Yesterday, a body was found on the beach. Preliminary investigations were only able to determine that well-known and popular instructor, Professor Y, had been killed some time the night before, and that his body was moved onto the beach sometime after. You have been hired to help solve the murder of Professor Y. You have received a list of the 5 most likely suspects and possible weapons of choice.

Your task is to find out:

- Who killed Professor Y?
- What was the murder weapon?
- Where was he killed?

Can you solve this mystery? Take some time to look over these problems this summer, and see where the clues take you.
CLUE

We spoke to one of the lifeguards who was on duty yesterday.
Each of the possible suspects is associated with his/her own equation.
Solve each equation.
Those with the HIGHEST & LOWEST answers have the best alibis and can be ruled out as murderers.

[Mayor Celina Dillard]
\[2x - 12 = -4\]
x = __________

[Driver Wallace Duarte]
\[5x - 9 = 1\]
x = __________

[Lifeguard Aiden Ali]
\[3x = -21\]
x = __________

[Surfer Jaxon Yung]
\[4x - 12 = 10\]
x = __________

[Hotel Manager Raquel Trejo]
\[\frac{x}{2} = \frac{3}{2}\]
x = __________

[Conclusions after speaking with this lifeguard]

_________________________ and __________________________ did not commit the murder
CLUE

We spoke to the Owner of the French Fry Hut

Each of the possible weapons is associated with its own equation.

Solve each equation.

Those with the HIGHEST & LOWEST answers can be ruled out as possible weapons in this murder.

[Putter]

\[3(x - 7) = 8\]

\[x = \_] \_ \_ \_ \_

[Shark’s Tooth]

\[4(x + 2) = 3(x + 1)\]

\[x = \_] \_ \_ \_ \_

[Surfboard]

\[6(x - 3) = 2(x - 9)\]

\[x = \_] \_ \_ \_ \_

[Beach Towel]

\[2(x + 1) = 3(x + 7)\]

\[x = \_] \_ \_ \_ \_

[Sunscreen]

\[12(x - 0.5) = 4(x + 2.5)\]

\[x = \_] \_ \_ \_ \_

[Conclusions after speaking with French Fry Hut Owner]

________________________ and _________________________ were not used as the murder weapon
CLUE

We spoke with one of the local townspeople. Each of the weapons is associated with one of the polynomials below. Each has been factored already. If factored correctly, we can safely assume that the associated weapon was NOT used in this crime.

[Putter]

\[6x^2 - 12x + 30 \equiv 6(x^2 - 2x + 5)\]  Correct or incorrect?

[Shark’s Tooth]

\[2x^2 - 9x + 4 \equiv (2x + 1)(x - 4)\]  Correct or incorrect?

[Surfboard]

\[6x^2 + 13x + 6 \equiv (3x + 2)(2x - 3)\]  Correct or incorrect?

[Beach Towel]

\[x^2 + 4x - 21 \equiv (x + 3)(x - 7)\]  Correct or incorrect?

[Sunscreen]

\[5x^2 - 3x - 2 \equiv \text{cannot be factored}\]  Correct or incorrect?

[Conclusions after speaking with townspeople]

__________________________ was not used as a murder weapon
CLUE

We spoke with the retired sheriff.
Each suspect is associated with a polynomial problem below.
Add and/or subtract each as shown.
The 2 that simplify to the same answer belong to suspects that can be ruled out as murderers.

[Mayor Celina Dillard]
\[(2x^2 - 6x + 1) + (3x^2 + 3x - 7)\]  = ______________________ 

[Driver Wallace Duarte]
\[(8x^3 + 2x^2 - 5x + 11) - (3x^3 + 4x^2 - 2)\]  = ______________________ 

[Lifeguard Aiden Ali]
\[(4x^2 + 2x + 9) - (3x - 7) + (x^2 - 2x - 22)\]  = ______________________ 

[Surfer Jaxon Yung]
\[(5x + 3) + (x - 2)\]  = ______________________ 

[Hotel Manager Raquel Trejo]
\[(7x^2 - 9x + 2) + (3x^2 - 6 + 4x)\]  = ______________________ 

[Conclusions after speaking with retired sheriff]______________________________
______________________________ and ________________________ were not the murderer
CLUE

We spoke with the hotel owner. Each suspect is associated with a problem below. Two of them will result in the same simplified answer. Those two suspects have questionable alibis, and could be the murderer.

