

Engineering Marvels

Bridges Around the World

Understanding Fractions



Elise Wallace

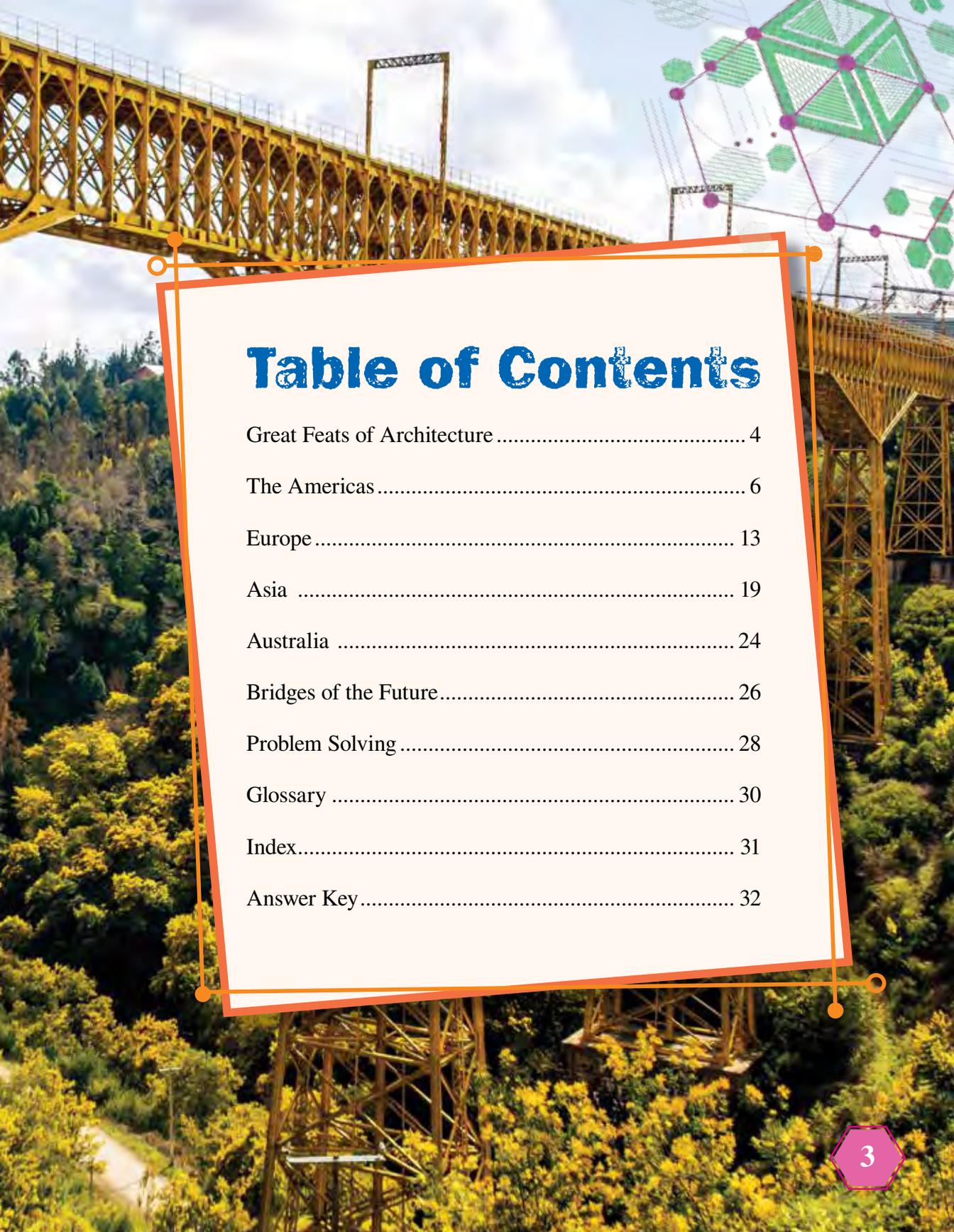


Table of Contents

Great Feats of Architecture	4
The Americas	6
Europe	13
Asia	19
Australia	24
Bridges of the Future.....	26
Problem Solving	28
Glossary	30
Index.....	31
Answer Key.....	32

