

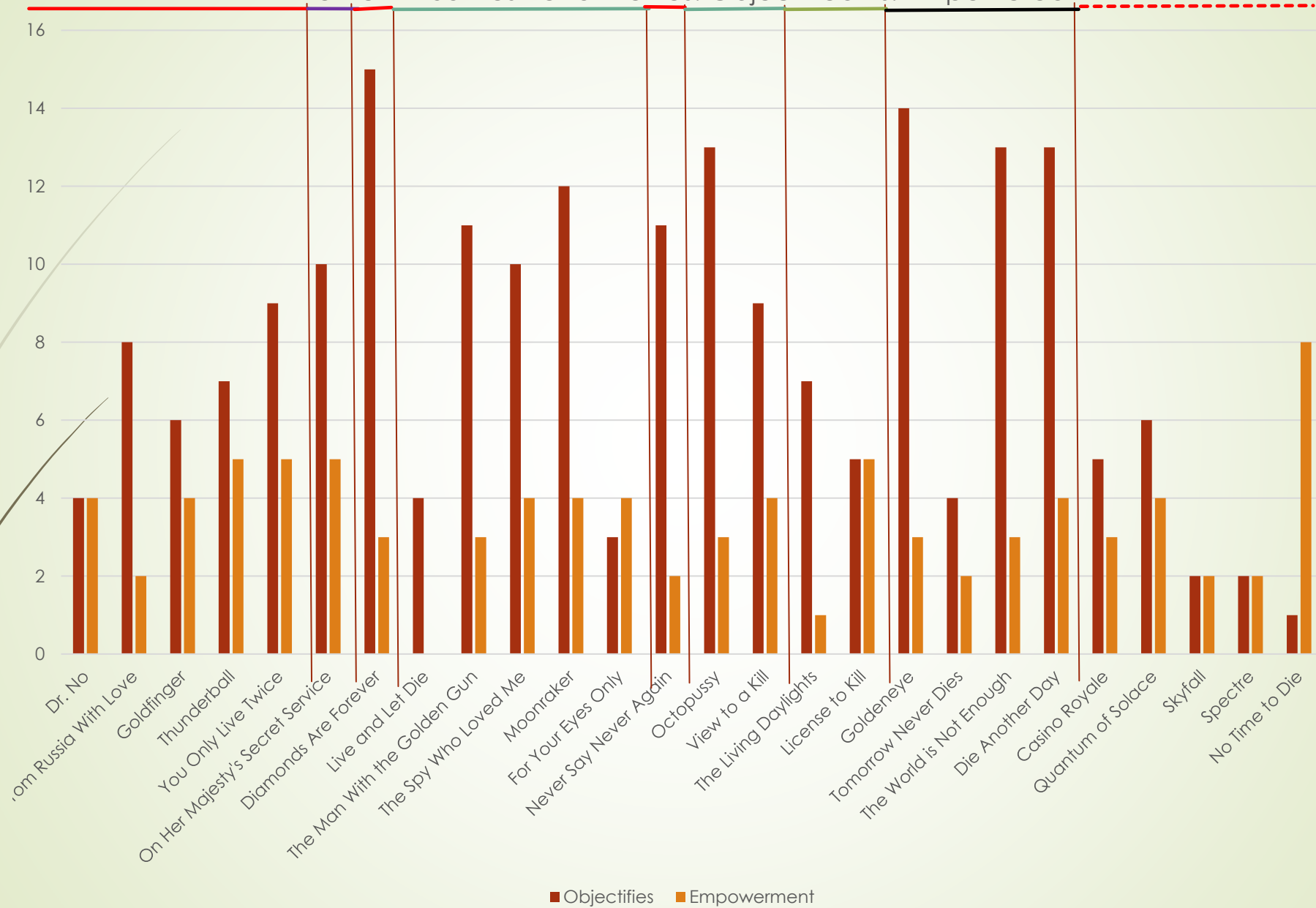


Using James Bond as a Central Theme in a Quantitative Literacy Course



Let's start with gender equity when it comes to the 007 movie franchise. Ummm...

Women in James Bond Movies: Objectified vs. Empowered



Average Connery Objectifies = 7.28571429

Average Connery Empowerment = 3.57142857

Average Craig Objectifies = 3.2

Average Craig Empowerment = 3.8

Percent change over time?