[Mayor Celina Dillard]
\( (6x - 2)(x + 15) \) = 

[Driver Wallace Duarte]
\( (x + 2)(6x - 15) \) = 

[Lifeguard Aiden Ali]
\( (4x + 15)(2x - 1) \) = 

[Surfer Jaxon Yung]
\( (3x - 10)(3x + 3) \) = 

[Hotel Manager Raquel Trejo]
\( 3(2x - 5)(x + 2) \) = 

[Conclusions after speaking with the hotel owner] 

___________________ and _________________ might be the murderer
We spoke with a father of two who had brought his family into town for the weekend.

Each weapon is associated with an expression below. Evaluate each weapon’s expression. The 2 weapons with the LOWEST simplified totals can be ruled out as murder weapons in this case.

[Putter]

\[ 3(R + W) - 2H; \quad R = 2, W = 5, H = 1 \]

= ____________

[Shark’s Tooth]

\[ -4(3P - 2N); \quad P = 6, N = 4 \]

= ____________

[Surfboard]

\[ (A + B - C)^2 - 2D; \quad A = -3, B = -4, C = -8, D = 11 \]

= ____________

[Beach Towel]

\[ 11(H - 2W); \quad H = 5, W = -1 \]

= ____________

[Sunscreen]

\[ 9L - 5C + Y; \quad L = 3, C = 1, Y = 6 \]

= ____________

[Conclusions after speaking with the father of 2]

______________________________

_________________________ and _____________________ were not the weapons used in this murder
CLUE

We spoke with a delivery guy for the local pizza parlor.
Each suspect is associated with an expression below.
Evaluate each suspect's expression.
The 2 suspects with the LOWEST simplified totals can be ruled out as murderers in this case.

A = 5; B = 3; C = -1; D = 4; E = -2 ← use these values for all 5 suspects' problems

[Mayor Celina Dillard]
\[ C(A + D) \] =

[Driver Wallace Duarte]
\[ 3B + 4E \] =

[Lifeguard Aiden Ali]
\[ \frac{A}{E} \] =

[Surfer Jaxon Yung]
\[ (2B \times 3D)^{1/A} \] =

[Hotel Manager Raquel Trejo]
\[ C^A \times D \] =

[Conclusions after speaking with the pizza delivery guy]

__________________ and _________________ can be ruled out as murder suspects
CLUE

We spoke with an older couple who was walking on the beach that morning. Each of the suspects is associated with a simplified exponent expression below. Those with correctly simplified expressions can be ruled out as potential murderers in this case.

[Mayor Celina Dillard]
\[
\left( \frac{x}{3y^2} \right)^3 = \frac{8x^3}{27y^6}
\]
Correct or incorrect?

[Driver Wallace Duarte]
\[
\left( \frac{2x^4}{3y^2} \right)^3 = \frac{6x^{12}}{9y^6}
\]
Correct or incorrect?

[Lifeguard Aiden Ali]
\[
\frac{a^{-2}b^3}{c^{-4}d^{-1}} = \frac{b^3c^4d}{a^2}
\]
Correct or incorrect?

[Surfer Jaxon Yung]
\[
(2x^4y^{-3})^{-1} = \frac{x^4}{-2y^3}
\]
Correct or incorrect?

[Hotel Manager Raquel Trejo]
\[
(-2x^2y^{-4})^{-2} = \frac{y^8}{4x^4}
\]
Correct or incorrect?

[Conclusions after speaking with the older couple]

_______________ and _______________ can be ruled out as potential murderers
CLUE

We spoke with the Fire Chief.
Each weapon is associated with a scenario described below.
Find the slope of each line described.
Any weapon with a slope greater than 1 can be ruled out as the murderer’s choice in this case.

... What is the slope of the line that passes through the points...

[Putter]
... (19, -16) and (-7, -15)? Slope = _____________

[Shark’s Tooth]
... (3, 0) and (-11, -15)? Slope = _____________

[Surfboard]
... (20, 8) and (9, 16)? Slope = _____________

[Beach Towel]
... (-4, 7) and (-6, -4)? Slope = _____________

[Sunscreen]
... (19, -2) and (-11, 10)? Slope = _____________

[Conclusions after speaking with the fire chief]

We can rule out ___________________________ as potential murder weapons
CLUE

We spoke with the mime on the boardwalk (ironic, right? Well – WE did most of the talking 😊)

*Graph the lines described on the grid below.*

*The lines will cross through all locations except for the true location where the murder took place.*

\[
\begin{align*}
y &= x + 2 \\
y &= -\frac{1}{3}x - 4 \\
y &= -\frac{7}{9}x - 1 \\
y &= (x + 6)^2 + 3
\end{align*}
\]
FINAL CONCLUSIONS

MURDERER:

WEAPON:

LOCATION: