

PREVIEW

GRADE 8

ANGLE RELATIONSHIPS

Complete Unit Resource • CCSS 8.G.A.5

WHAT YOU'RE LOOKING AT

Selected pages from the full 49-page resource.

This is a PREVIEW of the full unit.

8 selected pages from the full 49-page resource.

PREVIEW PAGES

FULL UNIT PAGES

Solutions, drills, glossary, quiz, unit test, and answer key are in the full version.

How to Use This Resource

This unit is designed as a complete, ready-to-teach resource for Grade 8 angle relationships, aligned to CCSS.MATH.CONTENT.8.G.A.5. It moves systematically from foundational vocabulary through formal proofs and real-world applications, supporting both first-time instruction and targeted review. Every section follows the same rhythm: **guided notes** to introduce concepts, **worked examples** to model problem-solving, **practice drills** with fully worked solutions, and **application problems** that connect the geometry to the world outside the classroom. Teachers may use the entire unit in sequence or pull individual sections for remediation or enrichment.

Structure of Each Topic

Each of the four topics opens with a clear statement of the standard and the key vocabulary, followed by theorem boxes that codify the geometric relationships students must master. Worked examples then demonstrate the full problem-solving protocol: identify the angle pair, state the relevant theorem, set up an equation, solve algebraically, and verify the answer. Drill sections provide progressive practice, with every solution spelled out in the same five-step format so students can self-check and teachers can pinpoint exactly where reasoning breaks down. Application sections translate the abstract relationships into shadow problems, ramp angles, and indirect measurement contexts.

Callout Box Legend

[Thm]	Theorem Box — Formal statement of a geometric theorem with its conditional (If ...) and conclusion (Then ...).
[!]	Watch Out! — Common misconception or frequent student error, with clarification.
[?]	Your Turn — A quick practice problem modelled on the preceding example, with the answer immediately below.
[RW]	Real-World Connection — How the concept appears in everyday contexts (shadows, ramps, architecture, navigation).
[*]	Key Idea — A concise summary of the central insight of a section.

Suggested Pacing

A typical class can complete this unit in 8 to 10 instructional days. Topic 1 (transversals) deserves two days because the angle vocabulary is foundational to everything that follows. Topic 2 (proving lines parallel) fits into one day, but students who struggle with algebraic equations will need additional practice. Topic 3 (triangle angles) requires two days: one for the angle sum theorem and one for the exterior angle theorem. Topic 4 (AA similarity) requires two days, including time for the real-world indirect-measurement problems. The remaining day is for the unit review and test. Teachers may use the quiz as a mid-unit checkpoint after Topic 2.

Topic 1: Angle Pairs & Transversal Vocabulary

CCSS.MATH.CONTENT.8.G.A.5

When a transversal crosses two or more lines, it creates eight angles at the intersection points. Understanding the special relationships between these angle pairs allows us to find unknown angle measures and prove geometric properties. In this topic we build the vocabulary needed to describe these angle pairs and state the theorems that govern their behaviour when the lines are parallel. Master this vocabulary first, because every theorem in the rest of the unit depends on correctly identifying which kind of angle pair you are looking at.

