

TEACHING AND PRACTICE PACKET

Angles, parallels and similarity



Grade 8 • NC.8.G.5

Explain triangle, parallel-line and angle-angle relationships with informal arguments.

Seven instructional sections • 30 multiple-choice tasks • 30 open and performance tasks

Teacher scripts, worked models, reproducible workspaces, complete keys and observation tools

Reusable over multiple lessons. Select tasks to match the evidence you need; this is not a 60-item single-sitting assessment.

Free sample | Contents

NC.8.G.5 | Eighth Grade mathematics

This sample contains 24 complete selected pages from the 139-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-17, 32-35, 92, 107-108

Representative activities

M01: sample PDF page(s) 18; original page(s) 17

M02: sample PDF page(s) 18; original page(s) 17

O01: sample PDF page(s) 19-20; original page(s) 32-33

O02: sample PDF page(s) 21-22; original page(s) 34-35

Selected teacher prompts and keys: original page(s) 92, 107-108

Using this sample

Read the preparation and access guidance before using a selected activity.
Keep teacher keys and private preparation pages separate from student copies.
Use the original resource contents to see the scope of the complete packet.

Complete paid download

The complete resource includes the full PDF task bank and teaching materials.

ALIGNMENT

Exact standard and scope

Use informal arguments to analyze angle relationships.

- Recognize relationships between interior and exterior angles of a triangle.
- Recognize the relationships between the angles created when parallel lines are cut by a transversal.
- Recognize the angle-angle criterion for similarity of triangles.
- Solve real-world and mathematical problems involving angles.

What students will demonstrate

Explain triangle, parallel-line and angle-angle relationships with informal arguments. Every task names its specific target. Recognition evidence from the M bank complements, but does not replace, construction, experimentation and justification in the O bank.

Source basis: NCDPI Grade 8 Quick Reference Guide (2025), printed page 32. Current adopted-2017 standards apply in 2026–27 and 2027–28; the 2026 revision begins in 2028–29. See source notes for verification limits.

NAVIGATION

Seven sections, two reusable banks

Warm-up: M01-M04 and O01-O04

Relate the three interior angles; Relate an exterior angle to remote interiors; Use corresponding angles with parallel lines; Use alternate interior angles.

I Do: M05-M08 and O05-O08

Use same-side interior angles; Use two angles to determine similarity; Evaluate an angle-angle similarity claim; Solve an angle equation with a triangle.

We Do: M09-M13 and O09-O13

Interpret an angle in a real setting; Build an informal angle argument; Relate the three interior angles; Relate an exterior angle to remote interiors; Use corresponding angles with parallel lines.

Collaborative practice: M14-M18 and O14-O18

Use alternate interior angles; Use same-side interior angles; Use two angles to determine similarity; Evaluate an angle-angle similarity claim; Solve an angle equation with a triangle.

Independent practice: M19-M23 and O19-O23

Interpret an angle in a real setting; Build an informal angle argument; Relate the three interior angles; Relate an exterior angle to remote interiors; Use corresponding angles with parallel lines.

Small-group reteach: M24-M27 and O24-O27

Use alternate interior angles; Use same-side interior angles; Use two angles to determine similarity; Evaluate an angle-angle similarity claim.

Exit ticket: M28-M30 and O28-O30

Solve an angle equation with a triangle; Interpret an angle in a real setting; Build an informal angle argument.

Every student page and worked key carries the item-specific target. Choose one core performance and a few supporting items in a session; retain the remaining items for later practice, reassessment or a different learner.

PREPARATION

Materials, pacing and access

Materials

Pencils, eraser, ruler, protractor, colored pencils and tracing paper or transparencies. Reproduce student pages at a readable scale. Grids use coordinate units, not physical centimeters; no actual-size measurement is inferred. Geometry software is optional, never required.

Prerequisites

Review ordered pairs, signed coordinates, segment length as coordinate distance and the meaning of a vertex, side and angle. For angles, review straight angles and opposite rays. Check these prerequisites separately before interpreting standard-specific performance.

