

Tessellation: shapes that fit together

CURRICULUM ALIGNMENT

SHA.TRN.3

model and explain the effects of transformations on shapes and line segments.

SHA.SHP.3a

investigate and analyse the properties of 3-D and 2-D shapes and identify classes of shapes based on these properties.

SHA.SAL.3b

compare and classify angles, recognising them as a property of a shape and as a description of a turn.

INTERACTIVES Pattern Blocks · challenge, display, explore

WHAT THIS LESSON TEACHES

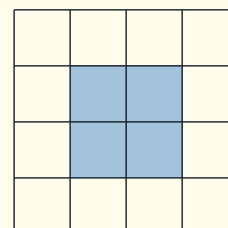
A tessellation is a pattern where copies of the same shape fit together to cover a surface with no gaps and no overlaps. Squares, equilateral triangles and regular hexagons tessellate; circles and regular five-sided shapes leave gaps.

- Square floor tiles laid side by side cover the floor with no gaps.
- Round coins laid together leave little empty spaces at every join.

MODEL THIS ON THE BOARD

4 SQUARES TESSELLATE

- 1 The grid shows 4 unit squares fitted edge to edge in a block.
- 2 Every shared side meets exactly, with no gap and no overlap.
- 3 The 4 corners meet in the middle and fill a full turn.
- 4 The block is one bigger square, so the squares tessellate.



DISCUSSION STARTER

REFLECT Which shapes tessellate easily, and which leave gaps?

LESSON ARC

Open with two photos — a gap-free tiled floor beside pentagon paving stones that leave gaps — and ask why straight edges still fail. On the IWB, tile squares, hexagons, then circles, tracing where copies meet. Pupils draw four squares then four hexagons in copy. The Class Challenge combines triangles with squares, then triangles round hexagons. The closing maths-talk cracks the pentagon puzzle: corners must close round a point.

TEACHING MOVES

1. **Getting Started.** Take two or three hands-up answers, not open call-outs. Steer pupils toward noticing the square tiles meet edge to edge while the five-sided stones don't close up. Hold the word 'tessellation' back — and leave the pentagon puzzle unsolved on the board; you crack it in the wrap.
2. **Watch and Notice.** Trace a finger along where four square corners meet — nothing left over. On hexagons, ask what animal builds this (honeycomb). On circles, hold out silently and let the class spot the

gaps: a round edge can never sit flat against another round edge. Then reconnect to the pentagon photo — straight edges, still gaps — and say you'll solve it at the end.

3. **Try It Together.** Pupils take turns at the board; the rest of the class agrees or corrects out loud — this round is for talking it through, not marking. Before each new shape, take a whole-class call-out prediction: 'will this one fit with no gaps?' When a pupil spots hexagons leaving triangle-shaped spaces, flag it to return to in the Class Challenge.
4. **Fit the Shapes in Your Copy.** Pupils draw four squares meeting with no gaps, then attempt four hexagons. Walk the room glancing for edges that meet flush — this is whole-class copybook practice, not marking. Expect the hexagons to be harder to draw; that struggle is part of the point, so don't rescue it too fast.
5. **Class Challenge.** Brisk practice round — pupils take turns at the board, check each answer, class confirms, move on. On the final triangle-and-hexagon round, work it together first so pupils see a ring of triangles filling the space around each hexagon, then let a pupil fill the outline. Ask the pupil at the board to point to the join where the two shapes meet.
6. **What Did We Notice?.** Draw out two ideas and revoice. First: straight edges must meet flush — that's why round circles fail. Second, the harder one: a pentagon's corners can't close all the way round a point. Revoice a strong answer as 'a shape tessellates when its straight sides meet flush AND its corners close neatly round a point.'

COMMON MISCONCEPTIONS

⚠ Pupils decide a shape must tessellate just because it has straight edges — 'the pentagon has straight sides like the square, so it should fit'.

Send a pupil to the board to crowd pentagons round a single point. Everyone watches the wedge of empty space that opens no matter how they rotate them. Straight edges aren't enough — the corners have to close round the point.

⚠ When combining two shapes, pupils lay them side by side in separate patches rather than interlocking them into one repeating tiling.

On the IWB, drag one triangle to nest into the gap left by the hexagons rather than beside them. Point to the shared edge and say 'the two shapes have to hold hands along an edge, not sit in their own corner.'

DIFFERENTIATION

EMERGING

- Give these pupils only squares and equilateral triangles in the copybook draw — leave the hexagons as a watch-and-agree task at the IWB.
- Draw the first two squares for them on squared paper so they add the matching pair rather than starting from a blank page.

DEVELOPING

- After the copy work, ask them to draw a regular pentagon and mark exactly where the gap opens when three corners meet.
- Challenge them to find a second way to combine triangles and hexagons — a different repeating arrangement that still leaves no gaps.

PROFICIENT

- At the board during Class Challenge, hand them a non-regular shape from pattern blocks (a rhombus or trapezoid) and ask them to predict, then test, whether it tiles — and explain why using the 'corners round a point' rule.
- Ask them to pull ahead and design a two-shape tiling of their own on squared paper, then justify to you why it has no gaps.

✂ **Cross-curricular:** Link to Visual Arts — pupils spot tessellations in Islamic tile patterns or a local church floor, then design a repeating tile of their own.

ANSWER KEY

c) Both (triangles and hexagons); dots show angles fit round a point with no gaps

Q1: Yes

a) Always : Squares always tessellate because 4 corners fill a full turn.

- b) **Never** : Round shapes always leave little empty spaces at every join.
- c) **Always** : Regular hexagons always tessellate, like a honeycomb.

- d) **Sometimes** : It only tessellates if it has no gaps or overlaps, like squares but not circles.

EXTENSION SHEET · STRETCH ANSWERS

S1: **rotation**

S2: **rotation**

S3: **reflection**

S4: **rotation**

S5: **translation**

Investigation: Which shapes tile the page? — open-ended; scan pupils' working for valid solution paths rather than a single answer.