

# **ARRESTED DEVELOPMENT**

## *Investigations and Math*

**CRJ 241 Criminal Investigations**  
**By Professors Dixon and Williamson**

# Project Objectives

**Students should be able to:**

- **Use general problem solving skills**
- **Use deductive reasoning**
- **Read and interpret graphs**
- **Solve linear equations**
- **Use mathematical models to help make decisions**

# **Project Description**

**Solving a crime by using mathematical models and deductive reasoning.**

- **Using blood spatter to help determine the height of a suspect**
- **Using a mathematical model to help determine time of death**
- **Using the results from the mathematical models to narrow down the possible suspects to eventually solve a murder**

# Middlesex Community College

## The Scene of the Crime



**Bedford Campus**

# Sister Mary Elizabeth



- **In 1957 Middlesex Community College was a convent and rumor has it that Sister Mary Elizabeth stole valuable treasure from the Vatican. Historian David Kalivis told the story of Sister Mary Elizabeth; she allegedly stole the treasure and brought it back to the United States to feed the poor. Sister Mary Elizabeth was brutally murdered in the dormitory, which is now building 5 Bedford House. Prior to her murder she allegedly buried the treasure somewhere on the campus. To this day the treasure has never been found.**

# Michael Williamson



Professor of Mathematics was found dead in the Trustees Building which is located on the Bedford Campus of Middlesex Community College on January 31, 2008.

Investigators stated that the victim was hit several times over the back of the head with an unknown object.



# Victim: Michael Williamson

**Michael Williamson was a known treasure hunter. Rumor has it that he may have located a map and the journal of Sister Mary Elizabeth.**

**Investigators have learned that Mr. Williamson was fired 5 years ago from the Museum of Science after several pieces of King Tut's jewels went missing. Boston Police were never able to charge Williamson with the theft.**



# Who killed the professor?





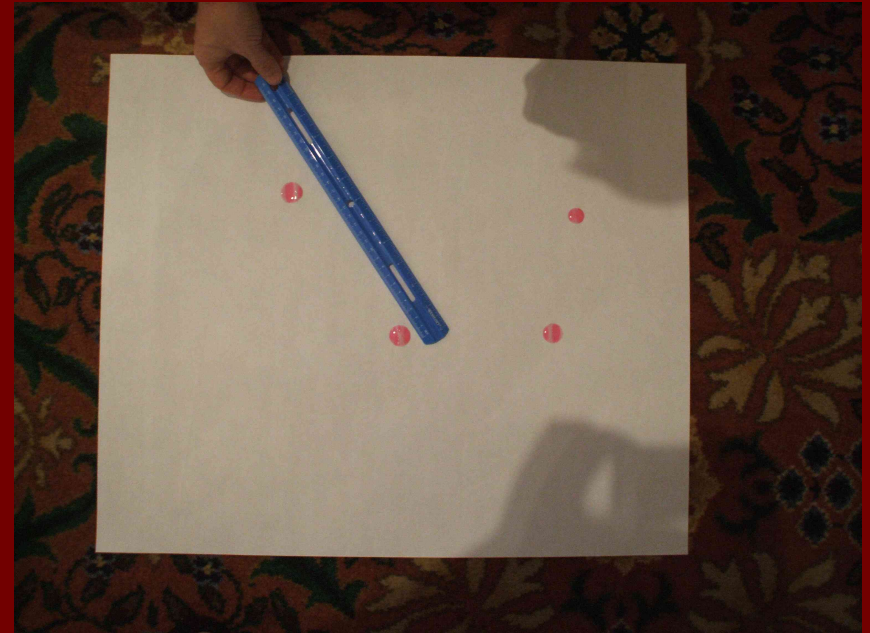
# Blood from the Suspect



# Narrowing down the Suspects

## Using Data Collection

- Drop a drop of fake blood from a height of six inches onto a sheet of paper.
- Measure the diameter of the blood spatter and record it on the data table.
- Repeat this process for 12 inches and then every six inches after that until the data table is filled. Be consistent with the amount of fake blood in each drop.



## Enter the data in the calculator

- Press the **[STAT]** key. From the **EDIT** menu choose option **1:Edit...** (If there is already data in the lists, clear it out.)
- Enter the height (in inches) in **L1**.
- Enter the diameter (in mm) of the blood spatter in **L2**.

## Graph the data.

- Press **[2nd] [Y=]** to get into the **STAT PLOTS** menu.
- Select **1:Plot 1**
- Move cursor over **ON** and press **[ENTER]** to turn on **Plot 1**.
- For **TYPE**, select the first option, the scatter plot.
- Choose **L1** for the **Xlist:**. (This is the height data.)
- Choose **L2** for the **Ylist:**. (This is the diameter data.)
- Press **[ZOOM]**
- Scroll down and choose **9:ZoomStat** to see a scatter plot of your data.

