

Angle Relationships in Triangles and Parallel Lines

Grade 8 math · Worksheet · Standards: 8.G.A.5

Name: _____ Date: _____ Class: _____

These problems apply the triangle angle sum, the exterior angle theorem, and the angle pairs made by parallel lines and a transversal (standard 8.G.A.5). Early problems ask for one missing angle; later ones set up equations and justify each step.

Mark each known angle on a sketch and name the relationship before solving.

Standards: 8.G.A.5 · **Level:** Grade 8

Problem 1 Third angle (easy)

A triangle has angles of 48° and 73° . Find the third angle.

Problem 2 Right triangle (easy)

One acute angle of a right triangle is 37° . Find the other acute angle.

Problem 3 Isosceles apex (easy)

An isosceles triangle has a vertex angle of 40° . Find each base angle.

Problem 4 Exterior angle (easy)

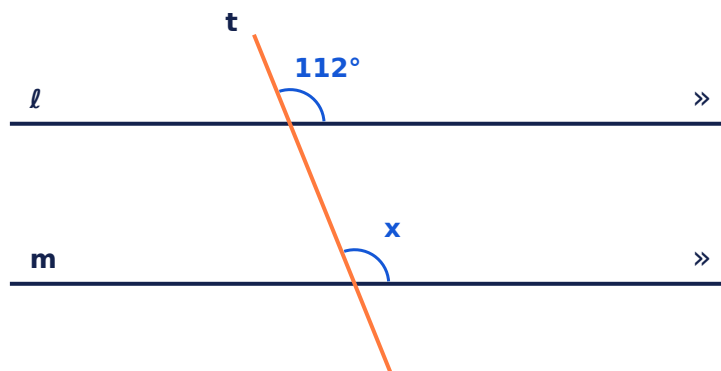
The remote interior angles of a triangle measure 52° and 64° . Find the exterior angle at the third vertex.

Problem 5 Vertical and adjacent (easy)

Two lines cross. One angle measures 128° . Find the vertical angle and the angle adjacent to it.

Problem 6 Corresponding angles (medium)

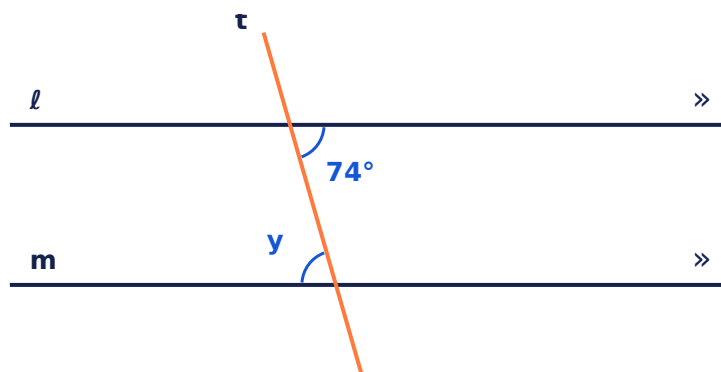
In the figure, $\ell \parallel m$. Find x and name the angle relationship.



Parallel lines cut by a transversal.

Problem 7 Alternate interior (medium)

In the figure, $\ell \parallel m$. Find y .



Parallel lines cut by a transversal.

Problem 8 Same-side interior (medium)

Two parallel fence rails are crossed by a brace. A same-side interior angle measures 143° . Find the other one.

Problem 9 Triangle with x (medium)

The angles of a triangle measure $(x + 10)^\circ$, $(2x - 5)^\circ$, and $(3x + 13)^\circ$. Find x and each angle.

Problem 10 Exterior with x (medium)

An exterior angle of a triangle measures $(5x - 12)^\circ$. The remote interior angles measure $(x + 20)^\circ$ and $(2x + 10)^\circ$. Find x and the exterior angle.