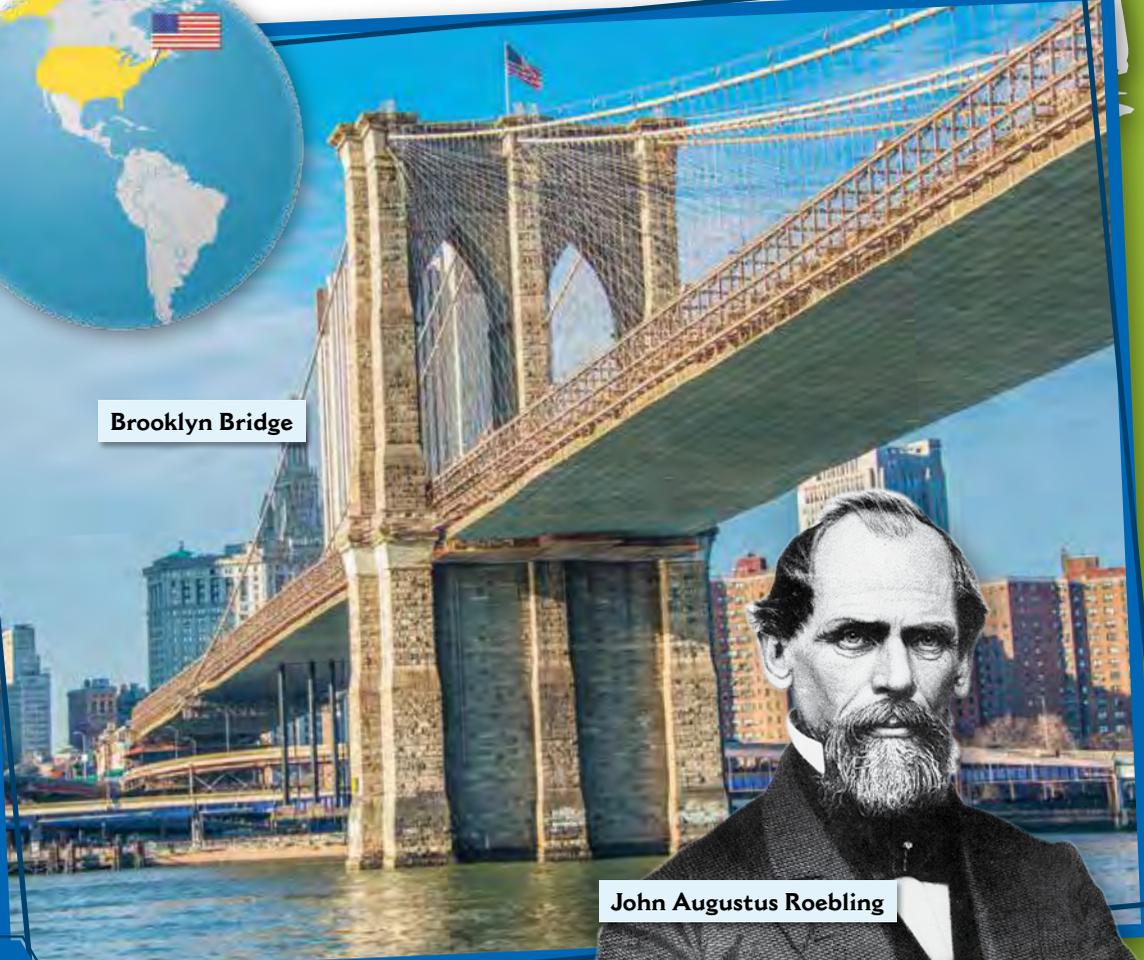
Brooklyn Bridge

The Brooklyn Bridge is **iconic**. It spans the East River between Brooklyn and Manhattan in New York City. It was designed by John Augustus Roebling. This **suspension bridge** was the first to use steel cables.

Sadly, Roebling died before building began. His son took over the project. When it was completed in 1883, it was the longest bridge in the world. It has a total length of 5,989 feet (1,825 meters). Each day, thousands of people still cross the Brooklyn Bridge.



