Allow time for:

- developing reasoning
- asking questions to test ideas and to think about different interpretations
- generating examples and non-examples to support/disprove conjectures

When they have thought about where they want to place each statement, and just as importantly why, students could compare, explain and justify their findings to others.

Students might be interested in rewriting the "never true" ones, to make them true and/or creating statements about this topic for other students to think about.