

Lines, Angles and Shapes

Unit 14 Overview: 12 lessons

Students name points, lines, segments and rays with symbols, find and draw parallel and perpendicular lines, and sort angles as acute, right or obtuse. They learn that an angle is a turn and a degree is 1/360 of a full turn, measure and draw angles with a protractor, and add the parts of an angle to find an unknown part. Then they sort triangles by their angles and shapes by their sides and angles, and find lines of symmetry. Two lessons are taught in 4th grade in some states: the quadrilateral family, and the faces, edges and vertices of solid figures.

THE UNIT, DAY BY DAY

Day 1	Pre-Check	What students already know, before the first lesson.
Day 2	14.1 Points, lines, segments and rays	I can name lines, segments and rays with symbols.
Day 3	14.2 Parallel and perpendicular lines	I can find and draw parallel and perpendicular lines.
Day 4	14.3 Acute, right and obtuse angles	I can sort angles as acute, right or obtuse.
Day 5	14.4 Angles as turns	I can find the degrees in part of a full turn.
Day 6	14.5 Measure angles	I can measure an angle with a protractor.
Day 7	14.6 Draw angles	I can draw an angle of a given size.
Day 8	14.7 Find an unknown angle	I can find an unknown angle with an equation.
Day 9	14.8 Classify triangles	I can sort triangles by their angles.
Day 10	14.9 Classify shapes by sides and angles	I can sort shapes by their angles and parallel sides.
Day 11	14.10 The quadrilateral family ★	I can decide always, sometimes or never for quadrilaterals.
Day 12	14.11 Lines of symmetry	I can find and draw lines of symmetry.
Day 13	14.12 Solid figures ★	I can count the faces, edges and vertices of a solid.
Day 14	Unit Review	The review, to go over together.
Day 15	Unit Test	Form A; Form B (other numbers) is for a retest.

★ Taught in 4th 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

- A protractor and a ruler for each student
- Index cards to check right angles with their corners
- Dot paper and square grid paper (the Graph Paper maker prints both)
- Paper shapes and letters to fold and sort, and shape cards
- Solid figures or boxes, cans and party hats; straws and clay

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



Lines, Angles and Shapes

Lesson 14.1: Points, lines, segments and rays

GOAL Students tell points, lines, line segments and rays apart and name each with letters and a symbol: a line goes on both ways, a segment has two endpoints, and a ray starts at an endpoint and goes on one way.

About 45 minutes

I can name lines, segments and rays with symbols.

THE LESSON

- 1 Warm up** (5 min) Shine a flashlight across the room: where does the light start, and where does it stop? Then trace the edge of a desk: where does it start and stop?
- 2 Teach** (10 min) Draw point A. Draw a line through K and L with arrows at both ends, and write KL with a two-headed arrow over it; LK is right too. Draw a segment from B to D and write BD with a bar over it. Draw a ray from W through X and write WX with a one-headed arrow over it. W comes first, because a ray is named from its endpoint; ray XW points the other way.
Say: "A line goes on both ways, a segment stops at both ends, and a ray starts at a point and goes on forever. I name a ray from where it starts."
- 3 Try it together** (10 min) Partners draw figures on dot paper as you call them out (ray FG, segment NP, line BC) and trade papers to check the arrows, the bars and the order of the letters. Then they find a segment, a ray and a line in the room.
- 4 Practice** (15 min) Students name points, lines, segments and rays on sheet 1 of Lines, Rays and Angles and draw each figure on dot paper on sheet 5.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 14.1** and circle a face beside the "I can" line. On question 1, look for line ST (or TS) with a two-headed arrow and segment UV (or VU) with a bar. On question 2, look for a ray that starts at Q and goes through P, its arrow past P; an arrow at Q means ray PQ was drawn.

Ready for more? Draw a picture made of 2 rays, 2 segments and a line, and name each one.

GET READY

- Rulers and dot paper
- A flashlight
- Cards with a line, a segment and a ray

WORDS TO USE

line: straight, and goes on forever both ways

line segment: part of a line with two endpoints

ray: starts at an endpoint and goes on forever one way

point: an exact place, named with a capital letter

ASK

- Does it stop at both ends, at one end, or at neither?
- Does the order of the letters matter? When?
- Where do you see a ray in this room?

WATCH FOR

Names a ray from the wrong end. Put a finger on the endpoint first: that letter comes first.

Puts a bar over a line. Look at the ends: arrows on both mean a line.

Thinks a long segment is a line. Length does not matter: a line has no endpoints.

