

# The Rajah's Rice: Comparing India's Population Over Time

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<b>Grade Level</b>	8
<b>Duration</b>	2-3 class periods

## National Standards

### GEOGRAPHY

#### Element 1: The World in Spatial Terms

1. How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information.

## AZ Standards

### ELA

#### Reading

##### Key Ideas and Details

8.RI.1 Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

8.RI.3 Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).

##### Craft and Structure

**8.RI.4** Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.

#### Writing

##### Text Types and Purposes

**8.W.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with well-chosen, relevant facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

### MATHEMATICS

## Arizona Social Studies Standards

### GEOGRAPHY

**The use of geographic representations and tools helps individuals understand their world.**

8.G1.1 Use geographic tools and representations to analyze historical and modern political and economic issues and events. Key tools and representations such as maps, globes, aerial and other photos, remotely sensed images, tables, graphs, and geospatial technology

**Human-environment interactions are essential aspects of human life in all societies.**

8G2.2 Evaluate how political, social, and economic decisions throughout time have influenced cultural and environmental characteristics of various places and regions.

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### Expressions and Equations

8.EE.A.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions

### Statistics and Probability

8.SP.A.2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

### SLOP Elements

<b>Preparation</b> Adapting content Linking to background Linking to past learning Strategies used	<b>Scaffolding</b> Modeling <b>Guided practice</b> Independent practice <b>Comprehensible input</b>	<b>Grouping Option</b> <b>Whole class</b> <b>Small groups</b> Partners Independent
<b>Integrating Processes</b> <b>Reading</b> <b>Writing</b> <b>Speaking</b> <b>Listening</b>	<b>Application</b> Hands on Meaningful Linked to objectives <b>Promotes engagement</b>	<b>Assessment</b> <b>Individual</b> Group <b>Written</b> Oral

### Arizona English Language Proficiency Standards

#### Grade 6-8

#### Basic

#### Listening and Reading

Standard 1 By the end of each language proficiency level, an English learner can construct meaning from oral presentations and literary and informational text through grade appropriate listening, reading, and viewing.

B-1: determine the central idea or theme and explain how they are supported by using some text evidence.

B-2: recount specific details and information in a variety of texts.

B-3 identify and describe similarities and differences between multiple texts.

#### Speaking and Writing

Standard 3 By the end of each language proficiency level, an English learner can speak and write about grade appropriate complex literary and informational texts and topics.

B-3 compose informational text that includes details to develop a topic while using appropriate conventions.

B-5: use examples of precise language and domain-specific vocabulary within informative texts.

#### Listening, Speaking, Reading, and Writing

Standard 7 By the end of each language proficiency level, an English learner can conduct research and evaluate and communicate findings to answer questions or solve problems.

B-1: gather information from multiple provided resources to answer questions.

B-2: paraphrase observations/information notes with labeled illustrations, diagrams, or other graphics, as appropriate.

B-3: cite sources used in research.

B-4: restate the main idea using evidence from text or presentations.

## Overview

Students need to understand that squaring (using exponents) is not the same as doubling. A way to have students discover the difference is to use population over time as an example and to understand the consequences of population growing too quickly.

## Purpose

In this lesson, students will learn about exponents through reading a folktale story from India. Students will be able to link math to social studies by analyzing population change over time and creating a graph to show their findings. This lesson contains strategies for teaching diverse learners (ELLs).

## Key Vocabulary

**line of best fit:** a precise line drawn over the most data points possible

**scatter plot:** a graph that shows the relationship between two sets of data

**line graph:** a graph that shows change over time

**outlier:** a data point on a graph or in a set that is much bigger or much smaller than the next closest data point

**population:** all the people living in a particular place

## Materials

- Paper
- Scissors
- Population of India (2016 and Historical)
- India population history
- Population Growth in India since 1901
- Rough Draft handout
- Final Draft handout
- 3 Jars
- Rice
- Vocabulary Cards and Vocabulary Test
- Graphing Checklist
- Scoring Rubric for Explanation: Population Growth in India
- Graphing paper (optional)
- [The Rajah's Rice](#) by D. Berry (see Sources)
- PowerPoint showing how to make the foldable
- Foldable Definitions for Inside
- Foldable Labels for Front Side

## Objectives

The student will be able to:

1. Apply the properties of integer exponents to generate expressions to predict future population in India.
2. Graph population data using previous knowledge. Predict a line of best fit for the data.
3. Analyze population change over time by applying the properties of exponents to determine if growth is exponential.
4. Use the graph they created to write a paragraph explaining their prediction of India's population.