* Objectifies: $(3.2 - 7.29)/7.29$

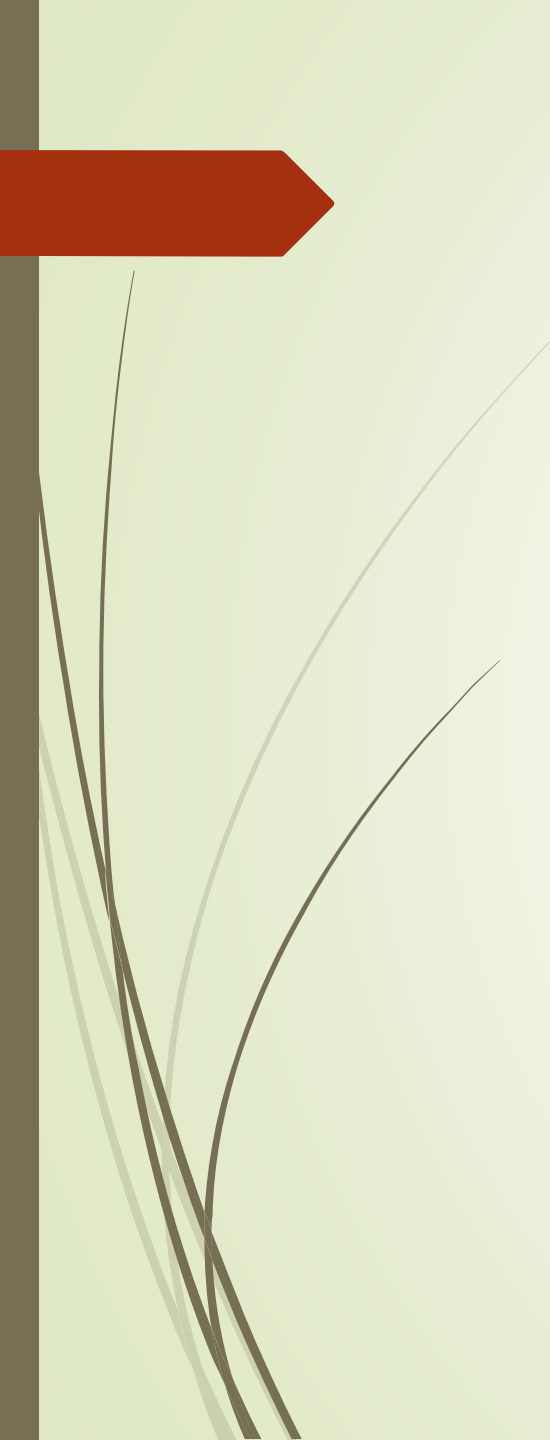
* A decrease of about 56.1%

* Empowerment: $(3.8 - 3.6)/3.6$

* An increase of about 5.6%

From "Goldfinger" (begin at 7:20 until 7:42)






Speaking to Jill Masterson in the movie *Goldfinger*, Bond claims that the champagne should be drunk at 38 Fahrenheit. (This occurs right before Goldfinger kills her by completely covering her in gold paint.) Most wine experts recommend 7 to 9 Celsius as the optimal temperature for champagne. So, was Bond telling the truth? Prove it by converting 38 degrees Fahrenheit into Celsius. Use the formula $C = \frac{5}{9}(F - 32)$.

(Source: <https://www.imdb.com/title/tt0058150/goofs>)

From "Thunderball" (begin at 1:40 until 1:55, pausing at 1:44)






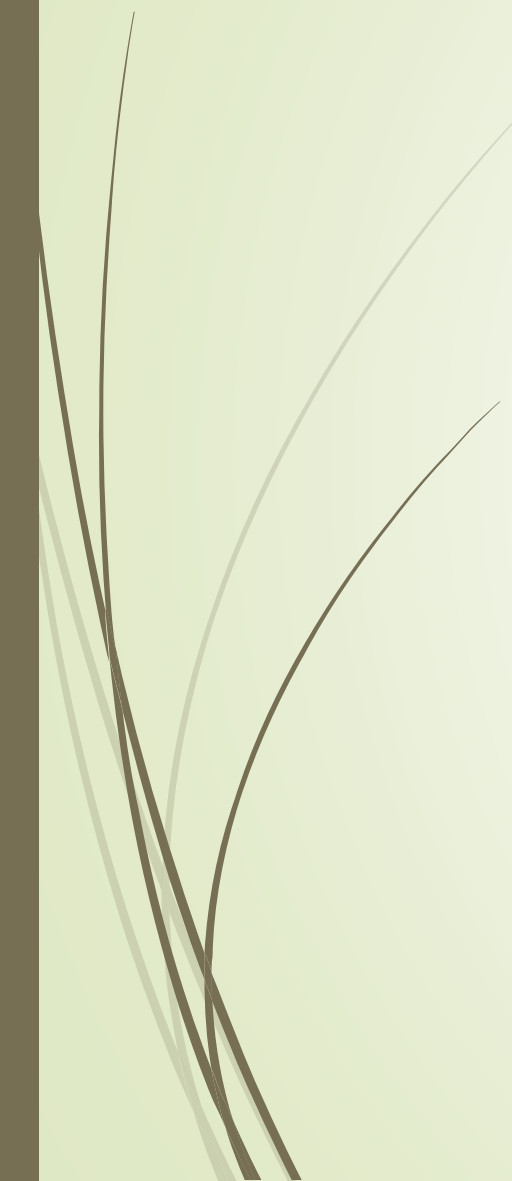
Assume there are 12 chief members of Spectre (not including Blofeld, the main bad guy of Spectre). What is the probability that Operatives #5 and #6 get “fired”, in no particular order?

From “Live and Let Die” (begin at 2:30 until 3:49)






What is the probability that Solitaire would draw the Lover's card? What is the probability that she wouldn't draw the Lover's card?



From "Never Say Never Again" (entire clip)





According to the American Association of Clinical Chemistry, the average value for urine pH is 6.0.


(Source:

<https://www.medicalnewstoday.com/articles/323957.php#normal-ph-level>)

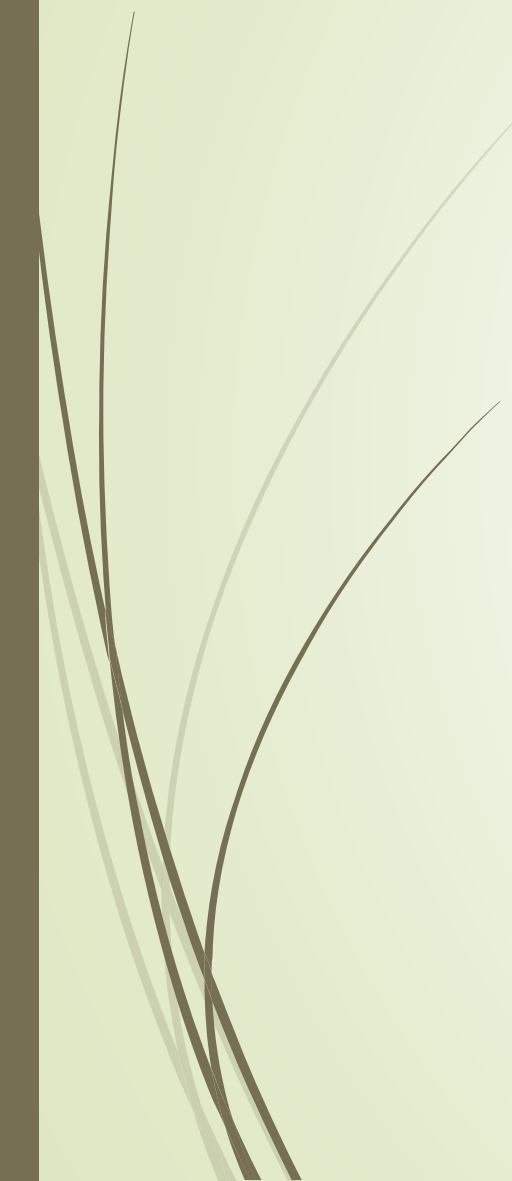
In the movie *Never Say Never Again*, Bond takes down an adversary by throwing one of his urine samples in the bad guy's face. So, we could say that Bond has very acidic urine. Suppose his urine has a pH of 4.0. Compare the pH of Bond's urine to the average urine. How much more acidic is Bond's urine than that of the average human?