Need help? Use the cards: say what each end does before naming the figure.

ON ANIMAL MATH

PRINTABLE

Lines, Rays, and Angles: sheets 1 and 5

MAKER

Graph Paper: Paper Type Square Dots

QUIZ

Angles Quiz: the Lines, Rays and Segments level

EXIT TICKET

4th Grade Lines, Angles and Shapes Exit Tickets: Exit Ticket 14.1

Lines, Angles and Shapes

Lesson 14.2: Parallel and perpendicular lines

GOAL Students tell parallel lines (they never meet), perpendicular lines (they meet at a right angle) and lines that cross at other angles, find them in letters and shapes, and draw them on dot paper.

About 45 minutes

I can find and draw parallel and perpendicular lines.

THE LESSON

- 1 Warm up** (5 min) Show pictures of railroad tracks, a window corner and open scissors. Ask how the lines in each are different.
- 2 Teach** (10 min) Draw two lines that never meet: parallel. Draw two that cross at a square corner, checked with a card: perpendicular. Draw two that cross at a slant: intersecting, not perpendicular. Show the symbols for parallel and perpendicular. On dot paper, draw a line 4 dots right and 1 up, then another from a new dot with the same steps: parallel.
Say: "Parallel lines never meet. Perpendicular lines meet at a square corner. Other lines can cross at a slant."
- 3 Try it together** (10 min) Partners sort the letter cards: parallel lines, perpendicular lines, both or neither. Then each draws a parallel and a perpendicular pair on dot paper for the other to check.
- 4 Practice** (15 min) Students sort pairs of lines on sheet 2 of Lines, Rays and Angles, then name lines with the symbols on sheet 1 of Classifying Triangles and Quadrilaterals.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 14.2** and circle a face beside the "I can" line. On question 1, look for the pair that meets at a square corner; the first pair is parallel and the second crosses at a slant. On question 2, look for a line through P with the same steps as AB; one that would meet AB is not parallel.

Need help? Lay two pencils on the desk: slide one to keep it parallel, then turn it to a square corner for perpendicular.

Ready for more? Draw a shape with exactly one pair of parallel sides and two right angles.

GET READY

- Index cards to check right angles
- Dot paper and rulers
- Letter cards: E, H, L, N, T, V, X, Z

WORDS TO USE

parallel: always the same distance apart, so they never meet

perpendicular: meet at a right angle, a square corner

intersecting: cross or meet at a point

ASK

- Will these lines ever meet if we make them longer?
- How can you check for a right angle?
- Where do you see parallel lines in this room?

WATCH FOR

Calls any lines that cross perpendicular. Check the corner with a card: only a square corner is perpendicular.

Thinks short lines that do not touch are parallel. Make them longer with a ruler: do they meet?

Draws a parallel line by eye, and it slants.

Count the dots over and up, and copy the same steps.

ON ANIMAL MATH

PRINTABLE

Lines, Rays, and Angles: sheet 2

PRINTABLE

Classifying Triangles and Quadrilaterals: sheet 1

QUIZ

Angles Quiz: the Parallel and Perpendicular level

EXIT TICKET

4th Grade Lines, Angles and Shapes Exit Tickets: Exit Ticket 14.2

Lines, Angles and Shapes

Lesson 14.3: Acute, right and obtuse angles

GOAL Students sort angles against a right angle: acute is smaller than a square corner, right is a square corner, and obtuse is bigger but less than a straight angle. Where they are taught, students also name straight and reflex angles.

About 45 minutes

I can sort angles as acute, right or obtuse.

THE LESSON

- 1 Warm up** (5 min) Students open their arms a little, to a square corner, then wide, and name each opening in their own words.
- 2 Teach** (10 min) Line one edge of an index card up with one ray. If the other ray is inside the card, the angle is acute; along the edge, right; outside, obtuse. On a clock, the hands make an acute angle at 1:00, a right angle at 3:00 and a straight angle at 6:00; a book opened wider than a square corner is obtuse. A reflex angle is more than a straight angle.
Say: "I line my card up with one ray. Inside the card is acute, along the edge is right, and outside is obtuse."
- 3 Try it together** (10 min) Partners hunt for angles with their cards (a book corner, open scissors, a door) and label each one acute, right or obtuse, then count the angles of each kind in a shape on the board.
- 4 Practice** (15 min) Students name angles on sheet 3 of Lines, Rays and Angles and count the right angles in shapes on sheet 4, then judge angles against a right angle on sheets 2, 4 and 5 of Right Angles.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 14.3** and circle a face beside the "I can" line. On question 1, look for acute, right and obtuse. On question 2, look for 1 acute, 1 right and 2 obtuse angles in the kite; 0 obtuse means its side corners were not checked.

