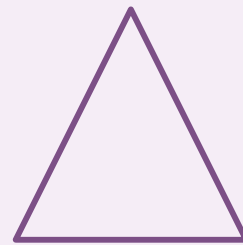
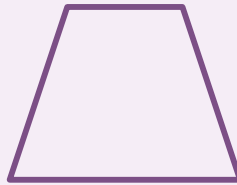


Geometry Reasoning Lab: Shapes, Angles, Area, and Claims

6 complete activities from Geometry Reasoning Lab, each with a worked answer.



HOW TO USE

1. Read the situation and the evidence first.
2. Show your thinking in the work boxes, not only an answer.
3. Explain how you know your answer makes sense.
4. Try the new problem at the bottom of the page.

6 activities • 3 answer pages • From the 32-activity collection

10 US Letter pages • Print at 100% / Actual Size

Original Bobotemp educational printable • Fictional names, places and prices

Name _____ Date _____

LEVEL 1



Read each clue. Cross out any figure that does not fit. Circle the one figure that fits every clue.

On the Riverside town map, a path starts at the fountain, point A. It passes the library, point B, and keeps going past the edge of the map without stopping. Four figure names are written on the board: line AB, ray AB, segment AB, and ray BA. Use the clues to decide which name matches the mystery path.

EVIDENCE TO USE

- Clue 1: The figure has at least one endpoint.
- Clue 2: It goes on forever in at least one direction.
- Clue 3: Point A is an endpoint of the figure.
- Segment: 2 endpoints. Ray: 1. Line: 0.

1. List the figures that survive each clue.

2. Name the mystery path and draw it with correct endpoint and arrow marks.

A blank sheet of graph paper with a grid pattern. The grid consists of 10 columns and 10 rows of squares. The paper has rounded corners and a light gray border.

3. Explain why ray BA is not the same as ray AB.

TRY IT • A fence runs from the gate, point G, to the shed, point H, and stops at both. Name the figure and tell how many endpoints it has.

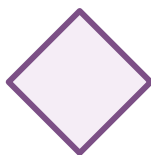
Name _____ Date _____

LEVEL 1



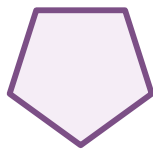
Record the attributes of each shape card in a table, then use your table to answer the questions.

Four shape cards lie on the table, each turned a different way. There is a triangle pointing down, a square tilted so it stands on a corner, an upside-down pentagon, and a hexagon tipped on its side. Record the sides and vertices for each card in a table. Then find the total number of vertices on all four cards.

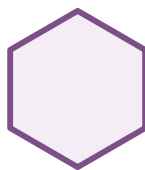


Card 1

Card 2



Card 3



Card 4

- Card 1: triangle, pointing down
- Card 2: square, tilted on a corner
- Card 3: pentagon, upside down
- Card 4: hexagon, tipped on its side
- A vertex is a point where two sides meet.

1. Fill in the table with the sides and vertices for each card.

2. Find the total number of vertices and show your addition.

[illegible]

3. Does turning a card change its vertex count? Explain.

TRY IT • An octagon card and a quadrilateral card are added to the table. How many vertices do these two new cards have together?

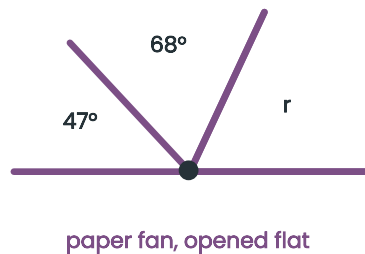
Name _____ Date _____

LEVEL 2



Use the fact that angle measures add. Write and solve an equation for the unknown part.

A paper fan is opened flat so its outer edges form a straight line, which is a straight angle. Two rays from the center split the fan into three sections. The left section measures 47 degrees and the middle section measures 68 degrees. Use the drawing of the fan; it is not to scale. Find the measure of the right section.



EVIDENCE TO USE

- Straight angle = 180 degrees
- Left section: 47 degrees
- Middle section: 68 degrees
- Right section: unknown, r
- Not drawn to scale

1. Write one equation using r for the unknown.

2. Solve and show each step.

[illegible]

3. Check by adding all three sections.

TRY IT • A right angle is split into two parts. One part is 28 degrees. What is the other part?