Guided Notes: Identifying Angle Pairs

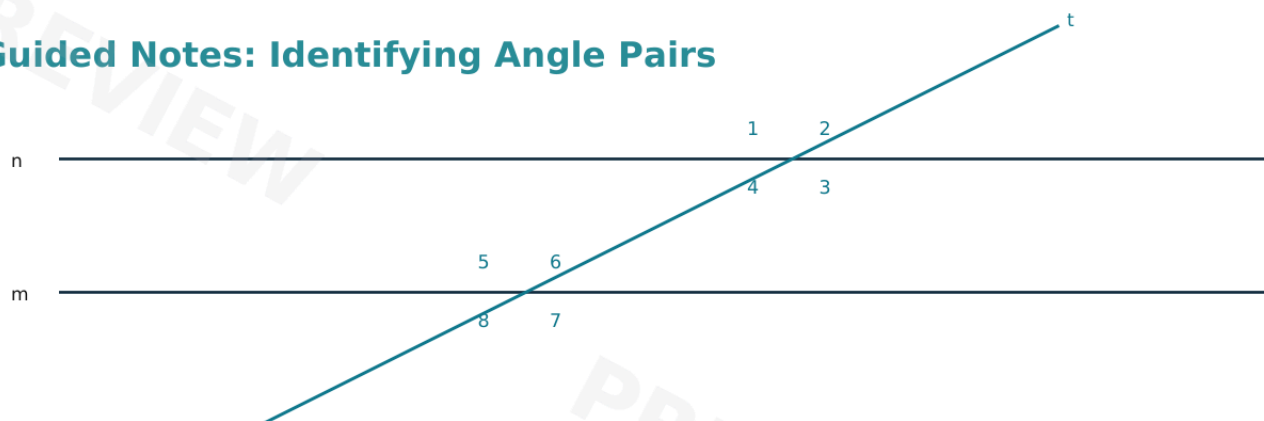


Figure 1. Two parallel lines m and n cut by transversal t , forming eight angles numbered 1 through 8.

Angle Pair Type	Definition	Pairs in Figure 1
Corresponding Angles	Angles in the same relative position at each intersection.	$\angle 1$ & $\angle 5$, $\angle 2$ & $\angle 6$, $\angle 3$ & $\angle 7$, $\angle 4$ & $\angle 8$
Alternate Interior Angles	On opposite sides of the transversal, but inside the parallel lines.	$\angle 3$ & $\angle 5$, $\angle 4$ & $\angle 6$
Alternate Exterior Angles	On opposite sides of the transversal, but outside the parallel lines.	$\angle 1$ & $\angle 8$, $\angle 2$ & $\angle 7$
Co-Interior (Same-Side Interior)	On the same side of the transversal and inside the parallel lines.	$\angle 3$ & $\angle 6$, $\angle 4$ & $\angle 5$
Vertical Angles	Opposite each other at a single intersection point. Always congruent, parallel or not.	$\angle 1$ & $\angle 4$, $\angle 2$ & $\angle 3$, $\angle 5$ & $\angle 8$, $\angle 6$ & $\angle 7$

[!] Watch Out!

The parallel-lines assumption matters. When the lines are NOT parallel, only vertical angles have a guaranteed relationship. Corresponding, alternate interior, alternate exterior, and co-interior angle pairs may have any measures when lines are not parallel. The theorems above all require the parallel-lines hypothesis.

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Worked Examples

Example 1: Corresponding Angles

Given: Line $m \parallel n$, transversal t . $m\angle 1 = (3x + 5)^\circ$, $m\angle 5 = (4x - 10)^\circ$. Find x and the angle measures.

Step 1: Identify the relationship.

$\angle 1$ and $\angle 5$ are corresponding angles (same relative position at each intersection).

Step 2: Apply the theorem.

Corresponding Angles Theorem $\rightarrow m\angle 1 = m\angle 5$.

Step 3: Set up the equation.

$$3x + 5 = 4x - 10$$

Step 4: Solve for x algebraically.

$$3x - 4x = -10 - 5$$

$$-x = -15$$

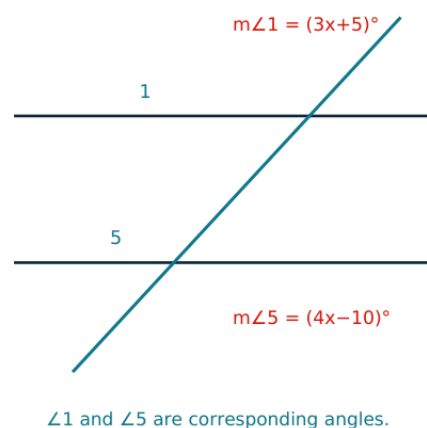
$$x = 15$$

Step 5: Substitute back.

$$m\angle 1 = 3(15) + 5 = 50^\circ$$

$$m\angle 5 = 4(15) - 10 = 50^\circ$$

Conclusion: $x = 15$, both angles $= 50^\circ$.



[?] Your Turn

Try it: Line $m \parallel n$, transversal t . $m\angle 2 = (5x + 8)^\circ$, $m\angle 6 = (7x - 4)^\circ$. Find x .

