Angle Relationships

Investigate mistakes and missing measures

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

QUICK REVIEW

Complementary angles sum to 90°; supplementary angles sum to 180°. Vertical angles, formed by two intersecting lines, are equal. A linear pair is adjacent and supplementary. Angles around one point sum to 360°. Adjacent angles need not be equal or supplementary unless an extra condition is given. Translate the stated relationship into an equation, then check the resulting angle measures.

Worked example

Two complementary angles are $(2x+5)^\circ$ and $(x+10)^\circ$. Find both.

1. Complementary means $(2x+5)+(x+10)=90$, so $3x+15=90$.
2. Solve $3x=75$ to obtain $x=25$. The angles are $2(25)+5=55^\circ$ and $25+10=35^\circ$.
3. The check $55+35=90$ confirms the complement relationship; neither angle is the variable value 25.
Answer: $55^\circ, 35^\circ$

Practice Problems

Show your thinking.

1. A student says adjacent angles $40^\circ, 70^\circ$ must form a linear pair. Evaluate the claim.

2. The supplement of an angle is 143°. Recover the original angle and its complement.

3. Can a 108° angle have a positive complement? Justify numerically.

4. Vertical angles are $(7x-11)^\circ$ and $(4x+25)^\circ$. Find their common measure.

5. A student makes a vertical angle supplementary to 76° and writes 104°. Correct it.

6. Two supplementary angles differ by 42°. Find both.

7. Three equal angles and one 96° angle fill a point. Recover each equal angle.

8. A student says 89° and 91° are complementary because they nearly make right angles. Correct the classification.

9. A linear pair has one angle 4 times the other. Recover both.

10. Can two positive equal angles be both complementary and supplementary? Use their required values.

Answer Key

1. No; their sum is $110°$.
2. $37°$; complement $53°$.
3. No.
4. $73°$
5. $76°$
6. $69°, 111°$
7. $88°$
8. Supplementary.
9. $36°, 144°$
10. No.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The angles total $40 + 70 = 110$ degrees.

2. A linear pair must sum to $180°$, but $110 \neq 180$; the missing amount is $70°$.

3. They may be adjacent within a $110°$ whole, but adjacency does not establish opposite outer rays or a straight angle.

Problem 2

1. The original angle is $180 - 143 = 37$ degrees.

2. Its complement is $90 - 37 = 53$ degrees.

3. The checks $37 + 143 = 180$ and $37 + 53 = 90$ distinguish the two relationships and verify both requested measures.

Problem 3

1. A complement would satisfy $108 + c = 90$.

2. Solving gives $c = 90 - 108 = -18$ degrees, which is not a positive angle measure.

3. Thus there is no positive complement. The $108°$ angle does have supplement $180 - 108 = 72°$, a different relationship.

Problem 4

1. Equality gives $7x - 11 = 4x + 25$, so $3x = 36$ and $x = 12$.

2. Substitute: $7(12) - 11 = 73$ and $4(12) + 25 = 73$ degrees.

3. The requested angle is $73°$, not $12°$. Opposite positions justify the equality used in the equation.

Problem 5

1. The calculation $180 - 76 = 104$ gives an adjacent linear-pair angle.

2. The opposite vertical angle instead equals $76°$. The neighboring angles are $104°$ each.

3. The full-turn check $76 + 104 + 76 + 104 = 360$ verifies the pattern and locates the student's mistaken angle.

Problem 6

1. Let the smaller be x; the larger is $x + 42$. Then $x + (x + 42) = 180$.

2. Solve $2x = 138$ to get $x = 69$, and the larger angle is $69 + 42 = 111$.

3. The checks $69 + 111 = 180$ and $111 - 69 = 42$ verify both the sum and difference.

Problem 7

1. The equal angles share the remaining $360 - 96 = 264$ degrees.

2. Each one is $264/3 = 88$ degrees.

3. The sum $3(88) + 96 = 264 + 96 = 360$ checks the full turn. The three equal pieces do not each get $264°$.

Problem 8

1. The actual sum is $89 + 91 = 180$ degrees.

2. Complementary would require $90°$, while $180°$ is the supplementary total.

3. Thus these angles are supplementary, not complementary. Their individual closeness to $90°$ does not determine the pair relationship.

Problem 9

1. Write the smaller as x and larger as $4x$: $x + 4x = 180$.

2. Then $5x = 180$, so $x = 36$ degrees and $4x = 144$ degrees.

3. The checks $36 + 144 = 180$ and $144/36 = 4$ verify both the linear pair and the stated multiplicative comparison.

Problem 10

1. Equal complementary angles require $2x = 90$, giving $x = 45°$.

2. Equal supplementary angles require $2x = 180$, giving $x = 90°$.

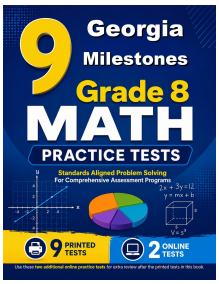
3. Because $45 \neq 90$, the same two positive equal angles cannot satisfy both sum conditions simultaneously.

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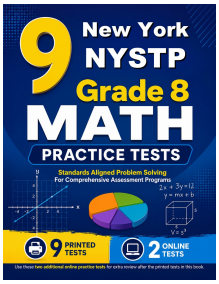
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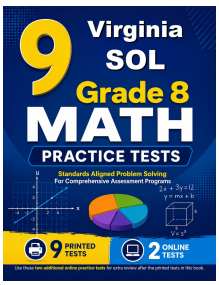
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