**Hollywood Physics Project**

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| --- | --- | --- |
| After some intense research, the scientist shown in the cartoon learned how to defy the force of gravity.  In space, astronauts can perform feats like this but on or near Earth, we have not found a way to escape its gravitational field.  In movies and television, however, the directors are able to use special effects to defy the laws of physics. The characters can fly, pick up cars, jump over buildings, levitate in the air, and run at impossible speeds. |  | breaking-laws-of-physics-cartoon.gif |

*How can we tell if movies “break the law”?*

Sometimes movies obviously break from reality.  Other times, though, this is not so obvious.  As you will learn in this project, analyzing the motion of an object with respect to time can help us determine the forces causing the motion and if the motion is possible under the same physical laws we observe everyday.

*Is this only important for show business?*

Important beyond movies, physicists analyze the motion of subatomic particles to decipher the scientific mysteries of our time.  Athletes analyze motion to improve performance and develop game plans.  Police analyze motion to investigate car accidents and crime scenes.  Engineers analyze the motion of everything they build, from bridges to supersonic aircraft.

Understanding the connection between force and motion allows scientists to understand the causes of motion and provides an ability to predict or control motion.  The project of modeling force and motion got moving with Galileo Galilei in the early 1600’s and leapt forward with Isaac Newton’s Laws of Motion (*Principia,* 1687).  These laws have served as a foundation for human’s understanding of all facets of our world, leading to all modern science and engineering, our trips to the moon and beyond.

Challenge: Use the video analysis tools and physics equations to analyze a Hollywood action scene and Creekwood Action scene and determine whether the scences violate the laws of physics.

Product: A google presentation with analysis of a Hollywood Video and a scene created by your team. Your audience is a group of elderly citizens who have not been in high school physical science for a very long time.

Step 1: Find a Clip

* The video clip must be only one-dimensional
* Slow enough to make accurate estimates of distances and times (if in slo-mo, you need to account for this)
* Must include acceleration
* Avoid extreme violence, profanity or other things generally inappropriate for school.

Submit the clip for review before proceeding video approved 🞎

Step 2: Trim clip to desired length:

1. Open tubechop.com or other video clip software.
2. Select the portion of the video needed for analysis (between 20-45 seconds)

STEP 3: Imbed Original Video in Presentation

To help the audience connect to your analysis, you need to embed the video into your presentation.

* 1. Limit the video length to the specific section you analyzed (use youtube.com/edit) or movie maker (we don’t have all day to watch a movie)
  2. Incorporate **screenshots** throughout the presentation to help the reader understand the exact points of interest.
  3. Introduce concepts to the audience before applying them (remember your audience).
  4. Cite your sources

STEP 4: Physics APP Analysis

Pick the object/ person in the clip that you are going to analyze. **Play the video in the physics app.**

1. Determine the distance the object traveled: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Explain how your group determined this value:

2. Grab a screen shot of the distance and label. (d) imbed in presentation.

3. Determine the time it took the object/person to travel (d): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Explain how your group determined this value: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Put the time value in the presentation.

5. Use the distance and time to calculate the average velocity of the object:

6. Put this calculation and all work in presentation.

7. Assuming your object started from rest calculate the acceleration using the velocity from question 5:

8. Put this calculation and all work in presentation.

9. Conduct research to determine the best estimate of mass for your object in kilograms. Cite your source. **Mass=**

Source: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10. Calculate the force of the moving object in the video using your estimated mass and the previous acceleration calculation.

Work:

11. Put this calculation and all work in presentation.

12. Take a screenshot from your scene and create a force diagram using arrows. You do not have to calculate the friction value, just label it, if needed.

Draw simple force diagram here:

13. Put this is presentation.

Step 3: Design your Own Scene

A. Create an action scene and video using the physics app.

B. Imbed the video in your presentation.

C. Video cannot include any depiction of violence, weapons, profanity or vehicles. video approved 🞎

Pick the object/ person in the clip that you are going to analyze. **Play the video in the physics app.**

1. Determine the distance the object traveled: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Explain how your group determined this value:

2. Grab a screen shot of the distance and label. (d) imbed in presentation.

3. Determine the time it took the object/person to travel (d): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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