Need help? Trace the corner of the card onto each angle so the square corner is drawn right on it.

Ready for more? Draw a shape with 2 acute angles, 1 right angle and 1 obtuse angle, or name the straight and reflex angles on sheet 1 of Measuring Angles with a Protractor.

GET READY

- An index card for each student, to check corners
- Angle cards and pictures of everyday angles
- A clock with hands that move

WORDS TO USE

acute angle: smaller than a right angle

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

obtuse angle: bigger than a right angle, less than a straight line

ASK

- Is it smaller or bigger than the corner of your card?
- What kind of angle do the hands make at 2:00?
- Can a triangle have two obtuse angles? Try to draw one.

WATCH FOR

Thinks longer rays make a bigger angle. The size of an angle is how far it opens, not how long its rays are.

Names an angle by how it sits on the page. Turn the card: the opening stays the same.

Misses angles inside a shape. Put a dot in each corner and check each one with the card.

ON ANIMAL MATH

PRINTABLE

Lines, Rays, and Angles: sheets 3–4

PRINTABLE

Right Angles: sheets 2, 4 and 5

QUIZ

Angles Quiz: the Acute, Right and Obtuse level

EXIT TICKET

4th Grade Lines, Angles and Shapes Exit Tickets: Exit Ticket 14.3

Lines, Angles and Shapes

Lesson 14.4: Angles as turns

GOAL Students see an angle as a turn about a point: a full turn is 360 degrees, so a degree is $\frac{1}{360}$ of a turn, and a quarter turn is $360 \div 4 = 90$ degrees.

About 45 minutes

I can find the degrees in part of a full turn.

THE LESSON

- 1 Warm up** (5 min) Everyone stands and turns: a full turn, a half turn, a quarter turn. Ask how many quarter turns make a full turn.
 - 2 Teach** (10 min) Start the two strips on the plate together and turn one all the way around: a full turn, 360 degrees. A half turn is $360 \div 2 = 180$ degrees, a straight angle; a quarter turn is $360 \div 4 = 90$, a right angle. Fit pattern blocks around one point: 4 square corners fill a full turn, so each is 90 degrees; 6 triangle corners, so each is $360 \div 6 = 60$; 3 hexagon corners, 120 each. The minute hand turns 30 degrees a number, so 12 to 11 is 330.
- Say:** "An angle measures a turn. A full turn is 360 degrees, so I divide 360 by the number of equal parts."
- 3 Try it together** (10 min) Partners fit blocks around one point in the Pattern Blocks tool: three hexagons, four squares, six triangles, then two hexagons and two triangles. For each, they write a corner as a fraction of a turn and in degrees, and check that the corners add up to 360.
 - 4 Practice** (15 min) Students find the degrees in parts of a turn, name angles and count the minute hand's turn on sheet 1 of Measuring Angles with a Protractor.
 - 5 Exit ticket** (5 min) Students do **Exit Ticket 14.4** and circle a face beside the "I can" line. On question 1, look for 40 degrees, $360 \div 9$; 9 means the turn was not shared out of 360. On question 2, look for 240 degrees, 8 numbers of 30; 120 means the hand was turned the wrong way, from 12 back to 8.

Ready for more? How many degrees does the hour hand turn in 3 hours? In 6 hours?

GET READY

- Paper plates with two paper strips pinned to the middle
- Pattern blocks, or the Pattern Blocks tool
- A clock with hands that move

WORDS TO USE

degree: one of 360 equal turns in a full circle

full turn: all the way around: 360 degrees

vertex: the point the rays turn about

ASK

- How many of these turns make a full turn?
- How many degrees is each part?
- Which way does the minute hand turn?

WATCH FOR

Thinks a half turn is 100 or 50 degrees. Start from the full turn, 360, then divide by the equal parts.

Counts the numbers on a clock as degrees. Each number the minute hand passes is 30 degrees: multiply.

Turns the minute hand backward. Clock hands turn from 12 to 1 to 2: follow that way.

Need help? Turn a strip on the plate one equal part at a time and count by the degrees.

ON ANIMAL MATH

PRINTABLE

Measuring Angles with a Protractor: sheet 1

TOOL

Pattern Blocks: fit blocks around one point

TOOL

Teaching Clock

EXIT TICKET

4th Grade Lines, Angles and Shapes Exit Tickets: Exit Ticket 14.4

Lines, Angles and Shapes

Lesson 14.5: Measure angles

GOAL Students measure angles with a protractor: center mark on the vertex, zero line along one ray, then read the scale that starts at 0 on that ray, and check the measure against the kind of angle.

