

Shapes and Perimeter

Unit 13 Overview: 11 lessons

Students find perimeter as the distance around: they count units around shapes on grid paper, add side lengths and find a missing side. They compare rectangles with the same perimeter and different areas, and decide whether a story asks for area or perimeter. Then they describe quadrilaterals by their right angles and parallel sides, sort rhombuses, rectangles and squares, and draw quadrilaterals in none of those groups. Some states add polygons, lines and angles, symmetry and solids.

THE UNIT, DAY BY DAY

Day 1	Pre-Check	What students already know, before the first lesson.
Day 2	13.1 Perimeter: the distance around	I can find a perimeter by adding the sides.
Day 3	13.2 Find a missing side	I can find a missing side from the perimeter.
Day 4	13.3 Same perimeter, different area	I can compare rectangles with the same perimeter.
Day 5	13.4 Area or perimeter?	I can tell if a problem asks for area or perimeter.
Day 6	13.5 Quadrilaterals: angles and parallel sides	I can describe quadrilaterals by their angles and sides.
Day 7	13.6 Rhombuses, rectangles and squares	I can sort rhombuses, rectangles and squares.
Day 8	13.7 Draw quadrilaterals	I can draw quadrilaterals, even ones that fit no group.
Day 9	13.8 Polygons from triangles to octagons ★	I can name polygons and put shapes together.
Day 10	13.9 Points, lines, rays and angles ★	I can name lines, rays, segments and angles.
Day 11	13.10 Lines of symmetry ★	I can find and draw lines of symmetry.
Day 12	13.11 Solid figures and unit cubes ★	I can count unit cubes and sort solid shapes.
Day 13	Unit Review	The review, to go over together.
Day 14	Unit Test	Form A; Form B (other numbers) is for a retest.

★ Taught in 3rd grade in some states. Skip these lessons if yours teaches them in another grade; animalmath.com/standards shows your state's list.

GET READY FOR THE UNIT

- Centimeter grid paper, square dot paper and rulers for every student
- Square tiles (about 20 for each pair) and unit cubes (about 30 for each pair)
- Paper quadrilaterals and an index card for each student, to check right angles
- Pattern blocks and paper shapes to fold for the state lessons

HOW EACH LESSON GOES

- 1. Warm up** (5 min)
- 2. Teach** (10 min)
- 3. Try it together** (10 min)
- 4. Practice** (15 min)
- 5. Exit ticket** (5 min): a quick check on the lesson.

Each lesson page ends with the Animal Math sheets, makers, tools and quizzes for it. "Sheet 3" is the third worksheet of a pack; a color pack prints each sheet again in black and white.

CHECKING AS YOU GO

PRINTABLE	Pre-Check: Day 1, with a key	EXIT TICKET	Exit Tickets: one a lesson, four to a page
PRINTABLE	Unit Review: the day before the test	PRINTABLE	Unit Test: Forms A and B, with keys



Shapes and Perimeter

Lesson 13.1: Perimeter: the distance around

GOAL Students find the perimeter, the distance around a shape, by counting units around it on grid paper and by adding its side lengths, and write the unit.

About 45 minutes

I can find a perimeter by adding the sides.

THE LESSON

- 1 Warm up** (5 min) Walk the edge of a taped rectangle on the floor, counting steps all the way back to the start. Ask what the steps measured: the distance around.
- 2 Teach** (10 min) Draw a rectangle 5 squares long and 4 squares tall on grid paper. Trace the edge with a finger and count each unit side: 5, 4, 5, 4, so 18 units. Put a tick on each side as you count it. Then draw a pentagon with sides of 7 cm, 4 cm, 6 cm, 4 cm and 5 cm and add them: 26 cm.
Say: "Perimeter is the distance around. I add the length of every side, and I mark each side so I count it once."
- 3 Try it together** (10 min) Pairs build a shape with 6 square tiles, trace it on grid paper and count the units around it. Compare shapes: a 2 by 3 rectangle is 10 units around, a row of 6 tiles is 14. The same tiles can make different perimeters.
- 4 Practice** (15 min) Students count the units around shapes on sheet 1 of Perimeter, add the sides on sheet 2 and find rectangle perimeters from two sides on sheet 3. Early finishers draw two shapes on grid paper that are each 14 units around.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 13.1** and circle a face beside the "I can" line. On question 1, look for 16 units; 12 means the sides inside the notch were missed, and 7 means they counted the squares. On question 2, look for 24 cm; 14 means only two sides were added.

