* Challenger Space Shuttle (exponential regression, quadratic regression, and prediction) (can modify lesson to highlight probability, multiplication rule)
* Materials needed

0-ring to show students

computer with internet access

projection system for video clips on computer

Fathom on teacher computer and/or student computer lab with Fathom software

1) Have a quick talk with students about simple probability. This will help them understand the short video clip in step 4.

Probabilities range form 0 to 1, not likely to highly likely. If P(failure) =.023 then the P(success) = ?

2) Write space shuttle and NASA on the board. Students use scrap paper to individually list any ideas or thoughts that come to mind with those two words. 2 minutes

Students turn to a partner and share. 3 minutes

Students report out some of their ideas to the whole class. 5 minutes

As a point of teacher curiosity, I wonder if teens in 2010 have a positive or negative view of space exploration? Are their views based on factual information? Do they have much background knowledge about NASA?

3) Watch video clip at <http://www.youtube.com/watch?v=Mr1TMyxArXk&feature=related> . Space Shuttle Challenger Explosion - ABC News - 1/28/1986 10 minutes

Listen to audio clip at <http://www.youtube.com/watch?v=gEjXjfxoNXM> . President Ronald Reagan - Address on the Challenger Disaster 5 minutes

Answer the following questions with their partners. What questions do have about the disaster? What do you think were the long-term consequences of the disaster? What was the mood of the nation at the time? 2 minutes

Whole group discusses what President Reagan should do now? 3 minutes

4) Watch this video clip <http://www.learner.org/resources/series65.html> . Click on the Random Variables video, and set it up to see minute 4. The clip runs through 7 minutes and 19 seconds.

POSE THESE QUESTIONS TO STUDENTS “Was the Challenger explosion a fluke, or could it have been predicted and possibly avoided?” and “How does math help us determine that?”

5) Open Fathom with shuttle O-ring data. Create a scatter plot using Temp as the independent variable and Failures as the dependant variable.

Describe any pattern you see between temperature and O-ring failure.

If I tell you the forecasted low temperature for the morning of the Challenger Space Shuttle launch was 31 degrees Fahrenheit, what does the scatter plot reveal about the likelihood of O-ring failure?

6) This data set can be modeled using an exponential function. Find the exponential regression that fits this data set. Right click on the middle of the graph and select Plot Function.

Using the model, how many O-rings are predicted to fail at 31 degrees Fahrenheit?

7) Should we delete all of the data points that lie on the x-axis? What would the model look like if we did?

Create another graph using Temp as the independent variable and Failures as the dependant variable.

Right click in the middle of your plot, select Add Filter, and enter the restriction Failure > 0.

Does this scatter plot reveal a connection between temperature and O-ring failure? Does it make the case as strongly as the previous scatter plot?

8) What function might best model this data set? Find the regression that fits this data set best. Right click on the middle of the graph and select Plot Function.

Using the model, how many O-rings are predicted to fail at 31 degrees Fahrenheit?

9) Officials argued that flights with no O-ring failures provided no information for the study, and disregarded these data points. Discuss the wisdom of that decision, and how it affected the models.

10) Partners answer the following questions. “Was the Challenger explosion a fluke, or could it have been predicted and possibly avoided?” and “How does math help us determine that?”