3 + □ = 12

18 – 6 + 2 = □

Engineering Marvels

The London Eye

Odd and Even Numbers

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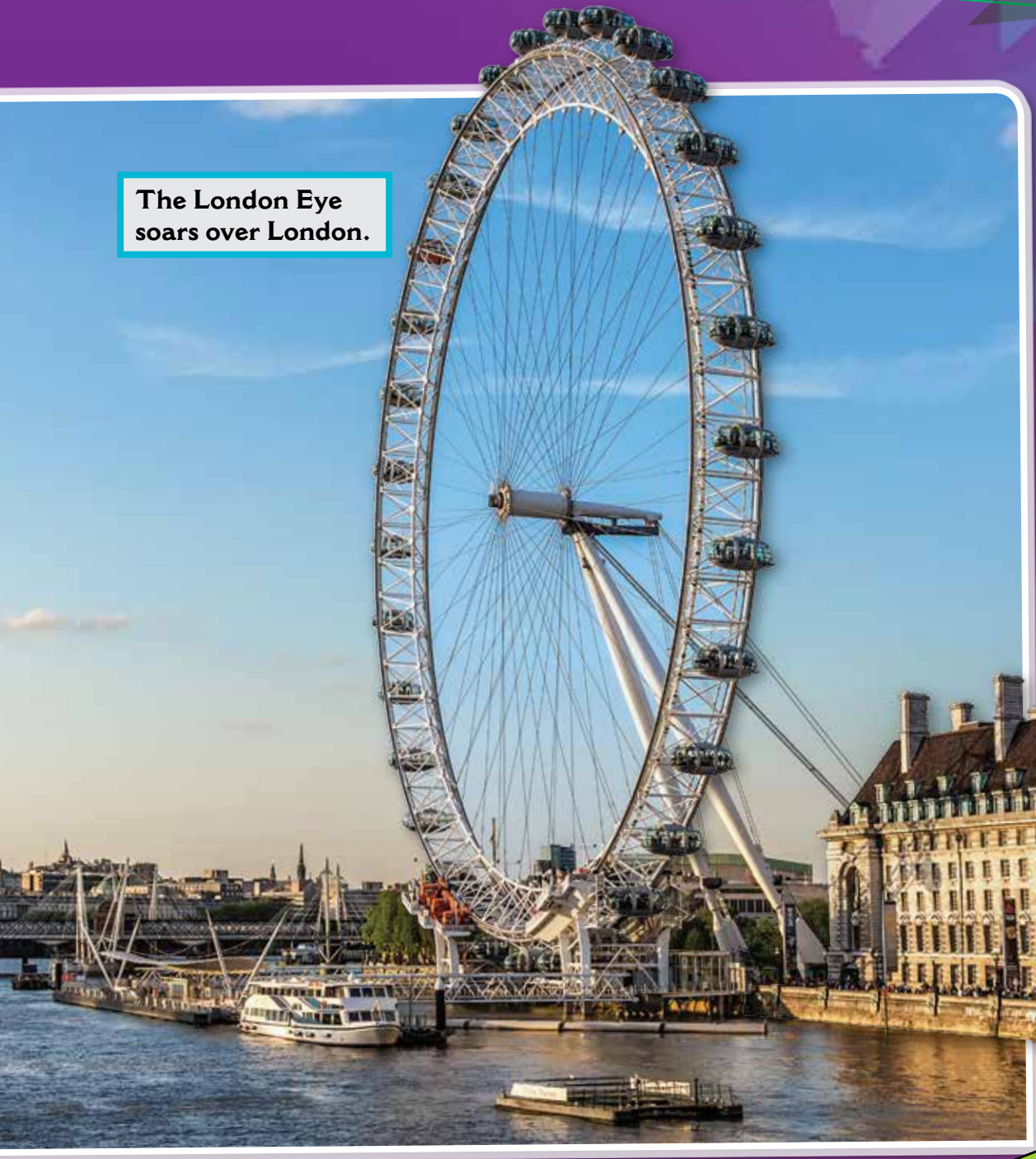
An Eye on London

Look up…way up! Meet the London Eye. The London Eye is an **observation** wheel. It is the tallest one in Europe!

The London Eye opened on March 9, 2000. On the Eye, guests can see most of London. They have a bird's-eye view! Many locals love the London Eye. It is a must-see for many **tourists**, too. Now, it is your turn to take a spin!