Answer: $x = 6$ (set $5x + 8 = 7x - 4 \rightarrow 12 = 2x \rightarrow x = 6$).

Example 2: Co-Interior Angles

Parallel Line Drill Solutions (Detailed)

Each solution identifies the angle pair, evaluates whether the congruence or supplementary condition holds, then states the appropriate converse theorem (or rejects the parallel-lines conclusion).

1. $\angle 1$ and $\angle 8$ are alternate exterior angles. Both 110° , so congruent. By the Converse of the Alternate Exterior Angles Theorem, $m \parallel n$. → Answer: Yes — Converse of Alt. Ext. $\angle$ s Theorem

2. $\angle 3$ and $\angle 5$ are alternate interior angles. Both 75° , so congruent. By the Converse of the Alternate Interior Angles Theorem, $m \parallel n$. → Answer: Yes — Converse of Alt. Int. $\angle$ s Theorem

3. $\angle 3$ and $\angle 6$ are co-interior angles. $80^\circ + 100^\circ = 180^\circ$. By the Converse of the Co-Interior Angles Theorem, $m \parallel n$. → Answer: Yes — Converse of Co-Int. $\angle$ s Theorem

4. $\angle 2$ and $\angle 6$ are corresponding angles. $95^\circ \neq 85^\circ$. The converse condition fails. → Answer: No — Corresponding angles are not congruent

5. $\angle 4$ and $\angle 6$ are alternate interior angles. Both 105° , so congruent. → Answer: Yes — Converse of Alt. Int. $\angle$ s Theorem

6. $\angle 1$ and $\angle 5$ are corresponding angles. Both 140° , so congruent. → Answer: Yes — Converse of Corresponding Angles Theorem

7. $\angle 2$ and $\angle 7$ are alternate exterior angles. Both 60° , so congruent. → Answer: Yes — Converse of Alt. Ext. $\angle$ s Theorem

8. $\angle 3$ and $\angle 6$ are co-interior angles. $120^\circ + 130^\circ = 250^\circ$, not 180° . → Answer: No — Co-Int. angles are not supplementary

9. $\angle 4$ and $\angle 5$ are co-interior angles. $89^\circ + 91^\circ = 180^\circ$. → Answer: Yes — Converse of Co-Int. $\angle$ s Theorem

10. $\angle 1$ and $\angle 8$ are alternate exterior angles. Both 50° , so congruent. → Answer: Yes — Converse of Alt. Ext. $\angle$ s Theorem

11. $\angle 3$ and $\angle 5$ are alternate interior angles. $135^\circ \neq 55^\circ$. → Answer: No — Alt. Int. angles are not congruent

12. $\angle 2$ and $\angle 6$ are corresponding angles. Both 112° , so congruent. → Answer: Yes — Converse of Corresponding Angles Theorem

13. $\angle 4$ and $\angle 5$ are co-interior angles. $72^\circ + 108^\circ = 180^\circ$. → Answer: Yes — Converse of Co-Int. $\angle$ s Theorem

14. $\angle 1$ and $\angle 5$ are corresponding angles. $65^\circ \neq 75^\circ$. → Answer: No — Corresponding angles are not congruent

15. $\angle 3$ and $\angle 6$ are co-interior angles. $90^\circ + 90^\circ = 180^\circ$. → Answer: Yes — Converse of Co-Int. $\angle$ s Theorem

Triangle Angle Sum & Exterior Angle Drill

CCSS.MATH.CONTENT.8.G.A.5

Find the value of x (and any indicated angle measures). Show all algebraic steps. Problems 1–10 use the Triangle Angle Sum Theorem; problems 11–20 use the Exterior Angle Theorem.

1. $m\angle A = 50^\circ$, $m\angle B = 60^\circ$, $m\angle C = (2x)^\circ$.
Find x .

2. $m\angle A = 40^\circ$, $m\angle B = (2x)^\circ$, $m\angle C = 60^\circ$.
Find x .

3. $m\angle A = x^\circ$, $m\angle B = x^\circ$, $m\angle C = 90^\circ$. Find x .