About 45 minutes

I can measure an angle with a protractor.

THE LESSON

- 1 Warm up** (5 min) Show three angles. Students say acute or obtuse and guess each one: about 30, about 90 or about 150 degrees?
- 2 Teach** (10 min) Draw an angle of 42 degrees. Put the center mark of the protractor on the vertex and the zero line along one ray. Follow that ray out to its 0, then read up the same scale to the other ray: 42. The other scale says 138, but the angle is acute, so 138 cannot be right. Measure an obtuse angle of 104 degrees the same way and check that it is more than 90.
Say: "Center on the vertex, zero on a ray, then read the scale that starts at 0 on that ray. Last, I check that the number fits the kind of angle."
- 3 Try it together** (10 min) Partners measure the angles of a paper triangle and of an open book cover: one measures and the other checks that the reading fits the kind of angle. Rays that are too short get made longer with a ruler first.
- 4 Practice** (15 min) Students read angles on a printed protractor and pick the measure that makes sense on sheet 2 of Measuring Angles with a Protractor, then measure with their own protractors on sheet 3.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 14.5** and circle a face beside the "I can" line. On question 1, look for 22 degrees; 158 means the wrong scale was read, since the angle is acute. On question 2, look for 143 degrees; 37 means the wrong scale. A reading a few degrees off usually means the center mark was not on the vertex.

Need help? Run a finger along the ray to its 0, and keep the finger on that scale while reading up to the other ray.

Ready for more? Draw a triangle, measure its three angles and add them. Try another triangle: what do you notice?

ON ANIMAL MATH

PRINTABLE

Measuring Angles with a Protractor: sheets 2-3

QUIZ

Angles Quiz: the Read a Protractor level

EXIT TICKET

4th Grade Lines, Angles and Shapes Exit Tickets: Exit Ticket 14.5

GET READY

- A protractor for each student
- Angles drawn large on paper
- Rulers to make short rays longer

WORDS TO USE

protractor: a tool for measuring angles in degrees

vertex: the point where the two rays meet

scale: a row of numbers; read the one that starts at 0 on your ray

ASK

- Is the angle acute or obtuse? Which number makes sense?
- Which scale starts at 0 on your ray?
- Where is the center mark on your protractor?

WATCH FOR

Reads the wrong scale. Say acute or obtuse first, then pick the number that fits.

Lines up the bottom edge, not the zero line. Find the zero line and the center mark before measuring.

Cannot read the angle because a ray is too short. Make the ray longer with a ruler until it crosses the scale.

Lines, Angles and Shapes

Lesson 14.6: Draw angles

GOAL

Students draw an angle of a given size with a protractor and a ruler: draw a ray, put the center mark on its endpoint, mark a dot at the measure on the scale that starts at 0, and join the dot to the endpoint.

About 45 minutes

I can draw an angle of a given size.

THE LESSON

- 1 Warm up** (5 min) Show an angle and ask: is it about 45, 90 or 135 degrees? Then students sketch an angle of about 60 degrees without a protractor.
- 2 Teach** (10 min) Draw a ray. Put the center mark on its endpoint and the zero line along the ray. Find 48 on the scale that starts at 0 on this ray and make a dot. Lift the protractor and join the endpoint to the dot with a ruler. Check: 48 is acute, and the angle is smaller than a square corner. Then draw 126 degrees from a ray that points left: now the other scale starts at 0.
Say: "Center on the endpoint, zero on the ray, and a dot at the number on the scale that starts at 0. Then I join the dot with a ruler."
- 3 Try it together** (10 min) Partners take turns picking an angle card, drawing the angle, and measuring each other's angle to check it. A drawing within a degree or two is right.
- 4 Practice** (15 min) Students draw angles of a given size from a ray on sheet 4 of Measuring Angles with a Protractor.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 14.6** and circle a face beside the "I can" line. On question 1, look for an acute angle of 68 degrees from the ray that points left; an obtuse angle of 112 means the wrong scale was used. On question 2, look for 165 degrees, opening wide; 15 degrees means the wrong scale.

Need help? Start with rays that point right, and highlight the scale that starts at 0 on them.

Ready for more? Draw a right angle, then a ray inside it that splits it into two angles, one twice as big as the other.