Height	Height (inches)	Diameter of Drop (mm)
6"	6	
1'	12	
1' 6"	18	
2'	24	
2' 6"	30	
3'	36	
3' 6"	42	
4'	48	
4' 6"	54	
5'	60	
5' 6"	66	
6'	72	
6' 6"	78	

# Suspects Grid

**Narrowing down  
the Suspects**

<b>Suspects:</b>	<b>Motivation</b>	<b>Height</b>	<b>Alibi (opportunity)</b>
<b>Peyton Paxson</b>			
<b>Lynda Pintrich</b>			
<b>Vanessa Dixon</b>			
<b>Michelle Bloomer</b>			
<b>Joe Gardner</b>			

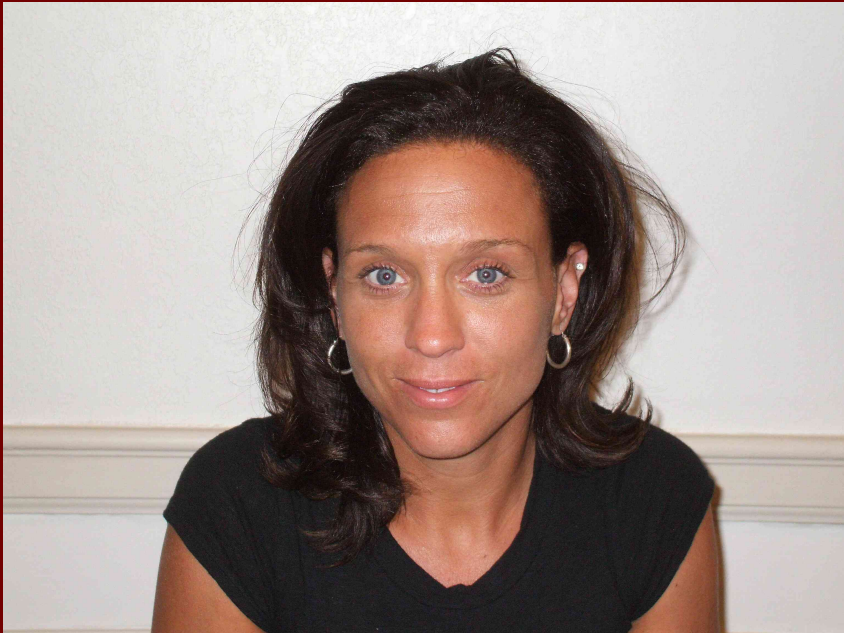
# Calculating the Time of Death

- Using Newton's Law of Cooling to determine time of death.

$$u(t) = T + (u_0 - T)e^{kt}$$

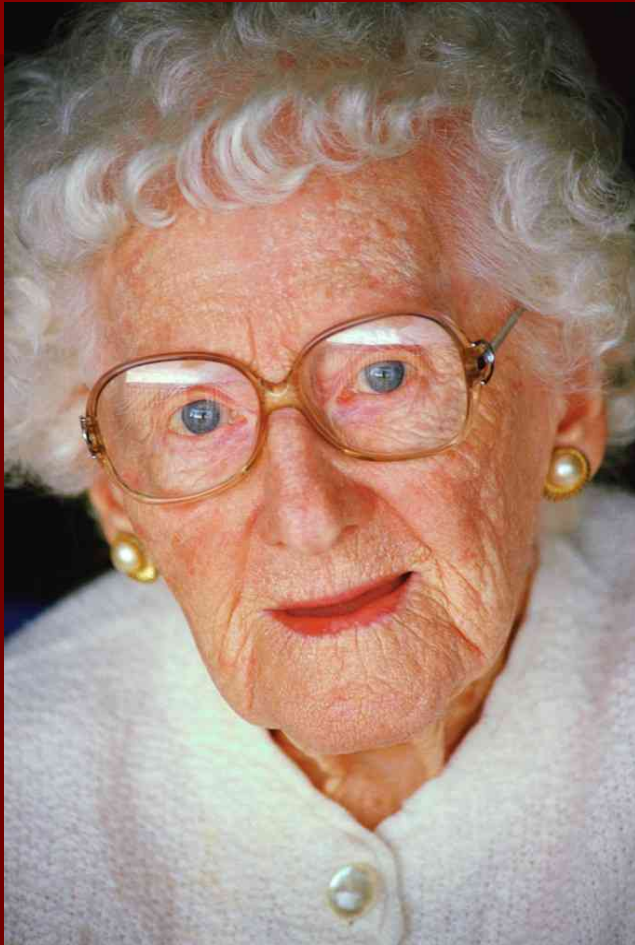
- Using time of death information to evaluate suspects' alibis.

# Suspect #1: Vanessa Dixon



- Head of Security at Middlesex Community College
- Office: located in building 5 Bedford House
- 5'9"/blue eyes/ brown hair
- Motive: Money
- Suspect is currently under investigation by FBI for identity fraud

# Suspect #2: Lynda Pintrich



- Secretary to President Carole Cowan
- Office: Trustees House
- 5'4"/green eyes/blondish reddish brown hair
- Motive: Money
- Suspect is under investigation by MCC for surfing the web for off shore bank accounts

# Suspect #3: Peyton Paxson



- Director of Finance
- Office: Building 10 room 201
- 6'3"/brown eyes/ brown hair with a neatly trimmed goatee
- Motive: Money
- Suspect just recently bought the Mercedes CLS55 (valued at \$110,000) and a \$500,000 condo at Hampton Beach



# Suspect#4: Michelle Bloomer



- Executive Chef
- Office: Campus Center 2<sup>nd</sup> Floor above the kitchen
- 5'1"/brown eyes/brown hair
- Motive: Money
- Suspect is currently under investigation by the gambling commission for illegal booking (bird fighting)

# Suspect#5: Joseph Gardener



- Head Custodian
- Office: Building 15  
Custodian Hall
- 5'11"/brown eyes/grayish  
silver hair
- Motive: Money
- Suspect had a prior  
charge of assault &  
battery and attempted  
murder. However,  
Gardner was never  
convicted because of lack  
of evidence and the  
victim refused to testify.

**Suspect is now in custody!**