From "View to a Kill" (begin at 6:03 until 6:26)






In the movie *View to a Kill* (Roger Moore's last Bond movie), the bad guy Zorin has a businessman dumped out of a zeppelin. I calculated the distance from the zeppelin to the water to be 108 feet. Using the formula $f(t) = -16t^2$, find the time it took for him to fall to the water.



From “The World is Not Enough” (begin at 6:30 until 6:43)






In the movie *The World Is Not Enough*, James Bond mentally calculates that a bomb, traveling 106 miles at a rate of 70 miles per hour will detonate in 78 minutes. Guess what? Bond not only has a flaw when it comes to women and booze, but math as well! His calculation was wrong! How much time (in minutes) will it really take for the bomb to detonate?

From "Casino Royale" (begin at 0:12 until 0:30)





In the movie *Casino Royale* Bond crashes his car while trying to avoid hitting Vesper Lynde, who is tied up and lying in the middle of the highway. The Aston Martin has a stopping distance of 180 feet after traveling 80mph. Now, I think Bond was a bit intoxicated at this point, so his reaction time was a bit slower, at 0.8 seconds. How far (in feet) will the car travel between the time Bond first sees Vesper on the road 270 feet away and the time that he steps on the brakes? Will he stop in time to save Vesper?

If you want a bunch of James Bond exercises sent to you, email me! I'm happy to share!

➤ ben.moulton@uvu.edu



Sequences

When the actor Daniel Craig took over as James Bond, the following were his “kill counts” for his first three movies: *Casino Royale* = 12, *Quantum of Solace* = 16, *Skyfall* = 18. Now, the kill count in the next movie *Spectre* was actually 32, but for the purposes of this problem let’s assume the kill count for *Spectre* = 22 instead. So, the trend we are looking at is as follows: 12, 16, 18, 22, Based on this trend, what could one have expected the “kill count” to be in the next Bond movie *No Time To Die*? Is this an example of an arithmetic sequence, a geometric sequence, or neither?

No Time To Die estimated kill count = 22

Type of sequence (circle one): arithmetic geometric **neither**

Problem Solving

The Spectre organization consists of #1 (the main dude, known as Ernst Stavro Blofeld), and 12 members, known cryptically as #2, #3, #4, and so on until we reach #13. Suppose Blofeld needs to make an “adjustment” by firing two of Spectre’s members at random. How many ways can he do this?

$$13(12) = 156 \text{ combinations}$$

Problem Solving Techniques

In all the James Bond (MI6 special agent 007) movies up through the 2020 release of “No Time To Die”, Bond drives 13 different types of Aston Martin cars, and 17 cars of some other make. If we assume this trend continues, and if we assume he will drive a total of 510 cars over the film’s franchise, how many of these cars will likely be some type of the Aston Martin make?

$$\frac{13}{13 + 17} = \frac{x}{510}$$

$$\frac{13}{30} = \frac{x}{510}$$

$$\frac{13}{30}(510) = x$$

$$x = 221$$

Estimating and Evaluating

In the movies Casino Royale, Quantum of Solace, and Skyfall, the following contents and their cost (in pounds) are listed below:

Tom Ford sunglasses = 250
Zero Halliburton briefcase = 240
ST Dupont cufflinks = 150
Tailored Brioni dinner jacket = 3000
Omega Seamaster watch = 1800
Tom Ford tuxedo = 3700

Since Bond is pretty rough of his contents, assume he has to get an entirely new outfit each movie. Estimate the total amount of money (in pounds) James Bond will spend on these contents over the span of the three movies.

Reference: <https://www.towergateinsurance.co.uk/from-towergate-with-love>

Using front end rounding:

Estimations are

Tom Ford sunglasses = 300

Zero Halliburton briefcase = 200

ST Dupont cufflinks = 200

Tailored Brioni dinner jacket = 3000

Omega Seamaster watch = 2000

Tom Ford tuxedo = 4000

Total = $300+200+200+3000+2000+4000 = 9700$ pounds

Set Notation

Let A represent the list of all the countries James Bond has visited. Let B represent the countries Bond visited when Roger Moore played the character. Find $|B'|$.

$A = \{England, Jamaica, Turkey, Switzerland, Bahamas, Japan, Greece, Portugal, Scotland, Netherlands, USA, Hong Kong, Thailand, Egypt, Sardinia, Brazil, India, Germany, France, Austria, Mexico, Spain, Italy\}$

$B = \{England, Switzerland, Greece, Scotland, USA, Hong Kong, Thailand, Egypt, Sardinia, Brazil, India, Germany, France\}$

$B' = Jamaica, Turkey, Bahamas, Japan, Portugal, Netherlands, Austria, Mexico, Spain, Italy$

$$|B'| = \underline{\quad 10 \quad}$$

<https://www.onthetracksof007.com/destinations>

Subsets and Venn Diagrams

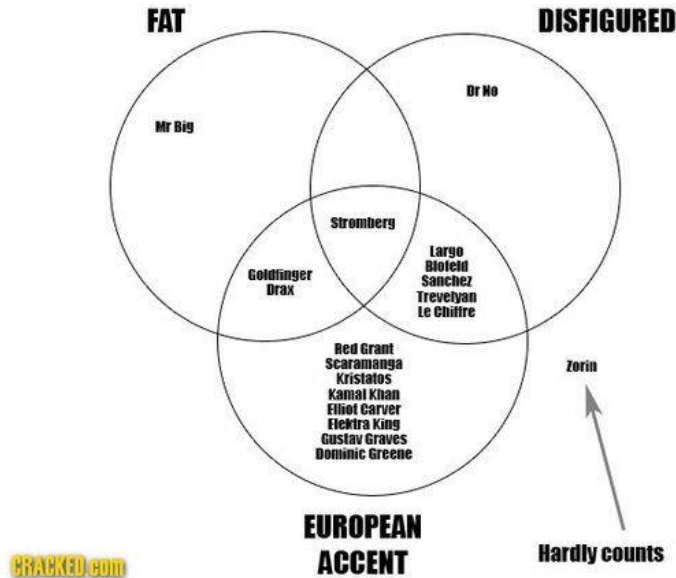
J contains the list of people who sang the James Bond theme songs made during the Pierce Brosnan era. If $J = \{Madonna, Sheryl Crow, Tina Turner, Garbage\}$, how many subsets does J contain?