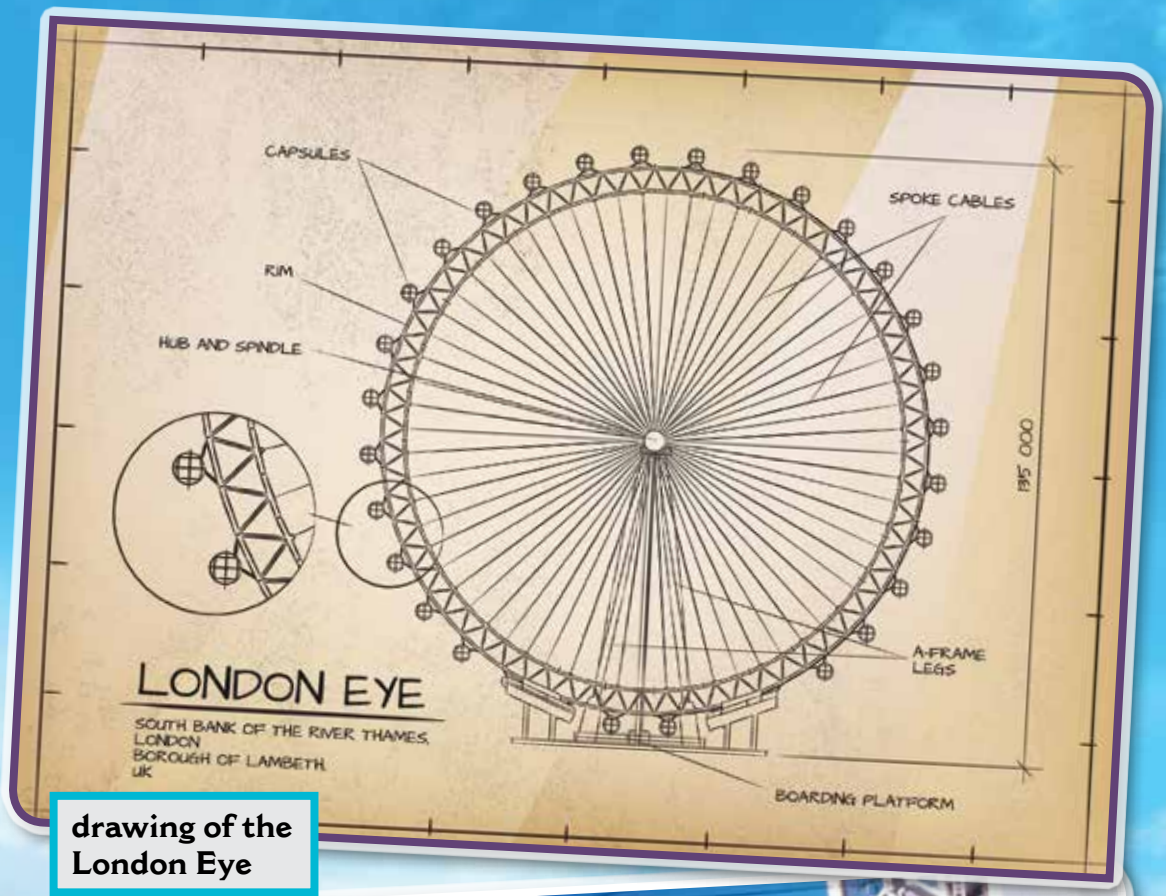


The London Eye soars over London.