GET READY

- A protractor and a ruler for each student
- Paper with a ray drawn on it
- Angle cards from 20 to 160 degrees

WORDS TO USE

endpoint: where the ray starts; the angle's vertex

mark: a small dot at the measure, to draw the second ray through

scale: read the one that starts at 0 on the ray

ASK

- Which scale starts at 0 on your ray?
- Should this angle be acute or obtuse?
- How can you check your drawing?

WATCH FOR

Uses the scale that starts at 180 on the ray.

Say first whether the angle is acute or obtuse, and check the drawing fits.

Moves the protractor before marking the dot.

Hold it still and mark the dot before lifting it.

Draws the second ray without a ruler. Join the endpoint and the dot with a ruler.

ON ANIMAL MATH

PRINTABLE

Measuring Angles with a Protractor: sheet 4

QUIZ

Angles Quiz: the Read a Protractor level

EXIT TICKET

4th Grade Lines, Angles and Shapes Exit Tickets: Exit Ticket 14.6

Lines, Angles and Shapes

Lesson 14.7: Find an unknown angle

GOAL Students see that the parts of an angle add up to the whole angle, and find an unknown part with an equation, using 90 for a right angle and 180 for a straight angle.

About 45 minutes

I can find an unknown angle with an equation.

THE LESSON

- 1 Warm up** (5 min) With pattern blocks, fit two triangle corners into a hexagon corner: $60 + 60 = 120$. Ask which two corners fill a square corner.
- 2 Teach** (10 min) Draw a right angle split by a ray into a 61 degree part and a part x . The parts add up to the whole: $61 + x = 90$, so $x = 29$ degrees; measure to check. Then a straight angle split into 106 degrees and x : $106 + x = 180$, so $x = 74$. Then a 100 degree angle split into 37 and x : $37 + x = 100$, so $x = 63$. Subtracting works too: $100 - 37 = 63$.
Say: "The parts add up to the whole. I write an equation with a letter for the unknown part, then solve it."
- 3 Try it together** (10 min) Partners solve two stories with a sketch and an equation: a sprinkler turns through 180 degrees and has turned 125; how much more will it turn? A gate is open 25 degrees and opens 45 more; how far open is it now?
- 4 Practice** (15 min) Students find unknown angles with equations and solve the angle stories on sheet 5 of Measuring Angles with a Protractor.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 14.7** and circle a face beside the "I can" line. On question 1, look for $x + 57 = 140$ (or $x = 140 - 57$) and $x = 83$; 197 means the angles were added. On question 2, look for 82 degrees, $180 - 98$; 278 means the two were added, and 262 means a straight angle was taken as 360.

Need help? Shade the known part and write its measure inside it, then write the whole above the angle.

Ready for more? Two rays split a straight angle into three parts. Two parts are 45 and 70 degrees. Find the third.

GET READY

- Protractors
- Pattern blocks, or the Pattern Blocks tool
- Angles split into two parts, drawn large

WORDS TO USE

adjacent angles: angles side by side that share a ray

unknown angle: the part we need to find, named with a letter

equation: a number sentence with an equal sign, like $61 + x = 90$

ASK

- What is the whole angle? Which part do you know?
- What equation shows the parts and the whole?
- How can you check your answer?

WATCH FOR

Adds the known part to the whole. Point to the whole: the parts make it, so the unknown is smaller.

Uses 180 for a right angle. Look for the square mark or the straight line before writing the whole.

Trusts a measure over the equation. Check the protractor's center; the equation is exact.

ON ANIMAL MATH

PRINTABLE

Measuring Angles with a Protractor: sheet 5

TOOL

Pattern Blocks: fit two corners into a third

QUIZ

Angles Quiz: the Unknown Angles level

EXIT TICKET

4th Grade Lines, Angles and Shapes Exit Tickets: Exit Ticket 14.7

Lines, Angles and Shapes

Lesson 14.8: Classify triangles

GOAL Students sort triangles by their angles: a right triangle has a right angle, an obtuse triangle has an obtuse angle, and an acute triangle has three acute angles. Where it is taught, they also sort them by their sides.

About 45 minutes

I can sort triangles by their angles.

