Angles in Triangles and Parallel Lines

Models and mappings

Name _____ **Date** _____ **Score** _____ / 10

QUICK REVIEW

A triangle has angle sum 180°. An exterior angle equals the sum of the two remote interior angles and forms a 180° linear pair with the adjacent interior angle. For parallel lines cut by a transversal, corresponding and alternate interior angles are equal; same-side interior angles sum to 180°. State the relationship before substituting the given measures.

Worked example

A triangle has angles 48° and 67°. Find the third angle and its adjacent exterior angle.

1. The two known interior angles total $48^\circ + 67^\circ = 115^\circ$.
2. The third is $180^\circ - 115^\circ = 65^\circ$. Its adjacent exterior angle is $180^\circ - 65^\circ = 115^\circ$.
3. The exterior also equals the remote-angle sum $48^\circ + 67^\circ = 115^\circ$, checking both results.
Answer: 65° and 115°

Practice Problems

Show your thinking.

1. A triangle has angles $42^\circ, 73^\circ, x^\circ$. Find x.

2. A right triangle has one acute angle 28°. Find its other acute angle.

3. An isosceles triangle has vertex angle 46°. Find each equal base angle.

4. The remote interior angles of a triangle are 39° and 58°. Find the exterior angle.

5. Two parallel lines are cut by a transversal. One angle is 112°. Find its corresponding angle.

6. Alternate interior angles on parallel lines are 64° and $(3x + 4)^\circ$. Find x.

7. Same-side interior angles on parallel lines are 117° and y°. Find y.

8. A triangle has angles $x^\circ, 2x^\circ, 3x^\circ$. Find all three.

9. An exterior angle is 128° and one remote interior angle is 47°. Find the other remote angle.

10. A triangle has a 110° angle and two equal angles. Find an exterior angle at either equal-angle vertex.

Answer Key

1. $x = 65$
2. $62°$
3. $67°$
4. $97°$
5. $112°$
6. $x = 20$
7. $y = 63$
8. $30°, 60°, 90°$
9. $81°$
10. $145°$

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The known angles total $42 + 73 = 115$ degrees.
2. Use the triangle sum: $x = 180 - 115 = 65$ degrees.
3. The check $42 + 73 + 65 = 180$ confirms that the missing interior angle is $65°$.

Problem 2

1. The right angle contributes $90°$, leaving $180 - 90 = 90$ degrees for both acute angles.
2. The missing angle is $90 - 28 = 62$ degrees.
3. Check $90 + 28 + 62 = 180$; the second angle is acute as required.

Problem 3

1. The two equal angles together measure $180 - 46 = 134$ degrees.
2. Each base angle is $134/2 = 67$ degrees.
3. The total $46 + 67 + 67 = 180$ checks the isosceles triangle; the vertex angle is not divided by two.

Problem 4

1. The exterior-angle theorem gives $e = 39 + 58 = 97$ degrees.
2. The adjacent interior angle is $180 - 97 = 83$ degrees.
3. The check $39 + 58 + 83 = 180$ verifies the triangle and the exterior angle $97°$.

Problem 5

1. For parallel lines, the corresponding angle equals the given angle: $c = 112°$.
2. The angle adjacent to either one is $180 - 112 = 68$ degrees.
3. Thus the requested angle is $112°$, not its supplement $68°$; the corresponding positions matter.

Problem 6

1. Alternate interior angles are equal here, so $3x + 4 = 64$.
2. Subtract 4 and divide by 3: $3x = 60$, so $x = 20$.
3. Substitution gives $3(20) + 4 = 64$ degrees, matching the stated angle on the other parallel line.

Problem 7

1. These interior angles are supplementary: $117 + y = 180$.
2. Subtract 117 to get $y = 180 - 117 = 63$ degrees.
3. The sum $117 + 63 = 180$ checks the parallel-line relationship; equality would be the wrong relationship here.

Problem 8

1. The angle sum gives $x + 2x + 3x = 180$, or $6x = 180$.
2. Divide by 6: $x = 30$, so $2x = 60$ and $3x = 90$.
3. The measures $30 + 60 + 90 = 180$ degrees fit the required ratio $1 : 2 : 3$.

Problem 9

1. The remote angles sum to the exterior angle: $47 + r = 128$.
2. Subtract 47: $r = 128 - 47 = 81$ degrees.
3. The adjacent interior angle is $180 - 128 = 52$ degrees, and $47 + 81 + 52 = 180$ checks the result.

Problem 10

1. The equal interior angles share $180 - 110 = 70$ degrees, so each is $70/2 = 35°$.
2. The requested exterior is $180 - 35 = 145$ degrees.
3. It also equals the remote sum $110 + 35 = 145$, confirming that the exterior is at a base vertex.

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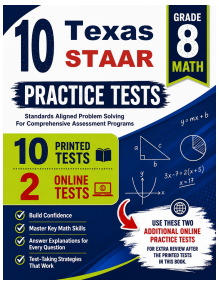

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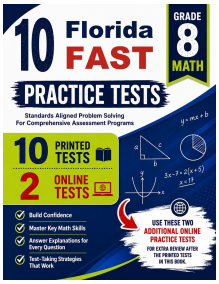

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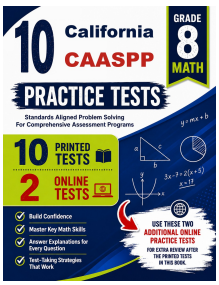

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