Brooklyn Bridge



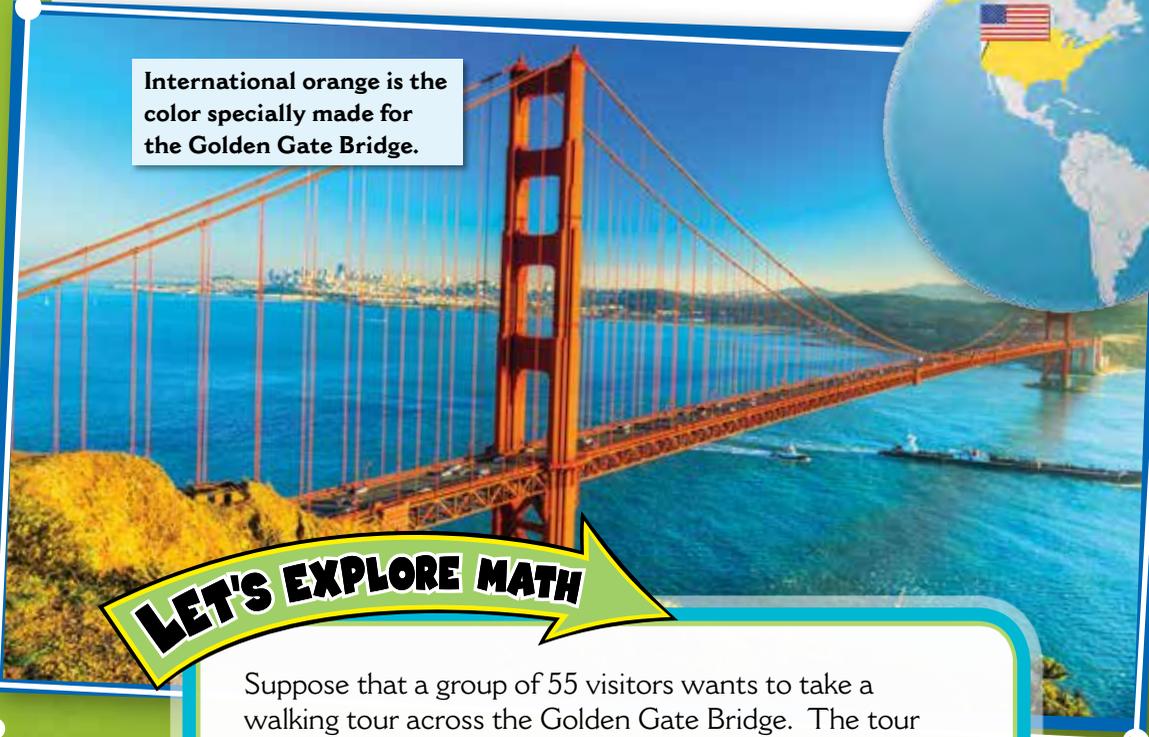
John Augustus Roebling

Golden Gate Bridge

The Golden Gate Bridge is a suspension bridge in San Francisco, California. Joseph B. Strauss oversaw its construction. He was an engineer. He hired Irving Morrow to help design the bridge. It was finished in 1937.

The main span of the bridge is 4,200 ft. (1,280 m) long. This span is suspended from two cables that join two tall towers. The towers are 746 ft. (227 m) tall.

The bridge has a distinct red-orange hue. No one thought red paint could withstand the salty air. But, Morrow liked the color and found a **durable** paint. The bright color makes the bridge visible even on the foggiest days.



International orange is the color specially made for the Golden Gate Bridge.

LET'S EXPLORE MATH

Suppose that a group of 55 visitors wants to take a walking tour across the Golden Gate Bridge. The tour guides can only have a maximum of 12 people in each group. How many tour guides are needed to take all of the visitors on walking tours? Explain your reasoning.

Malleco Viaduct

Sometimes bridges must cross land instead of water. The Malleco Viaduct is one of Chile's great structures. It has an intriguing history. Built in the late 1800s, the bridge was part of the country's plan to extend its railways.



There was just one problem with the plan: the depth of the Malleco River Valley. The river is 361 ft. (110 m) below the land! To build a railroad, engineers would need to find a way around or over the valley. The choice was clear but not simple. A **viaduct**, or railroad bridge, would have to be constructed. This bridge would cross the valley.

