Grade 7 Math, Explained

Unit 18 · Symmetry and Tessellation

HARDER PRACTICE QUESTIONS

Full marks 35

Write your answers on separate paper. Give a reason for each answer. Use squared or dotted paper where a question asks you to draw, and mark every line of symmetry with a dashed line and every center of symmetry with a dot. Letters are plain block capitals.

1 Spot the errors [4]

Saugat wrote these four. Each one is wrong. Correct it, and say what went wrong.

i. A rectangle has 4 lines of symmetry: two through the middles of its sides and its two diagonals.

ii. The letter N has a line of symmetry down its middle.

iii. A figure with point symmetry always has at least one line of symmetry.

iv. An equilateral triangle has point symmetry, because it fits on itself after a turn.

2 Words in a mirror and upside down [4]

i. Which of the letters A, B, C, D, E, H, K, M, T, X have a line of symmetry **down** the middle, and which **across** the middle? Which have both?

ii. The word MOM looks the same in a mirror stood beside it. Explain why, using its letters.

iii. Which of these words look the same after half a turn: NOON, MOM, SIS, SWIMS? What does MOM become?

iv. Which of these words look the same in a mirror laid flat **below** them: BOX, MOM, CHOICE, TOOT? Give a reason.

3 Regular shapes [4]

A shape is **regular** when all its sides are equal and all its angles are equal.

i. Draw an equilateral triangle, a square and a regular hexagon, and draw all their lines of symmetry. How many has each?

ii. A regular pentagon has 5 sides. How many lines of symmetry do you expect it to have? Where do they run?

iii. Which of the triangle, the square, the pentagon and the hexagon have point symmetry?

iv. Find a rule: which regular shapes have point symmetry?

4 Complete the figure [4]

On squared paper, draw an X-axis and a Y-axis. Join (0, 4), (1, 3), (2, 1) and (2, 0) in that order: this is a quarter of a figure.

i. Complete it so that the Y-axis is a line of symmetry. Write the new corners.

ii. Then complete it so that the X-axis is a line of symmetry too. Write all the corners of the finished figure.

iii. How many corners does the finished figure have? Why is (2, 0) not one of them?

iv. Does the finished figure have point symmetry? Where is its center?

5 Line, point, both or neither? [4]

For each four-sided shape, say how many lines of symmetry it has and whether it has point symmetry. Give a reason.

a. A parallelogram that is not a rectangle or a rhombus

b. A rhombus that is not a square

c. A kite (two pairs of equal sides next to each other) that is not a rhombus

d. A trapezium whose two slanting sides are equal

6 Triangles in a triangle [4]

Construct an equilateral triangle with sides of 4 cm. Mark every centimeter along each side, and join the marks with lines parallel to the sides. The big triangle is now tiled with small equilateral triangles with sides of 1 cm.

i. How many small triangles are in the top row, and in each row below it? How many point up, and how many point down?

ii. Copy and complete the table for big triangles with sides of 1, 2, 3 and 4 cm.

Side of the big triangle	1 cm	2 cm	3 cm	4 cm
Small triangles pointing up	.....	.....	.....	.....
Small triangles pointing down	.....	.....	.....	.....
Small triangles in all	.....	.....	.....	.....

iii. What kind of numbers are the totals? How many small triangles would a big triangle with sides of 10 cm hold?

iv. A big triangle holds 64 small triangles. How long are its sides, and how many of the small triangles point down?

7 Tiling a veranda [4]

Ishwor tiles a rectangular veranda 4 m long and 3.2 m broad with square tiles 40 cm on a side.

i. How many tiles fit along the length, and how many across the breadth?

ii. How many tiles does he need?

iii. With tiles 20 cm on a side, how many would he need? Why is it 4 times as many, not twice?

iv. He cuts each 40 cm tile along a diagonal into two triangles and tiles the floor with the triangles. How many triangles does he need, and does the floor need any more tiles than in ii?

8 Think: two lines make a point [4]

i. On squared paper, draw a shape with exactly one line of symmetry and no point symmetry, and a shape with point symmetry and no line of symmetry.

ii. Draw a shape with exactly two lines of symmetry. Does it have point symmetry?

iii. Try to draw a shape with exactly two lines of symmetry, at right angles, and **no** point symmetry. What happens?

iv. Explain why: think of folding along one line and then along the other. Where does each point of the shape end up?

9 Make your own [3]

i. Write a word of three or more letters that looks the same in a mirror stood beside it.

ii. On squared paper, design a tile pattern with exactly 4 lines of symmetry, and mark them.

iii. Name a shape, other than a triangle or a square, that tiles a floor, and give a reason.