The Story

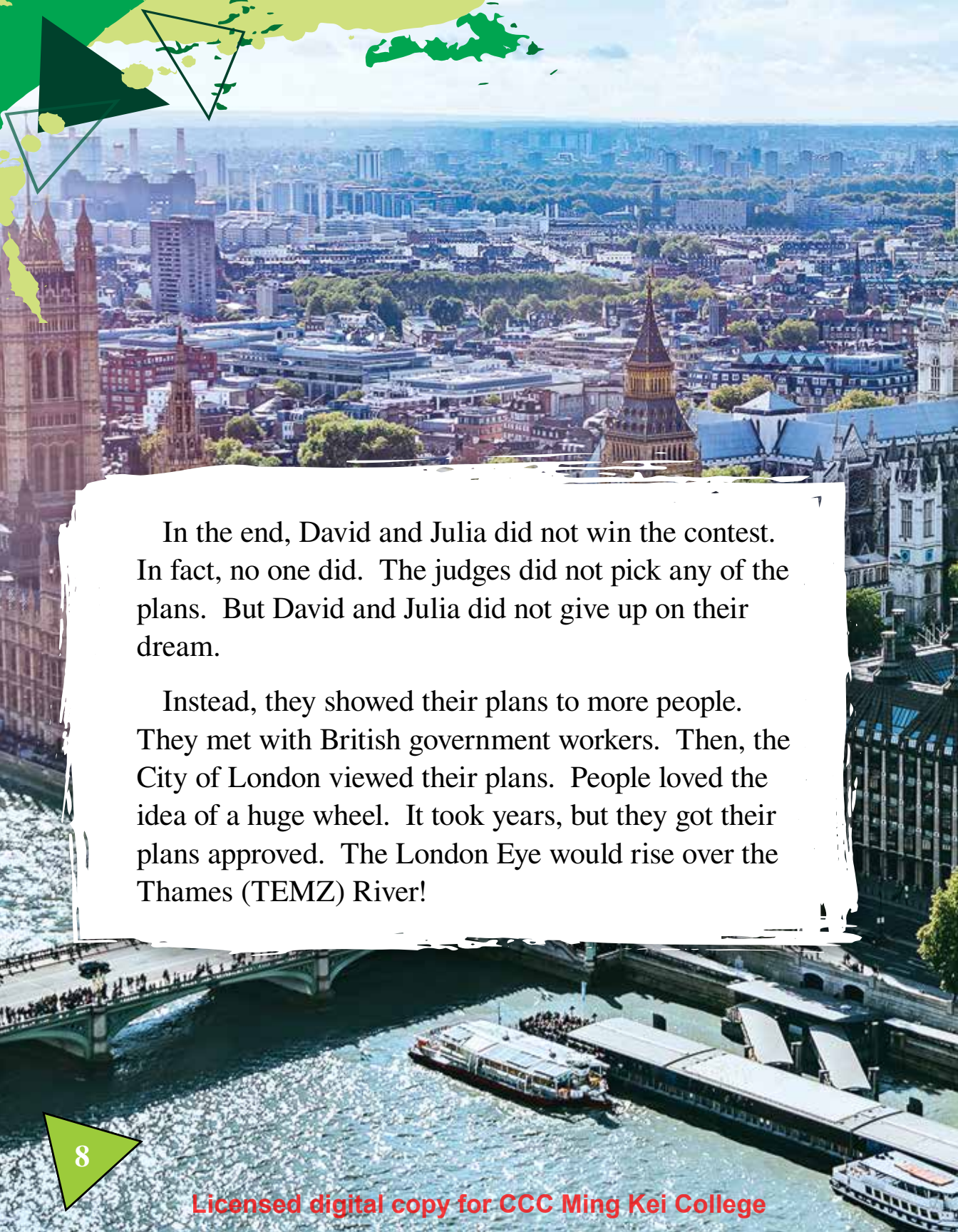
In 1993, a British newspaper printed an article. It said there would be a big contest. The winner would be the person or group who could build the best **landmark**. Two **architects** named David Marks and Julia Barfield read the story. They thought they could win. The pair planned to build a huge wheel. This wheel would take guests high in the air. They could view London from the sky!