THE LESSON

- 1 Warm up** (5 min) Ask: can a triangle have two right angles? Students try to draw one and say why it does not close.
- 2 Teach** (10 min) Check every corner of three paper triangles with a card. A square corner makes a right triangle; a corner wider than the card, an obtuse triangle; every corner inside the card, an acute triangle. Every triangle has at least two acute angles, so check the biggest. Then measure the sides: three equal sides is equilateral, two is isosceles, none is scalene.
Say: "I find the biggest angle. A right angle makes a right triangle, an obtuse angle an obtuse triangle, and if all three are acute, it is acute."
- 3 Try it together** (10 min) Partners draw an acute, a right and an obtuse triangle on dot paper, trade, and name each other's triangles with a card. Then they try to draw a right triangle with two equal sides.
- 4 Practice** (15 min) Students name triangles by their angles and by their sides, and decide which pairs of names a triangle can have, on sheet 2 of Classifying Triangles and Quadrilaterals.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 14.8** and circle a face beside the "I can" line. On question 1, look for right, acute and obtuse; acute for the first means its tilted square corner was missed, so turn a card to check it. On question 2, look for any triangle with a square corner on the dots; a tilted one is right too.

Need help? Mark each corner A, R or O after checking it with the card, then name the triangle.

Ready for more? Can a triangle be right and isosceles? Obtuse and equilateral? Draw it, or explain why not.

GET READY

- Index cards to check corners
- Paper triangles of every kind
- Dot paper and rulers

WORDS TO USE

right triangle: has one right angle

obtuse triangle: has one obtuse angle

acute triangle: all three angles are acute

isosceles and scalene: 2 equal sides; no equal sides

ASK

- Which is the biggest angle? What kind is it?
- Can a triangle have two obtuse angles? Why not?
- Is your right triangle isosceles or scalene?

WATCH FOR

Names a triangle from one acute angle. Every triangle has acute angles: check the biggest one.

Misses a right angle that is tilted. Turn the card, not the triangle, and line it up along one side.

Mixes up names by sides and by angles. Ask first: am I looking at the angles or the sides?

ON ANIMAL MATH

PRINTABLE

Classifying Triangles and Quadrilaterals: sheet 2

MAKER

Graph Paper: Paper Type Square Dots

QUIZ

Shapes Quiz: the Classify Shapes level

EXIT TICKET

4th Grade Lines, Angles and Shapes Exit Tickets: Exit Ticket 14.8

Lines, Angles and Shapes

Lesson 14.9: Classify shapes by sides and angles

GOAL Students sort shapes by their parallel and perpendicular sides and their angles, mark them (matching arrows on parallel sides, a small square in each right angle), and name quadrilaterals from what they have.

About 45 minutes

I can sort shapes by their angles and parallel sides.

THE LESSON

- 1 Warm up (5 min)** Show a rectangle. Ask how many right angles it has and which sides are parallel; students show the pairs with their arms.
- 2 Teach (10 min)** On dot paper, draw a pentagon shaped like an arrow: a straight up left side, a flat top and bottom, and two slanted sides, each 2 dots over and 2 up or down, that meet in a point. Check each corner with a card: the two left corners and the point are right angles, each marked with a small square; the other two are obtuse. Mark the parallel top and bottom with arrows. Then draw a rectangle on a slant (long sides 4 dots right and 2 up, short sides 1 right and 2 down): four right angles though no side is flat, and two pairs of parallel sides (one arrow, then two arrows).
Say: "I mark what I find: a square in each right angle and matching arrows on parallel sides. Then I count the pairs, not the sides."
- 3 Try it together (10 min)** Partners sort shape cards into a Venn diagram on the floor: has a right angle, has parallel sides. They mark each card before placing it.
- 4 Practice (15 min)** Students read the marks to name quadrilaterals on sheet 3 of Classifying Triangles and Quadrilaterals and sort shapes on sheet 5, then review best names on sheets 2 and 3 of Quadrilaterals.
- 5 Exit ticket (5 min)** Students do **Exit Ticket 14.9** and circle a face beside the "I can" line. On question 1, look for the right triangle and the pentagon; the rhombus and the kite have no right angle. On question 2, look for 2 pairs; 4 counts each parallel side, not each pair.

Need help? Use one color for each pair of parallel sides, and draw a square in every right angle.

Ready for more? Draw a hexagon with three pairs of parallel sides.

GET READY

- Shape cards: quadrilaterals, triangles, pentagons and hexagons
- Dot paper and colored pencils
- Two hoops or yarn circles for a Venn diagram

WORDS TO USE

parallel sides: two sides that never meet, marked with matching arrows

right angle mark: a small square in the corner

parallelogram: a quadrilateral with two pairs of parallel sides

ASK

- Which corners are right angles? How did you check?
- Which sides are parallel? How many pairs?
- Which names fit this shape?

WATCH FOR

Counts parallel sides, not pairs. Mark each pair with its own arrows, then count the kinds of arrows.