Need help? Run a finger around the shape and put a dot on each unit side, or lay a string around it and measure the string.

Ready for more? Find two shapes made of 8 tiles with different perimeters.

GET READY

- Centimeter grid paper and a ruler for each student
- Square tiles for each pair
- Painter's tape for a rectangle on the floor

WORDS TO USE

perimeter: the distance all the way around a shape

side: one of the straight edges of a shape

unit: what we measure in, like centimeters

ASK

- How do you know you counted every side once?
- Why do we write a unit after a perimeter?
- Can two shapes made of the same tiles have different perimeters?

WATCH FOR

Counts the squares instead of the sides around. Trace the edge with a finger and count each unit side, not each square.

Counts a corner square once. A corner square has two sides on the outside. Tick each side as you count it.

Adds only the two labeled sides of a rectangle. Opposite sides of a rectangle are equal: write the other two lengths first.

ON ANIMAL MATH

PRINTABLE

Perimeter: sheets 1-3

MAKER

Graph Paper: Paper Type Square Grid, Square Size 1 Centimeter

QUIZ

Area and Perimeter Quiz: the Perimeter level

EXIT TICKET

3rd Grade Shapes and Perimeter Exit Tickets: Exit Ticket 13.1

Shapes and Perimeter

Lesson 13.2: Find a missing side

GOAL Students find a missing side when they know the perimeter: they add the sides they know and subtract from the perimeter. In a square or a rectangle they use the sides that are equal.

About 45 minutes

I can find a missing side from the perimeter.

THE LESSON

- 1 Warm up** (5 min) A triangle has sides of 8 cm, 6 cm and 7 cm. Students find its perimeter (21 cm). Ask: if one side were hidden and we knew the perimeter, could we find it?
- 2 Teach** (10 min) Draw a pentagon with sides of 6 m, 6 m, 4 m, 4 m and ?, and write Perimeter = 25 m. Add the known sides: $6 + 6 + 4 + 4 = 20$. Subtract from the perimeter: $25 - 20 = 5$, so the missing side is 5 m. Check: $20 + 5 = 25$. Then a square with a perimeter of 36 cm: 4 equal sides, so $36 \div 4 = 9$ cm. Last, a rectangle 18 ft around with a 5 ft side: the two 5 ft sides make 10, the other two make 8, so each is 4 ft.
Say: "The perimeter is all the sides added. If I take away the sides I know, what is left is the missing side."
- 3 Try it together** (10 min) Partners solve on whiteboards: a quadrilateral with sides of 7, 3 and 8 cm that is 24 cm around (6 cm); a square 20 in around (5 in); a rectangle 22 m around with an 8 m side (3 m). They check each by adding all the sides.
- 4 Practice** (15 min) Students find missing sides on sheet 4 of Perimeter and solve the perimeter stories on sheet 5. Early finishers make a missing side puzzle for a partner.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 13.2** and circle a face beside the "I can" line. On question 1, look for 5 yd; 25 means they added the three sides and stopped. On question 2, look for 7 in; 14 means they cut the perimeter in half, and 24 means they took away 4.

Need help? Label every side on a drawing, cross out each known side as you add it, then subtract.

Ready for more? A rectangle is 30 cm around and one side is twice the other. How long is each side?

GET READY

- Shapes on chart paper, each with one side marked ?
- Whiteboards and markers
- Grid paper

WORDS TO USE

missing side: the side whose length we do not know yet

known sides: the sides with their lengths written

equal sides: sides with the same length, like the 4 sides of a square

ASK

- What do the known sides add up to?
- How can you check your missing side?
- Why can you divide by 4 for a square?

WATCH FOR

Writes the sum of the known sides as the answer. That is part of the perimeter. Subtract it from the whole perimeter.

Halves the perimeter of a square. A square has 4 equal sides: share the perimeter into 4.

Uses one side of a rectangle only once. Draw the rectangle and label all 4 sides before you subtract.

