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## Unit 7, Lesson 3: Nonadjacent Angles

Let's look at angles that are not right next to one another.

### 3.1: Finding Related Statements

Given  $a$  and  $b$  are numbers, and  $a + b = 180$ , which statements also must be true?

$$a = 180 - b$$

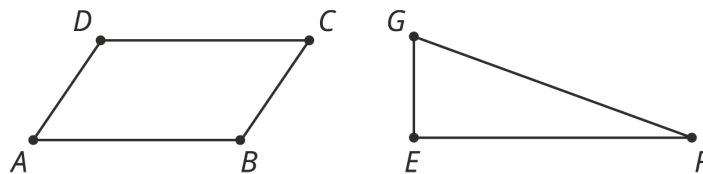
$$a - 180 = b$$

$$360 = 2a + 2b$$

$$a = 90 \text{ and } b = 90$$

### 3.2: Polygon Angles

Use any useful tools in the geometry toolkit to identify any pairs of angles in these figures that are complementary or supplementary.



### 3.3: Vertical Angles

Use a straightedge to draw two intersecting lines. Use a protractor to measure all four angles whose vertex is located at the intersection.

Compare your drawing and measurements to the people in your group. Make a conjecture about the relationships between angle measures at an intersection.

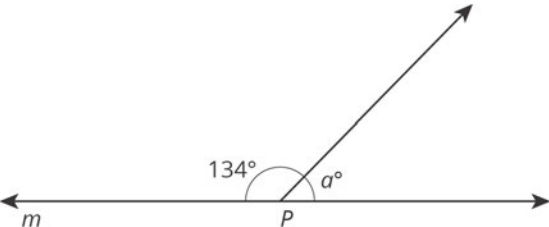
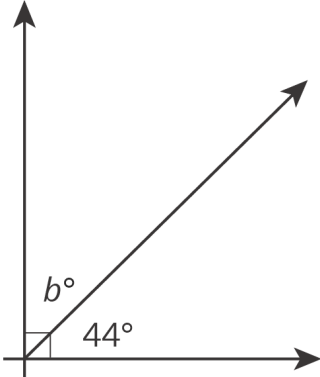
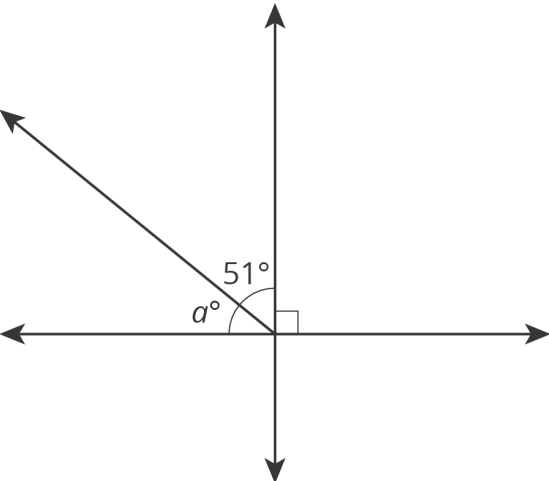
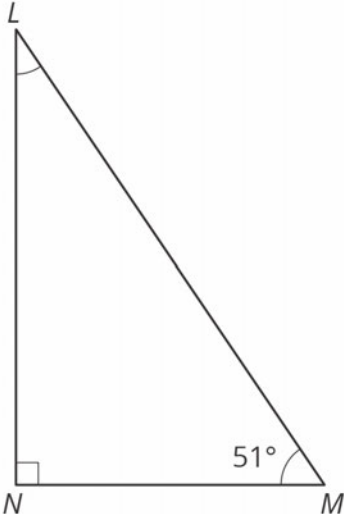
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### 3.4: Row Game: Angles