Source: <https://www.rollingstone.com/music/music-lists/james-bond-movie-theme-songs-ranked-worst-to-best-154927/goldfinger-shirley-bassey-150465/>

$$2^4 = 16$$

Applications and Survey Analysis

James Bond Villains



How many villains were fat and had a European accent? 3

How many villains are disfigured? 7

Which villains (give me names, not numbers) were disfigured or fat, but did not have a European accent? Mr. Big, Dr. No

Rates and Unit Rates

In the movie *Spectre*, James Bond travels from London to the Austrian Alps to meet Madeleine Swann. Excluding the ferry across the English Channel, assume the distance driven in his Aston Martin DB10 is about 750 miles. Also assume that the car consumed 54 gallons of gas in the process (like Bond really cares about gas mileage!). What kind of gas mileage (in miles per gallon) did the Aston Martin DB10 get?

$$\frac{750 \text{ miles}}{54 \text{ gallons}} \approx 13.9 \text{ MPG}$$

Rates and Unit Rates

How much alcohol does each Bond drink?	
Sean Connery	
Movie	units
Dr No	11.5
From Russia With Love	16
Goldfinger	12
Thunderball	14.5
You Only Live Twice	9.5
Diamonds Are Forever	6
George Lazenby	
Movie	units
On Her Majesty's Secret Service	9.5
Roger Moore	
Movie	units
Live and Let Die	15.5
The Man With the Golden Gun	11.5
The Spy Who Loved Me	7
Moonraker	7
For Your Eyes Only	10.5
Octopussy	14.5
A View To A Kill	14.5
Timothy Dalton	
Movie	units
The Living Daylights	5.5
License to Kill	4
Pierce Brosnan	
Movie	units
Goldeneye	8
Tomorrow Never Dies	22
The World Is Not Enough	12.5
Die Another Day	5.5
Daniel Craig	
Movie	units
Casino Royale	26
Quantum of Solace	18

Connery Total = **69.5 units**
 Connery Consumption per movie = **11.6 units**

Lazenby Total = **9.5 units**

Moore Total = **80.5 units**
 Moore Consumption per movie = **11.5 units**

Dalton Total = **9.5 units**
 Dalton Consumption per movie = **4.75 units**

Brosnan Total = **48 units**
 Brosnan Consumption per movie = **12 units**

Craig Total = **76 units**

Skyfall	16
Spectre	16

Craig Consumption per movie = **19 units**

Which Bond drank the most per movie? _____ **Craig** _____

Proportions and Percentages

Consider the following information regarding the list of James Bond's cars he used in each movie.

List of Bond's Cars	
Movie	Car
Dr. No	Sunbeam Alpine
From Russia With Love	Bentley Mark IV
Goldfinger	Aston Martin DB5
Thunderball	Aston Martin DB5
You Only Live Twice	Toyota 2000 GT
On Her Majesty's Secret Service	Aston Martin DBS
On Her Majesty's Secret Service	Mercury Cougar
Diamonds Are Forever	Ford Mustang
The Man with the Golden Gun	AMC Hornet
The Spy Who Loved Me	Lotus Esprit
For Your Eyes Only	Lotus Esprit Turbo
For Your Eyes Only	Citroen 2CV
Octopussy	Bajaj RE
A View to a Kill	Renault Taxi
A View to a Kill	Rolls Royce Silver Cloud II
The Living Daylights	Aston Martin V8
Goldeneye	Aston Martin DB5
Goldeneye	BMW Z3
Tomorrow Never Dies	Aston Martin DB5
Tomorrow Never Dies	BMW 750iL
The Wold is Not Enough	BMW Z8
Die Another Day	Ford Fairlane
Die Another Day	Aston Martin V12 Vanquish
Casino Royale	Aston Martin DBS V12
Casino Royale	Aston Martin DB5
Quantum of Solace	Aston Martin DBS V12
Skyfall	Aston Martin DB5
Spectre	Aston Martin DB10
No Time o Die	Aston Martin DB5

Find the proportion of some type of Aston Martin in each movie to the total number of cars.

Proportion = 13/29

Using Percentages – Budget of Bond Movies

The first James Bond movie, *Dr. No*, was made on a budget of \$1.1 million. By contrast, the latest James Bond movie, *No Time To Die*, was made with a budget of \$250 million. Find the percent change between the two movies.

$$\text{Percent Change} = \frac{\text{new} - \text{original}}{\text{original}} \cdot 100 = \frac{250 - 1.1}{1.1} \cdot 100 \approx 22,627.27\%$$

007 Thirty-eight degrees Fahrenheit

Speaking to Jill Masterson in the movie *Goldfinger*, Bond claims that the champagne should be drunk at 38 Fahrenheit. (This occurs right before Goldfinger kills her by completely covering her in gold paint.) Most wine experts recommend 7 to 9 Celsius as the optimal temperature for champagne. So, was Bond telling the truth? Prove it by converting 38 degrees Fahrenheit into Celsius. Use the formula $C = \frac{5}{9}(F - 32)$.

(Source: <https://www.imdb.com/title/tt0058150/goofs>)

$$C = \frac{5}{9}(38 - 32) \approx 3.3 \text{ degrees Celsius}$$

Bond was not telling the truth.