top of the London Eye



drawing of the London Eye

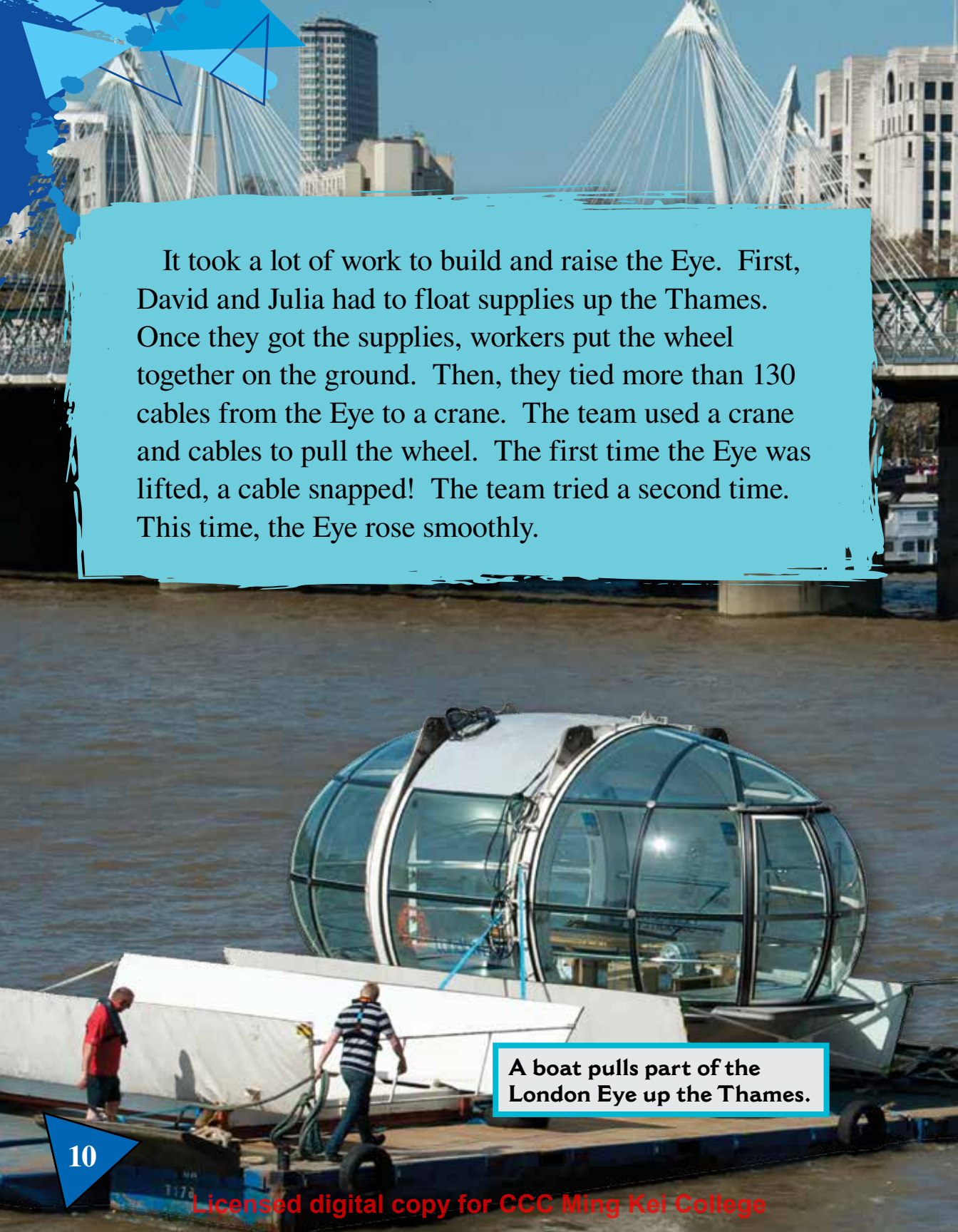
Julia Barfield and David Marks work on the London Eye.



In the end, David and Julia did not win the contest. In fact, no one did. The judges did not pick any of the plans. But David and Julia did not give up on their dream.

Instead, they showed their plans to more people. They met with British government workers. Then, the City of London viewed their plans. People loved the idea of a huge wheel. It took years, but they got their plans approved. The London Eye would rise over the Thames (TEMZ) River!

It took a lot of work to build and raise the Eye. First, David and Julia had to float supplies up the Thames. Once they got the supplies, workers put the wheel together on the ground. Then, they tied more than 130 cables from the Eye to a crane. The team used a crane and cables to pull the wheel. The first time the Eye was lifted, a cable snapped! The team tried a second time. This time, the Eye rose smoothly.



A boat pulls part of the London Eye up the Thames.

Workers use cranes to lift the Eye.

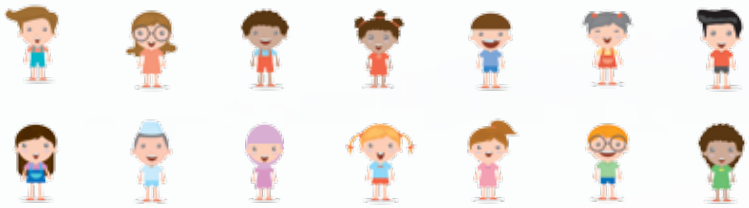
The London Eye made its **debut** in 2000. It stands tall today. It soars over the Thames at 443 feet (135 meters) high. All that height was not cheap to build. The wheel cost about £70 million (British pounds). That is more than $85 million (U.S. dollars)!

The Eye was a big project. It took seven years to build. Hundreds of people worked on it. Their hard work was worth it. Now, the Eye is a **beloved** part of London.

Let's Explore Math

Imagine that two classes are on field trips to ride the London Eye. Use the illustrations to find out how many students are in each class. Will each student have a partner? Why or why not?

1. Class One



2. Class Two

The Ride

The first step to ride the London Eye is to buy a ticket. Guests must often wait in long lines to buy their tickets. But there is a way to skip the wait. Tickets can be bought online. This takes planning ahead. But it can be worth it.