ON ANIMAL MATH

PRINTABLE

Perimeter: sheets 4-5

QUIZ

Area and Perimeter Quiz: the Missing Side level

EXIT TICKET

3rd Grade Shapes and Perimeter Exit Tickets: Exit Ticket 13.2

Shapes and Perimeter

Lesson 13.3: Same perimeter, different area

GOAL Students find the perimeter and the area of rectangles on grid paper and see that rectangles with the same perimeter can have different areas, and rectangles with the same area can have different perimeters.

About 45 minutes

I can compare rectangles with the same perimeter.

THE LESSON

- 1 Warm up** (5 min) Show a rectangle 4 squares long and 2 squares tall. Students find its area (8 square units) and its perimeter (12 units). Ask which number counts squares and which counts units around.
- 2 Teach** (10 min) Draw a 12 by 1 rectangle and a 7 by 6 one. Both are 26 units around, but the first covers 12 squares and the second covers 42. Write both in the chart. Then draw 10 by 2 and 5 by 4: both cover 20 squares, but they are 24 and 18 units around.
Say: “The same distance around can hold a different number of squares. The long, thin rectangle holds the fewest.”
- 3 Try it together** (10 min) Each pair builds every rectangle with 20 tiles (1 by 20, 2 by 10, 4 by 5), draws them on grid paper and writes each perimeter (42, 24 and 18 units). Same area, different perimeters: which is the longest way around?
- 4 Practice** (15 min) Students compare rectangles with the same perimeter on sheet 3 of Area and Perimeter and draw rectangles for a given perimeter or area on sheet 4. Early finishers find the rectangle with the greatest area that is 28 units around.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 13.3** and circle a face beside the “I can” line. On question 1, look for perimeters of 22 and 22 and areas of 10 and 30; the areas written as the perimeters mean the two were mixed up. On question 2, look for perimeter circled.

Need help? Build each rectangle with tiles first, count the tiles for the area, then count the edges around.

Ready for more? Find every rectangle with a perimeter of 32 units and the area of each.

GET READY

- Centimeter grid paper and colored pencils
- 20 square tiles for each pair
- A chart with two columns: perimeter and area

WORDS TO USE

area: the number of squares that cover a shape

perimeter: the distance around a shape

square units: what area is measured in

ASK

- Which number tells the squares inside? Which tells the distance around?
- Two rectangles are both 14 units around. Do they cover the same space?
- Which rectangle with 20 tiles has the shortest perimeter?

WATCH FOR

Writes the same number for the area and the perimeter. Count squares for the area, then trace and count units around for the perimeter.

Thinks the same perimeter means the same area. Shade both rectangles and count the squares: they are different.

Forgets the unit or writes units for an area. Area is in square units, perimeter in units.

ON ANIMAL MATH

PRINTABLE

Area and Perimeter: sheets 3–4

MAKER

Graph Paper: Paper Type Square Grid, Square Size 1 Centimeter

QUIZ

Area and Perimeter Quiz: the Perimeter level

EXIT TICKET

3rd Grade Shapes and Perimeter Exit Tickets: Exit Ticket 13.3

Shapes and Perimeter

Lesson 13.4: Area or perimeter?

GOAL Students decide whether a problem asks for the distance around (perimeter) or the space covered (area), solve it, and write the right unit: feet for a perimeter, square feet for an area.

About 45 minutes

I can tell if a problem asks for area or perimeter.

THE LESSON

- 1 Warm up** (5 min) Hold up a picture frame and a placemat. Ask: does the frame go around the picture or cover it? Does the placemat go around the table or cover part of it?
- 2 Teach** (10 min) Write two stories about a garden 10 meters long and 3 meters wide. A fence goes around it: perimeter, $10 + 3 + 10 + 3 = 26$ meters. Soil covers it: area, $10 \times 3 = 30$ square meters. Underline the clue words, around and covers. The numbers are the same; the question decides.
Say: "Is it going around, or is it covering? Around is perimeter. Covering is area."
- 3 Try it together** (10 min) Read the job cards aloud. Students show an open hand for perimeter or a fist for area and say the clue word. Then solve one together: a border goes around a bulletin board 5 feet long and 4 feet wide (18 feet).
- 4 Practice** (15 min) Students find both for the rectangles on sheet 2 of Area and Perimeter and sort the jobs on sheet 5. Early finishers write an area story and a perimeter story about the same rectangle.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 13.4** and circle a face beside the "I can" line. On question 1, look for area, perimeter, area. On question 2, look for 48 square feet; 28 feet means they found the perimeter, and 48 feet means the unit was not square feet.