US and Metric Equivalents

Most of the countries where James Bond drives his Aston Martin operate on the metric system. What would the speed limit of 75 miles per hour be in kilometers per hour? How about in meters per second? Use the conversion rate of $1 \text{ mile} \approx 1.6 \text{ kilometers}$.

$$\frac{75 \text{ miles}}{\text{hour}} \cdot \frac{1.6 \text{ km}}{\text{mile}} = 120 \text{ km/hour}$$

US and Metric Equivalents

007 Semi Trucks in *License to Kill*

In the movie *License to Kill*, James Bond destroys four semi trucks at the end of the movie in a pretty spectacular fashion. Now, a semi truck takes 525 feet to stop after recognizing the need to stop (source: HG.org). Suppose Bond is in one of these trucks traveling at 90 miles an hour and sees an accident on the road ahead. Also suppose he is alert and can react within 0.5 seconds. How far (in feet) will the truck travel between the time Bond first sees the accident and the time that he steps on the brakes? What is the total distance traveled from the time Bond sees the accident until he is able to come to a complete stop?

$$\frac{90 \text{ miles}}{\text{hour}} \cdot \frac{1 \text{ hour}}{60 \text{ minutes}} \cdot \frac{1 \text{ minute}}{60 \text{ seconds}} \cdot \frac{5280 \text{ feet}}{1 \text{ mile}} \cdot 0.5 \text{ seconds} = 66 \text{ feet}$$

66 feet traveled between the time Bond first sees the accident and the time he steps on the brakes.

$$66 \text{ feet} + 525 \text{ feet} = 591 \text{ feet}$$

591 feet is the total distance traveled between the time Bond sees the accident until he is able to come to a stop.

US and Metric Equivalents

007 Aston Martin Stopping Distance

Let's consider one of his favorite cars, the Aston Martin (we'll go with an Aston Martin V-8 Vantage in this case). It has a stopping distance of 107 feet after traveling 60mph. Again assuming Bond's reaction time of 0.5 seconds, how far (in feet) will the car travel between the time Bond first sees a woman in distress on the road 200 feet away and the time that he steps on the brakes? Will he be able to stop before hitting the woman or will he run into her?

$$\frac{60 \text{ miles}}{\text{hour}} \cdot \frac{1 \text{ hour}}{60 \text{ minutes}} \cdot \frac{1 \text{ minute}}{60 \text{ seconds}} \cdot \frac{5280 \text{ feet}}{1 \text{ mile}} \cdot 0.5 \text{ seconds} = 44 \text{ feet}$$

44 feet traveled between the time Bond first sees the woman in distress and the time he steps on the brakes.

$$44 \text{ feet} + 155 \text{ feet} = 199 \text{ feet}$$

199 feet is the total distance traveled between the time Bond sees the woman in the road until he is able to come to a stop. The woman was 200 feet away, so he will barely avoid hitting her.

Working with Units

007 The World Is Not Enough Math Error!

In the movie *The World Is Not Enough*, James Bond mentally calculates that a bomb, traveling 106 miles at a rate of 70 miles per hour will detonate in 78 minutes. Guess what? Bond not only has a flaw when it comes to women and booze, but math as well! His calculation was wrong! How much time (in minutes) will it really take for the bomb to detonate?

$$106 \text{ miles} \left(\frac{1 \text{ hour}}{70 \text{ miles}} \right) \left(\frac{60 \text{ minutes}}{1 \text{ hour}} \right) \approx 90.9 \text{ minutes}$$

90.9 minutes, not 78 minutes.

The Language of Functions

007 Falling from a Zeppelin

In the movie *View to a Kill* (Roger Moore's last Bond movie), the bad guy Zorin has a businessman dumped out of a zeppelin. I calculated the distance from the zeppelin to the water to be 108 feet. Using the formula $f(t) = -16t^2$, find the time it took for him to fall to the water.

$$f(t) = -16t^2$$

$$-108 = -16t^2$$

$$6.75 = t^2$$

$$t \approx 2.6 \text{ seconds}$$

Frequency Distribution

The following table represents a grouped frequency distribution of the number of Bond movie ratings for 23 Bond movies. What is the class width?

1.5

Average Rating	Number of Bond Movies
0.0 - 1.49	0
1.5 - 2.99	0
3.0 - 4.49	0
4.5 - 5.99	4
6.0 - 7.49	14
7.5 - 8.99	5

Linear Growth

007 AMC Hornet vs. AMC Matador

Suppose that Mr. Scaramonga (the bad guy in *The Man With the Golden Gun*) is in a car, the AMC Matador, traveling 60MPH, with a 20 mile head start on James Bond. Write a function, using the function notation $f(t)$, to show the progress of his car at a given point in time t . Now suppose James Bond begins the chase in the car he drives in the same movie, an AMC Hornet, traveling at 90MPH. Write a function, this time using the function $b(t)$, to show the progress of Bond's car at a given point in time t . How long **in minutes** will it take for Bond to overtake Mr. Scaramonga?

$$f(t) = 60t + 20$$

$$b(t) = 90t$$

$$60t + 20 = 90t$$

$$20 = 30t$$

$$t = \frac{2}{3} \text{ hour} = 40 \text{ minutes for Bond to overtake Mr. Scaramonga.}$$

Exponential Growth

007 Movie Production Costs

The production costs of James Bond movies, from *Dr. No* (first “official” movie) to *Spectre* (26th “official” Bond movie) have exponentially increased for the most part over time and can be modeled by the function

$$f(x) = 1,000,000(1.24)^x$$

Based on this model, what can you anticipate the 27th “official” Bond movie, *No Time to Die*, to cost?

Source:

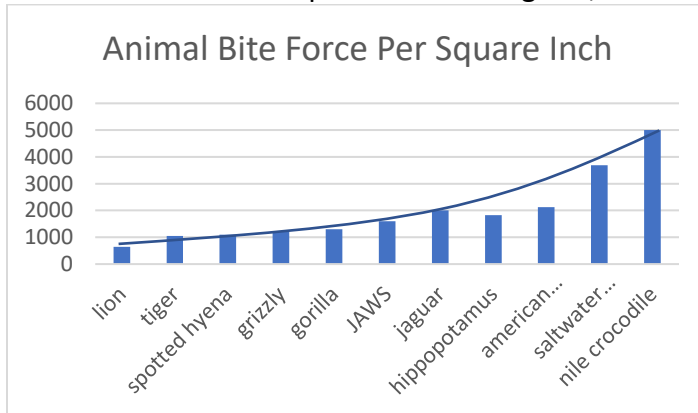
<https://www.the-numbers.com/movies/franchise/James-Bond#tab=summary>

$$f(27) = 1,000,000(1.24)^{27} = \$332,954,968$$

Exponential Equations

007 JAWS Bite Strength

One of the best James Bond villains of all time is Jaws, who made appearances in *The Spy Who Loved Me* and *Moonraker*. If we compared his bite strength in pounds per square inch (psi) to the animals with the top ten “bite strengths”, we come out with the following chart.