Suggested sequence

Session 1: warm-up and one modeled experiment. Session 2: guided and collaborative construction. Session 3: independent explanations and sequence tests. Session 4, if useful: targeted reteaching and exit evidence. Split or repeat sessions to suit learners; no timing or item-count cutoff defines mastery.

Neutral access supports

Read directions aloud without adding mathematical conclusions. Enlarge grids, offer tactile axes, permit a scribe to record the learner's stated reasoning, and allow a physical or digital construction. Keep the same mathematical decisions and record the support used.

Preserve evidence

Collect the first independent response before discussing a correction. Record answer-supplying hints separately from neutral access. If drawing or communication access prevents interpretable evidence, use N/O rather than a numerical zero.

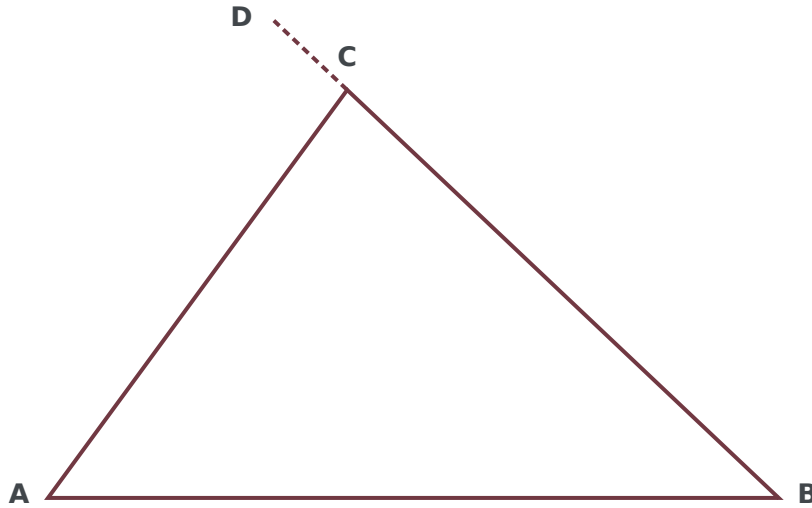
Stretch and respond

Ask learners to produce a second valid sequence or a counterexample after they can explain a first one. If coordinate signs or angle relationships are insecure, isolate one vertex or one intersection, then return to the full task without disclosing its answer.

WORKED TEACHER MODEL

Triangle and exterior angles

Draw triangle ABC with $A=48^\circ$ and $B=67^\circ$. Ask learners to predict a way to use a straight angle. Trace or tear the three corners and arrange them along a line. Say: "The copied corners fill a straight angle; their measures total 180° ." Then $C=180-48-67=65^\circ$. Extend BC beyond C. The exterior at C is $180-65=115^\circ$, also $48+67$. Ask why the exterior cannot equal the interior unless both are 90° .

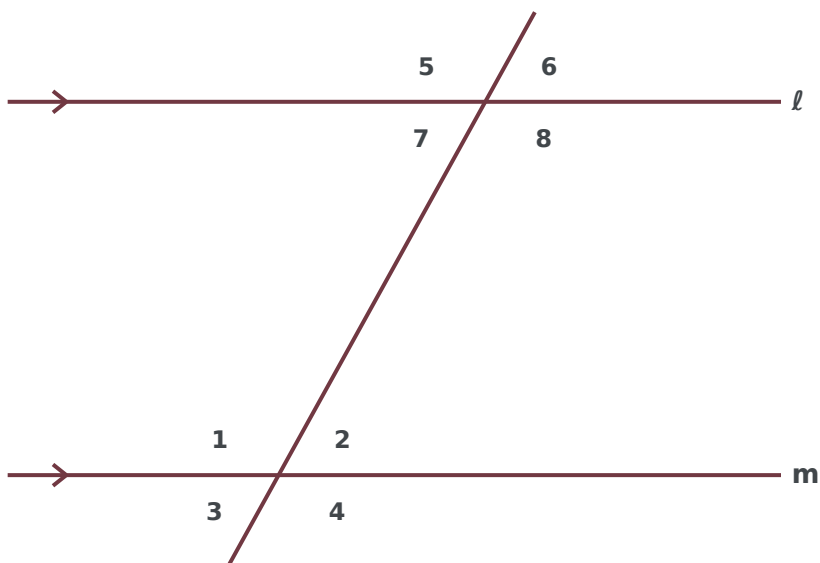


Teacher move: pause before stating each computed measure. Have a learner name the relationship and point to the exact rays or matched vertices. Accept another valid chain of reasons; require the chain, not only a remembered result. Diagrams are schematic and are not for measuring supplied angles.

