

# FBI Project



## TASKS

### Cell Phone Triangulation

1. Complete cell phone triangulation and sketch diagrams using the Law of Cosines and Law of Sines.

### Forensic Practice

2. Complete and solve the forensics case given fictitious cell phone data.

### Catch the Suspect

3. Students will catch the guilty suspect by analyzing data using Law of Cosines and Law of Sines.

## CELL PHONE TRIANGULATION

As the world becomes increasingly reliant on mobile technology, we have never been more connected. As a cell phone searches for a signal, its location is pinpointed and coordinated across a number of applications. Cell towers can determine the cell phone's specific location depending on how strong the signal is (i.e. how far away the phone is from the tower). The Law of Cosines and Law of Sines can be used to pinpoint an exact location.

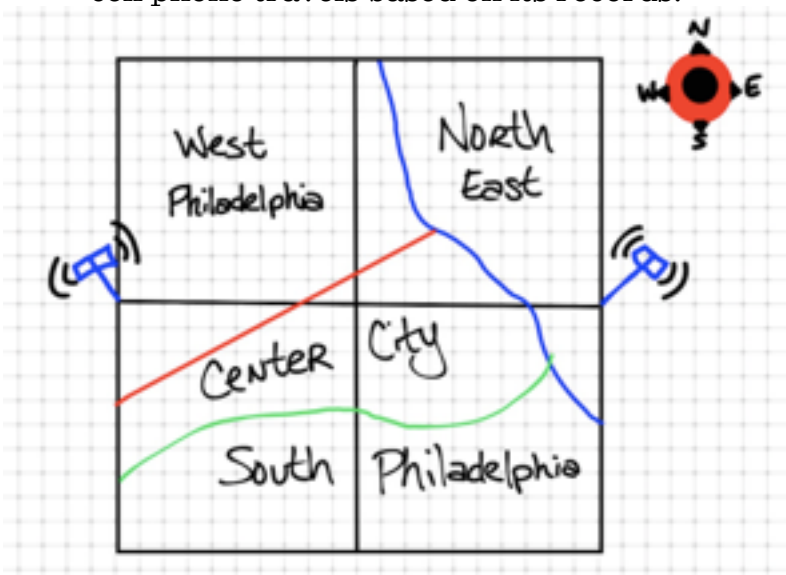
In this task, information relayed from two cell phone towers.

1. The distance between two cell towers is 42 miles. From the western cell tower, a phone signal is  $20^\circ$  north of east and is 48 miles away. How far away is the cell phone from the eastern cell phone tower? Sketch a diagram.
2. The distance between two towers is 38 miles. From the western cell tower, a phone is 21 miles away and from the eastern cell tower the same phone is 52 miles away. Determine the angles and the directions from each of the cell tower. Sketch a diagram

# Forensics

Today, important ethical questions about surveillance are being asked. The idea that people can be watched at any time is highly controversial. The world of forensics is glamorized on TV shows like CSI and often is associated with dissecting a crime scene. Mobile devices are used as forensics evidence in court. Since mobile phones can be tracked at all times, the information can be used to prove that a suspect was at a certain location. To date, thousands of criminal cases have been proven with forensic cell phone evidence.

In this task, you must use the Law of Sines and the Law of Cosines to determine where a cell phone travels based on its records.



The map on the left is a 400 mi<sup>2</sup> snapshot of Philadelphia. Cell phone Towers A and B are 20 miles apart.

## Phone Records for 215-555-3061

	Tower A	Tower B
9:15	Unknown	18 miles away 23° North of West
11:33	7.28 miles away	19.28 miles away

The cell towers are located at  $(-10, 0)$  and  $(10, 0)$ .

How far away was the phone from Tower A at 9:15?

