Finding Every Line of Symmetry

Teacher		**Class**	Grade 4
Subject	Math	**Topic**	Line symmetry
Date		**Room**	
Lesson length	60 minutes	**Country**	United States

Students learn that a fold makes symmetry only when both sides match exactly. They test shapes by folding and draw every line of symmetry.

Curriculum links

- Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts.
- understand that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry [2]

Learning objectives

- Students will recognize a line of symmetry as a fold into matching parts.
- Students will identify line-symmetric and not symmetric figures using fold test.
- Students will draw all lines of symmetry for squares, rectangles and triangles.

Success criteria

- I can explain the fold test for matching parts.
- I can sort figures into symmetric and not symmetric.
- I can draw all symmetry lines for a shape with a ruler.

What students already know

Hold up a paper heart. Ask: If I fold it down the middle, will both sides land exactly on each other? Have students show thumbs up or down and say why.

Key words

line of symmetry	straight fold where both sides match exactly [3]
two-dimensional figure	flat shape with length and width
line-symmetric	having at least one fold with two parts that match [4]
mirror image	exact flipped copy that lines up when folded [6]

Materials

- slides 1-11
- video clip 1 Grade 4 Lines of Symmetry
- shape sheets with squares, rectangles, triangles
- rulers
- stickers
- thin pre-cut paper shapes for folding
- crayons or colored pencils

Before the lesson

- Print shape sheets with squares, rectangles, isosceles and equilateral triangles, plus Worksheet Task B for each pair
- Pre-cut thin paper copies of the same shapes for fold-first support
- Test Video clip 1 (0:00–1:34) on slide 6 and set up ruler and stickers at tables

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- Worksheet Task B copies
- mini whiteboards or thumbs for checking

Lesson outline

0–8 min **Starter** 8 min · Whole class

Hook interest and surface ideas about folding to find matching halves.

YOU DO

1. Show Slide 1 title and Slide 2 objectives and read them in student words.
2. Show Slide 5 vote: Which would you fold first to look for symmetry? Paper heart, butterfly photo, block letter H, wall clock face.
3. Use the hook: Who can find every single hiding line? Some shapes have more than one — let's see who finds them all.
4. Take a quick vote and ask students to justify which object looks easiest to fold into matching parts.

STUDENTS DO

1. Vote for one of the four pictures and raise hands.
2. Turn and talk to a partner about why that shape might fold into matching parts.

Say: Who can find every single hiding line? Some shapes have more than one — let's see who finds them all. Today we will test folds and draw every fold that makes both sides match exactly. Vote for what you would test first and tell your neighbor why.

Ask: Which of these would be easy to fold so both sides match? (Paper heart, butterfly photo, and block letter H look like both sides would match.) · What would you look for after you fold? (Both halves match exactly with no overlap or extra sticking out.)

Check understanding: Count votes and listen for match exactly language; if vague, model match means edges and corners land on each other.

Support: Offer sentence frame: I would fold ___ first because both sides look ___ . **Stretch:** Ask which choice might have more than one matching fold and why.

Use: Slides 1-2, 5

8–20 min **Teaching** 12 min · Whole class

Teach the fold test definition and how to mark a true line of symmetry.

YOU DO

1. Show Slide 3 big idea and Slide 4 key words, emphasizing a line of symmetry is a fold that makes both sides match exactly.
2. Play Video clip 1 on Slide 6 and tell students to listen for fold into matching parts and spot the dashed line of symmetry.
3. Model with a large paper heart using Slide 7 steps: imagine folding along one straight line, check both halves match with no overlap, draw a dashed line if sides mirror [3].
4. Show a near-miss fold that cuts in half but does not make mirror halves [3].

STUDENTS DO

1. Watch the video and point to the dashed line when they see it.
2. Copy the fold-test steps with hand motions and echo the big idea.

Say: A line of symmetry is a fold that makes both sides match exactly. Imagine folding along one straight line. If both halves land right on top with no overlap, draw that fold as a dashed line with a ruler.