WORKED TEACHER MODEL

Parallel lines and a transversal

Use the labeled schematic with angle $2 = 58^\circ$. Say: “Vertical angles give $3 = 58^\circ$. Linear pairs give $1 = 4 = 122^\circ$.” Slide the lower intersection along the transversal until it overlays the upper intersection. Because the lines are parallel, corresponding rays align: $6 = 58^\circ$, $5 = 122^\circ$, $7 = 58^\circ$, $8 = 122^\circ$. Ask which equalities would remain if the lines were not parallel. Only the within-intersection vertical and linear-pair relationships are guaranteed.

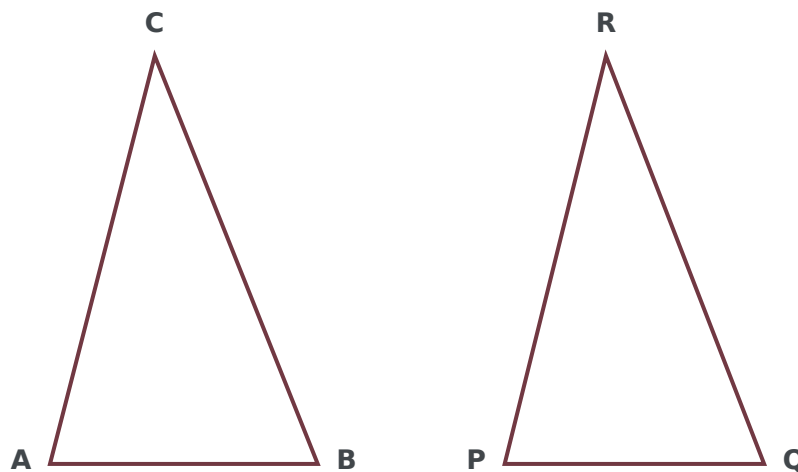


Teacher move: pause before stating each computed measure. Have a learner name the relationship and point to the exact rays or matched vertices. Accept another valid chain of reasons; require the chain, not only a remembered result. Diagrams are schematic and are not for measuring supplied angles.

WORKED TEACHER MODEL

Why two angles establish similarity

Suppose $A=P=42^\circ$ and $B=Q=73^\circ$. Both remaining angles are 65° . Say: “Scale AB until it equals PQ, then align the endpoints.” The equal endpoint angles force the two remaining rays to meet at the same third vertex. Thus a dilation and rigid motions map one triangle onto the other, establishing $ABC \sim PQR$. Different side lengths before scaling show why AA establishes similarity but not necessarily congruence.



Teacher move: pause before stating each computed measure. Have a learner name the relationship and point to the exact rays or matched vertices. Accept another valid chain of reasons; require the chain, not only a remembered result. Diagrams are schematic and are not for measuring supplied angles.

REFERENCE AND REASONING

A reusable reasoning anchor

1. Name the angle using its vertex or the diagram label.
2. Separate givens from conclusions; a schematic appearance is not a given.
3. Use a straight angle, vertical angles, triangle sum or a parallel-line relationship.
4. For AA, match two angle pairs and write the vertices in corresponding order.
5. Explain why each relationship applies, including where parallelism is needed.
6. Check positive angle values and interpret an interior angle versus a turn.

Useful language: “I know ___ because ___. Therefore ___. I checked ___ by ___. This supports ___, and it does not by itself establish ___.” A complete explanation names the mathematical relationship and applies it to the specific figure.