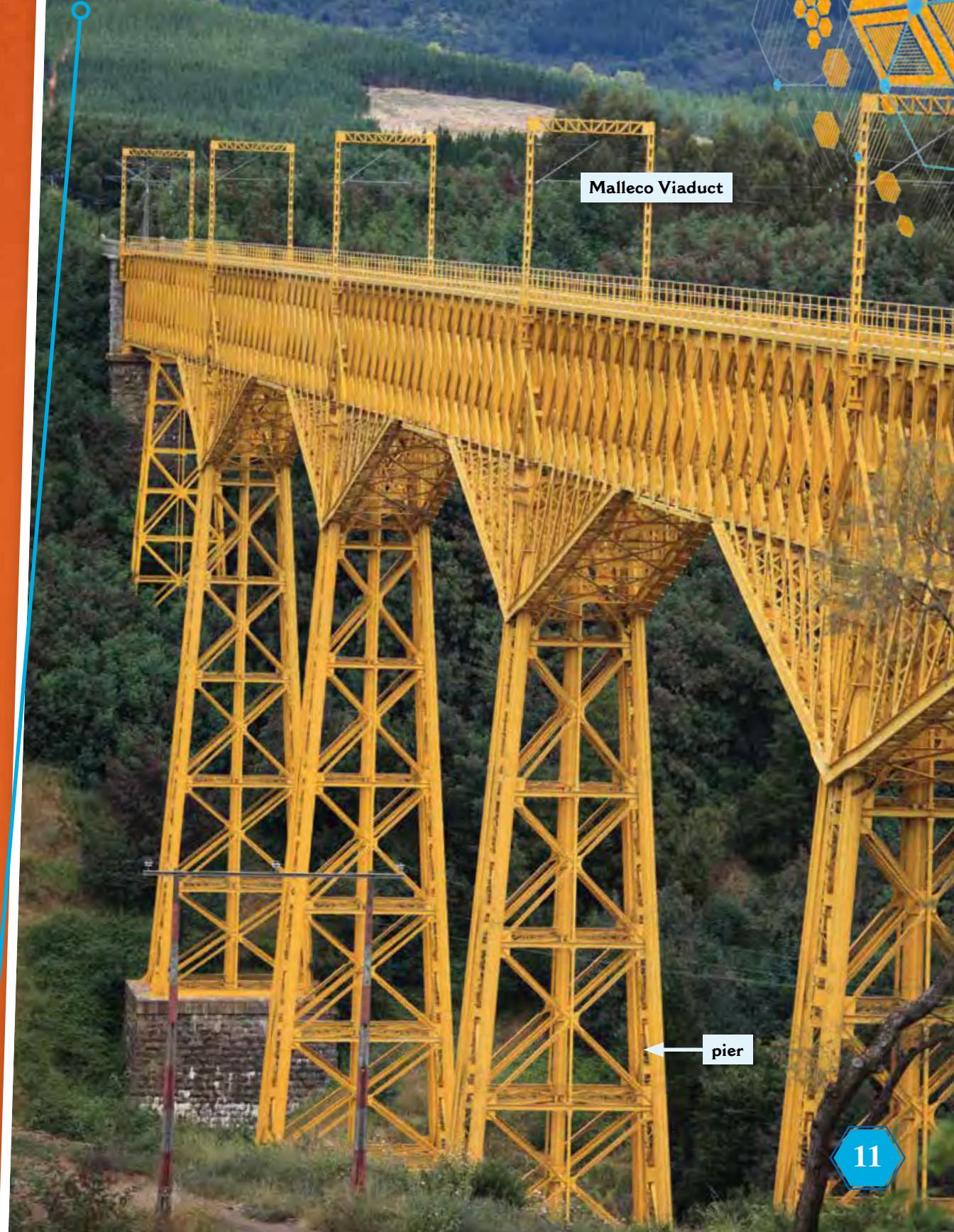
To create this structure, the bridge would need **substantial** support. There are four piers, or pillars, at the center of the bridge. Each pier helps support the weight of the bridge. At each end of the bridge, two stirrups also help bear the weight of the structure. All of the supporting structures are made of steel.

The bridge was completed in 1890. At that time, it was the highest railroad bridge in the world at 333 ft. (101 m). It spans 1,419 ft. (432.5 m) across the valley below.

LET'S EXPLORE MATH

The Malleco Viaduct has 5 equal sections. Imagine that 3 crews are performing maintenance. Use the model to show how they could equally share the work. How much of a section does each crew maintain?

