TOPIC OVERVIEW

Topic C — Angle Relationships

Triangle Sum, Exterior Angles, and Parallel Lines





This overview guide contains...

The topic calendar — every objective and scheduled assessment across this part of the unit

Vocabulary — the terms you must build into your artifacts

Check Your Understanding problem sets — an extra tool to monitor your progress. Completing all questions is not required, but a guide kept up with, completed in full, and turned in at the end of the quarter raises your Standards Mastery Check score by **5%**. Answer keys for every question are posted on the class website.

Since this guide contains so much foundational information vital to success in this course, it is **essential** to keep up with it. It's THE **most important document** needed for success.

Topic Calendar

Monday, September 14th – Friday, September 18th

ARTIFACT 8 · Triangle Sum Theorem

ARTIFACT 9 · Exterior Angle Theorem

WEEK 6 **SEPTEMBER 14–18**

BLOCK 1

MON–TUE, SEP 14–15

I can complete a statement that describes an angle relationship when given a partially labeled diagram and three labeled diagrams of an angle relationship. **8.8D**

I can determine missing angle measures when given a partially labeled diagram. **8.8D**

ARTIFACT 10 · Parallel Lines and Transversals

BLOCK 2

WED–THU, SEP 16–17

Block 1 objectives, continued. **8.8D**

Public Presentation · Improve Dallas

preparation introduced Wed–Thu, Sep 16–17 · presentations due Friday, Sep 25

Unit 1 Mid-Unit Assessment · all TEKS to date (8.10A–D, 8.3A–C)

Friday, Sep 18 · revisions due Tuesday, Sep 29 · also this day: Q1 Mathematical Process, Weeks 4–6

AFTER THE TOPIC

Performance Task 1.3 revisions due Tuesday, Sep 22

Performance Task 1.4 · Angle Relationships

in class Wed–Thu, Sep 23–24 · revisions due Wednesday, Oct 7

Vocabulary

All of these terms must be eventually added to at least one artifact (Artifact 8, 9, and/or 10!)

angle	two rays sharing an endpoint (the vertex); measured in degrees
vertex	the common endpoint of the two rays of an angle
degree	the unit for measuring angles; a full turn is $360°$
right angle	an angle that measures exactly $90°$ (shown by a small square)
straight angle	an angle that measures $180°$ (a straight line)
adjacent angles	two angles that share a vertex and a side but do not overlap
complementary angles	two angles whose measures add to $90°$
supplementary angles	two angles whose measures add to $180°$
linear pair	two adjacent angles whose outer sides form a straight line; they are supplementary
vertical angles	the opposite angles formed by two intersecting lines; they are equal
congruent angles	angles with equal measure
interior angle	an angle inside a triangle
triangle sum theorem	the three interior angles of any triangle add to $180°$
exterior angle	the angle formed outside a triangle when one side is extended
remote interior angles	the two interior angles not next to a given exterior angle
exterior angle theorem	an exterior angle equals the sum of its two remote interior angles
isosceles triangle	a triangle with two equal sides and two equal base angles
parallel lines	lines in the same plane that never meet (marked with arrows)

transversal	a line that crosses two or more other lines
corresponding angles	angles in the same position at each crossing; equal when the lines are parallel
alternate interior angles	angles between the two lines, on opposite sides of the transversal; equal when parallel
same-side interior angles	angles between the two lines, on the same side of the transversal; supplementary when parallel
similar triangles	triangles with equal corresponding angles and proportional sides (symbol $\sim$)
angle-angle (AA) criterion	if two angles of one triangle equal two angles of another, the triangles are similar

Check Your Understanding

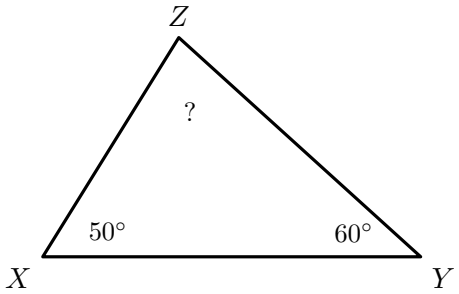
Topic C – Angle Relationships

Triangle Sum, Exterior Angles, and Parallel Lines

Questions 1-9 cover Artifact 8 (Triangle Sum Theorem)

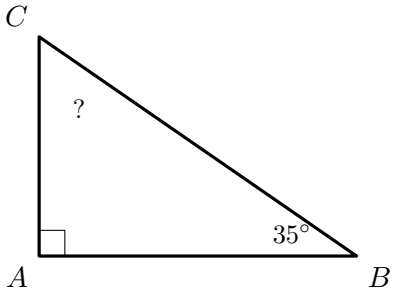
1. State the **triangle sum theorem**, and in one sentence explain what it lets you find.