REPRODUCIBLE ORGANIZER

Represent, reason and check

Name: _____ Date: _____

Givens and correspondence**Representation or calculation****Justification and check****Conclusion in the problem's context**

TEACHING SCRIPT

Warm-up

Core: O01 | Optional bank: M01-M04, O01-O04

Specific target: Relate the three interior angles. Select 10–25 minutes for a core task and discussion, with additional construction time as needed. Timing is a planning estimate, not a proficiency rule.

Launch and organization

Elicit a first attempt before giving a model. Ask learners to name the given information and what they need to establish.

Teacher language and modeling

“Which measures are given, and which relationship connects them?” Have the learner identify the rays forming each angle and label only what is known.

Verified core solution

Triangle interior angles sum to 180° . $C = 180 - 38 - 67 = 75^\circ$. A valid construction has two rays meeting to form the specified angles. The three copied corners fill a straight angle. Measurements may vary slightly; the straight-line argument explains the exact sum.

Evidence and response to a gap

If a learner subtracts or adds without a reason, ask them to identify a straight angle, a triangle or an equal-angle pair. If correspondence is the issue, mark matching angles before naming triangles. Do not state the missing measure as a cue.

Close: ask “What did your check establish, and what evidence would be insufficient?” Record the first explanation, representation and accuracy separately. Select the next item to test the unresolved target; note any answer-supplying cues apart from access supports.

TEACHING SCRIPT

I Do

Core: O05 | Optional bank: M05-M08, O05-O08

Specific target: Use same-side interior angles. Select 10–25 minutes for a core task and discussion, with additional construction time as needed. Timing is a planning estimate, not a proficiency rule.

Launch and organization

Model the core task aloud, stopping before each decision. Use a different-color pen for givens and deductions. Learners annotate the reasoning, then try another item.

Teacher language and modeling

“Which measures are given, and which relationship connects them?” Have the learner identify the rays forming each angle and label only what is known.

Verified core solution

Angles 2, 3, 6 and 7 are 52° . Angles 1, 4, 5 and 8 are 128° . Vertical angles are equal and adjacent linear-pair angles sum to 180° at each intersection. A translation along the transversal takes one parallel line onto the other, so corresponding angles agree. Without parallelism, the equalities across intersections are not guaranteed. Angles 2 and 8 are same-side interior angles. They sum to 180° , so angle $8 = 180 - 52 = 128^\circ$.

Evidence and response to a gap

If a learner subtracts or adds without a reason, ask them to identify a straight angle, a triangle or an equal-angle pair. If correspondence is the issue, mark matching angles before naming triangles. Do not state the missing measure as a cue.

Close: ask “What did your check establish, and what evidence would be insufficient?” Record the first explanation, representation and accuracy separately. Select the next item to test the unresolved target; note any answer-supplying cues apart from access supports.

TEACHING SCRIPT

We Do

Core: O09 | Optional bank: M09-M13, O09-O13

Specific target: Interpret an angle in a real setting. Select 10–25 minutes for a core task and discussion, with additional construction time as needed. Timing is a planning estimate, not a proficiency rule.

Launch and organization

Have learners supply the next step and its reason. Write a proposed step only after they explain its effect on the whole figure.

Teacher language and modeling

“Which measures are given, and which relationship connects them?” Have the learner identify the rays forming each angle and label only what is known.

Verified core solution

The park boundary is a triangle, so its interior angles total 180° . Third angle = $180 - 40 - 67 = 73^\circ$. Extend the direction of travel BC beyond C. The turn toward CA is the smaller exterior angle 107° , supplementary to the interior 73° . The turn and interior add to 180° .

Evidence and response to a gap

If a learner subtracts or adds without a reason, ask them to identify a straight angle, a triangle or an equal-angle pair. If correspondence is the issue, mark matching angles before naming triangles. Do not state the missing measure as a cue.

Close: ask “What did your check establish, and what evidence would be insufficient?” Record the first explanation, representation and accuracy separately. Select the next item to test the unresolved target; note any answer-supplying cues apart from access supports.

TEACHING SCRIPT

Collaborative practice

Core: O14 | Optional bank: M14-M18, O14-O18

Specific target: Use alternate interior angles. Select 10–25 minutes for a core task and discussion, with additional construction time as needed. Timing is a planning estimate, not a proficiency rule.