Triangle Possibility Grid: The Game Flag



A triangular flag for a class game has sides of 5 inches, 5 inches, and 8 inches. Rosa measured its largest angle with a protractor and got about 106 degrees. Use the two clues to choose the one name from the list that describes the flag by both its sides and its angles.



	acute	right	obtuse
equilateral			
isosceles			
scalene			

- Choices: equilateral acute, isosceles right
- scalene right, isosceles obtuse, scalene obtuse
- Side lengths: 5 in, 5 in, 8 in
- Largest angle: about 106 degrees
- Clue 1: Exactly two sides are equal.
- Clue 2: One angle is greater than 90 degrees.

[illegible][illegible][illegible]

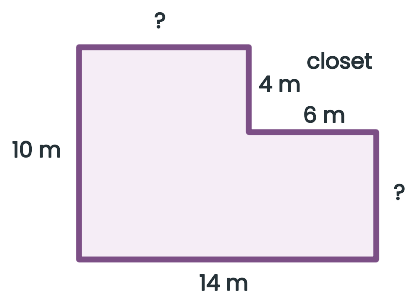
Name _____ Date _____

LEVEL 3



Find the unlabeled edges first. Then find the area two different ways and compare.

The floor plan for a community art room is an L shape. Its outer edges measure 14 meters across the bottom and 10 meters up the left side. A storage closet that is 6 m wide and 4 m tall fills the top-right corner and is not part of the room. Some side lengths are unlabeled. Find the room's area two ways, by subtracting and by splitting into two rectangles. Show that both methods agree.



art room floor plan (not to scale)

EVIDENCE TO USE

- Bottom edge: 14 m
- Left edge: 10 m
- Missing corner: 6 m wide, 4 m tall
- Top edge of room: unlabeled
- Right edge of room: unlabeled
- Not drawn to scale

1. Find the two unlabeled edges.

[illegible]

2. Find the area by subtracting the corner.

[illegible]

3. Find the area by splitting into two rectangles, then compare.

TRY IT • Split the same room with a horizontal cut instead. What are the two rectangles, and what is their total area?

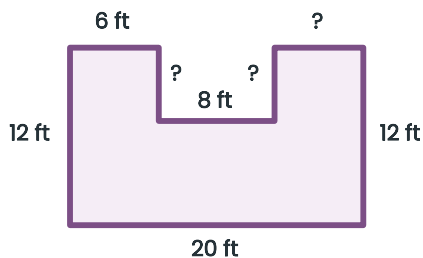
Name _____ Date _____

LEVEL 3



Use opposite and matching edges to deduce every unlabeled length before finding the perimeter.

Use the drawing of this U-shaped garden bed as you read. The bottom edge is 20 feet, and the left and right outer edges are each 12 feet. A notch 8 feet wide is cut down into the top. The top-left edge is 6 feet, and the floor of the notch is 7 feet above the bottom edge. The top-right edge and both notch walls are not labeled. Deduce every missing length, then find the perimeter of the bed.



garden bed (not to scale)

EVIDENCE TO USE

- Bottom edge: 20 ft
- Left and right outer edges: 12 ft each
- Top-left edge: 6 ft
- Notch width: 8 ft
- Notch floor: 7 ft above the bottom edge
- Not drawn to scale

1. Find the top-right edge and explain how.

[illegible]

2. Find the height of each notch wall.

[illegible]

3. Add all 8 edges to find the perimeter.

TRY IT • A rectangle that is 10 m by 6 m has a 3 m by 2 m corner cut off. What is the perimeter of the new shape?

1. Line Hunt: Name the Mystery Path

LEVEL 1

The mystery path is ray AB.

WORKED REASONING • Clue 1 removes line AB because a line has no endpoints. Ray AB, segment AB, and ray BA survive. Clue 2 removes segment AB because a segment stops at both ends. Line AB, ray AB, and ray BA go on forever in at least one direction. Clue 3 keeps only figures with an endpoint at A, which are ray AB and segment AB. The only name that survives all three clues is ray AB. To draw it, put a dot at A, pass through B, and add an arrow beyond B.

WATCH FOR • Students often think ray AB and ray BA are the same because they use the same letters. The first letter names the endpoint. Ray BA starts at B and goes on forever through A, which is the opposite direction.

TRANSFER • Segment GH (or segment HG). It has 2 endpoints.

2. Attribute Table: Vertex Count

LEVEL 1

There are 18 vertices in all ($3 + 4 + 5 + 6 = 18$).