Need help? Draw the rectangle and trace the edge for perimeter, or shade it for area, before solving.

Ready for more? A yard is 9 meters by 7 meters. Find how much fence goes around it and how much grass covers it.

GET READY

- A picture frame and a placemat
- Job cards: ribbon, tiles, a border, grass seed, a fence
- Whiteboards and markers

WORDS TO USE

around: a perimeter word: fence, border, frame, trim

cover: an area word: carpet, tiles, paint, grass

square feet: the unit for an area measured in feet

ASK

- What word in the story tells you it is around?
- Why is the answer in square feet?
- Would you buy carpet by the perimeter? Why not?

WATCH FOR

Adds the sides for every story. Ask whether the story goes around or covers before choosing what to do.

Writes feet for an area. Area counts squares: square feet.

Uses only the two numbers for a perimeter. A rectangle has 4 sides: add both lengths and both widths.

ON ANIMAL MATH

PRINTABLE

Area and Perimeter: sheets 2 and 5

QUIZ

Area and Perimeter Quiz: the Perimeter level

EXIT TICKET

3rd Grade Shapes and Perimeter Exit Tickets: Exit Ticket 13.4

Shapes and Perimeter

Lesson 13.5: Quadrilaterals: angles and parallel sides

GOAL Students describe a quadrilateral by its attributes: 4 straight sides, how many right angles it has, how many pairs of parallel sides, and whether its sides are equal.

About 45 minutes

I can describe quadrilaterals by their angles and sides.

THE LESSON

- 1 Warm up** (5 min) Show a triangle, a pentagon, a shape with a curved side and a dart with a corner that points in. Ask which are quadrilaterals: only the dart, with 4 straight sides.
- 2 Teach** (10 min) Hold up the paper rectangle. Count its 4 sides and check each corner with the card: 4 right angles. Top and bottom are parallel, and so are left and right: 2 pairs of parallel sides. Then hold up the kite: no right angles, no parallel sides. Fill a chart for both: right angles, pairs of parallel sides, equal sides.
Say: "A quadrilateral has 4 sides. I check each corner for a right angle, and each pair of sides across from each other for parallel."
- 3 Try it together** (10 min) Pairs fill the chart for the paper parallelogram and rhombus, checking corners with the card and laying a ruler along the sides across from each other.
- 4 Practice** (15 min) Students circle the quadrilaterals and fill the table on sheet 1 of Quadrilaterals, then count right angles and parallel sides in shapes on sheet 4 of Lines, Rays, and Angles. Early finishers draw one with 2 pairs of parallel sides and no right angles.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 13.5** and circle a face beside the "I can" line. On question 1, look for 0 right angles and 1 pair of parallel sides; 2 pairs means the slanted sides were counted as parallel. On question 2, look for the rectangle and the parallelogram circled; circling the right trapezoid means one pair was counted as two.

Need help? Give a chart with pictures: a card corner for right angles and train tracks for parallel, and check one attribute at a time.

Ready for more? Sort the paper shapes by how many pairs of parallel sides they have: 0, 1 or 2.

GET READY

- Paper quadrilaterals: a square, a rectangle, a rhombus, a parallelogram, a kite
- An index card for each student, to check right angles
- Square dot paper and rulers

WORDS TO USE

quadrilateral: a closed shape with 4 straight sides

right angle: a square corner, like the corner of a card

parallel: side by side and always the same distance apart, like train tracks

ASK

- How do you check if an angle is a right angle?
- Which sides are parallel? How do you know?
- Is a shape with a corner pointing in still a quadrilateral?

WATCH FOR

Calls any two sides parallel. Parallel sides go the same way and never meet. Lay a ruler on one and slide it to the other.

Counts each parallel side as a pair. A pair is two sides. Two parallel sides make one pair.

Judges a right angle by eye. Check every corner with the corner of a card.