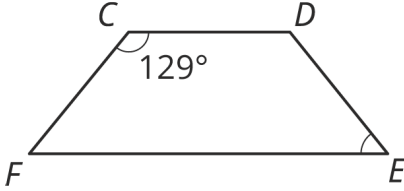
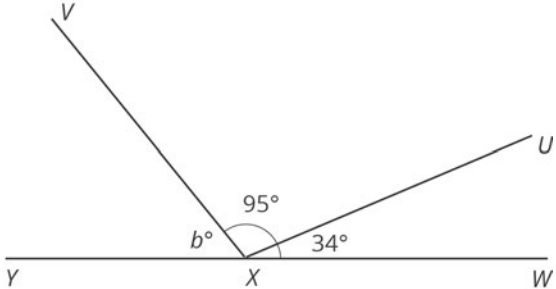
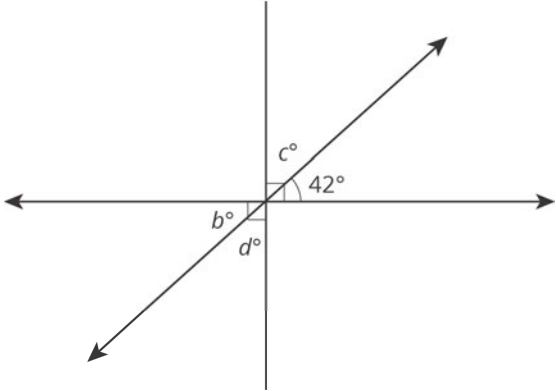
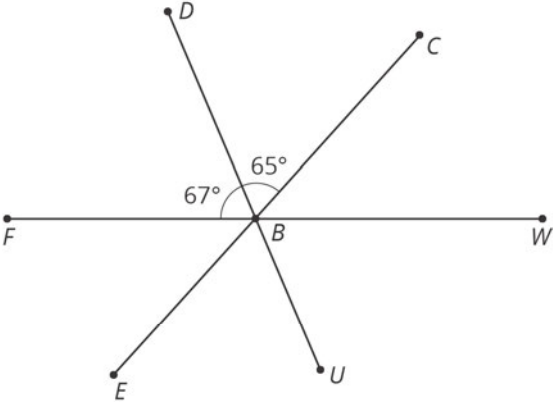
Find the measure of the angles in one column. Your partner will work on the other column. Check in with your partner after you finish each row. Your answers in each row should be the same. If your answers aren't the same, work together to find the error and correct it.

column A	column B
<p><i>P</i> is on line <i>m</i>. Find the value of <i>a</i>.</p> 	<p>Find the value of <i>b</i>.</p> 
<p>Find the value of <i>a</i>.</p> 	<p>In right triangle <i>LMN</i>, angles <i>L</i> and <i>M</i> are complementary. Find the measure of angle <i>L</i>.</p> 

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column A	column B
<p>Angle <math>C</math> and angle <math>E</math> are supplementary. Find the measure of angle <math>E</math>.</p> 	<p><math>X</math> is on line <math>WY</math>. Find the value of <math>b</math>.</p> 
<p>Find the value of <math>c</math>.</p> 	<p><math>B</math> is on line <math>FW</math>. Find the measure of angle <math>CBW</math>.</p> 
<p>Two angles are complementary. One angle measures 37 degrees. Find the measure of the other angle.</p>	<p>Two angles are supplementary. One angle measures 127 degrees. Find the measure of the other angle.</p>

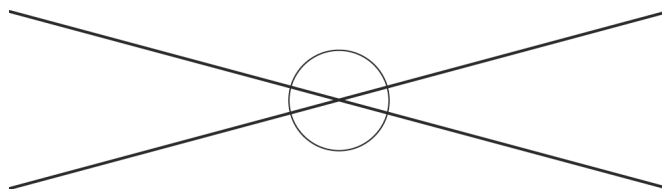
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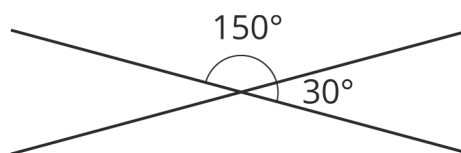
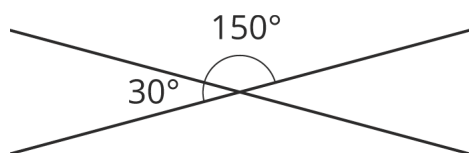
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### Lesson 3 Summary

