

## Lesson 2.2 Angle Relationships

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Lesson 2.2  
Angles

## Lesson 2.2 Angle Relationships

### Workbook pages 71-80

#### MA.912.GR.1.1

Prove relationships and theorems about lines and angles. Solve mathematical and real-world problems involving postulates, relationships and theorems of lines and angles.

#### Content Objective

Students use the properties of perpendicular lines to find the measures of angles.



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### Learn

#### Complementary and Supplementary Angles

Complementary and Supplementary Angles	
90	180
Complementary Angles	Supplementary Angles
Definition	
two angles with measures that have a sum of $90^\circ$	two angles with measures that have a sum of $180^\circ$



90

180



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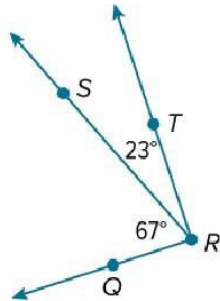


## Learn

### Complementary and Supplementary Angles

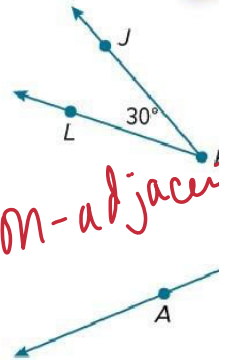
#### Examples of Complementary Angles

adjacent  
next  
to  
(share  
ray  $\overrightarrow{RS}$ )



$$m\angle QRS + m\angle SRT = 90$$

$$67 + 23 = 90$$



non-adjacent

$$m\angle JKL + m\angle ABC = 90$$

$$30 + 60 = 90$$



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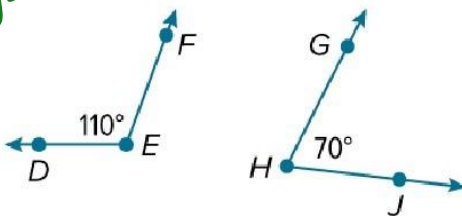
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## Learn

### Complementary and Supplementary Angles

#### Examples of Supplementary Angles

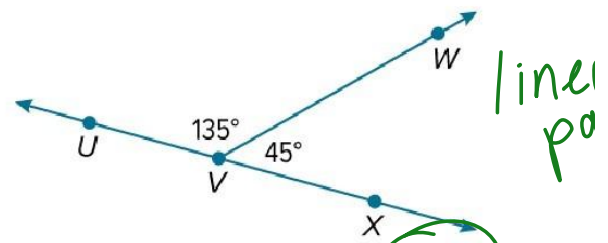
non-adjacent



$$m\angle DEF + m\angle GHJ = 180$$

$$110 + 70 = 180$$

Adjacent



linear pair

$$m\angle UVW + m\angle WVX = 180$$

$$135 + 45 = 180$$



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## Example 1

## Complementary and Supplementary Angles

Find the measures of two **complementary** angles if the measure of the **larger** angle is five more than four times the measure of the **smaller** angle.


$$4(17) + 5 = 73 + 5 = 78$$
$$4x + 5$$
$$x + 17$$
$$73 + 17 = 90^\circ$$
$$4x + 5 + 1x = 90$$
$$5x + 5 = 90$$
$$5x = 85$$
$$\frac{5x}{5} = \frac{85}{5}$$
$$x = 17^\circ$$



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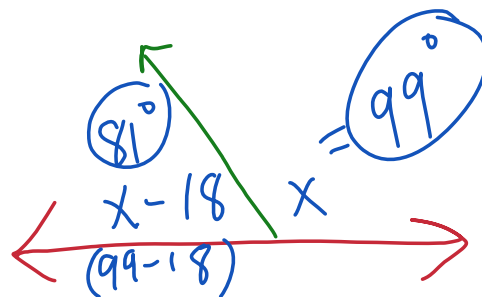
### Example 1

#### Complementary and Supplementary Angles

#### Check

The difference between the measures of two **supplementary** angles is  $18^\circ$ . Find the measure of each angle.

$$x - 18 + x = 180$$
$$2x - 18 = 180$$
$$+18 \quad +18$$
$$\hline 2x = 198$$
$$\frac{2x}{2} = \frac{198}{2}$$
$$x = 99^\circ$$



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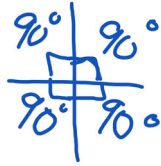


### Learn

#### Perpendicularity

Lines, segments, or rays that intersect at right angles are **perpendicular**. Segments or rays can be perpendicular to lines or other line segments and rays. The right angle symbol indicates that the lines are perpendicular.

symbol indicates that the lines are perpendicular.