Worked example: Paper heart test: 1) Hold heart upright. 2) Fold along the vertical middle. 3) Check top, sides, and point all land on each other. 4) It matches, so the crease is a line of symmetry — draw it dashed with a ruler. 5) Fold side-to-side across the middle — the point does not match the top curves, so that is not a line of symmetry [3].

Ask: What makes a fold a line of symmetry? (The figure can be folded along the line into matching parts [4].) · Why is a line that just cuts a shape in half not always enough? (It must divide the object into two mirror-image halves, not just two pieces [3].) · How do we show a line of symmetry on paper? (Draw a straight dashed line with a ruler where the fold matched.)

Check understanding: Students show thumbs up if heart vertical fold matches and thumbs down for horizontal; reteach with slow fold if split.

Support: Start with vertical lines only and use thin paper with a light pre-crease, checking that both halves overlap exactly when folded. **Stretch:** Have students predict yes or no before folding, then fold to check and explain what matched or did not match.

Use: Slides 3-4, 6-7, Video clip 1 (0:00–1:34)

20–30 min **Guided practice** 10 min · Whole class

Prove why equal halves are not always symmetric halves using rectangle and square.

YOU DO

1. Hold up a large paper rectangle marked with vertical, horizontal, and diagonal lines.
2. Fold and test each line with the class, narrating whether corners and edges line up exactly [6].
3. Compare with a square diagonal fold that does match to show shapes behave differently.
4. Record results on the board as yes or no lines of symmetry.

STUDENTS DO

1. Give thumbs up or down for each rectangle line and say: It is symmetry because ___ matches when folded.
2. Fold small paper rectangles at desks to feel where edges line up.

Say: This line cuts it right down the middle, so it must be a line of symmetry — right? Talk to your partner. We will fold and see if the corners land exactly together. Matching size is not enough; the halves must be mirror copies.

Worked example: Rectangle test: 1) Fold vertical middle — left edge lands on right edge, so yes [11]. 2) Fold horizontal middle — top lands on bottom, so yes. 3) Fold corner to corner — corners meet but long edge does not land on short edge, sides stick out, so no. The rectangle has 2 lines of symmetry, one vertical and one horizontal [6].

Ask: Does the rectangle diagonal make mirror halves? (No, it cuts in half but does not create mirror-image halves [3].) · How many lines does the square have and where are they? (The square has 4 lines of symmetry that run vertically, horizontally, and diagonally from corner to corner [6].)

Check understanding: Mini whiteboards: draw rectangle with 2 correct lines; pull a small group to refold if diagonals are drawn.

Support: Let students fold a paper rectangle along each line to feel that corners and edges line up only on true lines [6]. **Stretch:** Ask students to compare with a square and discuss with a partner why diagonal folds behave differently there.

Use: Slide 10

30–50 min **Main activity** 20 min · Pairs

Draw all lines of symmetry for familiar shapes and prove each by folding.

YOU DO

1. Show Slide 9 task: fold each shape to test for matching halves, sort into symmetric and not symmetric piles, draw dashed lines with ruler, write the number of lines.
2. Distribute shape sheets with squares, rectangles, triangles, plus rulers and stickers, and model drawing one straight dashed line with a ruler.
3. Circulate as pairs fold, sort, draw, and place a sticker on each line they drew and count aloud, then fold to prove each line makes matching parts.
4. Direct pairs to complete Worksheet Task B to record lines counted.

STUDENTS DO

1. Fold each paper shape, sort as symmetric or not symmetric, then draw each true line dashed with a ruler.
2. Place a sticker on each line, count aloud, fold to prove, and complete Worksheet Task B.

Say: Work in pairs to find every hiding line. Fold first, then draw the matching fold as a dashed line with your ruler. Put a sticker on each line you prove and write how many you found. The square has 4, the rectangle has 2, and triangles depend on equal sides.

