**WHEN WAS THE MURDER COMMITTED?**



At noon on a cool C day in East Greenwich, Detective Podraza arrived at the crime scene to find the sergeant leaning over the body. The sergeant said that there were several suspects, who could be accounted for most of the morning.

* Sam was with musicians writing math songs except from 11:00-11:30 a.m.
* Isabella was at an AP exam from 7:30-10:30 a.m., but has no alibi for the time after the exam because she ran away screaming in anger.
* George was trying to set a world record for bouncing a soccer ball on his head, but he was not seen from 8:45-9:15 a.m.
* Alex was in class from 7:30-9:30 a.m. and 10:30-11:30, but he skipped his Algebra II class from 9:30-10:30 a.m. and could not be found.
* Hannah could only be accounted for from 9:00-10:30 because she was telling stories about the Dogman of Michigan.
* Lauren was trapped under an avalanche of highlighters from 8:00-9:00 a.m. and was accounted for. She was also in class from 10:00-11:30 a.m., but no one saw her between 9:00 and 10:00.

The sergeant was not sure the exact time of the murder, and it didn’t look like there was enough information to proceed any further. However, Detective Podraza remembered something he learned in high school called Newton’s Law of Cooling. The formula is:

 

* T is the temperature of the object at time t.
* S is the temperature of the surrounding area.
*  is the initial temperature of the object (at time t = 0)
* k is the rate of cooling, which depends on the composition of the object.
* t is the time in hours.

Detective Podraza recorded the temperature of the body at noon, and found it to be C. He then left for lunch. Upon returning at 1:00 p.m., he found the victim’s body temperature to be C. We can assume that a normal body temperature is C.

So Detective Podraza decided to let t = 0 be the time at which the murder was committed. But this posed a problem; what would t be at noon when the temperature was ? She couldn’t know this unless he knew when the crime was committed. So he tried a slightly different approach and determined the time of the crime.

1. Find the time of the murder as Detective Podraza did. Show all work.
2. Which suspect(s) now could be responsible for the crime?