ON ANIMAL MATH

PRINTABLE

Quadrilaterals: sheet 1

PRINTABLE

Lines, Rays, and Angles: sheet 4

QUIZ

Shapes Quiz: the Quadrilaterals level

EXIT TICKET

3rd Grade Shapes and Perimeter Exit Tickets: Exit Ticket 13.5

Shapes and Perimeter

Lesson 13.6: Rhombuses, rectangles and squares

GOAL Students sort quadrilaterals into rhombuses (4 equal sides), rectangles (4 right angles) and squares (both), and see that a square is a rectangle and a rhombus too.

About 45 minutes

I can sort rhombuses, rectangles and squares.

THE LESSON

- 1 Warm up** (5 min) Show a rhombus standing on a corner, then turn it to lie flat. Ask if it is the same shape: yes, turning a shape does not change it.
- 2 Teach** (10 min) Lay two overlapping yarn circles on the floor, labeled rectangle and rhombus. Test each paper shape: 4 right angles goes in the rectangle circle, 4 equal sides goes in the rhombus circle. The square has both, so it goes where the circles overlap. A parallelogram and a kite go outside both.
Say: "A square has 4 right angles, so it is a rectangle. It has 4 equal sides, so it is a rhombus too."
- 3 Try it together** (10 min) Students sort a second set of shapes into the circles one at a time, saying why: "It has 4 right angles, so it is a rectangle." Then answer together: Is every square a rectangle? Is every rectangle a square?
- 4 Practice** (15 min) Students write the best name for each shape on sheet 2 of Quadrilaterals and sort shapes in the Venn diagram on sheet 3. Early finishers do the riddles on sheet 5.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 13.6** and circle a face beside the "I can" line. On question 1, look for the tilted square and the rectangle circled; leaving out the square means they think a square is not a rectangle. On question 2, look for quadrilateral and rhombus; circling square means they did not check for right angles.

Need help? Give a checklist for each shape: 4 sides? 4 right angles? 4 equal sides? Then name it from the checks.

Ready for more? Draw a shape for each part of the Venn diagram, including one outside both circles.

GET READY

- The paper quadrilaterals from 13.5
- Two yarn circles for a Venn diagram on the floor, labeled rectangle and rhombus
- Index cards to check right angles

WORDS TO USE

rhombus: a quadrilateral with 4 equal sides

rectangle: a quadrilateral with 4 right angles

square: 4 equal sides and 4 right angles: a rectangle and a rhombus

ASK

- Why does the square go in both circles?
- Is every rectangle a square? Show me one that is not.
- What do a rhombus and a square have in common?

WATCH FOR

Leaves the square out of the rectangles.

Check the rule: 4 right angles. The square has them, so it is a rectangle.

Calls a tilted square a rhombus only. Check the corners with a card: they are right angles, so it is a square.

Calls any slanted shape a rhombus. A rhombus needs 4 equal sides. Measure or count dots to check.

ON ANIMAL MATH

PRINTABLE

Quadrilaterals: sheets 2, 3 and 5

PRINTABLE

Classifying Triangles and Quadrilaterals: sheets 3-4, a stretch

QUIZ

Shapes Quiz: the Quadrilaterals level

EXIT TICKET

3rd Grade Shapes and Perimeter Exit Tickets: Exit Ticket 13.6

Shapes and Perimeter

Lesson 13.7: Draw quadrilaterals

GOAL Students draw quadrilaterals on dot paper to fit attributes, such as a square or a rhombus, and draw quadrilaterals that are not rhombuses, rectangles or squares.

About 45 minutes

I can draw quadrilaterals, even ones that fit no group.

THE LESSON

- 1 Warm up** (5 min) On dot paper, each student draws any shape with 4 sides. Partners compare: are they the same? Many different shapes are quadrilaterals.
- 2 Teach** (10 min) Draw a square with sides 3 dots long. Then draw a rhombus with no right angles: each side goes 2 dots over and 1 dot up or down. Then move two corners of the square so no corner is a right angle and no two sides are equal: it is a quadrilateral in none of the groups. Check each drawing with a card corner and by counting dots.
Say: "I read the clue, I draw, and I check my shape against every part of the clue."
- 3 Try it together** (10 min) Partners draw a shape for each clue card: 2 long sides, 2 short sides and no right angles; 4 sides the same length with no side going straight across; 2 sides parallel and the other 2 the same length. They name each shape that has a name and check each other's drawings.
- 4 Practice** (15 min) Students draw shapes from clues and name them on sheet 4 of Quadrilaterals and answer the yes or no questions on sheet 5. Early finishers write a clue for a partner to draw.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 13.7** and circle a face beside the "I can" line. On question 1, look for 4 sides with one corner pointing in, like an arrowhead; a triangle means a side was left out. On question 2, look for a kite or a slanted parallelogram; a rectangle or a rhombus means part of the clue was missed.

