Grade 6 Math, Explained

Unit 19 · Symmetry and Tessellation

HARDER PRACTICE QUESTIONS

Full marks 28

Write your answers on separate paper. Give a reason for each answer. Use squared paper, a ruler, a protractor and paper to fold or cut where they help. The angles round a point add up to 360°, and the three angles of a triangle add up to 180°.

1 Fold the triangle [3]

Cut out an isosceles triangle ABC from paper, with AB = AC and $\angle A = 40°$. Fold it along its line of symmetry.

i. Which angle lands exactly on $\angle B$? What does that tell you about $\angle B$ and $\angle C$?

ii. Find $\angle B$ and $\angle C$.

iii. An equilateral triangle can be folded this way along 3 lines. What does that tell you about its three angles, and how big is each?

2 Words with a line of symmetry [3]

Write each word in plain capital letters. Which words have a line of symmetry? Say whether the line goes up and down or across.

MOM, BOX, NEPAL, TOOT, CHOICE, HIDE

3 Complete the cross [4]

On squared paper, draw two dotted lines that cross at a right angle at O: one across and one up and down. Mark the point 4 squares up from O. From there, draw a line 2 squares right, then 2 down, then 2 right, then 2 down, which brings you to the dotted line across.

i. Taking both dotted lines as lines of symmetry, complete the figure.

ii. How many sides does the whole figure have?

iii. How many lines of symmetry does it have? Draw them all.

iv. Find its area by counting squares.

4 Quadrilaterals folded [3]

Cut out each of these from paper, and find by folding how many lines of symmetry it has. Copy and complete the table.

Shape	Square	Rectangle	Rhombus (not a square)	Parallelogram (not a rectangle or rhombus)	Trapezium with equal slanting sides	Trapezium with two right angles
Lines of symmetry	.....	.....	.....	.....	.....	.....

5 Spot the error [3]

On squared paper, Pratiksha draws a dotted line up and down. To its left she draws a letter L: its upright is 4 squares tall and 3 squares to the left of the dotted line, and its foot runs 2 squares along the bottom, towards the dotted line. To draw its mirror image, she draws the same L again, 3 squares to the right of the dotted line, with its foot pointing right.

i. What is wrong with her image?

ii. Describe the correct mirror image: where is its upright, and which way does its foot point?

iii. Together, are the L and its correct mirror image a symmetric figure?

6 Which tiles fit? [4]

A room's floor is 3 m long and 2.4 m broad. It is to be covered with square tiles of one size, with no tile cut.

i. Square tiles come with sides of 20 cm, 25 cm, 30 cm, 40 cm, 50 cm and 60 cm. Which sizes cover the floor exactly?
ii. Which of these needs the fewest tiles? How many?
iii. How many 20 cm tiles are needed?

7 Think: shapes that close up [4]

Tiles close up with no gap only where their corners at a point add up to 360°.

i. A regular octagon has 8 equal sides, and each of its corners is 135°. Can octagons alone cover a floor? Why?
ii. Two octagons meet at a point. What angle is left there, and which tile fits it?
iii. A parallelogram has angles of 60°, 120°, 60° and 120°. Put one of each of its four corners together at a point. Do they close up?
iv. Can tiles of this parallelogram cover a floor?

8 Think: coloring a brick wall [4]

Bricks that share a side must have different colors.

i. In a wall where the bricks are in straight rows and columns, like squares on a chessboard, how many colors are enough?
ii. In a real wall, each row is moved along by half a brick. Each brick sits on two bricks below it, which are side by side. Why are two colors not enough?
iii. Show how to color such a wall with three colors.