2. Find the unknown angle in each triangle. Show the sum you used.



Find the measure of angle Z.

3. A right triangle is shown.

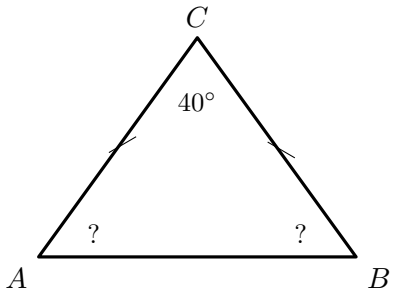


Find the measure of angle C. State how the right angle helps.

4. The interior angles of a triangle measure $(2x)^\circ$, $(3x)^\circ$, and 80°. Write an equation for the angle sum, solve for x, and find all three angle measures.

5. The three interior angles of a triangle measure x°, $(x+20)^\circ$, and $(x+40)^\circ$. Write an equation, solve for x, and find each angle.

6. An isosceles triangle has the apex angle and two equal base angles shown.



The two base angles are equal. Find the measure of each base angle. Show your reasoning.

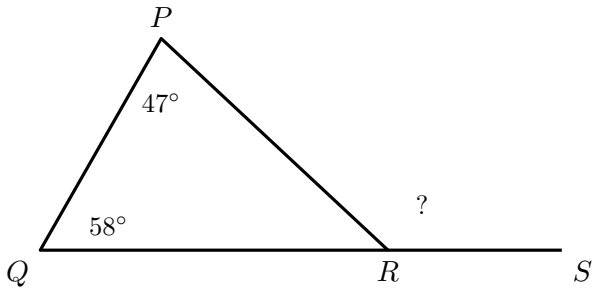
7. In an isosceles triangle, each base angle measures $(2x)^\circ$ and the apex angle measures $(x+20)^\circ$. Write an equation for the angle sum, solve for x, and find all three angles.

8. The interior angles of a triangle measure x°, $(2x-10)^\circ$, and $(x+30)^\circ$. Write an equation, solve for x, and find each angle.

9. A student claims a triangle can have two right angles. Use the triangle sum theorem to explain why this is impossible.

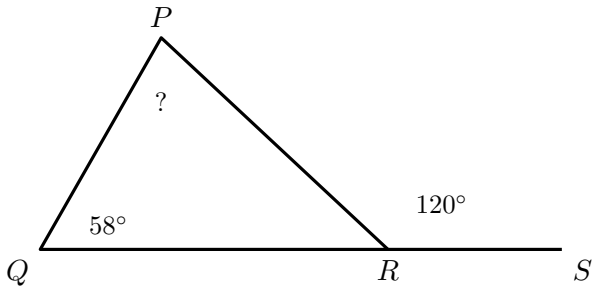
Questions 10-18 cover Artifact 9 (Exterior Angle Theorem)

10. Side QR of triangle PQR is extended to S. Find the exterior angle marked ? using only the two remote interior angles, and name the relationship you used.



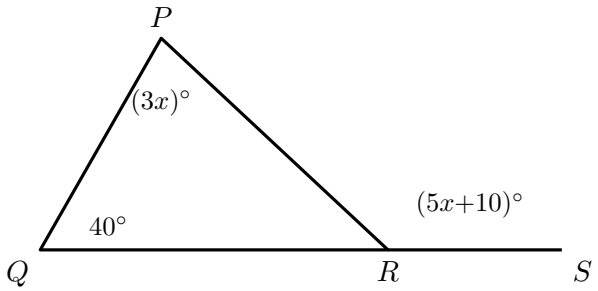
Find the exterior angle at R.

11. In triangle PQR, side QR is extended to S. The exterior angle at R is $120°$ and one remote interior angle is $58°$.



Find the remote interior angle at P.

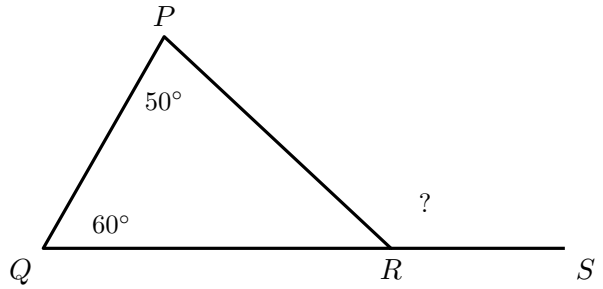
12. An exterior angle of a triangle measures $(5x + 10)°$. Its two remote interior angles measure $(3x)°$ and $40°$.



Write an equation using the exterior angle theorem, solve for x, and find the exterior angle.

13. An exterior angle of a triangle measures $140°$, and its two remote interior angles measure $(4x)°$ and $(3x)°$. Write an equation, solve for x, and find both remote interior angles.