4. $m\angle A = (3x)^\circ$, $m\angle B = (2x)^\circ$, $m\angle C = 40^\circ$.
Find x .

5. $m\angle A = x^\circ$, $m\angle B = (x + 10)^\circ$, $m\angle C = (x + 20)^\circ$. Find x and all angles.

6. $m\angle A = (4x)^\circ$, $m\angle B = x^\circ$, $m\angle C = (5x)^\circ$.
Find x and all angles.

7. $m\angle A = (3x + 10)^\circ$, $m\angle B = (2x + 20)^\circ$,
 $m\angle C = 50^\circ$. Find x and $m\angle A$.

8. $m\angle A = (6x)^\circ$, $m\angle B = (3x - 10)^\circ$, $m\angle C = 40^\circ$. Find x and $m\angle B$.

9. Isosceles $\triangle$: $m\angle A = (x + 20)^\circ$, $m\angle B = (x + 20)^\circ$, $m\angle C = (3x)^\circ$. Find x .

10. $m\angle A = x^\circ$, $m\angle B = (2x)^\circ$, $m\angle C = (3x - 12)^\circ$. Find x and $m\angle C$.

11. Ext $\angle D$ at $B = 120^\circ$. Remote $m\angle A = 40^\circ$, Remote $m\angle C = (x)^\circ$. Find x .

12. Ext $\angle D$ at $B = (5x)^\circ$. Remote $m\angle A = (2x)^\circ$, Remote $m\angle C = 30^\circ$. Find x .

13. Ext $\angle D$ at $C = (3x + 10)^\circ$. Remote $m\angle A = x^\circ$, Remote $m\angle B = 40^\circ$. Find x .

14. Ext $\angle D$ at $A = (6x)^\circ$. Remote $m\angle B = (2x + 10)^\circ$, Remote $m\angle C = 30^\circ$. Find x .

15. Ext $\angle D$ at $C = (4x + 5)^\circ$. Remote $m\angle A = x^\circ$, Remote $m\angle B = (2x + 15)^\circ$. Find x .

16. Ext $\angle D$ at $B = (7x)^\circ$. Remote $m\angle A = (x + 20)^\circ$, Remote $m\angle C = 40^\circ$. Find x .

17. Ext $\angle D$ at $A = (2x + 15)^\circ$. Remote $m\angle B = x^\circ$, Remote $m\angle C = 35^\circ$. Find x .

18. Ext $\angle D$ at $B = (5x)^\circ$. Remote $m\angle A = (3x + 5)^\circ$, Remote $m\angle C = 15^\circ$. Find x .

19. Ext $\angle D$ at $C = (8x + 2)^\circ$. Remote $m\angle A = (4x + 10)^\circ$, Remote $m\angle B = 26^\circ$. Find x .

20. Ext $\angle D$ at $A = (9x)^\circ$. Remote $m\angle B = 3(x + 10)^\circ$, Remote $m\angle C = (4x)^\circ$. Find x .

AA Similarity Activity

CCSS.MATH.CONTENT.8.G.A.5

Problems 1-5: Determine if the triangles are similar. Problems 6-8: Find the missing angle measure needed to prove similarity. Problems 9-15: Use proportions to find the missing side length.

1. $\triangle ABC$: $\angle A = 50^\circ$, $\angle B = 40^\circ$. $\triangle DEF$: $\angle D = 50^\circ$, $\angle E = 90^\circ$. Similar?

3. $\triangle MNO$: $\angle M = 60^\circ$, $\angle N = 60^\circ$. $\triangle PQR$: $\angle P = 60^\circ$, $\angle R = 60^\circ$. Similar?

5. $\triangle YZA$: $\angle Y = 15^\circ$, $\angle Z = 85^\circ$. $\triangle BCD$: $\angle B = 80^\circ$, $\angle C = 15^\circ$. Similar?

7. $\triangle KLM$: $\angle K = 20^\circ$, $\angle L = 90^\circ$. $\triangle NOP$: $\angle N = 90^\circ$, $\angle O = 70^\circ$. Find $m\angle M$.

