

In the year 2000, the world's population was about 6 billion people.

What do you think the world's population will be in 2050? Write your estimate on your Post-It note.

LO: Explore exponential growth in context.

The Story of the Chessboard

The King enjoyed playing chess so much that he decided to reward its inventor with whatever he chose. Instead of choosing gold, diamonds or land, the inventor asked for some rice, given to him in the following way:

One grain of rice placed on the first square of the chessboard

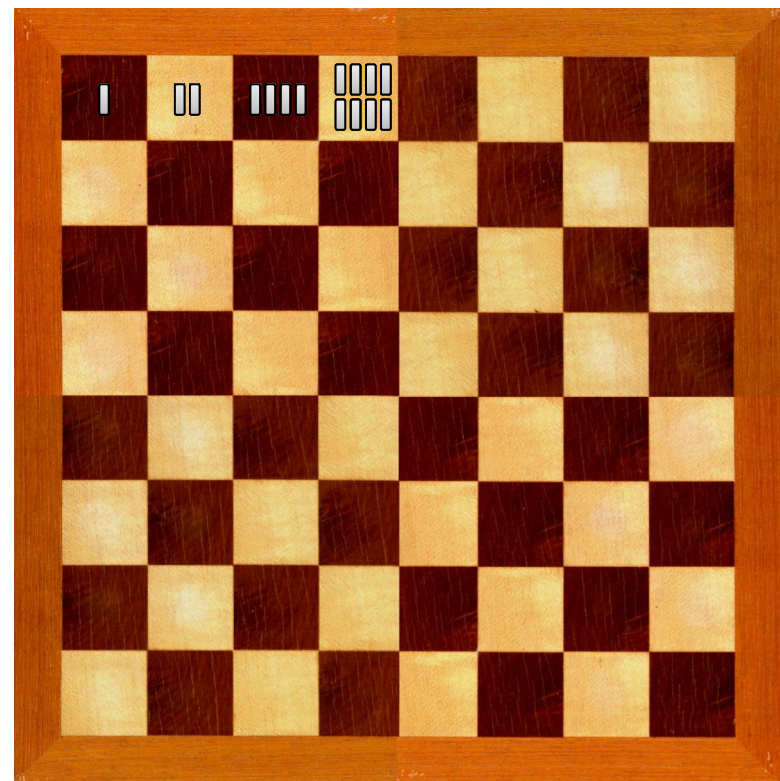
Two grains on the second square

Four grains on the third square

...and so on, doubling each time.

The King was secretly pleased that the inventor was asking for such a small reward, and asked his staff to count out the grains of rice as the inventor had asked...

Your task is to work out how many grains of rice will be on the 32nd square of the chessboard.



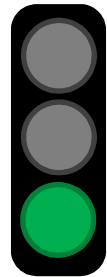
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Task

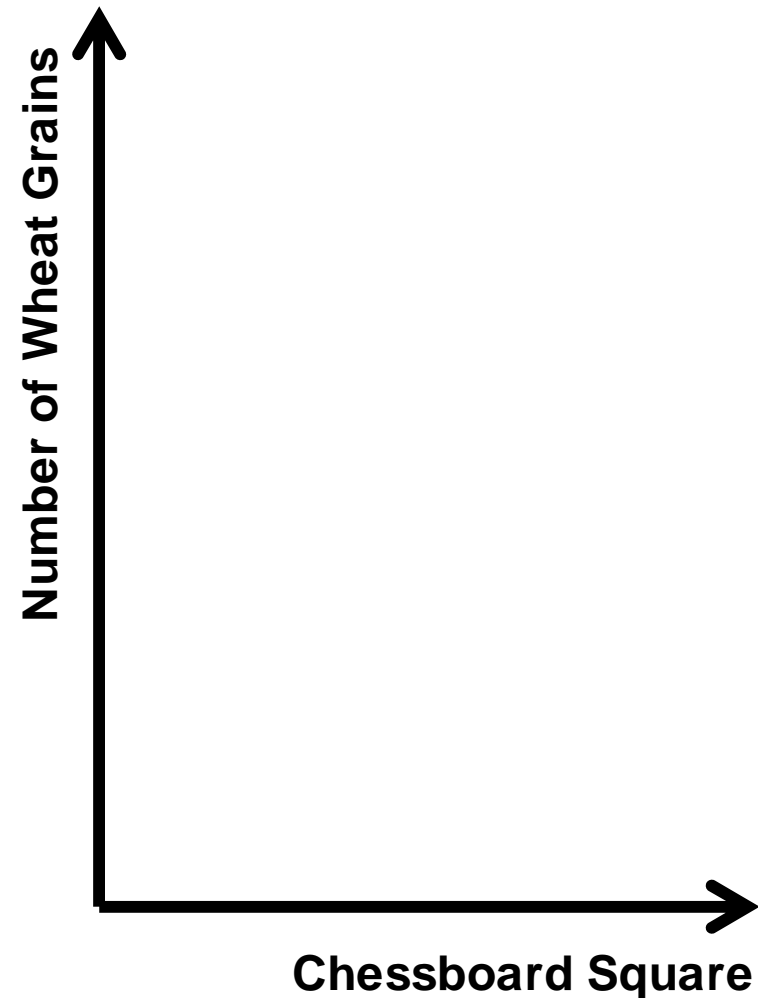


Work out how many grains of rice are on the 32nd square. Show how you have worked this out. Then show this information on a graph (see right).

