Harry Potter and the Age of Man

Created by Steve Klarevas
MATH 614: Rational Numbers and Proportional Reasoning for K-8 Teachers
Fall 2010

The Task

Best estimates for the age of the Earth put it at 4.54 billion years. Modern humans (in other words, humans that look like they do today) have been on the Earth for about 100,000 years.

Harry Potter and the Deathly Hallows is 784 pages long, and its average page has about 19 sentences.

If the Earth's existence, all 4.54 billion years of it, were a 784 page book with about 19 sentences per page, on what page and in which sentence on that page would modern humans make their first appearance?

Answer the question using pictures, words, tables, graphs, and/or symbols.

Big Ideas

- To strengthen students' proportional reasoning skills and their depth of knowledge regarding rational numbers, and to encourage them to attempt multiple approaches to solving any problem
- Application of scientific notation

Standards of Learning for Grades 3-4-5	Standards of Learning for Grades 6-7-8
	6.1 The student will describe and compare data using ratios.
	7.1b The student will determine scientific notation for numbers greater than zero.
	7.4 The student will solve single-step and multistep practical problems using proportional reasoning.
	8.3a The student will solve practical problems involving rational numbers, percents, ratios, and proportions.

Process Goals

- Problem Solving and Reasoning – Students will apply rational number sense and proportional reasoning to realize the small portion of time that modern man has occupied Earth.
- Connections and Representations – Students will recognize, assimilate, and use mathematical connections to solve the problem in the best manner they know. Students will use abstract or symbolic representation to record their findings and solve the problem.
- Communication – Students will justify their findings and present their results to the class with precise mathematical language.

Continue to next page for Related Tasks

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Related Task – How Can a Plane Just Disappear: A Geometric Probability Investigation

The task deals with the disappearance of Malaysian Airlines Flight 370. It is loosely related to "Harry Potter and the Age of Man" as it, too, deals with ratios (geometric probability), scientific notation, and the idea and realization of "smallness." Please see the actual task and lesson for more details.

Related Task – The Lewis Carroll Conundrum

The task is a dissection problem that deals with cutting up a square and rearranging it into a rectangle to find surprisingly that somehow an increase of one square unit of area has resulted. It is loosely related to "Harry Potter and the Age of Man" as it, too, deals with ratios (slope) and the idea and realization of "smallness." Please see the actual task and lesson for more details.

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Lesson Plan

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Materials

- The task
- A copy of *Harry Potter and the Deathly Hallows* for demonstration purposes
- Paper
- Pencils
- Calculators
- One large presentation paper per group

Facilitating Task

- Class will be divided into groups of 3-4 students.
- Read the task together and answer clarifying questions.
- Groups will be given materials upon request.
- Give students individual think time and then work together in groups.
- Groups present findings during last 10-15 minutes of class.

Misconceptions

- Questions may revolve around how to assimilate initial information from the worksheet to formulate a logical problem-solving approach (i.e., *"Where do I even begin?"*)
- Students may not be entirely sure what their answers mean in the context of the problem.

Suggested Prompts or Questions

- What is the question asking?
- What do you know?
- What is the unknown and how will you represent it?
- What does your numerical answer mean?
- Is your answer counting backwards from the end of the book?

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Name_____
Date_____

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Solution #1

total — counting backwards from now/end

$$\frac{\text{sentences}}{\text{years}} \quad \frac{14896}{4.54 \times 10^9} = \frac{x}{1 \times 10^5} \quad \frac{\text{sentences}}{\text{years}}$$

$x \approx .33$ of a sentence from the end

In other words modern humans show up about 2/3 of the way through the last sentence of the last page.

Continue to next page for Solution #2

Harry Potter and the Age of Man

Name **KEY**
Date

Solution #2

Math Explanation:

Age of the Earth: 4.54*10^9= 4,540,000,000 years

Sentences in the whole book: 784* 19 sentences= 14,896

Years per Sentence: 4,540,000,000/ 14,896= about 304,779.81

On the 784th page in the last sentence, the 304,779.81 years contain the 100,000 years where modern humans have been on Earth (in the last third of the sentence of the book).

Word Explanation:

First, I found the total number of sentences in the book. Then, I divided the 4.54 billion years (the age of the Earth) by 14,896 (the number of sentences in the book) and got about 304,779.81 (number of years per sentence). Since modern humans have been on Earth for about 100,000 years, that means they have to be a part of the 304,779.81 years in the last sentence. Therefore, modern humans would make their first appearance on the 784th page (the last page) in the 19th sentence (more precisely, in the last third of the last sentence of the book).