Thinks a slanted side cannot be parallel to anything. Look for a side with the same steps on the dots.

Marks a corner that is nearly square. Check with the card: nearly is not a right angle.

ON ANIMAL MATH

PRINTABLE

Classifying Triangles and Quadrilaterals: sheets 3 and 5

PRINTABLE

Quadrilaterals: sheets 2-3, a review

QUIZ

Shapes Quiz: the Quadrilaterals level

EXIT TICKET

4th Grade Lines, Angles and Shapes Exit Tickets: Exit Ticket 14.9

Lines, Angles and Shapes

Lesson 14.10: The quadrilateral family

GOAL Students place quadrilaterals in a family (parallelogram, then rectangle and rhombus, then square) and decide whether a statement about them is always, sometimes or never true.

About 45 minutes

★ Taught in 4th grade in some states

I can decide always, sometimes or never for quadrilaterals.

THE LESSON

- 1 Warm up** (5 min) Show a square and ask: is it a rectangle? Take a vote, and come back to it at the end.
 - 2 Teach** (10 min) Build the family tree: quadrilateral, then parallelogram (2 pairs of parallel sides), then rectangle (4 right angles) and rhombus (4 equal sides), then square (both). Each shape has everything above it. To test a statement, look for a shape that breaks it. A square is a quadrilateral: always. A rectangle has 4 equal sides: sometimes, when it is a square. A parallelogram has exactly one right angle: never, as one makes all four right.
- Say:** "A shape belongs to every group above it. Sometimes means it is true for one shape and not for another."
- 3 Try it together** (10 min) Partners hold up a shape card and stand under every sign that fits. Then they decide: A rectangle is a quadrilateral. A triangle is a parallelogram. A rhombus has 4 equal angles.
 - 4 Practice** (15 min) Students fill in the family tree and circle always, sometimes or never on sheet 4 of Classifying Triangles and Quadrilaterals. Early finishers do sheet 5 of Quadrilaterals.
 - 5 Exit ticket** (5 min) Students do **Exit Ticket 14.10** and circle a face beside the "I can" line. On question 1, look for sometimes, then always. On question 2, look for parallelogram and rectangle; rectangle alone means the tree was not used, and square means the side marks were not read.

Need help? Keep the family tree out and point to each group a shape belongs to, from the top down.

Ready for more? Write an always, a sometimes and a never statement of your own about rhombuses.

ON ANIMAL MATH

PRINTABLE **Classifying Triangles and Quadrilaterals:** sheet 4

PRINTABLE **Quadrilaterals:** sheet 5, for early finishers

QUIZ **Shapes Quiz:** the Quadrilaterals level

EXIT TICKET **4th Grade Lines, Angles and Shapes Exit Tickets:** Exit Ticket 14.10

GET READY

- A family tree of quadrilaterals on chart paper
- Shape cards, and a sign for each group
- Rulers and index cards

WORDS TO USE

always: true for every shape in the group

sometimes: true for some shapes in the group, not all

never: true for no shape in the group

ASK

- Can you find a shape where it is true? One where it is not?
- Which groups is a square in?
- What does a rectangle have that a parallelogram may not?

WATCH FOR

Says a square is not a rectangle because it looks different. Check the rule: 4 right angles. A square has them.

Says always after one example. Always means every shape: look for one that breaks it.

Says never when it is sometimes. Look for one shape that makes it true, like a square.

Lines, Angles and Shapes

Lesson 14.11: Lines of symmetry

GOAL Students find lines of symmetry by folding: a line of symmetry folds a shape into two halves that match exactly. They draw every line of symmetry of a shape and see that a shape can have none, one or many.

About 45 minutes

I can find and draw lines of symmetry.

THE LESSON

- 1 Warm up (5 min)** Fold a paper heart in half and open it. Ask what students notice about the two halves.
- 2 Teach (10 min)** Fold a paper square every way that works: across, down and on both diagonals, so 4 lines of symmetry. Fold a paper rectangle: across and down work, but on a diagonal the corners stick out, so 2 lines. Fold a parallelogram that leans: no fold works, so 0 lines. Then letters: M has 1 line, X has 2, and N has none.
Say: "A line of symmetry folds the shape so the halves match exactly. I test each fold before I draw the line."
- 3 Try it together (10 min)** Partners fold paper letters and shapes and sort them by how many lines they have: 0, 1, 2 or more. Then one draws half a shape on grid paper beside a line, and the other draws the matching half.
- 4 Practice (15 min)** Students decide yes or no for dashed lines on sheet 1 of Lines of Symmetry, draw one line on sheet 2 and every line on sheet 3, complete shapes on sheet 4 and sort shapes on sheet 5.
- 5 Exit ticket (5 min)** Students do **Exit Ticket 14.11** and circle a face beside the "I can" line. On question 1, look for 2, 1 and 0, with the lines drawn; a diagonal on the hexagon means the fold was not tested. On question 2, look for yes, then no: folded across, the long cross does not match.