An adult ticket is £24.95 (about $30). And a child ticket is £19.95 (about $25). Visitors can also pay for private bookings on the Eye. The capsule will be just for them and their guests. But this can get very pricey. For two people, it costs at least £380 (about $475)!

Let's Explore Math

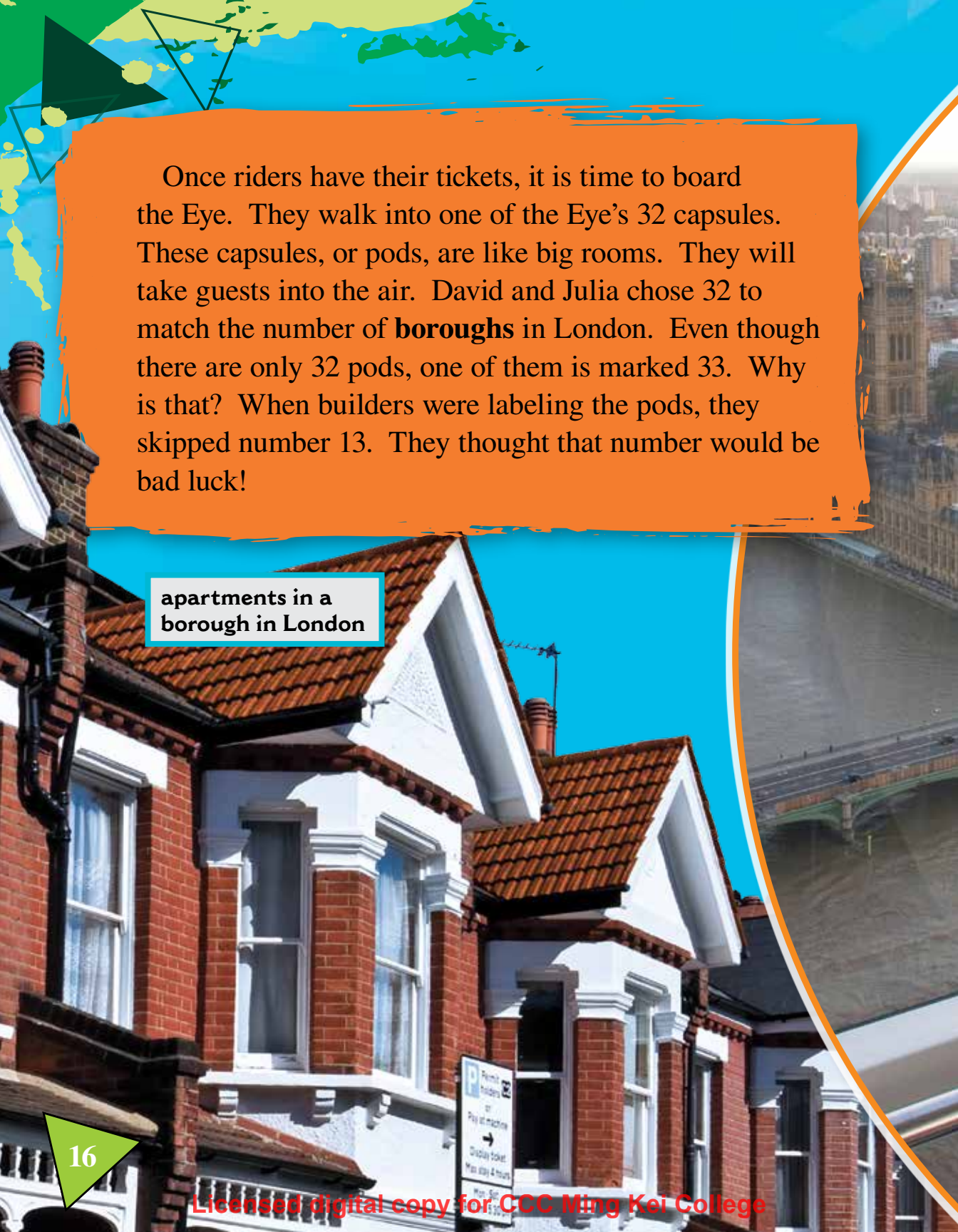
Imagine that hotels are giving away free pairs of tickets for guests to ride the London Eye. Use the chart to find each hotel's available tickets. Then, decide if there will be any leftover tickets at each hotel.

Hotel	Tickets	Total Number of Tickets	Any Leftover Tickets?
East			
West			
North			
South			

1. Which hotels have an even number of tickets? How do you know?
2. Which hotels have an odd number of tickets? How do you know?

Guests wait in line to board the London Eye.