## Procedures

*Prerequisite Knowledge: Students should have been introduced to the basics of exponents. Students should know how to graph data points.*

*Before the lesson: Prepare the 3 jars of rice. Amounts in the jars will be exponential.*

### SESSION ONE

#### Engage:

1. Bring out 3 different sized jars filled with rice.
2. Ask students to predict how many grains of rice are found in each container and write their prediction in their Interactive Notebook or on a slip of paper. (**Application: Promotes engagement**)
3. Have students share some of their predictions.

#### Explore:

1. Read the story of [The Rajah's Rice](#) to the students. (**Grouping Option: Whole class**).
2. Have students converse (small groups and whole class) about the story and how it relates to mathematics and population. Continue by reading the section about the chess board from the story.
3. Share the exact number of grains of rice in each jar. Have students decide who was the closest to guessing the number in each jar. (**Integrating Processes: Speaking, Listening**)

#### Explain:

1. Write the vocabulary words for this lesson on the whiteboard. Hand out copies of the vocabulary cards to those who may want and/or need them. Instruct them to put the cards in their Interactive Notebooks. Review the meaning of the vocabulary words with the whole class. (**Scaffolding: Comprehensible input**)
2. Next review what is an exponent. Model how to create a foldable on exponents by showing the

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PowerPoint. Guide students in creating their own foldable. (**Scaffolding: Guided Practice**)

3. Ticket Out of the Room: Have students turn to a shoulder partner and share their foldable. (**Integrating Processes: Speaking, Listening; Assessment: Individual, Written**)

### SESSION TWO

#### Elaborate:

1. Divide students into groups of four. (**Grouping Option: Small groups**)
2. Explain that students will be using several resources to create a graph and statement about the population of India. There will be rough draft and a final draft.
3. Distribute the Graphing Checklist and Scoring Rubric as well as the Rough Draft handout. Now distribute the three sources of data: Population of India (2016 and Historical), India population history, and Population Growth in India since 1901.
4. Explain the requirements of the graph by reviewing the checklist. Emphasize the idea that students must analyze the three sources of data given to them and come to a consensus with their group to determine the most appropriate way to design their graph. The graph will be drawn in the top section of the Rough Draft handout. Instruct students to work as a groups, but each student will create their own graph.
5. Now explain the writing prompt which will be completed in the lower section: "Describe the population trend of India using mathematical terms. Predict the population trend of India for the next 2 years." (**Integrating Process: Listening, Reading, Writing; Grouping Option: Small group; Assessment: Written, Individual**)
6. Provide time for students to create a rough draft based on the collaboration of their group. Rough drafts that are not completed will be homework.

### SESSION THREE

#### Evaluate:

1. Review Graphing Checklist and Scoring Rubric one more time and have students peer edit within their small groups.
1. When students are ready, they can complete the final draft of their graph and paragraph.

## Assessment

### ELA and Geography

The Vocabulary Test can measure language acquisition. A score of 80% or higher will be considered mastery.

The explanation of the graph can be graded using the Scoring Rubric for Explanation: Population Growth in India. A score of 12 points or higher on the rubric will be considered mastery.

### Mathematics and Geography

The graph created on India's population can be scored using the Graphing Checklist. A "Yes" in Teacher Column for 8 of the 10 items will be considered mastery.

## Extensions

1. Students can create a digital representation of their graph.
2. Students can compare India's population to the United States or another country.
3. Students can create a population pyramid. See <http://geoalliance.asu.edu/poppyramids>
4. Students can find different information to create a linear graph.
5. Use one of the websites below to get the current population information.

## Sources

Population information obtained from: <http://www.worldometers.info/world-population/india-population/>

<http://countrymeters.info/en/India>

[infochangeindia.org](http://infochangeindia.org)

Clip art provided copyright free from <http://office.microsoft.com/en-us/images/>

Berry, D. (1994). *The Rajah's Rice A Mathematical Folktale from India*. New York, NY: W. H. Freeman and Company.