***Yellow Starbust***

By Dan Meyer

<http://threeacts.mrmeyer.com/yellowstarbursts/>

**Instructor Notes**

By Trey Cox

**What is a Three Act Task?**

* If you are unfamiliar with Dan Meyer’s Three Act Tasks or would like to watch a good overview of how they can be effectively implemented in your classroom, be sure to watch this Youtube video: [Three Act Tasks](https://www.youtube.com/watch?v=8OHvrNAfURw) .
* A very good blog produced by Dan Meyer includes valuable information. On the blog he explains his philosophy of the Three Act Task as well as answers questions from classroom teachers can be found at: [dy/dan](http://blog.mrmeyer.com/2013/teaching-with-three-act-tasks-act-one/).
* You can find an Excel spreadsheet of Three Act Tasks created or inspired by Dan Meyer can be found [here](http://www.livebinders.com/play/play_or_edit?id=330579) . It includes over 70 lessons you can access from the spreadsheet. Most of the tasks do not include fully fleshed out lessons. That is the goal of the Teacher Notes and Student Handouts that I have created and posted on the AMP Network for your use.

**Overview of Lesson:**

The question is simple: Guess how many of those packs will have exactly one yellow Starburst, Two yellow Starbursts. The lesson hooks students immediately with the initial video clip of someone unwrapping Starburst packs and being disappointed when any yellow Starburst appear.

This lesson includes the following documents (find on the AMP Network or on the Dan Meyer website):

* thecolors
* totalpacks
* colorfrequency
* Answer video: <http://threeacts.mrmeyer.com/yellowstarbursts/act3/act3.mov>
* allfrequencies
* Student Activity
* Instructor Guide

**Common Core Standard(s) Addressed:**

[CCSS.Math.Content.7.SP.A.2](http://www.corestandards.org/Math/Content/7/SP/A/2/)  
Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

[CCSS.Math.Content.7.SP.C.6](http://www.corestandards.org/Math/Content/7/SP/C/6/)  
Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.

**Yellow Starburst - Student Activity**

By Shannon Bishop and Trey Cox

Watch: “[Starburst Mound](http://threeacts.mrmeyer.com/yellowstarbursts/act1/act1.mov)” Video Labeled Act One:

On your own (without any help from other students):

1. Guess how many of the packs shown in the video will have exactly one yellow Starburst. Explain how you chose your guess. Write down one guess that you know will be too large but is still reasonable (e.g. don’t write “a billion”) and one guess you know will be too small but is still reasonable (e.g. don’t write “0”). How do you this guess is too large?
2. Guess how many of the packs shown in the video will have exactly two yellow Starbursts. Explain how you chose your guess. Write down one guess that you know will be too large but is still reasonable (e.g. don’t write “a billion”) and one guess you know will be too small but is still reasonable (e.g. don’t write “0”). How do you this guess is too small?

Team up with at least one other student and brainstorm an answer to the following question:

1. What additional information would you like to have so you can try to answer the questions “How many packs have 1 yellow?” and “How many packs have two yellows?” **Don’t actually try to provide a numerical answer** – just state the information you think would be necessary to do so. (And you may **not** just say “open them all to find out”)

Information will be provided to you BEFORE you turn the page – DO NOT TURN THE PAGE!

1. Using the additional information you have been provided with regarding the Starburst mound – answer the following questions:
   1. How many packs will have 1 yellow in them?
   2. How many packs will have 2 yellows in them?
2. What assumptions about Starbursts are built into the method you’ve implemented in solving question 4?
3. How could knowing the color ***distribution*** of the Starburst colors in this sample help? Would that possibly change your answer? How so or why not?

Watch “[The Answer](http://threeacts.mrmeyer.com/yellowstarbursts/act3/act3.mov)” and then show the Frequency of Every Pair.

1. How close were your too high and too low guesses? What was the percent error of your guesses?
2. How close were your mathematical calculations? What was the percent error of your mathematical calculations?

