College Algebra Project 2

Algebra Boogaloo

Prologue

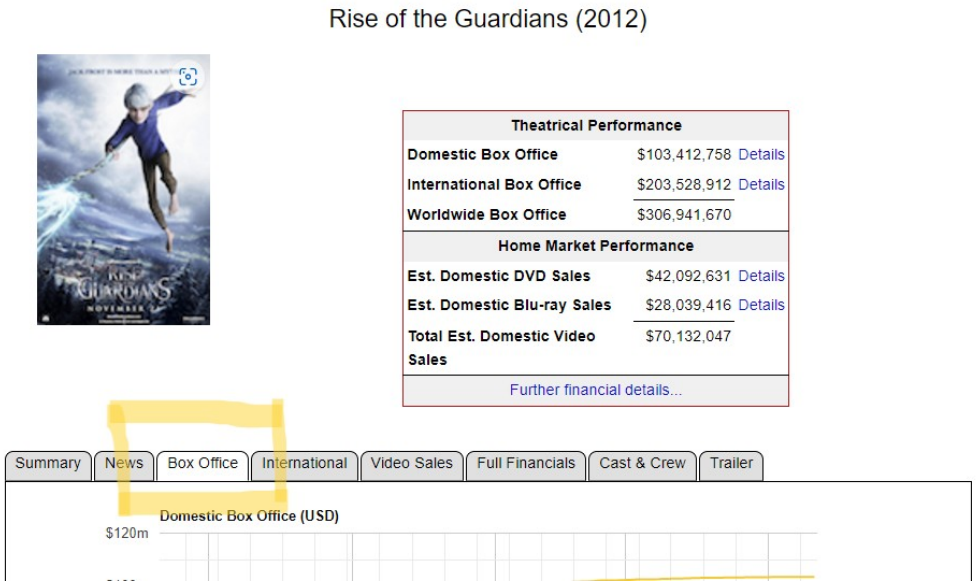
In the spring of 2023, I was regularly watching Dan Murrell's box office recaps on YouTube called "Charts with Dan". We were watching week-by-week to see if *Avatar 2: The Way of Water* would exceed the box office of *Top Gun: Maverick*. Through this discussion, I was able to create a method for pedicting future box office of a movie using an older movie as a reference. This method uses topics from this course. This project will go through this method step-by-step.

Act One

To start this project, we are going to need some data.

1. Pick two movies, one that is a couple of years old, and one that is more recent. As an example, I will pick *Rise of the Guardians* and *Red One*. (You may not pick those movies.) Write your movies below.
   Old Movie:
   New Movie:

2. Go to the website the-numbers.com and search for your movies. You will see a tab called "Box Office."



3. Scroll down to "Daily Box Office Performance" on the "Box Office" page. The weekend days are highlighted in light pink. This means that Fridays are at the top of a sequence of pink rows.

Daily Box Office Performance

Date	Rank	Gross	%YD	%LW	Theaters	Per Theater	Total Gross	Days
Nov 21, 2012	3	$4,837,243			3,653	$1,324	$4,837,243	1
Nov 22, 2012	5	$3,730,382	-23%		3,653	$1,021	$8,567,625	2
Nov 23, 2012	4	$9,219,537	+147%		3,653	$2,524	$17,787,162	3
Nov 24, 2012	4	$9,158,000	-1%		3,653	$2,507	$26,945,162	4
Nov 25, 2012	4	$5,395,928	-41%		3,653	$1,477	$32,341,090	5
Nov 26, 2012	5	$840,220	-84%		3,653	$230	$33,181,310	6
Nov 27, 2012	6	$900,040	+7%		3,653	$246	$34,081,350	7
Nov 28, 2012	6	$658,847	-27%	-86%	3,653	$180	$34,740,197	8
Nov 29, 2012	5	$707,056	+7%	-81%	3,653	$194	$35,447,253	9
Nov 30, 2012	5	$2,970,844	+320%	-68%	3,672	$809	$38,418,097	10
Dec 1, 2012	3	$6,258,906	+111%	-32%	3,672	$1,704	$44,677,003	11
Dec 2, 2012	2	$4,159,102	-34%	-23%	3,672	$1,133	$48,836,105	12
Dec 3, 2012	5	$565,496	-86%	-33%	3,672	$154	$49,401,601	13