Once riders have their tickets, it is time to board the Eye. They walk into one of the Eye's 32 capsules. These capsules, or pods, are like big rooms. They will take guests into the air. David and Julia chose 32 to match the number of **boroughs** in London. Even though there are only 32 pods, one of them is marked 33. Why is that? When builders were labeling the pods, they skipped number 13. They thought that number would be bad luck!

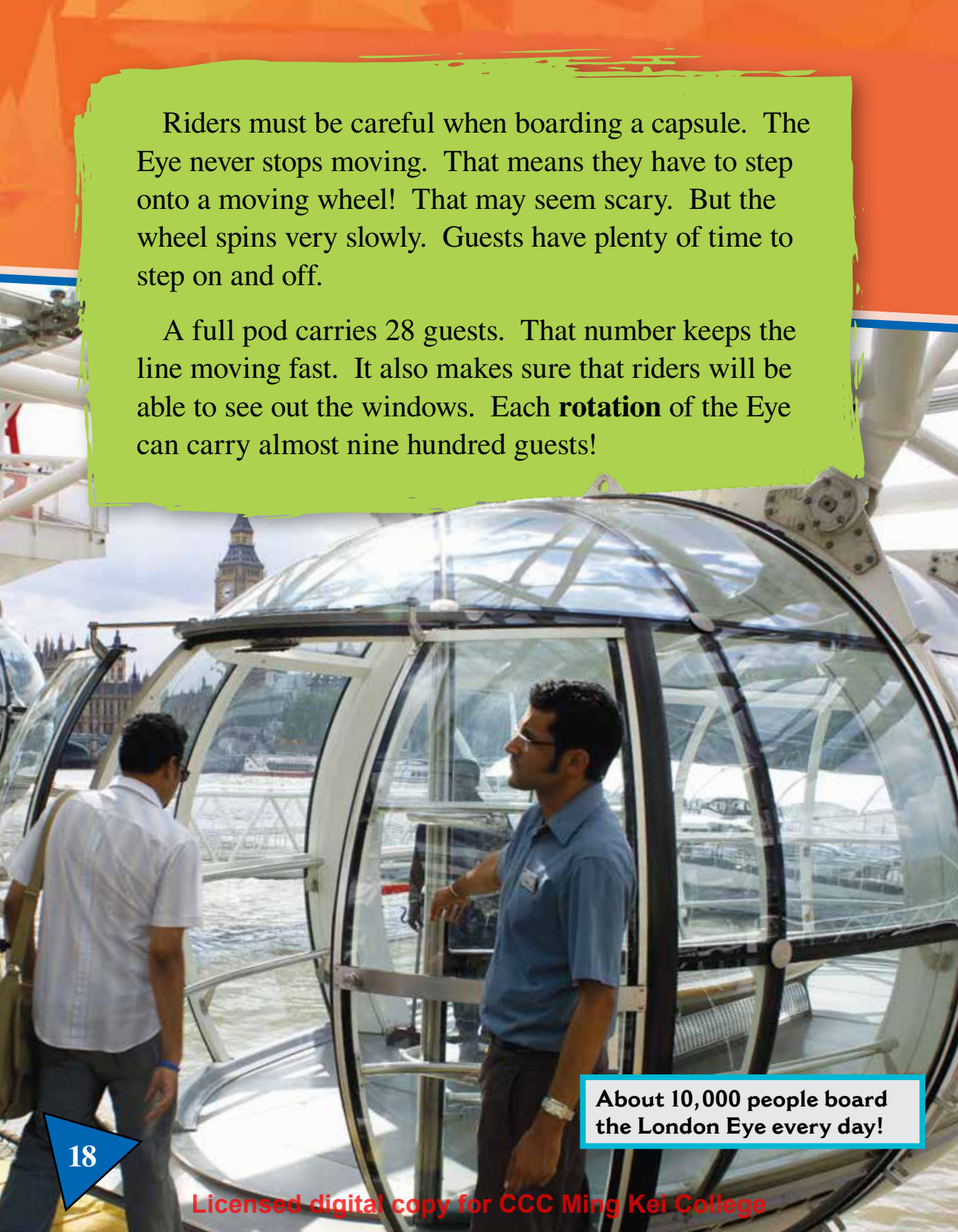


apartments in a borough in London

The London Eye provides one of the highest viewpoints in London.

Riders must be careful when boarding a capsule. The Eye never stops moving. That means they have to step onto a moving wheel! That may seem scary. But the wheel spins very slowly. Guests have plenty of time to step on and off.

A full pod carries 28 guests. That number keeps the line moving fast. It also makes sure that riders will be able to see out the windows. Each **rotation** of the Eye can carry almost nine hundred guests!