Problem 11 Parallel with x (medium)

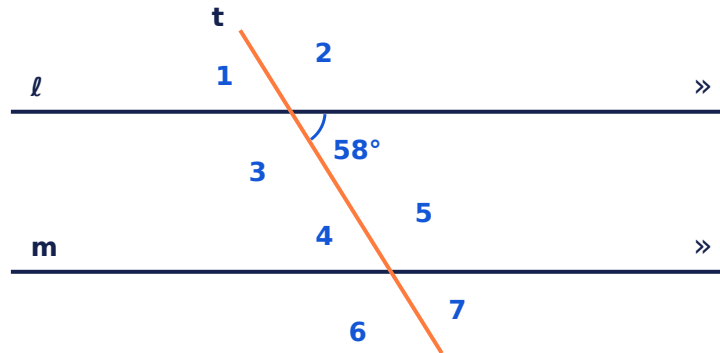
A transversal crosses two parallel lines, and a pair of corresponding angles measures $(3x + 8)^\circ$ and $(5x - 22)^\circ$. Find x and the angle measure.

Problem 12 Same-side with x (medium)

A transversal crosses two parallel lines, and the same-side interior angles measure $(7x - 5)^\circ$ and $(3x + 15)^\circ$. Find x and both angles.

Problem 13 All eight angles (medium)

In the figure, $\ell \parallel m$. Find the measure of each numbered angle.



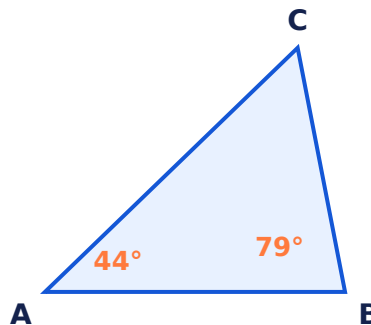
$\ell \parallel m$; the lower right angle at the top intersection is 58° .

Problem 14 Parallel or not? (medium)

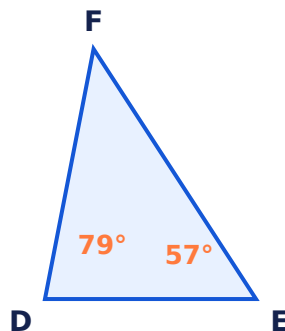
Decide whether lines ℓ and m must be parallel. (a) A transversal makes corresponding angles of 67° and 69° . (b) A transversal makes alternate interior angles of 81° and 81° . Explain each answer.

Problem 15 AA similarity (hard)

Triangle ABC has angles of 44° and 79° . Triangle DEF has angles of 79° and 57° . Are the triangles similar? Justify your answer.



$\triangle ABC$.



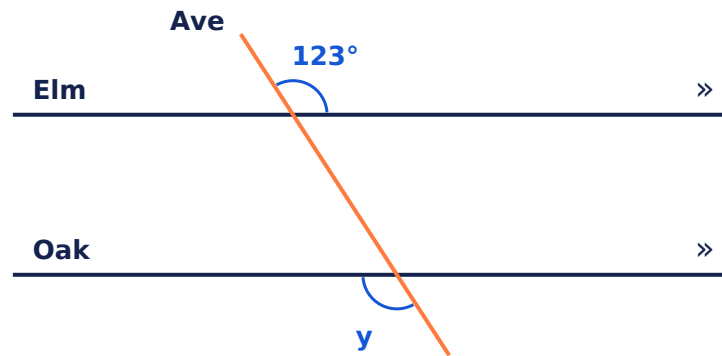
$\triangle DEF$.

Problem 16 Roof truss (medium)

A roof truss is an isosceles triangle with a 104° angle at the peak. Find each base angle where the truss meets the wall plate.

Problem 17 Parallel streets (hard)

Elm Street and Oak Street are parallel, and a straight avenue crosses both. At Elm Street, the angle between the avenue and the street on the upper right measures 123° . Find the angle y on the lower left at Oak Street, and explain your reasoning.



Two parallel streets cut by an avenue.

Problem 18 Garden angles (hard)

The angles of a triangular garden are in the ratio 3 : 4 : 5. Find each angle.

Problem 19 Find the interior angle (hard)

In $\triangle ABC$, $\angle A = (2x + 3)^\circ$ and $\angle B = (3x - 7)^\circ$. The exterior angle at C measures $(7x - 20)^\circ$. Find x and the interior angle at C.

Problem 20 Why 180? (hard)

A line through vertex B of $\triangle ABC$ is drawn parallel to side AC. The angles it makes with BA and BC measure 47° and 68° , and they are alternate interior angles with $\angle A$ and $\angle C$. Find $\angle ABC$ and explain why the three angles of the triangle total 180° .