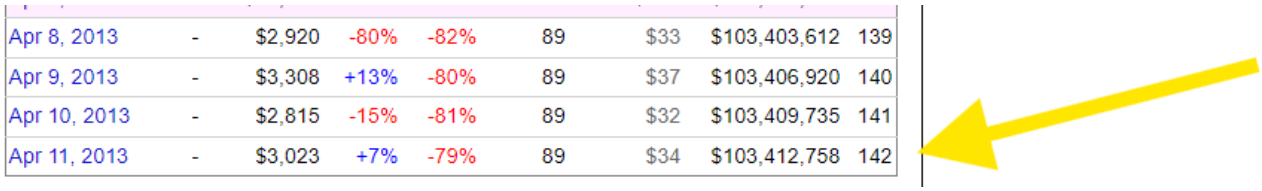
Record the total gross for the first 10 days the movie was in the theater. Start counting on the first Friday. Recored the data in millions of dollars and rounded to one decimal place. For *Rise of the Guardians*, the data is below.

Day	Total Gross (Millions of Dollars)
1	17.8
2	26.9
3	32.3
4	33.2
5	34.1
6	34.7
7	35.4
8	38.4
9	44.7
10	48.8

Record your data for the old movie and the new movie in the table below.

Day	Old Movie Total Gross (Millions)	New Movie Total Gross (Millions)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

4. Record the total gross for the old movie on the last day it is in theaters. For *Rise of the Guardians*, this is $103.4 million.



Apr 8, 2013	-	$2,920	-80%	-82%	89	$33	$103,403,612	139
Apr 9, 2013	-	$3,308	+13%	-80%	89	$37	$103,406,920	140
Apr 10, 2013	-	$2,815	-15%	-81%	89	$32	$103,409,735	141
Apr 11, 2013	-	$3,023	+7%	-79%	89	$34	$103,412,758	142

Act Two

Now that we have some data, we will use it to make a mathematical model to let us predict the box office of the new movie by using the box office of the old movie. We will start by creating the model and performing a sanity test on the model.

5. Perform a linear regression on the data. Use the Old Movie Total Gross for L1 in your calculator and the New Movie Gross for L2 in your calculator. Write the regression equation below. Round your parameters to two decimal places. (For my movies, the regression equation is $y = 1.385\,x - 11.946$.)

6. Record the total gross for days 11 through 15 for both movies.

Day	Old Movie Total Gross (Millions)	New Movie Total Gross (Millions)
11		
12		
13		
14		
15		

7. Use the regression equation to predict the new movie total gross from the old movie total gross for days 11 – 15. That is, plug in the old movie gross into the regression equation for x and record the y values below.

Day	Old Movie Total Gross (Millions)	Predicted New Movie Total Gross (Millions)
11		
12		
13		
14		
15		

8. Compare the actual new movie total grosses from question 7 to the predicted new movie total grosses from question 8. How close are the answers? Do you think this model works? Write your answer in a couple of complete sentences.

9. What is the meaning of the slope of the regression equation? Describe the slope in terms of the total grosses of the two movies. Use a complete sentence.

10. Use the regression equation to find the total gross when it was the same on the same day. (That is, solve the equation $x = ax + b$ for your regression line.)

Act Three

Now that we have created and tested our model, we will use it to make a bold prediction.

11. Use the total gross of the old movie and the regression equation to predict the gross of the new movie on the same day. Write your answer below. This is your predicted total gross for the new movie.

12. What are some ways you could improve this method? Write your answer in a couple of complete sentences.