

To the teacher:

In this task, students work together to create live data visualizations of a dataset about Marvel movies. Each student is given a data card that provides information about one movie, the student's job is to play the part of "data point" as the class works to physically organize themselves into 'live' visualizations of the data. The data provides opportunities for students to organize themselves into bar graphs, histograms, and scatter plots.

Introduction:

Start by explaining to students that each of them is going to represent one data point in the creation of a live data visualization. Let them know they will be given a data card that tells them information about one Marvel movie.

Explain to students some of the details of the dataset they will work with. The data set contains all of the Marvel movies released in the past 10 years. Marvel has made many, many movies! This data set consists of 34 movies, all released between 2011 and 2021. We have excluded those that were rated R, and those that were animated. Each data card contains data on the following variables for each movie:

- Title
- Genre(s)
- Release Year
- Average Audience Rating (an average rating on a scale of 1 to 10)
- Runtime (in minutes)

Share with students from where this data was sourced. Some students may be curious about how the movies are rated. These ratings were recorded from the Internet Movie Database (IMDb) which allows registered users to cast their rating for each move. Each users rating is out of 10, then IMDb displays the average of all ratings.

Dataset sources: <u>https://www.kaggle.com/promptcloud/all-marvel-cinematic-universe-movies-on-imdb</u> and updated using <u>https://www.imdb.com/list/ls000024621/</u>

Once you have explained to students the details of the dataset and the included variables, ask them to brainstorm different ways to use this information to organize the movies in various ways. Create a list on the board of what students come up with

Teacher note: If your students are not familiar, it can be helpful to remind students about bar charts, histograms, and scatter plots. A bar graph is used to represent categorical data (e.g. genre, type). Each bar represents a different variable, and the height is based on the frequency of that variable. Histograms are used to represent numerical data (e.g. numerical measures, ratings) in a single variable. Across the horizontal access all the values the variable takes on are represented

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Histogram

through "bins" or ranges of values. The height of each bar represents the frequency of that data measure. Histograms become especially interesting when working with continuous variables like decimals. For example, in the histogram below, where would you count a data point that measured 13.71428571?



Bar Graph

Finally, scatter plots are used to graph bivariate data—or data in two variables. The x and y-axis each represent numerical measures. For example, we can plot the height of a plant (y) over time (x).

Before you implement this activity with students, you'll want to prepare a very large x-y-axis (unlabeled) either outside or in a large indoor space. We have provided wording and values for the labels based on which type of visual you are challenging the class to create. You will need to print and cut the pages with data cards. There are 34 data cards on pages 5 through 9. Each student should have their own data card.

Here are six challenges you can pose to your class (2 bar graphs, 2 histograms, and 2 scatter plots). Upon the completion of each graph you might consider taking a picture of the Live Data Visual so that students can reference at least one of the graphs in a final reflection.

Included with each graph description are suggested axis labels. You can write the axis labels on paper or wipe off boards. Ask students to place the wipe off boards or paper labels out on the axis/axes. Each graph has a note on some interesting conversations/challenges students may face when creating the Live Data Visual. Note that for the bar graph and histograms, students whose data point lie in the same "bar" will want to organize themselves so that they create a rectangular bar shape (rather than standing alone to represent a point). To show that several data points/ students are together creating a rectangular bar, students in that category/bin can line up and extend their arms in front of themselves to create the sides of the bar for the picture you will take of the completed Live Data Visual. Here are the six challenge graphs:

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Challenge Graphs

(1) Bar Graph on Genre Categories

Horizontal axis labels: (Action, Adventure, Sci-Fi), (Action, Adventure, Fantasy) (Action Adventure Comedy), (Other)

Note: Students will need to decide what to do with those movies who do not distinctly fall into one of these categories. For example, some movies are labeled with the genres "Action, Adventure, Sci-Fi, Thriller". In these cases, it would be good for the class to have a conversation about where to plot this data point. Does it fall into the "Action, Adventure, Sci-Fi" group? Or does this data point go into the "Other" category?

(2) Bar Graph on Release year

Horizontal axis labels: 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021

Note: Although years are numbers, we are representing this data as a bar graph rather than a histogram. This is due in part to the fact that not all years have the same number of days (leap years!) which makes placing years into evenly spaced bins difficult.

(3) Histogram of average audience rating Horizontal axis labels: 4 - 5, 5 - 6, 6 - 7, 7 - 8, 8 - 9 Bin width: 1

Note: The labels on these bins are overlapping because the set of values representing ratings are continuous. Students will need to discuss what to do with data points that fall directly on the bin limits. For example, where does a movie with an average audience rating of 7 go? In the 6-7 bin? Or the 7-8 bin? Students should discuss this and make sure to sort all the movies in a consistent way.