If the lion's bite force is 650 psi and the Nile crocodile's bite force is 5000 psi, find the rate of increase, or “r” value. Use an x value of 11, and the formula $f(x) = a(1 + r)^x$. Show your work for *any* credit.

$$5000 = 650(1 + r)^{11}$$

$$7.6923 \approx (1 + r)^{11}$$

$$1.204 \approx 1 + r$$

$$r \approx 0.204$$

Or about 20.4%

Logarithmic Growth

007 Urine Acidity

According to the American Association of Clinical Chemistry, the average value for urine pH is 6.0. (Source: <https://www.medicalnewstoday.com/articles/323957.php#normal-ph-level>) In the movie *Never Say Never Again*, Bond takes down an adversary by throwing one of his urine samples in the bad guy's face. So, we could say that Bond has very acidic urine. Suppose his urine has a pH of 4.0. Compare the pH of Bond's urine to the average urine. How much more acidic is Bond's urine than that of the average human?

Formula for pH:

$$pH = -\log(H^+)$$

For Bond's urine:

$$4.0 = -\log(H^+)$$

$$-4.0 = \log(H^+)$$

If the base of the log is not shown, assume base 10,

$$-4.0 = \log_{10}(H^+)$$

Conversion from a logarithm to an exponential equation:

$$H^+ = 10^{-4.0}$$

Doing the same process for average urine acidity of 6.0 gives:

$$H^+ = 10^{-6.0}$$

Compare the two:

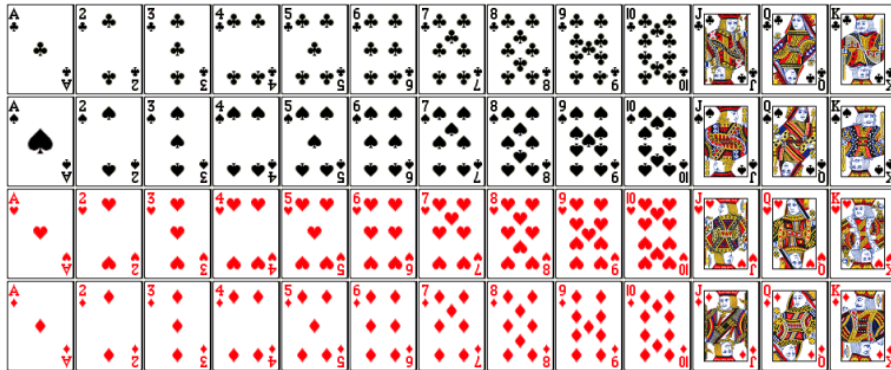
$$\frac{H^+ \text{ Bond urine sample}}{H^+ \text{ average urine sample}} = \frac{10^{-4.0}}{10^{-6.0}} = 10^2$$

Bond's urine is 100 times more acidic than that of the average human.

Introduction to Probability

007 Card Probability

You need to know how a deck of cards is made up and then answer the following probability question to help James Bond win a crucial card game against his latest enemy.



Bond has a choice of how he could win each hand. You must tell him which outcome has the higher probability. Bond either needs anything but a diamond or a non-picture card. *Make sure to indicate which option has a higher probability.*

Anything but a diamond = $\frac{3}{4}$

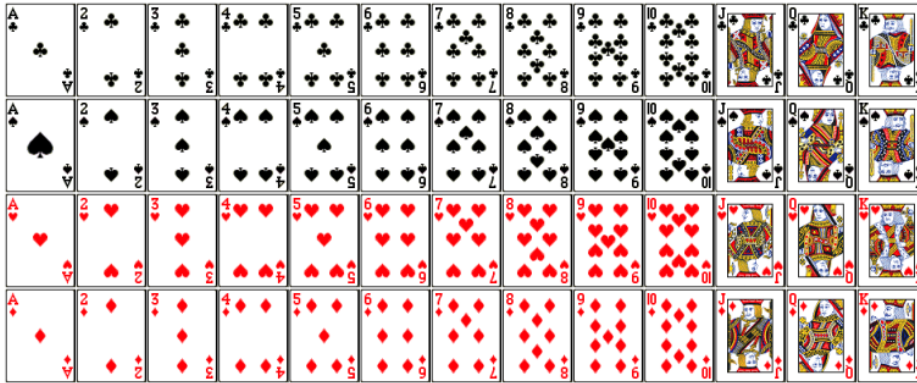
Non-picture card = $\frac{10}{13}$

Non-picture card has the higher probability

Introduction to Probability

James Bond and Cards

Use the illustration below to help you answer the question.



The question: What has a higher probability, Bond drawing a picture card or a 3?

Picture card = $\frac{3}{13}$

A 3 = $\frac{1}{13}$

Picture card has the higher probability

Counting Our Way to Probability

007 Bad Guys and Cars

The following is a list of some of the evil villains with whom Bond has dealt with over the years:

Dr. No	Mr. Big	Stromberg	Goldfinger	Drax
Largo	Blofeld	Sanchez	Trevelyan	Le Chiffre
Red Grant	Scaramanga	Kristatos	Kamal Khan	Elliot Carver
Elektra King	Gustav Graves	Dominic Greene		

Suppose he wants to “retire” four of these villains. How many different permutations are there? Again, Bond wants you to explain why he should take your advice, so you need to show him how you come up with your answer. (In other words, show your work.)

$$18P_4 = 73440$$

Answer: 73,440

Using Counting Methods to Find Probability

Video Games

According to the following website <https://www.imdb.com/list/ls025662776/>

There are 16 James Bond video games. If I randomly choose two video games, what is the probability that the two I choose will consist of each of my favorite video games? Express your answer as a fraction, **NOT** a decimal.

$$\frac{1}{16C2} = \frac{1}{120}$$

Addition and Multiplication Rules of Probability

007 Dice

Bond has decided to try his luck at dice.