--	--	--	--	--



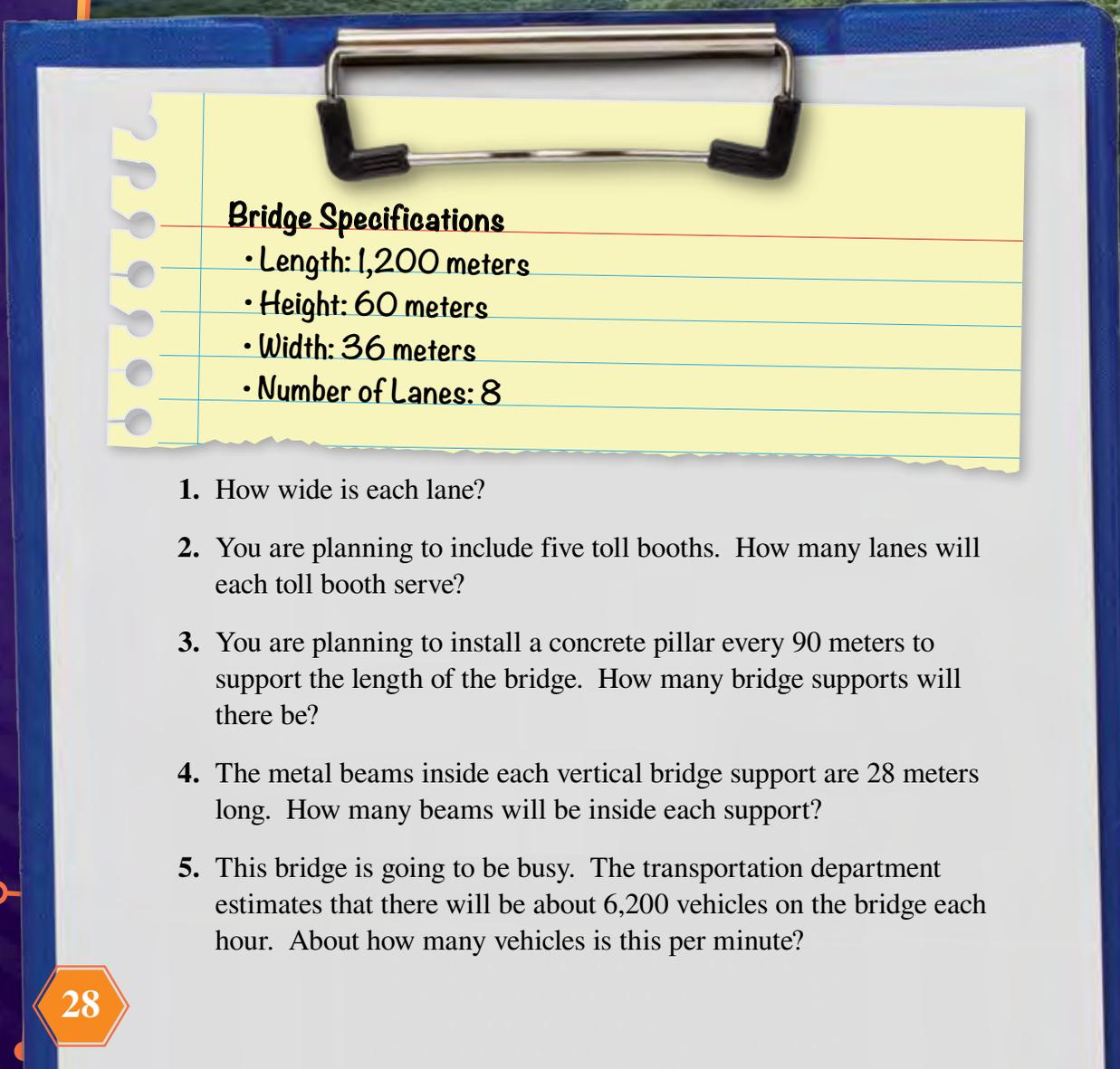
Malleco Viaduct

← pier



Problem Solving

Congratulations! Your engineering firm has been hired to design a highway bridge over a large valley. City council wants to understand the details about the bridge being planned for the community. So, it submits a list of questions for you to answer. Use the bridge specifications to answer them.



Bridge Specifications

- Length: 1,200 meters
- Height: 60 meters
- Width: 36 meters
- Number of Lanes: 8

1. How wide is each lane?
2. You are planning to include five toll booths. How many lanes will each toll booth serve?
3. You are planning to install a concrete pillar every 90 meters to support the length of the bridge. How many bridge supports will there be?
4. The metal beams inside each vertical bridge support are 28 meters long. How many beams will be inside each support?
5. This bridge is going to be busy. The transportation department estimates that there will be about 6,200 vehicles on the bridge each hour. About how many vehicles is this per minute?

