Angles in Triangles and Parallel Lines

Investigate mistakes and missing measures

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 student says a triangle with 55° and 68° has third angle 123°. Correct the error.

2. Can a triangle have angles $91^\circ, 48^\circ, 42^\circ$? Give a numerical reason.

3. An isosceles triangle has base angles 72°. Recover its vertex angle.

4. A triangle exterior angle is 120°. Its remote angles are $(2x + 10)^\circ$ and $(x + 20)^\circ$. Find x.

5. A student sets same-side interior angles on parallel lines equal: $x = 104$. Correct the missing angle x.

6. Corresponding angles are 82° and 79°. Can the two lines be parallel if these are exact measures?

7. Alternate interior angles on parallel lines are $(5x - 8)^\circ$ and $(3x + 22)^\circ$. Find their common measure.

8. A triangle has angles $(x + 15)^\circ, (x + 25)^\circ, 80^\circ$. Recover x.

9. A student says a 135° exterior angle makes its adjacent interior angle 135°. Correct the claim.

10. A right triangle has acute angles in ratio $2 : 3$. Recover both measures.

Answer Key

1. 57°
2. No; the sum is 181°.
3. 36°
4. $x = 30$
5. $x = 76$
6. No: $82 \neq 79$.
7. 67°
8. $x = 30$
9. 45°
10. $36^\circ, 54^\circ$

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The student found the known-angle sum $55 + 68 = 123$, not the missing angle.

2. Subtract that sum from 180: $180 - 123 = 57$ degrees.

3. The correct check is $55 + 68 + 57 = 180$; using 123 would give 246, impossible for a triangle.

Problem 2

1. Add the first two angles: $91 + 48 = 139$ degrees.

2. Adding the third gives $139 + 42 = 181$ degrees, not 180.

3. These exact measures cannot form a triangle. Keeping the first two would require $180 - 139 = 41^\circ$.

Problem 3

1. The equal base angles total $72 + 72 = 144$ degrees.

2. The remaining vertex angle is $180 - 144 = 36$ degrees.

3. The sum $72 + 72 + 36 = 180$ checks the result; the unequal vertex angle need not be obtuse.

Problem 4

1. The remote-angle sum gives $(2x + 10) + (x + 20) = 120$, so $3x + 30 = 120$.

2. Solve $3x = 90$ to get $x = 30$. The remote angles are 70° and 50°.

3. The check $70 + 50 = 120$ verifies the exterior angle; its adjacent interior is 60°.

Problem 5

1. Same-side interior angles add to 180°, so the correct equation is $x + 104 = 180$.

2. Subtract 104: $x = 76$ degrees.

3. The check $76 + 104 = 180$ works; the proposed pair $104 + 104 = 208$ does not satisfy the supplementary relationship.

Problem 6

1. Parallel lines would require corresponding measures to be equal, giving the equation $82 = 79$.

2. The difference is $82 - 79 = 3$ degrees, so that equality is false.

3. The exact mismatch $82 \neq 79$ rules out parallel lines; visual closeness is not enough to establish parallelism.

Problem 7

1. Equate the expressions: $5x - 8 = 3x + 22$, hence $2x = 30$ and $x = 15$.

2. Substitute: $5(15) - 8 = 67$ degrees and $3(15) + 22 = 67$ degrees.

3. The requested common angle is 67°, not the variable value 15. Both substitutions agree.

Problem 8

1. Add all angles: $(x + 15) + (x + 25) + 80 = 180$, so $2x + 120 = 180$.

2. Then $2x = 60$ and $x = 30$, giving angles 45° and 55°.

3. Check $45 + 55 + 80 = 180$. The variable value 30 is not itself one of the triangle angles.

Problem 9

1. The adjacent interior and exterior form a straight angle, so $i + 135 = 180$.

2. Solving gives $i = 180 - 135 = 45$ degrees.

3. The equal-angle claim would produce $135 + 135 = 270$, not a straight angle. The correct adjacent interior is 45°.

Problem 10

1. The acute angles total $180 - 90 = 90$ degrees. Write them as $2t$ and $3t$.

2. Then $5t = 90$, so $t = 18$ and the angles are $36^\circ, 54^\circ$.

3. The checks $36 + 54 = 90$ and $36/54 = 2/3$ verify both the triangle and the ratio.

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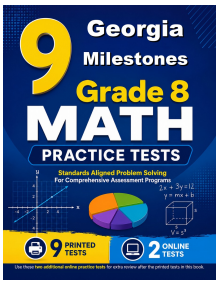

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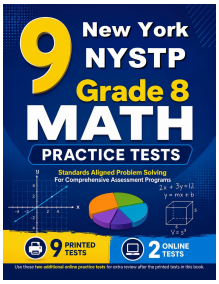

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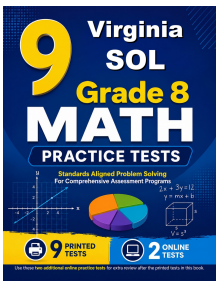

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