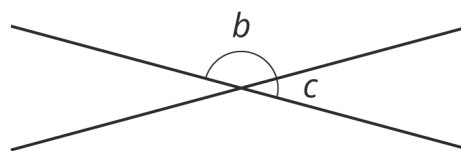
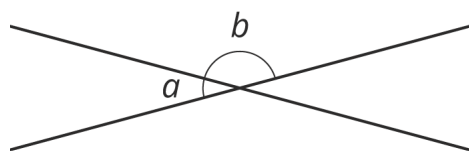
When two lines cross, they form two pairs of **vertical angles**. Vertical angles are across the intersection point from each other.



Vertical angles always have equal measure. We can see this because they are always supplementary with the same angle. For example:



This is always true!



$$a + b = 180 \text{ so } a = 180 - b.$$

$$c + b = 180 \text{ so } c = 180 - b.$$

That means  $a = c$ .

### Lesson 3 Glossary Terms

- vertical angles

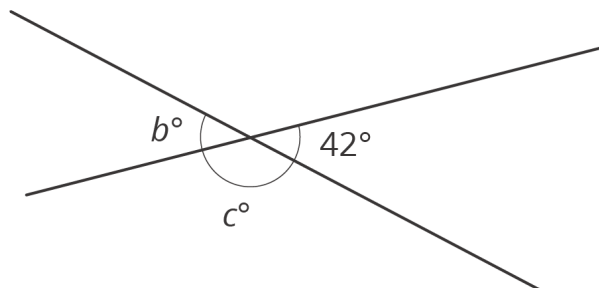
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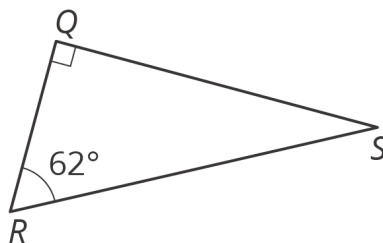
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## Unit 7, Lesson 3: Nonadjacent Angles

1. Two lines intersect. Find the value of  $b$  and  $c$ .



2. In this figure, angles  $R$  and  $S$  are complementary. Find the measure of angle  $S$ .



3. If two angles are both vertical and supplementary, can we determine the angles? Is it possible to be both vertical and complementary? If so, can you determine the angles? Explain how you know.

4. Match each expression in the first list with an equivalent expression from the second list.

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A.  $5(x + 1) - 2x + 11$

1.  $\frac{1}{4}x - 8$

B.  $2x + 2 + x + 5$

2.  $\frac{1}{2}(6x + 14)$

C.  $\frac{-3}{8}x - 9 + \frac{5}{8}x + 1$

3.  $11(9x + 4)$

D.  $2.06x - 5.53 + 4.98 - 9.02$

4.  $3x + 16$

E.  $99x + 44$

5.  $2.06x + (-5.53) + 4.98 + (-9.02)$

(from Unit 6, Lesson 22)

5. Factor each expression.

a.  $15a - 13a$

b.  $-6x - 18y$

c.  $36abc + 54ad$

(from Unit 6, Lesson 19)

6. The directors of a dance show expect many students to participate but don't yet know how many students will come. The directors need 7 students to work on the technical crew. The rest of the students work on dance routines in groups of 9. For the show to work, they need at least 6 full groups working on dance routines.

a. Write and solve an inequality to represent this situation, and graph the solution on a number line.

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b. Write a sentence to the directors about the number of students they need.

(from Unit 6, Lesson 17)

7. A small dog gets fed  $\frac{3}{4}$  cup of dog food twice a day. Using  $d$  for the number of days and  $f$  for the amount of food in cups, write an equation relating the variables. Use the equation to find how many days a large bag of dog food will last if it contains 210 cups of food.

(from Unit 2, Lesson 5)