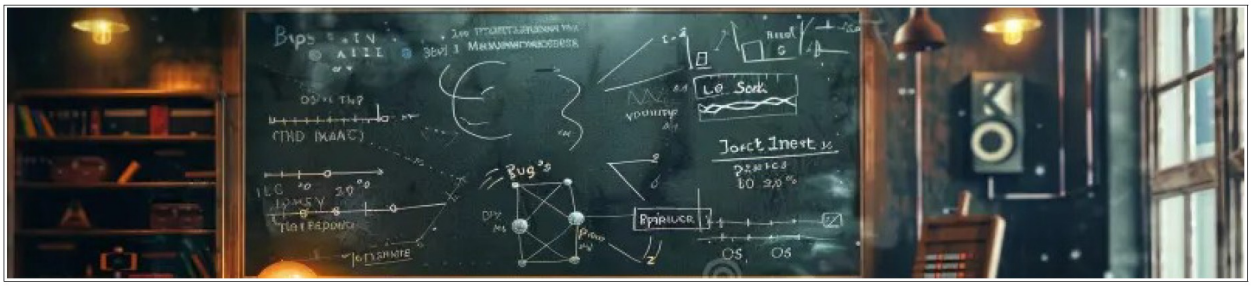
First Murder Mystery: A Warm-Up

Mrs Campbell was found dead in her physics classroom; a bullet to the brain seemed to be the cause of her death. It was not suicide for the bullet wound was on the left side and Mrs Campbell was right handed. Also, Mrs Campbell was too arrogant to end her own life.
After much asking around, Sherlock was able to gather that Mrs Campbell was the most hated teacher at St. Duke's school of scientific arts. Which made it a bit hard to narrow down the suspects. The only clue Sherlock found on the blackboard, in the room where she was murdered, was:

E=MC2



The suspects are:
Simeon Thompson: The student body president, who Mrs Campbell had been blackmailing.
Mary Campbell: Mrs. Campbell's twin, who had always been jealous of her twin sister.
Ruby Griffith: The principal, who had been looking for an excuse to fire her since day one.
Megan Fishwooten: The left-handed best friend, who had always been stuck in the shadow of Mrs Campbell.

Who was the culprit?

Answer:
MC=Mary Campbell
2=Twin
Mary Campbell is the culprit.

Second Murder Mystery

You and your class have rented out a mansion for an end of year celebration. Everyone is having a lot of fun hanging out, playing games, and eating food. Suddenly you all hear a loud scream coming from the upstairs of the mansion. Everyone rushes upstairs and you all see that on their way to the bathroom one of your classmates had discovered a dead body in the hallway outside of the library. The man who has died is the owner of the mansion and no one seems to know who did it. The only thing everyone agrees on is that it must be someone in the class because there was no one else in the mansion. At the time the body was found the entire class is present.

One of your friends comes up with the suggestion that maybe if they knew the time of death you can determine who must be the murderer based on who was most likely to be with the mansion owner at that time.

How would you proceed ?

Another one of your friends has the idea that knowing the temperature of the body would help to figure out the time of his death, so immediately a thermometer is found and the corpse's body temperature is taken. According to these measurements the body was 33.89 degrees Celsius at 6 pm when the body was found. Two hours later the body's temperature is taken again but it is now found to be 30.33 degrees Celsius.

Newton's formula for cooling: $T(t) = T_{env} + (T_0 - T_{env})\, e^{-kt}$

Where:

- $T(t)$ is the temperature of the body at time t,
- T_{env} is the temperature of the surrounding environment,
- T_0 is the initial temperature of the body (look up average body temperature for this),
- t is the time after death in hours, and
- k is a constant that can be calculated using the formula $e^{-2k} = \dfrac{T(t+2) - T_{env}}{T(t) - T_{env}}$.

Answer:

According to the wording of the problem treated, after substituting the values and processing the date, it can be said *k* approximately equals 0.07.
So the time *t* elapsed before the body was found at 6pm is about 1.38 hours: the owner was killed around 4.62 pm or 4:37pm (4:40pm).

Example of description: To find exponential minus 2k, we subtract the temperature of the surrounding environment from the temperature of the body at time t plus 2, and we divide the result by the temperature of the body at time t minus the temperature of the surrounding environment.

(-b)	negative b
a + b	a and b add up to/add a and b
+	plus
-	minus
a – b= c	to subtract b from a; to deduct b; c is the difference between a and b
a x b= c	a times b; to multiply a by b; c is the product of a by b
abc + abd=ab(c+d)	to factorise ab/to factor out ab; ab is the common factor
a(b+c)	a factor b plus c
a/b	a divided by b; a over b; numerator, denominator
(b+c)/a	b+c, all over a
a^n	a raised to the power n; a raised to the nth power; a to the n; a to the nth; a to the nth power
a^{-n}	a to the minus/negative n
l'exposant n	exponent n
a^2, a^3	to square a, to cube a, a squared, a cubed
sin2x, cos3y	sine squared x, cosine cubed y (pron. /sain/)
$a^{1/3}$	a to the one third
racine carrée de a	the square root of a
racine cubique de a	the cube root of a
e^x	e to the x; exponential x
x=ln y	natural/Naperian logarithm of y (dans la lecture d'une équation, ln y et log P se lisent sous forme abrégée comme en français)
n=log P	decimal/common logarithm of P (dans la lecture d'une équation, ln y et log P se lisent sous forme abrégée comme en français)
log2=0.30103	logarithme à 5 chiffres – 5 place logarithm; 0=caractéristique – characteristic; 30103=mantisse – mantissa; table de logs – log table, table of logs; règle à calcul – slide rule; échelle, graphe, papier – scale, graph, paper
Produit en croix	Cross-multiplication