Need help? Give one clue at a time, and start from a square to change.

Ready for more? Draw a trapezoid whose two slanted sides are the same length, and one whose slanted sides are not.

GET READY

- Square dot paper and rulers
- Clue cards with attributes to draw
- Index cards to check right angles

WORDS TO USE

attribute: something a shape has, like 4 right angles

clue: what the shape must have

none of the groups: not a rhombus, not a rectangle, not a square

ASK

- Which part of the clue did you check first?
- How do you know no sides are parallel?
- Is your shape a rectangle? How do you know it is not?

WATCH FOR

Draws a square for "a rectangle that is not a square". Make two sides longer than the other two, and keep the right angles.

Draws a shape with top and bottom flat for "no parallel sides". Tilt one of them: if they could be train tracks, they are parallel.

Draws sides that do not meet at the dots. Start and end every side on a dot, and use a ruler.

ON ANIMAL MATH

PRINTABLE

Quadrilaterals: sheets 4-5

MAKER

Graph Paper: Paper Type Square Dots

QUIZ

Shapes Quiz: the Quadrilaterals level

EXIT TICKET

3rd Grade Shapes and Perimeter Exit Tickets: Exit Ticket 13.7

Shapes and Perimeter

Lesson 13.8: Polygons from triangles to octagons

GOAL Students name polygons to the octagon by counting sides, even when a shape is turned or has a corner that points in, and name the shape two or three shapes make.

I can name polygons and put shapes together.

About 45 minutes

★ Taught in 3rd grade in some states

THE LESSON

- 1 Warm up** (5 min) Show a stop sign. Count its sides together: 8, an octagon. Then show a circle and ask why it is not a polygon (no straight sides).
- 2 Teach** (10 min) Put three green triangles together: the outline is a red trapezoid, 4 sides, a quadrilateral. Put a green triangle on two opposite sides of an orange square: the outline has 6 sides, a hexagon. Count the outline, not the pieces. Then show a T shape: 8 sides, an octagon, even with corners that point in.
Say: "I count the sides around the outside of the whole shape. The number of sides gives the name."
- 3 Try it together** (10 min) Partners build shapes with two or three pattern blocks, trace the outline, count the sides and write the name. They share one shape that surprised them.
- 4 Practice** (15 min) Students count sides and angles and name shapes on sheets 1-2 of 2D Shapes: Sides and Angles (it stops at hexagons; add octagons from the anchor chart). Early finishers fill a Shape to Fill outline with pattern blocks and name it.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 13.8** and circle a face beside the "I can" line. On question 1, look for triangle, hexagon and octagon; pentagon for the arrow shape means a side was missed where the corner points in. On question 2, look for quadrilateral and triangle; naming the pieces means they did not look at the outline.

Need help? Mark each corner with a dot and count the dots before naming.

Ready for more? Make an octagon with pattern blocks, or find the most sides you can make with three blocks.

GET READY

- Pattern blocks for each pair
- Polygon cards in different positions, some with a corner pointing in
- An anchor chart of polygon names, 3 to 8 sides

WORDS TO USE

polygon: a closed flat shape with straight sides

pentagon: a polygon with 5 sides

hexagon: a polygon with 6 sides

octagon: a polygon with 8 sides, like a stop sign

ASK

- How many sides does the outline have?
- Is a shape with a corner pointing in still a polygon?
- What shape do two of your blocks make?

WATCH FOR

Counts the inside line where two pieces meet.

Trace only the outline of the whole shape with a finger.

Names a turned shape wrong. Turning a shape does not change its name. Count the sides.

Misses a side where a corner points in. Put a dot on each corner, then count the dots.