What is the probability that the sum of the numbers rolled is either a 3 or 7? Express your answer as a fraction, **NOT** as a decimal. Show your work for *any* credit.

For a 3:

$$1+2$$

$$2+1$$

Two options

For a 7:

$$1+6$$

$$2+5$$

$$3+4$$

$$4+3$$

$$5+2$$

$$6+1$$

Six options

$$\frac{2+6}{36} = \frac{8}{36} = \frac{2}{9}$$

Expected Value

007 Daniel Craig Swimming

Daniel Craig is indisputably the most muscular of all the other Bonds. For his workout, suppose he swims twice a week 45% of the time, he swims five times a week 50% of the time, and 5% he doesn't go swimming at all in a given week. What is the expected value for the number of times Daniel Craig goes swimming during the week?

$$2(0.45)+5(0.5)+0(0.05) = 3.4$$

Linear vs. Exponential

007 Pig Velocity

In the 1987 movie *The Living Daylights*, James Bond helps General Georgi Koskov escape East Germany by putting him in this device called a “pig”, which is an enclosed capsule that can carry a person through a pipeline. In this case, the pipeline is the trans-Siberian pipeline. The table below is an estimation of the time elapsed at various movie “checkpoints”. Determine the following:

(a) Is the data linear or exponential? **Linear**

(b) Find the function using function notation $f(x)$ in terms of checkpoint x .

$$m = \frac{49 - 0}{5 - 0} = \frac{49}{5}$$

Then,

$$f(x) = \frac{49}{5}x$$

Checkpoint	Time Elapsed	Event
0	0	"Pig" is launched
1	8	gauge check
2	17	woman finishes distracting supervisor
3	23	East Germany checkpoint
4	39	border crossing
5	49	end point

Here are potential equations you can use:

$$f(x) = mx + b \quad m = \frac{y_2 - y_1}{x_2 - x_1} \quad f(x) = a(1 + r)^x$$

(c) Using the function generated in part “b”, determine the time elapsed at checkpoint 6.

$$f(6) = \frac{49}{5}(6) = 58.8 \text{ seconds}$$

Describing and Analyzing Data

007 Distance Traveled by Each Bond

The table below illustrates the number of films, the countries traveled, and the total number of miles logged by each James Bond. Find the median and mean of the miles traveled by the Bonds. Then find the median and mean of the miles traveled by the Bonds without the outlier, George Lazenby. (We're going to assume that Lazenby is the only outlier.) Which measure of center is best, the median or mean? Explain.

Actor	Films	Countries	Miles
Daniel Craig	4	15	71,804
Roger Moore	7	18	70,163
Sean Connery	6	17	50,208
Pierce Brosnan	4	16	48,688
Timothy Dalton	2	10	17,530
George Lazenby	1	3	4,955

Mean 1 = 43891.33 miles

Median 1 = 49448 miles

Mean 2 = 51678.6 miles

Median 2 = 50208 miles

Median is a better measure of center as it accounts for the outlier.

Describing and Analyzing Data

007 Villain Heights

The table below illustrates a partial list of the heights (in inches) of James Bond villains. With the exception of one of these villains, I chose villains shorter than myself. Find the median and the mean. Then, find the median and the mean *excluding* Richard Kiel's height. Based on the information you just found, which measure of center would you consider to be better in this situation? Why?

Some of Dr. Moulton's Favorite Bond Villains and Their Heights			
Actor	Character	Movie	Height
Donald Pleasence	Blofeld	You Only Live Twice	67
Richard Kiel	Jaws	Moonraker, The Spy Who Loved Me	86
Steven Berkoff	General Orlov	Octopussy	69
Robert Carlyle	Victor Zokas	The World Is Not Enough	68
Will Yun Lee	Colonel Moon	Die Another Day	69
Mathieu Amalric	Dominic Greene	Quantum of Solace	66
Rami Malek	Safin	No Time To Die	69

Mean 1 = 70.375 inches

Median 1 = 69 inches

Mean 2 = 68.07143 inches

Median 2 = 68.5 inches

The median is a better measure of center in this case (albeit slightly), as it accounts for the outlier.

Linear Regression

007 Success of Bond Films

The following chart shows the adjusted worldwide gross of James Bond films by the year they were released. It's hard to read, but the bubbles are all we need for this quiz. Does the chart give a positive, negative, or no correlation? Source: <https://chance.amstat.org/2014/04/james-bond/>

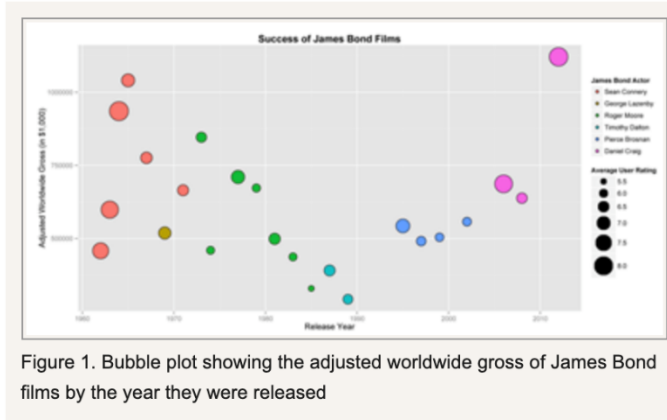


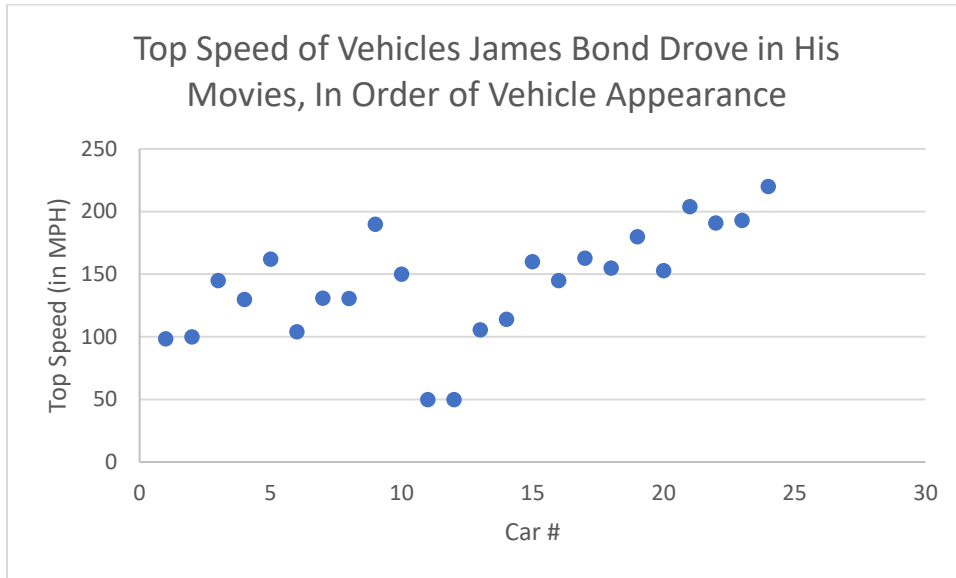
Figure 1. Bubble plot showing the adjusted worldwide gross of James Bond films by the year they were released