Launch and organization

Assign constructor, checker and explainer roles; rotate roles after one task. Each learner records a personal conclusion before the group compares.

Teacher language and modeling

“Which measures are given, and which relationship connects them?” Have the learner identify the rays forming each angle and label only what is known.

Verified core solution

Angles 2, 3, 6 and 7 are 63° . Angles 1, 4, 5 and 8 are 117° . Vertical angles are equal and adjacent linear-pair angles sum to 180° at each intersection. A translation along the transversal takes one parallel line onto the other, so corresponding angles agree. Without parallelism, the equalities across intersections are not guaranteed. Angles 2 and 7 are alternate interior angles. They are equal, so angle 7 = 63° .

Evidence and response to a gap

If a learner subtracts or adds without a reason, ask them to identify a straight angle, a triangle or an equal-angle pair. If correspondence is the issue, mark matching angles before naming triangles. Do not state the missing measure as a cue.

Close: ask “What did your check establish, and what evidence would be insufficient?” Record the first explanation, representation and accuracy separately. Select the next item to test the unresolved target; note any answer-supplying cues apart from access supports.

TEACHING SCRIPT

Independent practice

Core: O19 | Optional bank: M19-M23, O19-O23

Specific target: Interpret an angle in a real setting. Select 10–25 minutes for a core task and discussion, with additional construction time as needed. Timing is a planning estimate, not a proficiency rule.

Launch and organization

Provide only neutral access supports. Preserve the first drawing and explanation before any conference or correction.

Teacher language and modeling

“Which measures are given, and which relationship connects them?” Have the learner identify the rays forming each angle and label only what is known.

Verified core solution

The park boundary is a triangle, so its interior angles total 180° . Third angle = $180 - 49 - 58 = 73^\circ$. Extend the direction of travel BC beyond C. The turn toward CA is the smaller exterior angle 107° , supplementary to the interior 73° . The turn and interior add to 180° .

Evidence and response to a gap

If a learner subtracts or adds without a reason, ask them to identify a straight angle, a triangle or an equal-angle pair. If correspondence is the issue, mark matching angles before naming triangles. Do not state the missing measure as a cue.

Close: ask “What did your check establish, and what evidence would be insufficient?” Record the first explanation, representation and accuracy separately. Select the next item to test the unresolved target; note any answer-supplying cues apart from access supports.

TEACHING SCRIPT

Small-group reteach

Core: O24 | Optional bank: M24-M27, O24-O27

Specific target: Use alternate interior angles. Select 10–25 minutes for a core task and discussion, with additional construction time as needed. Timing is a planning estimate, not a proficiency rule.

Launch and organization

Inspect the first response for one specific gap. Model that prerequisite with a separate example, then return to the core task for fresh evidence.

Teacher language and modeling

“Which measures are given, and which relationship connects them?” Have the learner identify the rays forming each angle and label only what is known.

Verified core solution

Angles 2, 3, 6 and 7 are 71° . Angles 1, 4, 5 and 8 are 109° . Vertical angles are equal and adjacent linear-pair angles sum to 180° at each intersection. A translation along the transversal takes one parallel line onto the other, so corresponding angles agree. Without parallelism, the equalities across intersections are not guaranteed. Angles 2 and 7 are alternate interior angles. They are equal, so angle $7 = 71^\circ$.

Evidence and response to a gap

If a learner subtracts or adds without a reason, ask them to identify a straight angle, a triangle or an equal-angle pair. If correspondence is the issue, mark matching angles before naming triangles. Do not state the missing measure as a cue.

Close: ask “What did your check establish, and what evidence would be insufficient?” Record the first explanation, representation and accuracy separately. Select the next item to test the unresolved target; note any answer-supplying cues apart from access supports.

TEACHING SCRIPT

Exit ticket

Core: O28 | Optional bank: M28-M30, O28-O30

Specific target: Solve an angle equation with a triangle. Select 10–25 minutes for a core task and discussion, with additional construction time as needed. Timing is a planning estimate, not a proficiency rule.

