

### Conceptual Task: Triangulating a Waterspout

SMP	
1	2 ✓
3 ✓	4
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7 ✓	8 ✓

A tornado over water is called a waterspout.

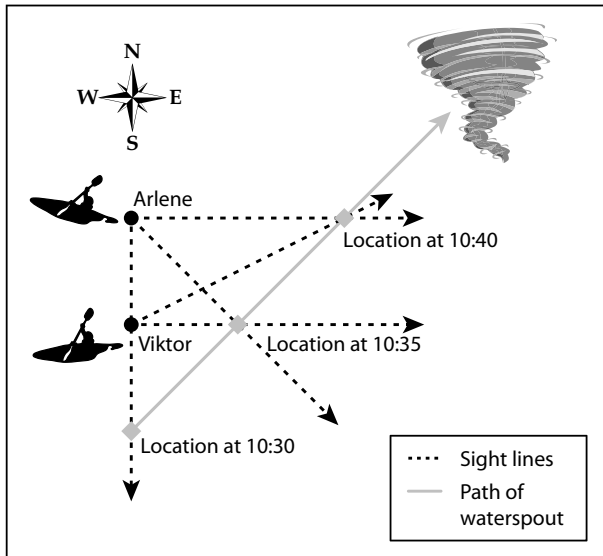
On Wednesday morning, Viktor and Arlene were out kayaking when a severe thunderstorm warning was issued. With conditions worsening, both sought shelter by anchoring in the protected coves of two small islands. The island Viktor landed on was due south of the island Arlene landed on.

- At 10:30 A.M., Viktor and Arlene reported a waterspout due south of their islands.
- At 10:35 A.M., Viktor observed the same waterspout due east of his island, while Arlene observed that it was southeast of her island.
- At 10:40 A.M., Viktor observed that the waterspout was to the northeast of his island while Arlene observed that it was due east of her island.

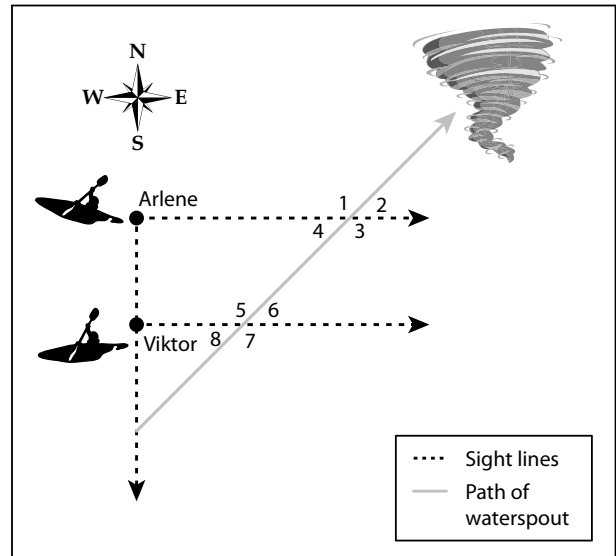
Soon after, the waterspout passed beyond the horizon and was no longer visible.

Consider the following diagrams. The one on the left shows the sight lines and locations. The one on the right is simplified, but has labeled angles.

Sight Lines and Locations



Angles



## Conceptual Task: Triangulating a Waterspout

### Exploration Questions

- a. In the angle diagram, what are the parallel lines? How do you know?
  
  
  
  
  
  
  
  
  
  
- b. In the angle diagram, what is the transversal? How do you know?
  
  
  
  
  
  
  
  
  
  
- c. There are two triangles in the sight line diagram. One is formed by Viktor, the waterspout's location at 10:30, and the waterspout's location at 10:35. The other is formed by Arlene, the waterspout's location at 10:30, and the waterspout's location at 10:40. What do you notice about these triangles?
  
  
  
  
  
  
  
  
  
  
- d. Is  $m\angle 4 \cong m\angle 8$ ? How do you know?
  
  
  
  
  
  
  
  
  
  
- e. The parallel postulate says that when a set of parallel lines is cut by a transversal, interior angles on the same side of the transversal must sum to  $180^\circ$ . For example,  $m\angle 4 + m\angle 5 = 180^\circ$ . Does this make sense if  $m\angle 4 \cong m\angle 8$ ? Defend your answer.

***continued***

Name: \_\_\_\_\_

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- f. What would happen if  $m\angle 4 + m\angle 5 \neq 180^\circ$ ? Would the lines still be parallel? How do you know? Draw an example that shows what would happen.
- g. In the angle diagram,  $\angle 1 \cong \angle 3 \cong \angle 5 \cong \angle 7$  and  $\angle 2 \cong \angle 4 \cong \angle 6 \cong \angle 8$ . What do you notice? Do you think this list will be the same for all sets of parallel lines cut by a transversal?
- h. Viktor isn't 100% sure he was facing east when he observed the waterspout the second time, but he does know the measure of  $\angle 8$ . If Arlene knows the measure of  $\angle 4$ , can they determine whether Viktor was facing east? Defend your answer.
- i. Could you tell if Viktor was facing east if you knew the measures of  $\angle 4$  and  $\angle 5$ ? Defend your answer.
- j. Are there other angle pairs that could tell you whether Viktor was facing east? Defend your answer, and give a specific example.