WORKED REASONING • In any polygon, the number of vertices equals the number of sides. The triangle has 3 sides and 3 vertices. The square has 4 sides and 4 vertices. The pentagon has 5 sides and 5 vertices. The hexagon has 6 sides and 6 vertices. Total: $3 + 4 = 7$, then $7 + 5 = 12$, then $12 + 6 = 18$ vertices. Turning a card moves the shape, but it does not add or remove any sides or corners, so every count stays the same.

WATCH FOR • Some students think the tilted square is a different shape, or has a different number of corners, because it stands on a point. Orientation does not change any attribute. It is still a square with 4 sides, 4 vertices, and 4 right angles.

TRANSFER • 12 vertices ($8 + 4 = 12$).

11. Angle Puzzle: The Paper Fan

LEVEL 2

The right section measures 65 degrees ($180 - 47 - 68 = 65$).

WORKED REASONING • The three sections do not overlap, and together they make the straight angle. Their measures add to 180 degrees: $47 + 68 + r = 180$. Known parts: $47 + 68 = 115$. Unknown part: $180 - 115 = 65$. Check: $47 + 68 + 65 = 180$. The right section is 65 degrees.

WATCH FOR • Students sometimes use 90 degrees as the whole because they expect every angle puzzle to be a right angle. Identify the whole first. A straight line makes 180 degrees.

TRANSFER • 62 degrees ($90 - 28 = 62$).

12. Triangle Possibility Grid: The Game Flag

LEVEL 2

The flag is an isosceles obtuse triangle.

WORKED REASONING • Clue 1: two sides are 5 inches and the third is 8 inches, so exactly two sides are equal. That keeps isosceles right and isosceles obtuse. Clue 2: 106 degrees is greater than 90 degrees, so the triangle is obtuse. That keeps isosceles obtuse and scalene obtuse. Only isosceles obtuse survives both clues. Impossible box example: equilateral right. When you measure an equilateral triangle, all its angles are equal and each one is 60 degrees, so none of them can be 90 degrees.

WATCH FOR • Some students name a triangle by only one attribute. Every triangle has both a side type and an angle type. A triangle with an obtuse angle can still have two equal sides.

TRANSFER • Scalene right triangle. No sides are equal, and one angle is a right angle.

21. Composite Floor Plan: Two Ways to One Area

LEVEL 3

The room's area is 116 square meters ($140 - 24 = 116$).

WORKED REASONING • Unlabeled edges: top edge = $14 - 6 = 8$ m, and right edge = $10 - 4 = 6$ m. Method 1, subtract: the whole rectangle is $14 \times 10 = 140$ square meters, the closet is $6 \times 4 = 24$ square meters, and the room is $140 - 24 = 116$ square meters. Method 2, split with a vertical cut: the left part is $8 \times 10 = 80$ and the right part is $6 \times 6 = 36$, for a total of $80 + 36 = 116$ square meters. Both methods count the same squares, so they must agree.

WATCH FOR • A common error is to multiply the two labeled edges ($14 \times 10 = 140$) and forget the closet. Another is to subtract the closet's perimeter instead of its area. Always subtract an area from an area.

TRANSFER • The bottom rectangle is 14 m by 6 m (84 square meters), and the top rectangle is 8 m by 4 m (32 square meters). $84 + 32 = 116$ square meters.

22. Missing Dimensions: The U-Shaped Garden Bed

LEVEL 3

The perimeter is 74 feet ($20 + 12 + 6 + 5 + 8 + 5 + 6 + 12 = 74$).

WORKED REASONING • Top-right edge: the two top edges and the notch together match the 20 ft bottom edge, so $20 - 6 - 8 = 6$ ft. Notch walls: the outer edge is 12 ft and the notch floor is 7 ft up, so each wall is $12 - 7 = 5$ ft. Going around the shape: $20 + 12 + 6 + 5 + 8 + 5 + 6 + 12 = 74$ feet. Check: a plain 20 by 12 rectangle has a perimeter of 64 feet, and the notch adds two 5 ft walls, so $64 + 10 = 74$ feet.

WATCH FOR • Students often assume that cutting a notch makes the perimeter smaller because the area shrinks. The notch removes area but adds two inside walls, so the perimeter grows.

TRANSFER • 32 meters, the same as the 10 m by 6 m rectangle. The two new edges (3 m and 2 m) replace equal lengths that were removed from the outside.