ON ANIMAL MATH

PRINTABLE

2D Shapes: Sides and Angles: sheets 1-2

TOOL

Pattern Blocks: Shape to Fill

QUIZ

Shapes Quiz: the Flat Shapes level

EXIT TICKET

3rd Grade Shapes and Perimeter Exit Tickets: Exit Ticket 13.8

Shapes and Perimeter

Lesson 13.9: Points, lines, rays and angles

GOAL Students name lines, line segments and rays, tell parallel from perpendicular lines, and name angles as right, acute (smaller than a right angle) or obtuse (larger), also in shapes.

About 45 minutes

★ Taught in 3rd grade in some states

I can name lines, rays, segments and angles.

THE LESSON

- 1 Warm up** (5 min) Show a flashlight beam (a ray: it starts at the flashlight and goes on), a pencil (a line segment: two ends) and a road that goes on both ways (a line).
- 2 Teach** (10 min) Draw a line with an arrow at each end, a line segment with a dot at each end, and a ray with one dot and one arrow. Then draw two lines that never meet (parallel) and two that cross in a square corner (perpendicular). Last, make angles with two straws: line one up with the card corner for a right angle, close it for acute, open it for obtuse.
Say: "Arrows mean it goes on and on; dots are endpoints. I check an angle with the corner of a card."
- 3 Try it together** (10 min) Students make angles with their arms: right, acute, obtuse. Then partners draw a shape on dot paper and label each of its angles right, acute or obtuse.
- 4 Practice** (15 min) Students name the figures on sheet 1 of Lines, Rays, and Angles, sort pairs of lines on sheet 2 and name angles on sheet 3. Early finishers mark the right angles in shapes on sheet 3 of Right Angles.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 13.9** and circle a face beside the "I can" line. On question 1, look for ray and perpendicular; line segment for the ray means the arrow was missed. On question 2, look for 2 right, 1 acute and 1 obtuse; acute and obtuse swapped means they mixed up smaller and larger.

Need help? Keep the index card corner on the desk and test every angle with it.

Ready for more? Find perpendicular and parallel lines in the room, and draw a shape with 2 acute and 2 obtuse angles.

GET READY

- An index card for each student
- Straws to make lines and angles
- Rulers and dot paper

WORDS TO USE

ray: part of a line with one endpoint

line segment: part of a line with two endpoints

perpendicular: crossing to make right angles

acute angle: smaller than a right angle

ASK

- How is a ray different from a line segment?
- How do you know these lines are perpendicular?
- Is this angle smaller or larger than a right angle?

WATCH FOR

Calls any crossing lines perpendicular. Check the corner with a card: perpendicular lines make right angles.

Mixes up acute and obtuse. Acute is a cute little angle, smaller than the card corner. Obtuse is wider.

Calls a ray a line. Look at the ends: one dot and one arrow is a ray.

ON ANIMAL MATH

PRINTABLE

Lines, Rays, and Angles: sheets 1-3

PRINTABLE

Right Angles: sheet 3

EXIT TICKET

3rd Grade Shapes and Perimeter Exit Tickets: Exit Ticket 13.9

Shapes and Perimeter

Lesson 13.10: Lines of symmetry

GOAL Students find lines of symmetry, lines that fold a shape into two matching halves, draw every line of symmetry a shape has, and know that some shapes have none.

I can find and draw lines of symmetry.

About 45 minutes
★ Taught in 3rd grade in some states

THE LESSON

- 1 Warm up** (5 min) Fold a paper heart in half down the middle. Ask whether the halves match. Then fold it the other way: they do not.
- 2 Teach** (10 min) Fold the letter H: it matches up and down and side to side, 2 lines of symmetry. Fold the A: 1 line, down the middle. Try the F: no fold makes the halves match, so 0 lines. Then fold a paper star with 5 points: 5 lines, one through each point.
Say: "A line of symmetry folds the shape so the two halves match exactly. I try every fold before I say how many."
- 3 Try it together** (10 min) Pairs fold the letter E (1 line, across the middle) and an L with one long arm and one short arm (0 lines), draw each fold line and say how many. Then they test a fold that cuts a shape into two halves that do not match.
- 4 Practice** (15 min) Students decide whether dashed lines are lines of symmetry on sheet 1 of Lines of Symmetry, draw one line on sheet 2 and draw all of them on sheet 3. Early finishers complete shapes on the grid on sheet 4.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 13.10** and circle a face beside the "I can" line. On question 1, look for 4, 2 and 0; 2 on the plus sign means the corner to corner folds were missed, and a line on the Z means they did not test by folding. On question 2, look for yes for the L and no for the trapezoid; no for the L means they tried only folds straight across or down.