Launch and organization

Ask for an individual response and one stated check. Use the evidence to choose the next lesson; do not require the whole remaining bank.

Teacher language and modeling

“Which measures are given, and which relationship connects them?” Have the learner identify the rays forming each angle and label only what is known.

Verified core solution

$(2x+10)+(x+20)+69=180$. Thus $3x=81$, so $x=27$. The angles are 64° , 47° and 69° ; all are positive and total 180° . Exterior at C is $180-69 = 111^\circ$, also $64+47 = 111^\circ$ from the two remote interiors.

Evidence and response to a gap

If a learner subtracts or adds without a reason, ask them to identify a straight angle, a triangle or an equal-angle pair. If correspondence is the issue, mark matching angles before naming triangles. Do not state the missing measure as a cue.

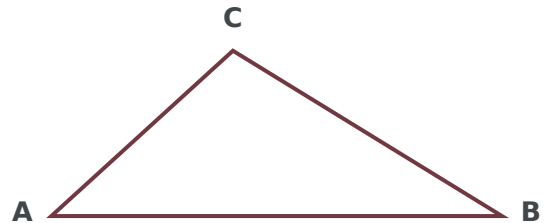
Close: ask “What did your check establish, and what evidence would be insufficient?” Record the first explanation, representation and accuracy separately. Select the next item to test the unresolved target; note any answer-supplying cues apart from access supports.

MULTIPLE-CHOICE BANK

M01-M02 • Choose and justify**M01 | Warm-up | Relate the three interior angles**

In triangle ABC, angle A = 38° and angle B = 67° . Find angle C.

- A. 104°
- B. 51°
- C. 116°
- D. 75°



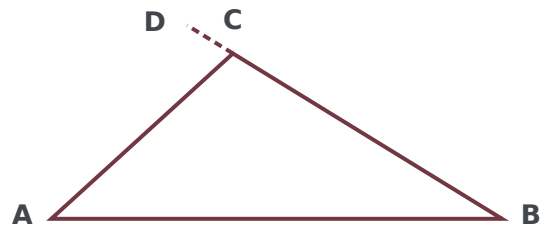
Reasoning / check: _____

Schematic; use the stated relationships, not measurement.

M02 | Warm-up | Relate an exterior angle to remote interiors

In triangle ABC, angle A = 39° and angle B = 68° . Extend BC beyond C to D. What is exterior angle ACD?

- A. 107°
- B. 148°
- C. 69°
- D. 83°



Reasoning / check: _____

Schematic; use the stated relationships, not measurement.

WARM-UP • OPEN / PERFORMANCE BANK

001 • Construct and explain

Target: Relate the three interior angles

Draw a triangle ABC with angle A = 38° and angle B = 67° using a ruler and protractor. Find angle C. Tear off or trace the three corners and arrange them along a straight line. Explain how your model supports the interior-angle sum and use it to justify your calculation.

Your construction / labeled sketch**Construction notes / copied angle arrangement**

WARM-UP • RESPONSE WORKSPACE

001 • Record and justify

Target: Relate the three interior angles**Coordinate / angle table and calculations (name each point, side or angle)****Measured comparisons or additional intermediate representation****Explanation, justification and independent check**

WARM-UP • OPEN / PERFORMANCE BANK

002 • Construct and explain

Target: Relate an exterior angle to remote interiors

Draw triangle ABC with angle A = 39° and angle B = 68° . Extend BC past C to D and mark exterior angle ACD. Find both the interior angle at C and the exterior angle. Give an informal argument connecting the exterior angle to the two remote interior angles; refer to a straight angle in your drawing.

Your construction / labeled sketch**Construction notes / copied angle arrangement**

WARM-UP • RESPONSE WORKSPACE

002 • Record and justify

Target: Relate an exterior angle to remote interiors

Coordinate / angle table and calculations (name each point, side or angle)

Measured comparisons or additional intermediate representation

Explanation, justification and independent check

WORKED MULTIPLE-CHOICE KEYS

M01-M02**M01 • Relate the three interior angles**

D. Triangle interior angles sum to 180° . $C = 180 - 38 - 67 = 75^\circ$. A: 104° does not satisfy the stated relationships. B: 51° does not satisfy the stated relationships. C: 116° does not satisfy the stated relationships. D: 75° agrees with the calculation.