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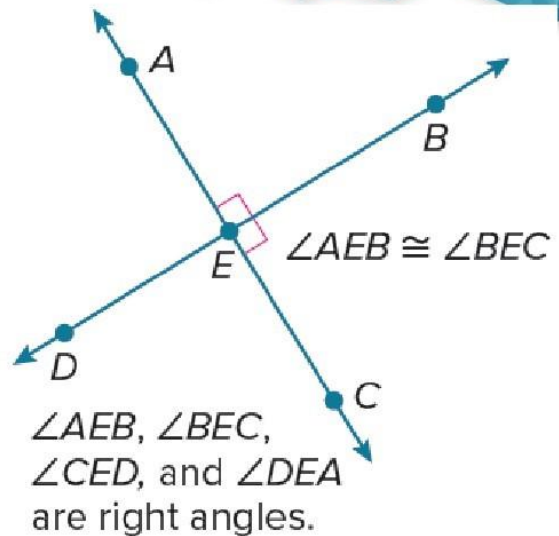


## Learn

### Perpendicularity

Perpendicular lines intersect to form Right angles

Perpendicular lines intersect to form 4 congruent adjacent angles, each 90 degrees.



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## Example 2

### Perpendicular Lines

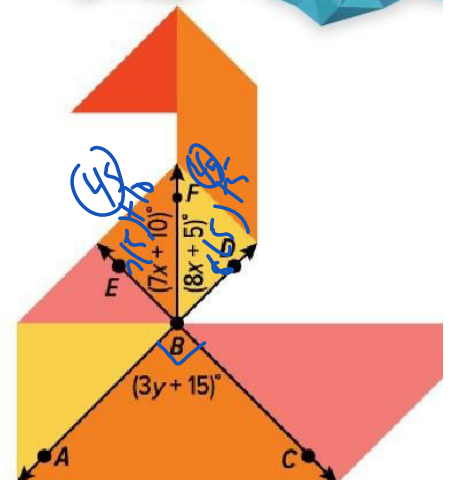
**TANGRAMS** The tangram is a puzzle consisting of eight flat shapes called *tans* which are put together to form images. Find the values of  $x$  and  $y$  such that  $\overrightarrow{AD}$  and  $\overrightarrow{EC}$  in the tangram are **perpendicular**.

Start with solving for  $x$  first.

$$7x + 10 + 8x + 5 = 90$$

$$15x + 15 = 90$$

$$\begin{array}{r} 15x + 15 = 90 \\ -15 \quad -15 \\ \hline 15x = 75 \end{array} \quad (x = 5)$$







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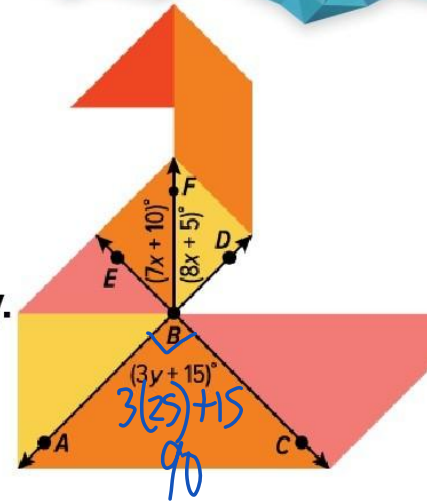


## Example 2

### Perpendicular Lines

**TANGRAMS** The tangram is a puzzle consisting of eight flat shapes called *tans* which are put together to form images. Find the values of  $x$  and  $y$  such that  $\overrightarrow{AD}$  and  $\overrightarrow{EC}$  in the tangram are perpendicular. Next solve for  $y$ .

$$\begin{array}{r} 3y + 15 = 90 \\ -15 \quad -15 \\ \hline 3y = 75 \\ \div 3 \quad \div 3 \\ \hline y = 25 \end{array}$$



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## Example 2

### Perpendicular Lines

#### Check

**DESIGN** Find the values of  $x$  and  $y$  such that  $\overrightarrow{PR}$  and  $\overrightarrow{QS}$  are perpendicular. Solve for  $x$  first.

$$\begin{array}{r} 5x + 6 + 2x = 90 \\ 7x + 6 = 90 \\ -6 \quad -6 \\ \hline 7x = 84 \\ \div 7 \quad \div 7 \\ \hline x = 12 \end{array}$$

$$5(12) + 6 = 66$$



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## Example 2

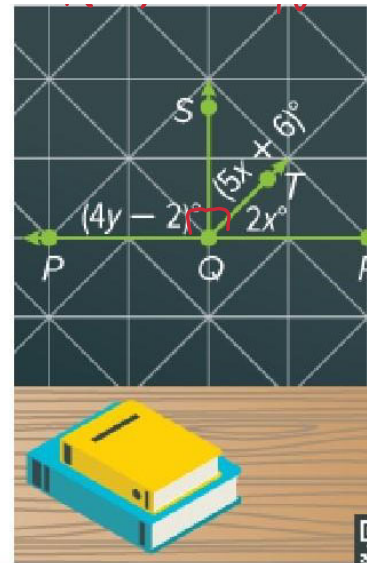
### Perpendicular Lines

#### Check

$$4(23) - 2 = 90$$

**DESIGN** Find the values of  $x$  and  $y$  such that  $\overrightarrow{PR}$  and  $\overrightarrow{QS}$  are perpendicular. Solve for  $y$  next.

$$\begin{array}{r}
 4y + 2 = 90 \\
 \hline
 4y = 88 \\
 y = 22
 \end{array}$$



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