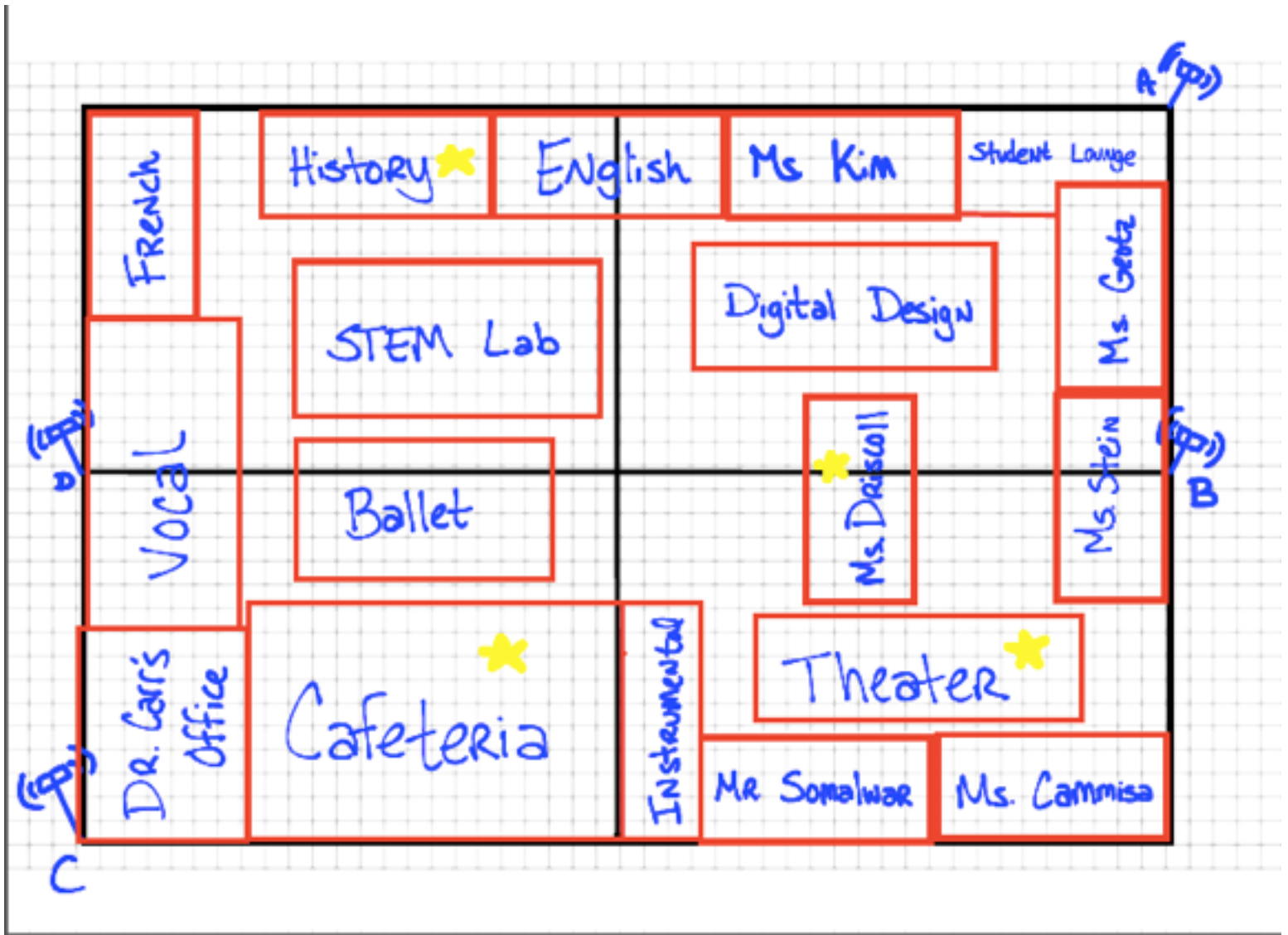
What part of Philadelphia was the phone located in at 9:15?

Describe the location of the phone at 11:33 from Tower B in terms of the angle?

What part of Philadelphia was the phone located in at 11:33?

# Catch the Suspect

A serial crime spree has rocked our school campus. Robberies occurred at a number of places from 3:30 PM to 4:00 PM. They have compiled a list of twenty suspects and have seized their iPads. They hope that these records will determine the identity of the guilty party. In this assignment, you must use the Law of Sines and Law of Cosines to determine where an iPad was located based on its records. Below is a map of our school. Stars denote the four located where the crimes were committed.



The cell towers are located at  $(23, 0)$ ,  $(23, 15)$ ,  $(-23, 0)$  and  $(-23, -15)$ . Each unit represents 5 meters. (Cell towers C and D are 75 meters apart;  $15 \text{ units} \cdot 5 \text{ m}$ )



**Suspect 1:**

Work Space:

# Suspect 1:

Work Space:

	Location of iPad
3:30	
3:40	
3:50	
4:00	



# Suspect 2:

Work Space:

# Suspect 2:

Work Space:

	Location of iPad
3:30	
3:40	
3:50	
4:00	



# Suspect 3:

Work Space:



# Suspect 3:

Work Space:

	Location of iPad
3:30	
3:40	
3:50	
4:00	

# Investigation Analysis

Use the results of your Catch the Suspect investigation to answer the following questions.

Suspect:

Can you rule them out a possible suspect? Why or why not?

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Can you rule them out a possible suspect? Why or why not?

After careful analysis of the footage, it has been determined that the robbery in the Cafeteria was committed at 4:00. Does this affect the results of your investigation?