Need help? Give paper copies to fold and check each line before drawing it.

Ready for more? Write your name in capital letters and find the lines of symmetry in each letter.

GET READY

- Paper shapes to fold: a heart, a star, an L shape, the letters A, E, F and H
- Pattern blocks for each pair
- Rulers

WORDS TO USE

line of symmetry: a fold line that makes two halves that match exactly

match: the halves lie right on top of each other

fold: bend the paper along a line

ASK

- If you fold on this line, do the halves match?
- How many lines of symmetry does the star have?
- Can a shape have no lines of symmetry?

WATCH FOR

Draws a diagonal on every four-sided shape.

Fold along the diagonal: the halves must match exactly.

Stops after finding one line. Try every fold: down, across and corner to corner.

Calls two halves of the same size a match.

Matching halves lie right on top of each other when folded.

ON ANIMAL MATH

PRINTABLE

Lines of Symmetry: sheets 1-4

TOOL

Pattern Blocks: build a design that matches on both sides of a line

EXIT TICKET

3rd Grade Shapes and Perimeter Exit Tickets: Exit Ticket 13.10

Shapes and Perimeter

Lesson 13.11: Solid figures and unit cubes

GOAL Students name and sort solid figures (cubes, rectangular prisms, pyramids, cylinders, cones and spheres) by their faces, edges and vertices and by whether they roll, and count the unit cubes in a box shaped solid layer by layer.

I can count unit cubes and sort solid shapes.

About 45 minutes

★ Taught in 3rd grade in some states

THE LESSON

- 1 Warm up** (5 min) Show a cereal box, a can and a ball. Ask which would roll and which would stack, and why.
- 2 Teach** (10 min) Hold up the box: count its 6 faces, 12 edges and 8 vertices. It is a rectangular prism. Then build a box 4 cubes long, 4 cubes wide and 2 cubes tall. Count one layer: $4 \times 4 = 16$ cubes. There are 2 layers: $16 + 16 = 32$ cubes. Some cubes are hidden inside, but every layer is full.
| **Say:** "I count the cubes in one layer, then I count the layers."
- 3 Try it together** (10 min) Partners build a box 5 by 1 by 3 and a box 2 by 2 by 7, count each by layers (15 and 28 cubes) and name each solid. Then they sort the solids into roll and do not roll.
- 4 Practice** (15 min) Students count cubes on sheets 1-2 of Counting Cubes and count faces, edges and vertices on sheet 2 of 3D Shapes: Faces, Edges and Vertices. Early finishers build two different boxes of 30 cubes.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 13.11** and circle a face beside the "I can" line. On question 1, look for 27 unit cubes and cube; 9 means only the top layer was counted, and rectangular prism means they did not check that all the edges are the same length. On question 2, look for the sphere and the cylinder.

Need help? Build the box with real cubes and take it apart layer by layer while counting.

Ready for more? Find two box shapes with the same number of cubes but a different number of layers.

GET READY

- Unit cubes, about 30 for each pair
- Solids or everyday things: a box, a can, a ball, a party hat
- A chart: faces, edges, vertices, rolls?

WORDS TO USE

face: a flat side of a solid

edge: where two faces meet

vertex: a corner where edges meet

layer: one level of cubes in a stack

ASK

- How many cubes are in one layer?
- How do you know there are cubes you cannot see?
- Which solids have a curved surface?

WATCH FOR

Counts only the cubes they can see. Count the cubes in one layer, then count the layers.

Calls every box a cube. A cube has all its edges the same length. Measure the edges.

Thinks a cylinder cannot roll. Lay it on its side and roll it: its curved surface rolls.

ON ANIMAL MATH

PRINTABLE

Counting Cubes: sheets 1-2

PRINTABLE

3D Shapes: Faces, Edges and Vertices: sheet 2

QUIZ

Shapes Quiz: the Solid Shapes level

EXIT TICKET

3rd Grade Shapes and Perimeter Exit Tickets: Exit Ticket 13.11