(4) Histogram of Runtime in Minutes

Horizontal axis: 90-94.5,94.5-99, 99-103.5, 103.5-108, 108-112.5, 112.5-117, 117-121.5, 121.5-126, 126-130.5, 130.5-135 **Bin width:** 4.5

Note: These bin labels overlap in the same way as above, so students should have a similar discussion to the one noted above. An interesting discussion topic here is why these bin labels were chosen. Notice there are a total of 10 bins, how does that imply the bid width?



(5) Scatter Plot, Release Year (x) vs. Runtime(y) X-axis: 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021 Y-axis: 90, 95, 100, 105, 110, 115, 120, 125, 130, 135

Note: Both the x and y axis labels do not start at 0. Students should discuss why these labels make sense in our context, but also how these labels might visually skew our data in some ways. How can we make sure viewers of our graph are aware that these labels do not start at 0?

(6) Scatter Plot, Release Year (x) vs. Average Audience Rating (y) X-axis: 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021 Y-axis: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Note: The y-axis is labeled with whole numbers but many of the average audience ratings are not whole numbers. Invite students to discuss why these labels may have been chosen, and what strategies they might use when plotting their points points to accurately represent the data measure. Also notice that the x-axis labels do not start at 0, which may invite a similar conversation to the one in graph (5).

Use a stool to take a picture of each graph the students create. Provide the visual for students to use in their own analysis and reflection of the task along with printouts of the entire data set. Students will select one of the graphs they created as a class and explore what they can learn about the data from the graph. Encourage students to re-engage with the data set for example, students can connect data entries to people in the graph, or students can import the data into Codap and re-create their graph using digital tools.

Final Write Up Questions for Students:

 Choose one of the graphs to investigate with your group. What patterns do you notice from this data visual?

What conclusions can you make about the data based on this visual?

2. Describe at least one thing you learned about creating data visualizations (bar graphs, histograms, and scatter plots). What did you enjoy about this task? What did you find challenging about this task?

| Title | Black Widow |
|----------------------|----------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2021 |
| Movie Rating | PG-13 |
| Review Rating | 6.8 |
| Movie Run Time | 134 min |

| Title | Shang-Chi and the Legend of the Ten Rings | |
|----------------------|--|--|
| Genres | Act Adv Fant | |
| Release Date | 2021 | |
| Movie Rating | PG-13 | |
| Review Rating | 7.9 | |
| Movie Run Time | 132 min | |

| Title | Venom: Let There Be Carnage |
|----------------------|--------------------------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2021 |
| Movie Rating | PG-13 |
| Review Rating | 6.9 |
| Movie Run Time | 90 min |

| Title | Venom | |
|----------------------|-----------------------|--|
| Genres | Act Adv Sci-Fi Thrill | |
| Release Date | 2021 | |
| Movie Rating | PG-13 | |
| Review Rating | 6.9 | |
| Movie Run Time | 90 min | |

| Title | The New Mutants |
|----------------|---------------------|
| Genres | Act Horr Mys Sci-Fi |
| Release Date | 2020 |
| Movie Rating | PG-13 |
| Review Rating | 5.3 |
| Movie Run Time | 94 min |

| Title | X-Men: Dark Phoenix |
|----------------------|---------------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2019 |
| Movie Rating | PG-13 |
| Review Rating | 5.7 |
| Movie Run Time | 113 min |

| Title | Captain Marvel | | |
|----------------|----------------|--|--|
| Genres | Act Adv Sci-Fi | | |
| Release Date | 2019 | | |
| Movie Rating | PG-13 | | |
| Review Rating | 7.1 | | |
| Movie Run Time | 123 min | | |

| Title | Spider-Man: Far from Home | |
|----------------------|------------------------------|--|
| Genres | Act Adv Sci-Fi | |
| Release Date | 2019 | |
| Movie Rating | PG-13 | |
| Review Rating | 7.5 | |
| Movie Run Time | 129 min | |

| Title | Avengers: Endgame | Title | Black Panther |
|----------------|-------------------|----------------------|----------------|
| Genres | Act Adv Sci-Fi | Genres | Act Adv Sci-Fi |
| Release Date | 2019 | Release Date | 2018 |
| Movie Rating | PG-13 | Movie Rating | PG-13 |
| Review Rating | 8.8 | Review Rating | 7.3 |
| Movie Run Time | 181 min | Movie Run Time | 134 min |

| Title | Avengers: Infinity War |
|----------------------|------------------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2018 |
| Movie Rating | PG-13 |
| Review Rating | 8.5 |
| Movie Run Time | 149 min |

| Title | Ant-Man and the Wasp | | |
|----------------------|----------------------|--|--|
| Genres | Act Adv Com Sci-Fi | | |
| Release Date | 2018 | | |
| Movie Rating | PG-13 | | |
| Review Rating | 7.1 | | |
| Movie Run Time | 118 min | | |

| Title | Spider-Man: Homecoming |
|----------------------|------------------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2017 |
| Movie Rating | PG-13 |
| Review Rating | 7.5 |
| Movie Run Time | 133 min |