Need help? Trace the shape, cut it out and fold it before drawing any line.

Ready for more? Find a capital letter with exactly 2 lines and one with none. Write a word using only letters that have a line.

GET READY

- Paper shapes to fold: a square, a rectangle, a parallelogram, a heart
- Paper letters: M, X, N, H
- Square grid paper and rulers

WORDS TO USE

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

match: every part of one half lands on the other half

symmetric: has at least one line of symmetry

ASK

- If you fold on this line, do the halves match?
- Can a shape have more than one line? How many can you find?
- Why is a diagonal of a rectangle not a line of symmetry?

WATCH FOR

Draws the diagonals of a rectangle. Fold it on a diagonal: the corners stick out.

Finds one line and stops. Test every way: across, down and both diagonals.

Thinks any line through the middle works. Fold a parallelogram through its middle: the halves do not match.

ON ANIMAL MATH

PRINTABLE

Lines of Symmetry: sheets 1-5

MAKER

Graph Paper: Paper Type Square Grid, Square Size 1/2 Inch

QUIZ

Shapes Quiz: the Classify Shapes level

EXIT TICKET

4th Grade Lines, Angles and Shapes Exit Tickets: Exit Ticket 14.11

Lines, Angles and Shapes

Lesson 14.12: Solid figures

GOAL Students name prisms and pyramids, count their faces, edges and vertices, see the shape of each face, and compare flat shapes with solid figures.

I can count the faces, edges and vertices of a solid.

About 45 minutes

★ Taught in 4th grade in some states

THE LESSON

- 1 Warm up** (5 min) Hold up a square and a cube. Ask how they are alike and how they are different.
- 2 Teach** (10 min) Build a cube with straws and clay: 12 straws are the edges, 8 clay balls the vertices, and 6 squares the faces. Fill the table. A triangular prism has 2 triangle bases and 3 rectangles: 5 faces, 9 edges, 6 vertices. A square pyramid has a square base and 4 triangles: 5 faces, 8 edges, 5 vertices. A prism has two matching bases joined by rectangles; a pyramid has one base and triangles that meet at a point.
Say: "I count faces, edges and vertices in order and mark each one, so I do not count it twice. A prism has two bases; a pyramid has one."
- 3 Try it together** (10 min) Partners build a rectangular prism and a triangular pyramid with straws and clay, fill in the table, and check: in each, the vertices and faces together are 2 more than the edges.
- 4 Practice** (15 min) Students name solids on sheet 1 of Solid Figures, count faces, edges and vertices and sort the solids on sheet 2, and compare flat shapes with solids on sheet 3.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 14.12** and circle a face beside the "I can" line. On question 1, look for 7 faces, 12 edges and 7 vertices; 6 edges means only the edges around the base, or only the slanted ones, were counted. On question 2, look for 8 rectangles; 10 means the two bases were counted too.

Need help? Hold a real solid and touch each vertex while counting aloud. The Solid Shapes level of the Shapes quiz reviews the names of the solids and the shapes of their faces.

Ready for more? A prism's base has 7 sides. Without a picture, find its faces, edges and vertices.

GET READY

- Solid figures, or a cereal box, a number cube and a tent shape
- Straws and clay balls to build with
- A table: solid, faces, edges, vertices

WORDS TO USE

face: a flat side of a solid

edge: where two faces meet

vertex: a corner where edges meet; more than one are vertices

ASK

- What shape is the base? How many sides does it have?
- How many faces meet at this vertex?
- How is a prism different from a pyramid?

WATCH FOR

Counts only what can be seen. Turn the solid, or count the dashed edges in a drawing too.

Counts an edge twice. Mark each edge as it is counted.

Calls a square a cube. A square is flat; it is one face of a cube.

ON ANIMAL MATH

PRINTABLE

Solid Figures: Faces, Edges and Vertices: sheets 1-3

QUIZ

Shapes Quiz: the Solid Shapes level

EXIT TICKET

4th Grade Lines, Angles and Shapes Exit Tickets: Exit Ticket 14.12