**Instructor Guide**

*Preface: This would be used as an introductory lesson to probability.*

**Yellow Starburst - Student Activity**

By Shannon Bishop and Trey Cox

Watch: “[Starburst Mound](http://threeacts.mrmeyer.com/yellowstarbursts/act1/act1.mov)” Video Labeled Act One:

(In groups or partnerships) Mention how important being able to judge reasonableness is.

On your own (without any help from other students):

1. Guess how many of the packs shown in the video will have exactly one yellow Starburst. Explain how you chose your guess. Write down one guess that you know will be too large but is still reasonable (e.g. don’t write “a billion”) and one guess you know will be too small but is still reasonable (e.g. don’t write “0”). How do you this guess is too large?

*Answers will vary. The purpose of this question is to get students to make a conjecture as to what they believe the answer will be within a reasonable interval. Focus on getting students to vocalize how they know their guess is too large BUT reasonable.*

1. Guess how many of the packs shown in the video will have exactly two yellow Starbursts. Explain how you chose your guess. Write down one guess that you know will be too large but is still reasonable (e.g. don’t write “a billion”) and one guess you know will be too small but is still reasonable (e.g. don’t write “0”). How do you this guess is too small?

*Answers will vary. As with question 1, the purpose of this question is to get students to make a conjecture as to what they believe the answer will be within a reasonable interval. Again, focus on getting students to vocalize how they know their guess is too small large BUT reasonable.*

Team up with at least one other student and brainstorm an answer to the following question:

1. What additional information would you like to have so you can try to answer the questions “How many packs have 1 yellow?” and “How many packs have two yellows?” **Don’t actually try to provide a numerical answer** – just state the information you think would be necessary to do so. (And you may **not** just say “open them all to find out”)

* *After brainstorming teams, pull together the class and have them discuss in a class discussion, record on white board*
* *Needed information includes:*
  + *The possible color Starbursts can be (see thecolors document)*
  + *The exact number of Starburst packs (see totalpacks document)*

Information will be provided to you BEFORE you turn the page – DO NOT TURN THE PAGE!

1. Using the additional information you have been provided with regarding the Starburst mound – answer the following questions:
   1. How many packs will have 1 yellow in them?

*Answers vary. Work with the students to try and utilize the data they have been given to come up with their conjecture and be able to back it up with valid justification. Without knowing the distribution of colors that are made there is no way to come up with an accurate estimate.*

* 1. How many packs will have 2 yellows in them?

*Answers vary. Work with the students to try and utilize the data they have been given to come up with their conjecture and be able to back it up with valid justification. Without knowing the distribution of colors that are made there is no way to come up with an accurate estimate.*

1. What assumptions about Starbursts are built into the method you’ve implemented in solving question 4?

*Most likely the assumption is that there are the same number of yellow, pink, orange, and red that the Starbucks company makes.*

1. How could knowing the color ***distribution*** of the Starburst colors in this sample help? Would that possibly change your answer? How so or why not?

*This would be very helpful, since we would know if it’s equally likely to get a yellow in a pack of two or not. It will change the answer from if there is an equal number of each color. This is because if there are more yellow than there will be more packs with yellow in them than if there weren’t very many.*

Watch “[The Answer](http://threeacts.mrmeyer.com/yellowstarbursts/act3/act3.mov)” and then show the Frequency of Every Pair.

1. How close were your too high and too low guesses? What was the percent error of your guesses?

*Answers vary. The percentage error is calculated by finding out how many over or under the guess was compared to the actual number of packs with yellow candies divided by the actual number of packs with yellow candies.*

1. How close were your mathematical calculations? What was the percent error of your mathematical calculations?

*Answers vary. The percentage error is calculated by finding out how many over or under the calculations were compared to the actual number of packs with yellow candies divided by the actual number of packs with yellow candies.*