Worked example: Square in a pair: 1) Fold vertical middle — matches, draw dashed line 1. 2) Fold horizontal middle — matches, draw line 2. 3) Fold corner to corner both ways — both match, draw lines 3 and 4 [6]. 4) Place 4 stickers, count aloud 1-2-3-4, write 4 lines. Isosceles triangle with two sides equal has 1 line, equilateral with all sides equal has 3 lines [11].

Ask: How do you know you found all the lines? (Tried vertical, horizontal, and corner folds and only kept folds where both sides match exactly.) · How many lines do your square, rectangle, and triangles have? (Square 4, rectangle 2 [6], isosceles triangle 1, equilateral triangle 3 [11].)

Check understanding: Teacher checks dashed lines and sticker counts per pair and asks one pair to fold-prove a line; if lines are missing, prompt to try the next direction.

Support: Give shapes already cut from thin paper so students can fold first, mark the crease, then draw over it with a ruler. **Stretch:** Have students try new quadrilaterals and describe where they looked for the next line after finding the first one.

Use: Slides 9-10, Worksheet Task B

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50–60 min **Plenary** 10 min · Whole class

Confirm the definition and that students can identify and count lines of symmetry.

YOU DO

1. Return to objectives on Slide 2 and restate success in student words.
2. Use Slide 11 quick quiz: define line of symmetry and decide if an irregular blob is line-symmetric.
3. Collect exit answers on whiteboards and correct the diagonal-rectangle error once more.

STUDENTS DO

1. Answer the quiz aloud and show whiteboards for the blob question.
2. Complete the three exit questions on paper.

Say: Tell me in your own words what a line of symmetry is. Show me how you test it. We will quiz quickly and then you will write your final answers to prove you can explain, sort, and draw.

Ask: What is a line of symmetry? (A line to fold on so both parts match exactly.) · Is an irregular blob line-symmetric? (No, no straight fold makes matching parts.)

Check understanding: Read all exit tickets; if many miss rectangle diagonals, plan a warm-up refold tomorrow.

Support: Provide the sentence starter: A line of symmetry is ___ because when I fold ___ . **Stretch:** Ask early finishers to name a shape with exactly one line and sketch where it goes.

Use: Slide 11

Common mistakes

Mistake	How to spot it	How to fix it
Thinking any line that makes two equal-size pieces is a line of symmetry, like the rectangle diagonal.	Student draws diagonal on rectangle or says half means symmetric.	Refold and check edges land exactly; stress it must divide into two mirror-image halves, not just two pieces the same size [3] [11].
Drawing only one line on a square or rectangle that has more than one.	Stops after vertical line and writes 1 for square or rectangle.	Prompt to test across, down, and both corners; recall square has 4 lines and rectangle has 2 lines [6].
Drawing a wobbly or off-center line and calling it symmetry.	Line is not straight or halves do not line up when folded.	Use a ruler for a straight dashed line and fold to prove both halves overlap exactly with no gaps [11].

Support

- Use thin paper with a light pre-crease and start with vertical lines only, checking overlap exactly when folded.
- Give pre-cut shapes to fold first, mark the crease, then draw over it with a ruler.
- Provide sentence frames and a picture checklist with the line started as a dot to finish.

Stretch

- Have students predict yes or no before folding, then fold to check and explain what matched.
- Have students hunt for a second line on the same shape and try new quadrilaterals, describing where they looked next.
- Have students design a new block letter with exactly one line and prove it by folding.

For the LSE or teaching assistant

Stay with the main-activity pairs that need folding help; hold the paper steady, guide slow folds, and prompt counting stickers aloud 1-2-3-4.

Check for understanding

Question	Answer
What is a line of symmetry and how do you test it?	A fold line where both sides match exactly; fold and check no overlap.
Is a rectangle diagonal a line of symmetry? Why?	No, it cuts in half but halves are not mirror images.
How many lines of symmetry do a square and an isosceles triangle have?	Square 4, isosceles triangle 1.

Homework

Complete Worksheet Task D: decide about mirror lines for shapes and capital letters.

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