About 10,000 people board the London Eye every day!

Let's Explore Math

Imagine that workers are loading capsules with two equal groups of riders at a time. Write addition facts to show how many riders are in each group.

Number of Riders	Addition Fact Showing Two Equal Groups
6	3 + 3
12	
16	
18	

1. Are the numbers of riders even or odd? How do you know?
2. Give an example of a number of riders that could not be split into two equal groups. Prove your solution using words, numbers, or pictures.

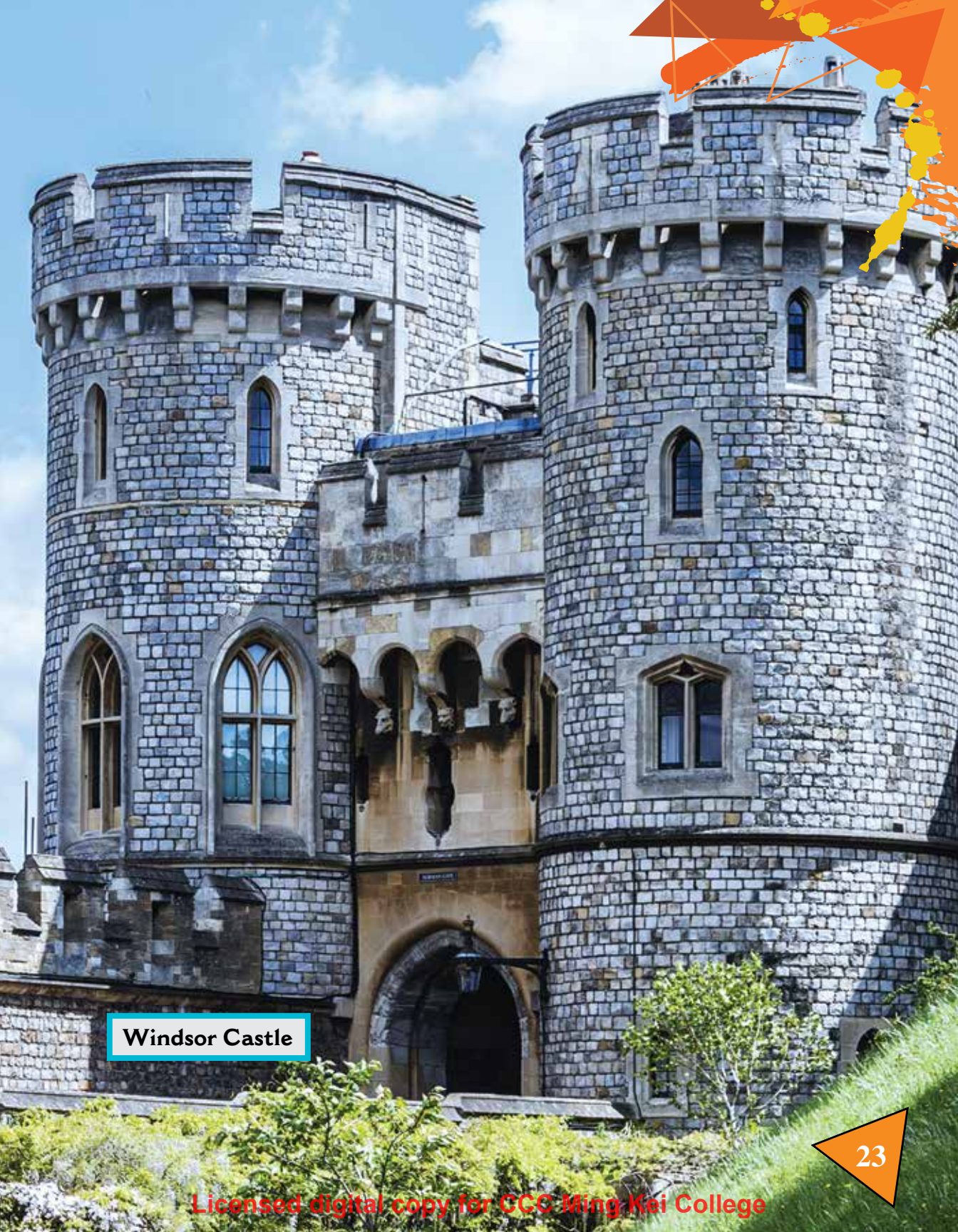
The View

Once the pods get high enough, riders have a clear view of London. There is so much to see in every direction. There are also tablet computers in each pod. The tablets show maps of landmarks. Guests can click on the maps. New screens pop up with facts about the buildings. It is a great way to learn about the city. A ride on the London Eye takes 30 minutes to complete. There is plenty of time to enjoy the sights!