Challenge



Work out how many grains of rice the inventor receives in total by the 32nd square.



LO: Explore exponential growth in context.

Square 32 contains **2,147,483,648** grains of rice.

The total amount on the board (up to square 32) is **4,294,967,295** grains of rice.

This is approximately 100,000kg of rice, which weighs the same as about 70 cars.

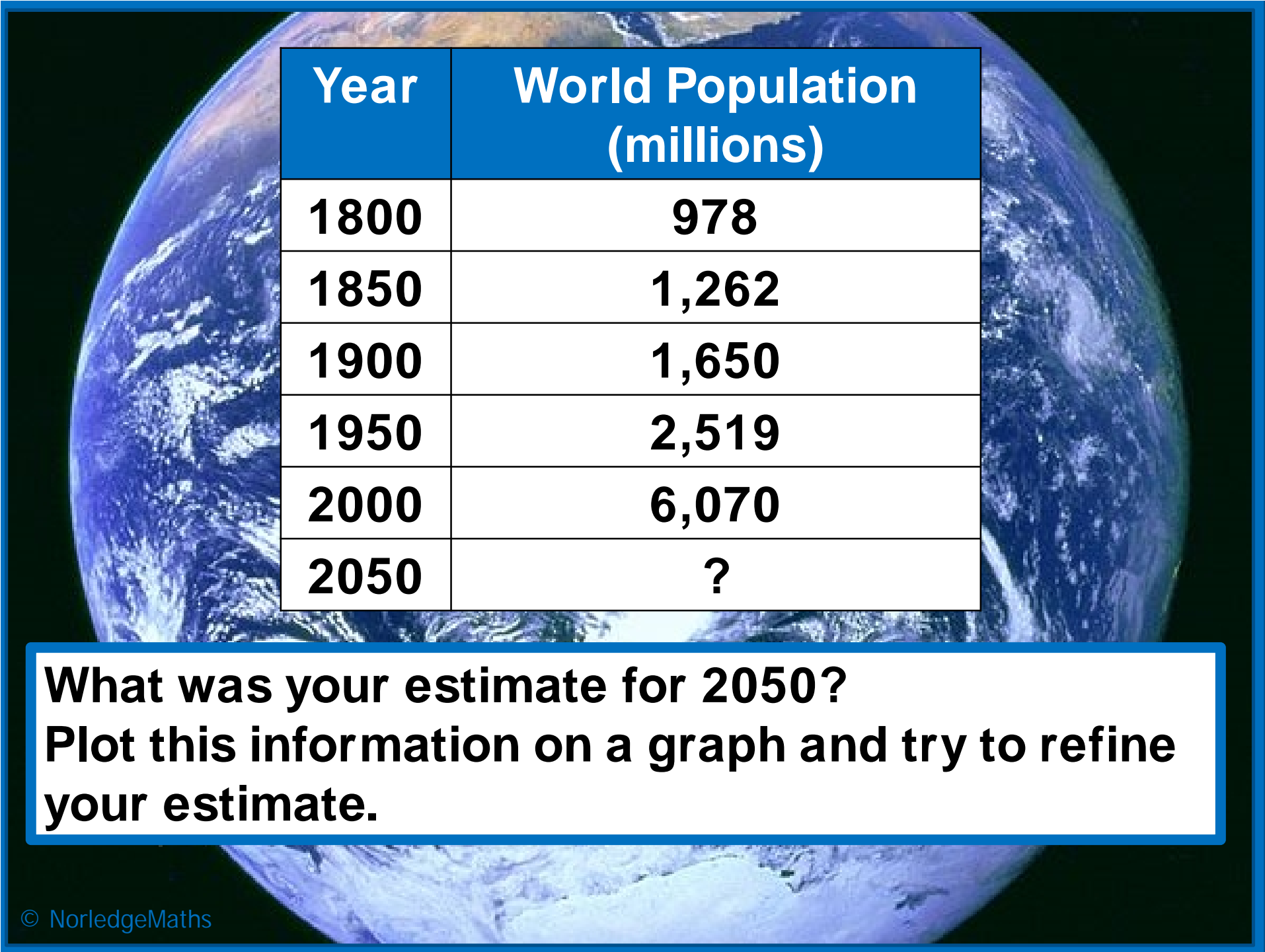
There are 2^{63} grains of rice on the last square. This is **9,223,372,036,854,775,808** grains of rice.

On the whole chessboard, the total is **18,446,744,073,709,551,615** grains of rice.