No correlation

Linear Regression

007 Top Speeds of Bond Cars

Find the equation of the linear regression line in slope-intercept form for the following data points. Is there a positive, negative, or no regression?



Positive correlation

Understanding Personal Finance

007 Ms. Ryder Sea Shells

In the movie *Dr. No*, the Bond girl Ms. Ryder says she can make a pretty good living selling seashells in Miami, and the one that she is holding in her hands can get her \$50. This seashell appears to be a large nautical conch seashell and is worth about \$90 today. What is the percent increase of the seashell's value?

$$\text{Percent Increase} = \frac{\text{new} - \text{original}}{\text{original}} \cdot 100 = \frac{90 - 50}{50} \cdot 100 = 80\%$$

On top of 100%, this makes a 180% increase.

Understanding Personal Finance

007 Q-Boat Percent Increase in Cost

Based on the website

<https://airows.com/automotive/you-can-buy-james-bonds-q-boat-for-under-10000>

the price of James Bond's Q-boat used in *The World Is Not Enough* was around \$8,400 when it was auctioned off in 1995. Let's assume the value of the boat has decreased by 30% from the previous year. What was the value of the boat in 1994?

$$\frac{8400 - x}{x} \cdot 100 = -30$$

$$\frac{8400 - x}{x} = -0.30$$

$$8400 - x = -0.30x$$

$$8400 = 0.7x$$

$$x = \$12,000 \text{ value in 1994}$$

Understanding Interest

007 Bond Winnings in *Casino Royale*... What if he invested it?

In the movie *Casino Royale*, James Bond beats bad guy Le Chiffre in poker and wins \$115 million. Suppose he deposited this money into an account earning 6% annual interest for 10 years. (Basically, he wants to really retire in style.) Calculate the future value of the investment if the interest is compounded semiannually. Round your answer to the nearest cent. Show your work! Use the formula:

$$A = P \left(1 + \frac{r}{n} \right)^{nt}$$

$$A = P \left(1 + \frac{r}{n} \right)^{nt} = 115 \left(1 + \frac{0.06}{12} \right)^{12(10)} \approx \$209.2 \text{ million}$$

Saving Money

007 Bond daughter's college fund

Suppose James Bond and Dr. Madeleine Swann just had a daughter and want to send her to THE most expensive college in the world. According to uscollegeinternational.com, this would be Franklin and Marshall College, with an annual tuition of \$58,615. Assume their daughter completes college in four years. Find the total amount it will cost to go to college for the four years. How much should Mr. and Mrs. Bond put aside in an account with an APR of 11% compounded monthly in order to have the tuition in place for the four-year degree, once their daughter turns 18? Round to the nearest cent, which means don't round until the very end! Use the formula:

$$PV = \frac{A}{\left(1 + \frac{r}{n}\right)^{nt}}$$

$$4(\$58,615) = \$234,460$$

$$PV = \frac{A}{\left(1 + \frac{r}{n}\right)^{nt}} = \frac{234,460}{\left(1 + \frac{0.11}{12}\right)^{12(18)}} \approx \mathbf{\$32,665.02}$$

Borrowing Money

007 Buying a Car

Bond sets his sights on an Aston Martin DB11, which costs \$250,000. He pays a 20% down payment and finances the remaining balance for 72 months with an APR of 6.5%. Determine the monthly payment that Bond pays. Round your answer to the nearest cent. Use the formula:

$$PMT = \frac{\left(P \cdot \frac{r}{n}\right)}{\left[1 - \left(1 + \frac{r}{n}\right)^{-nt}\right]}$$

$$0.2(250,000) = \$50,000$$

$$\$250,000 - \$50,000 = \$200,000$$

$$PMT = \frac{\left(200,000 \cdot \frac{0.065}{12}\right)}{\left[1 - \left(1 + \frac{0.065}{12}\right)^{-72}\right]} \approx \mathbf{\$3,361.99/month}$$

Borrowing Money

007 Money Penny's Financial Woes

In the movie *View to a Kill*, Bond's friend Ms. Money Penny hints that she has a potential gambling problem. Supposed that she picked up a gambling debt of \$200,000. Now suppose she wants to pay it off in five years at an APR of 23%. What would be her monthly payment?

$$PMT = \frac{\left(P \cdot \frac{r}{n}\right)}{\left[1 - \left(1 + \frac{r}{n}\right)^{-nt}\right]}$$

$$PMT = \frac{\left(P \cdot \frac{r}{n}\right)}{\left[1 - \left(1 + \frac{r}{n}\right)^{-nt}\right]} = \frac{\left(200,000 \cdot \frac{0.23}{12}\right)}{\left[1 - \left(1 + \frac{0.23}{12}\right)^{-12(5)}\right]} = \$5,638.09/\text{month}$$

Now suppose that she has an opportunity to pay off the \$200,000 at 0% APR, as long as she pays it off in two years, otherwise she will be hit with a 27% APR. However, it does have a one-time fee of 10%. What would her monthly payment be in this case, as long as she can pay it off before the two-year period is up?

$$0.10(200,000) = \$20,000 \text{ one time fee}$$

$$\text{Total} = 200,000 + 20,000 = \$220,000$$

$$\$220,000 \div 24 \text{ months} = \$9,166.67$$