9. $\triangle ABC \sim \triangle DEF$. $AB = 6$, $DE = 9$, $BC = 8$. Find EF .

11. $\triangle MNO \sim \triangle PQR$. $MN = 4$, $NO = 10$, $PQ = 6$. Find QR .

13. $\triangle YZA \sim \triangle BCD$. $YZ = 9$, $ZA = x$, $BC = 12$, $CD = 16$. Find x .

15. $\triangle KLM \sim \triangle NOP$. $KL = 2.5$, $LM = 4$, $NO = 10$. Find OP .

2. $\triangle GHI$: $\angle G = 30^\circ$, $\angle H = 70^\circ$. $\triangle JKL$: $\angle J = 30^\circ$, $\angle K = 80^\circ$. Similar?

4. $\triangle STU$: Right $\triangle$, acute $\angle S = 35^\circ$. $\triangle VWX$: Right $\triangle$, acute $\angle V = 55^\circ$. Similar?

6. $\triangle EFG$: $\angle E = 45^\circ$, $\angle F = 65^\circ$. $\triangle HIJ$: $\angle H = 45^\circ$, $\angle I = x^\circ$. Find x so $\triangle s$ are similar.

8. $\triangle QRS$: $\angle Q = 3x^\circ$, $\angle R = x^\circ$. $\triangle TUV$: $\angle T = 60^\circ$, $\angle U = 20^\circ$. Find x .

10. $\triangle GHI \sim \triangle JKL$. $GH = 5$, $HI = 7$, $JK = 15$. Find KL .

12. $\triangle STU \sim \triangle VWX$. $ST = 12$, $TU = 15$, $VW = 8$. Find WX .

14. $\triangle EFG \sim \triangle HIJ$. $EF = 3$, $FG = 5$, $HI = 7.5$. Find IJ .

Unit Quiz

CCSS.MATH.CONTENT.8.G.A.5

This 10-question quiz serves as a mid-unit checkpoint. Allow approximately 20 minutes. Show all algebraic work for full credit.

1. Name the angle pair relationship between $\angle 3$ and $\angle 5$ when lines m and n are parallel.

Answer: _____

2. If $m \parallel n$ and $m\angle 1 = 80^\circ$, find $m\angle 5$.

Answer: _____

3. If $m \parallel n$ and $m\angle 3 = 110^\circ$, find $m\angle 6$.

Answer: _____

4. Solve for x : $m \parallel n$, $m\angle 1 = (3x)^\circ$, $m\angle 5 = (2x + 15)^\circ$.

Answer: _____

5. Are lines m and n parallel if $m\angle 3 = 85^\circ$ and $m\angle 5 = 85^\circ$? State the theorem.

Answer: _____

6. In a triangle, two angles measure 50° and 60° . What is the measure of the third angle?

Answer: _____

7. An exterior angle of a triangle measures 120° . One remote interior angle is 40° . Find the other remote interior angle.

Answer: _____

8. Solve for x : A triangle has angles measuring x° , $2x^\circ$, and $3x^\circ$.

Answer: _____

9. What does the AA Similarity Theorem state?

Answer: _____

10. $\triangle ABC \sim \triangle DEF$. If $AB = 4$, $DE = 8$, and $BC = 6$, find EF .

Answer: _____

GET THE FULL UNIT

49 Pages • 4 Topics • 100+ Problems • Full Solutions

WHAT'S INSIDE THE FULL UNIT

TOPIC 1

Angle Pairs & Transversal Vocabulary

- 8 angle pair types + theorems
- 3 worked examples + Your Turn
- 40-problem drill + solutions

TOPIC 2

Proving Lines Are Parallel

- 4 converse theorems + proofs
- 2 worked examples
- 25-problem drill + solutions

+ **Glossary** + **Quiz** + **Unit Test** + **Answer Key** + **Extension Challenges**

TOPIC 3

Triangle Angle Sum & Exterior Angle

- Formal proof with parallel lines
- 3 worked examples
- 20-problem drill + solutions

TOPIC 4

AA Similarity & Indirect Measurement

- AA theorem + visual proof
- 15 AA activity + 10 real-world
- Full solutions for every problem

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