Evidence to examine: the chosen letter alone does not establish the student's reasoning or a specific misconception. Ask for the vertex calculation or angle relationship that supports the choice.

M02 • Relate an exterior angle to remote interiors

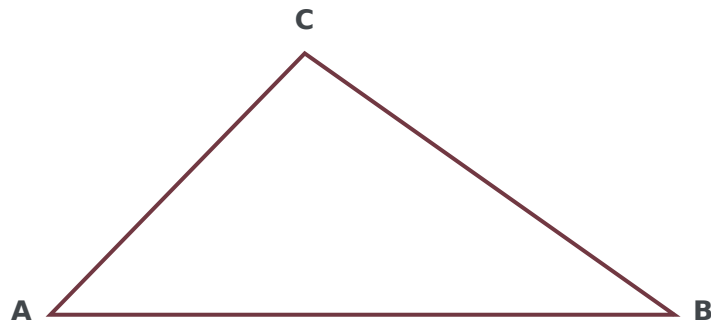
A. $C = 180 - 39 - 68 = 73^\circ$. Angles ACB and ACD form a linear pair, so $ACD = 180 - 73 = 107^\circ = 39 + 68$. A: 107° agrees with the calculation. B: 148° does not satisfy the stated relationships. C: 69° does not satisfy the stated relationships. D: 83° does not satisfy the stated relationships.

Evidence to examine: the chosen letter alone does not establish the student's reasoning or a specific misconception. Ask for the vertex calculation or angle relationship that supports the choice.

WORKED OPEN / PERFORMANCE KEY

001 • Relate the three interior angles

Triangle interior angles sum to 180° . $C = 180 - 38 - 67 = 75^\circ$. A valid construction has two rays meeting to form the specified angles. The three copied corners fill a straight angle. Measurements may vary slightly; the straight-line argument explains the exact sum.



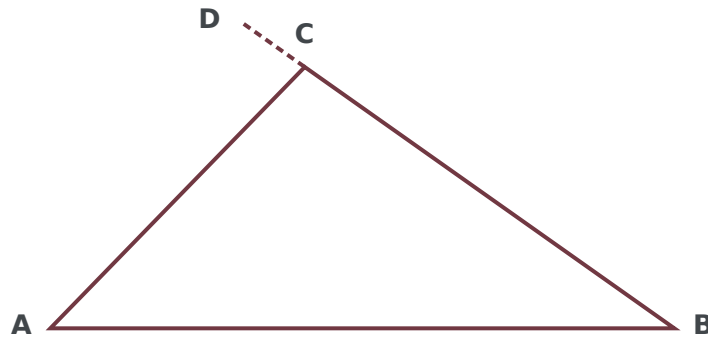
Schematic only. Use the numerical values and reasoning in this key to evaluate the student's own labeled construction. For tear-and-arrange or AA alignment, inspect the actual physical model and the accompanying explanation.

Assess separately: accuracy of values; faithful construction or representation; explanation of the applicable property; and the stated check or interpretation. A correct final value with no requested performance is incomplete evidence. Accept mathematically equivalent sequences or arguments when every required correspondence and condition is verified.

WORKED OPEN / PERFORMANCE KEY

002 • Relate an exterior angle to remote interiors

$C = 180 - 39 - 68 = 73^\circ$. Angles ACB and ACD form a linear pair, so $ACD = 180 - 73 = 107^\circ = 39 + 68$. The exterior angle equals the sum of the remote interiors because subtracting C from the triangle sum and from the linear-pair sum gives the same remainder.



Schematic only. Use the numerical values and reasoning in this key to evaluate the student's own labeled construction. For tear-and-arrange or AA alignment, inspect the actual physical model and the accompanying explanation.

Assess separately: accuracy of values; faithful construction or representation; explanation of the applicable property; and the stated check or interpretation. A correct final value with no requested performance is incomplete evidence. Accept mathematically equivalent sequences or arguments when every required correspondence and condition is verified.