Angle Relationships: Supplementary, Complementary, and Vertical Angles

Explore ideas and representations

Name _____ **Date** _____ **Score** _____ / 8

QUICK REVIEW

Complementary angles sum to $90°$; supplementary angles sum to $180°$; vertical (opposite) angles are equal. Determine whether the angles add to a right angle, add to a straight angle, or lie opposite each other. Diagrams are not to scale.

Worked example

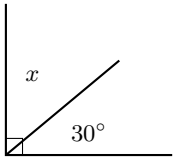
Find the supplement of $28°$.

1. Supplementary means $x + 28 = 180$.
2. $x = 180 - 28 = 152°$.
3. Check $152 + 28 = 180°$.
Answer: $152°$.

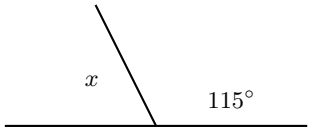
Practice Problems

Show your thinking.

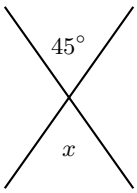
1. The marked angles are complementary. Find x and state the numerical relationship.



2. The marked angles are supplementary. Find x and state the numerical relationship.



3. The marked angles are vertical. Find x and state the numerical relationship.



4. Two complementary angles are x and $x + 40$ degrees. Write and solve an equation for both angles.

5. A straight angle is split into $(3x + 5)°$ and $82°$. Find x and the first angle.

6. Vertical angles measure $(2x + 10)°$ and $42°$. Find x and an adjacent angle.

7. Complementary angles are in ratio $2 : 3$. Find both angles.

8. Supplementary angles are $(3x + 10)°$ and $(5x + 10)°$. Find x and both angles.

Answer Key

1. $x = 60°$. The angles sum to $90°$.
2. $x = 65°$. The angles sum to $180°$.
3. $x = 45°$. The angles are equal.
4. $25°$ and $65°$.
5. $x = 31$; angle $98°$.
6. $x = 16$; adjacent angle $138°$.
7. $36°$ and $54°$.
8. $x = 20$; angles $70°, 110°$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Complementary angles sum to $90°$: $x + 30 = 90$.
2. $x = 90 - 30 = 60°$.
3. Check $60 + 30 = 90°$.

Problem 2

1. Supplementary angles sum to $180°$: $x + 115 = 180$.
2. $x = 180 - 115 = 65°$.
3. Check $65 + 115 = 180°$.

Problem 3

1. Opposite angles at the intersection are vertical, so $x = 45°$.
2. Each adjacent angle is $180 - 45 = 135°$.
3. Check around the point: $2(45) + 2(135) = 360°$.

Problem 4

1. $x + (x + 40) = 90$.
2. $2x = 90 - 40 = 50$, so $x = 25°$.
3. Other angle $25 + 40 = 65°$; check $25 + 65 = 90°$.

Problem 5

1. $3x + 5 + 82 = 180$.
2. $3x = 180 - 5 - 82 = 93$, so $x = 31$.
3. Angle $3(31) + 5 = 98°$; check $98 + 82 = 180°$.

Problem 6

1. Vertical angles are equal: $2x + 10 = 42$.
2. $x = (42 - 10)/2 = 16$.
3. Adjacent angle $180 - 42 = 138°$; all four total $2(42) + 2(138) = 360°$.

Problem 7

1. Write angles $2x, 3x$; complementary gives $2x + 3x = 90$.
2. $5x = 90$ gives $x = 18$, so angles $2(18) = 36$ and $3(18) = 54$ degrees.
3. Check $36 + 54 = 90°$ and divide both terms of $36 : 54$ by 18 to recover $2 : 3$.

Problem 8

1. Supplementary angles sum to $180°$: $3x + 10 + 5x + 10 = 180$.
2. $8x = 160$, so $x = 20$.
3. Substitute: $3(20) + 10 = 70$ and $5(20) + 10 = 110$ degrees. Check $70 + 110 = 180°$.

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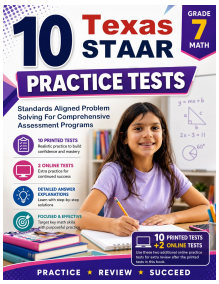

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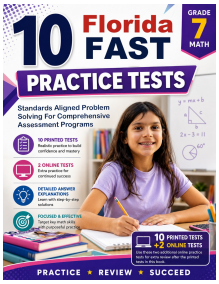

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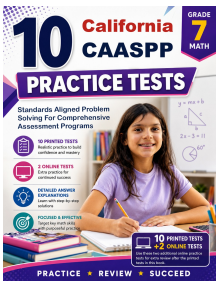

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