14. Side QR of triangle PQR is extended to S, with the two remote interior angles shown.



Find the *interior* angle of the triangle at R two ways: once using the three interior angles, and once using the exterior angle. Show both give the same measure.

15. An exterior angle of a triangle measures 130°, and one of its remote interior angles measures 70°. Find the other remote interior angle, and find the interior angle of the triangle next to the exterior angle.

16. At vertex R of a triangle, the interior angle measures $(4x)°$ and the exterior angle (along the extended side) measures $(5x)°$. Write an equation using the fact that they form a **linear pair**, solve for x, and find the interior angle at R.

17. Which equation correctly represents the exterior angle theorem for a triangle whose exterior angle is e and whose two remote interior angles are a and b?

    (A) $e = a + b$

    (B) $e = a - b$

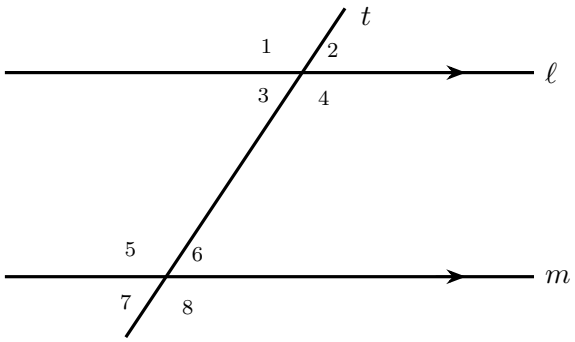
    (C) $e = 180 - a - b$

    (D) $a + b + e = 180$

18. Explain why the exterior angle theorem must be true. Use the idea that an exterior angle and the interior angle next to it form a straight angle (180°), together with the triangle sum theorem.

Questions 19-27 cover Artifact 10 (Parallel Lines and Transversals)

19. Lines ℓ and m are parallel and line t is a transversal. The eight angles are numbered. You are told that $\angle 1 = 110°$.



Find $\angle 2$, $\angle 4$, and $\angle 5$. For each one, name its relationship to $\angle 1$.

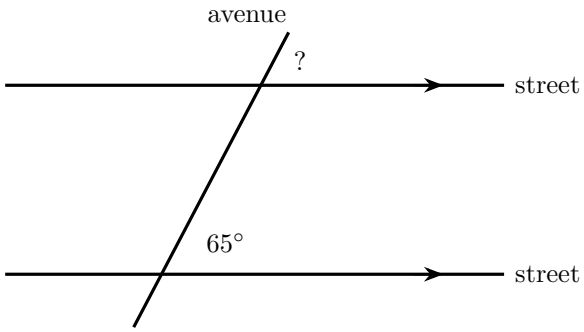
20. Lines ℓ and m are parallel and t is a transversal, with angles numbered as above. Complete the statement: $\angle 3$ and $\angle 5$ are which type of angle pair?
    (A) corresponding angles
    (B) alternate interior angles
    (C) same-side interior angles
    (D) vertical angles

21. Two parallel lines are cut by a transversal. A pair of **corresponding** angles measure $(3x)°$ and $(2x + 30)°$. Write an equation, solve for x, and find the measure of the angle.

22. Two parallel lines are cut by a transversal. A pair of **same-side interior** angles measure $(2x)°$ and $(3x + 20)°$. Write an equation, solve for x, and find both angle measures.

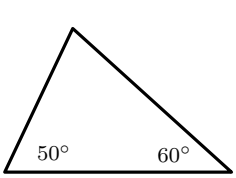
23. Two parallel lines are cut by a transversal. A pair of **alternate interior** angles measure $(4x - 10)°$ and $(3x + 20)°$. Write an equation, solve for x, and find the measure of the angle.

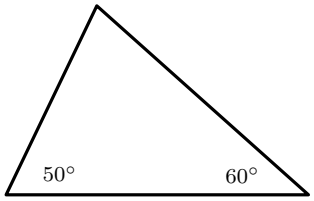
24. A straight avenue crosses two parallel streets, making a 65° angle at the lower street, as shown.



Find the angle marked ? at the upper street and name its relationship to the 65° angle.

25. Two triangles each have angles measuring 50° and 60°, as marked.





Find the third angle of each triangle. Then explain why the two triangles must be **similar**, naming the criterion you used.

26. Two triangles are similar by the angle-angle (AA) criterion. In the smaller triangle, the two shorter sides measure 3 and 4. In the larger triangle, the side corresponding to the side of length 3 measures 9. Write a proportion and solve for the length of the side corresponding to the side of length 4.

27. Explain why a straight transversal crosses every parallel line at the same angle. Use corresponding angles in your explanation.