This pile of rice would be larger than Mount Everest, and is about 1000 times more rice than can be produced in the world in a year.

Top of Mt. Everest =
8,848m or 8.8km

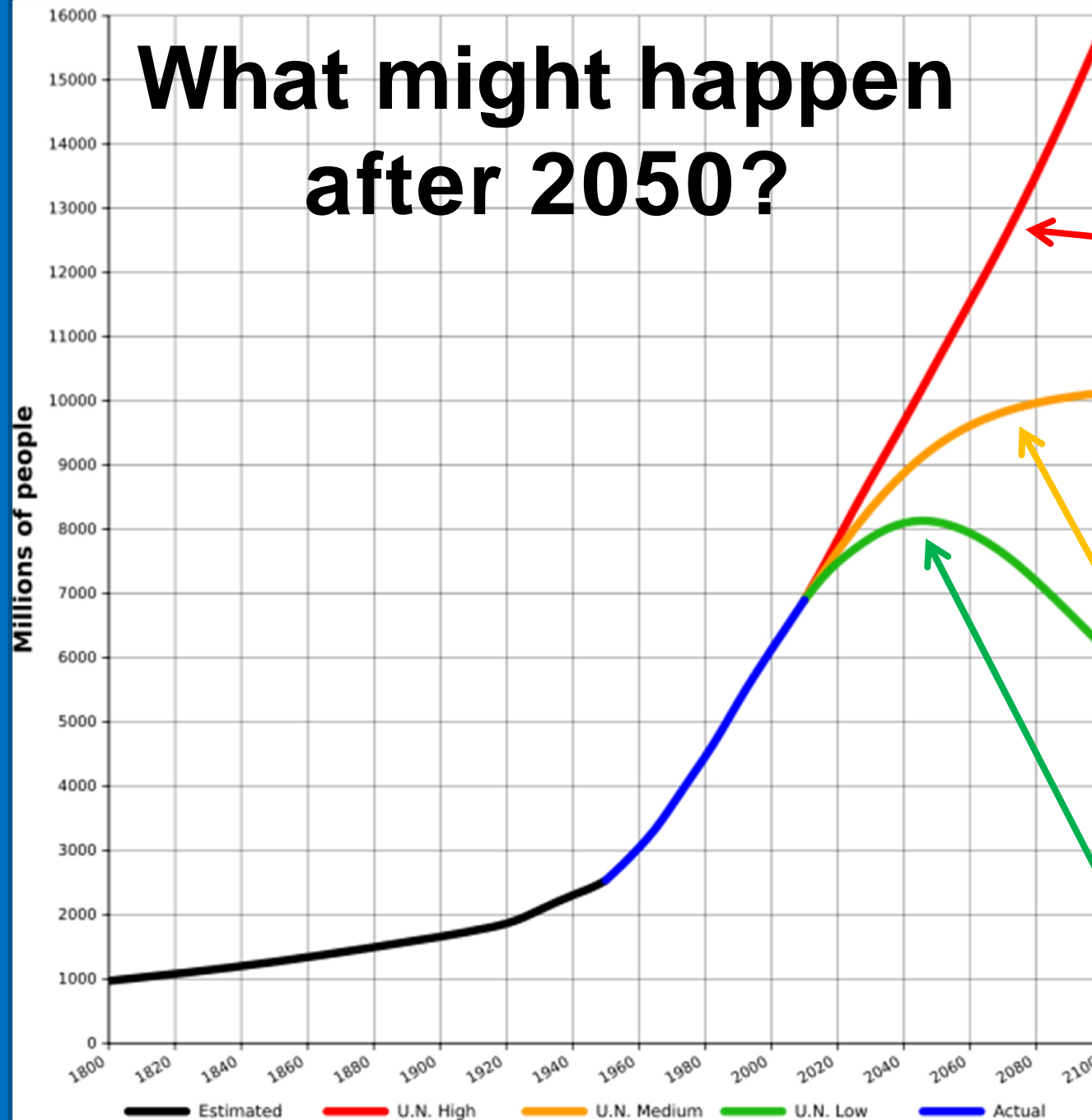




Year	World Population (millions)
1800	978
1850	1,262
1900	1,650
1950	2,519
2000	6,070
2050	?

What was your estimate for 2050?
Plot this information on a graph and try to refine your estimate.

What might happen after 2050?



Population may continue to increase at the same rate due to wealth increases and medical advances, leading to people living much longer.

Population may continue to increase, but at a much slower rate.

Population may decrease due to a lack of natural resources, such as energy supplies and food.



This type of growth is called **exponential** growth, and is typical increasing populations.

Mathematicians and scientists use data like world population statistics and construct mathematical models and graphs to predict what will happen in the future.

The current estimate for the world population in 2050 is around **9,000,000**. This is an **increase of 50% in just 50 years**.

Video: [What Stops Population Growth](#)
(Gapminder)

Image sources:

Earth: [Link](#)

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Everest: [Link](#)

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World population graph: [Link](#)

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