| Title | Guardians of the Galaxy Vol. 2 |
|----------------------|-----------------------------------|
| Genres | Act Adv Com Sci-Fi |
| Release Date | 2017 |
| Movie Rating | PG-13 |
| Review Rating | 7.7 |
| Movie Run Time | 136 min |

| Title | Thor: Ragnarok |
|----------------|----------------------------|
| Genres | Act Adv Com Fan Sci-Fl |
| Release Date | 2017 |
| Movie Rating | PG-13 |
| Review Rating | 7.9 |
| Movie Run Time | 130 min |

| Title | X-Men: Apocalypse |
|----------------------|-------------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2016 |
| Movie Rating | PG-13 |
| Review Rating | 6.9 |
| Movie Run Time | 144 min |

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| Title | Captain America: Civil War |
|----------------|-------------------------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2016 |
| Movie Rating | PG-13 |
| Review Rating | 7.8 |
| Movie Run Time | 147 min |

| Title | Doctor Strange |
|----------------------|--------------------|
| Genres | Act Adv Fan Sci-Fi |
| Release Date | 2016 |
| Movie Rating | PG-13 |
| Review Rating | 7.5 |
| Movie Run Time | 115 min |

| Title | Fantastic Four |
|----------------------|----------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2015 |
| Movie Rating | PG-13 |
| Review Rating | 4.2 |
| Movie Run Time | 100 min |

| Title | Ant-Man |
|----------------------|--------------------|
| Genres | Act Adv Com Sci-Fi |
| Release Date | 2015 |
| Movie Rating | PG-13 |
| Review Rating | 7.3 |
| Movie Run Time | 117 min |

| Title | Avengers: Age of Ultron |
|----------------|-------------------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2015 |
| Movie Rating | PG-13 |
| Review Rating | 7.3 |
| Movie Run Time | 141 min |

| Title | X-Men: Days of Future Past |
|----------------------|-------------------------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2014 |
| Movie Rating | PG-13 |
| Review Rating | 7.9 |
| Movie Run Time | 132 min |

| Title | The Amazing Spider-Man 2 |
|----------------|-----------------------------|
| Genres | Act Adv Fan |
| Release Date | 2014 |
| Movie Rating | PG-13 |
| Review Rating | 6.6 |
| Movie Run Time | 142 min |

| Title | Guardians of the Galaxy |
|----------------------|-------------------------|
| Genres | Act Adv Com Sci-Fi |
| Release Date | 2014 |
| Movie Rating | PG-13 |
| Review Rating | 8.1 |
| Movie Run Time | 121 min |

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| Title | Captain America: The Winter Soldier |
|----------------------|--|
| Genres | Act Adv Sci-Fi Thrill |
| Release Date | 2014 |
| Movie Rating | PG-13 |
| Review Rating | 7.8 |
| Movie Run Time | 136 min |

| Title | The Wolverine |
|----------------------|---------------|
| Genres | Act Sci-Fi |
| Release Date | 2013 |
| Movie Rating | PG-13 |
| Review Rating | 6.7 |
| Movie Run Time | 126 min |

| Title | Iron Man 3 |
|----------------|----------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2013 |
| Movie Rating | PG-13 |
| Review Rating | 7.2 |
| Movie Run Time | 130 min |

| Title | Thor: The Dark World |
|----------------------|----------------------|
| Genres | Act Adv Fant |
| Release Date | 2013 |
| Movie Rating | PG-13 |
| Review Rating | 6.9 |
| Movie Run Time | 112 min |

| Title | The Amazing Spider-Man |
|----------------|------------------------|
| Genres | Act Adv Fant |
| Release Date | 2012 |
| Movie Rating | PG-13 |
| Review Rating | 6.9 |
| Movie Run Time | 136 min |

| Title | The Avengers |
|----------------------|----------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2012 |
| Movie Rating | PG-13 |
| Review Rating | 8.1 |
| Movie Run Time | 143 min |

| Title | Ghost Rider: Spirit of Vengeance |
|----------------|-------------------------------------|
| Genres | Act Fan Thrill |
| Release Date | 2011 |
| Movie Rating | PG-13 |
| Review Rating | 4.3 |
| Movie Run Time | 96 min |

| Title | X-Men: First Class |
|----------------|--------------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2011 |
| Movie Rating | PG-13 |
| Review Rating | 7.7 |
| Movie Run Time | 131 min |

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| Title | Thor |
|----------------------|--------------------|
| Genres | Act Adv Fan Sci-Fi |
| Release Date | 2011 |
| Movie Rating | PG-13 |
| Review Rating | 7 |
| Movie Run Time | 115 min |

| Title | Captain America: The First Avenger |
|----------------------|---------------------------------------|
| Genres | Act Adv Sci-Fi |
| Release Date | 2011 |
| Movie Rating | PG-13 |
| Review Rating | 6.9 |
| Movie Run Time | 124 min |