These guests use the tablets on the London Eye to learn about the city's other landmarks.

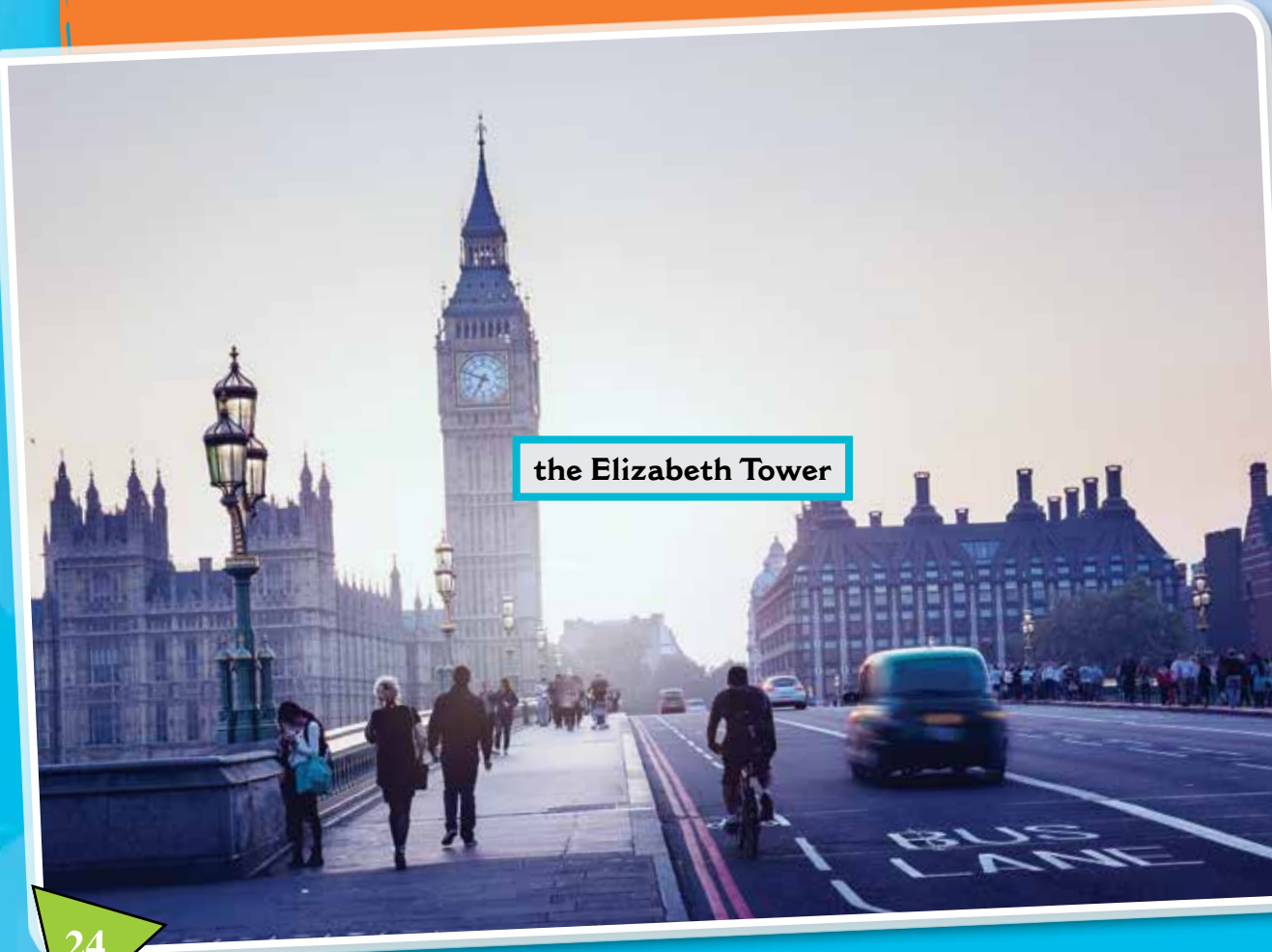
A rider on the London Eye takes a photo of the Palace of Westminster—another London landmark.

From the top of the Eye, riders see it all. If it is a clear day, they can see up to 25 miles (40 kilometers) away! Many riders try to look for London's royal places. They can wave at Buckingham Palace, where the Queen works. Other riders might squint their eyes and look to the left of the palace. On a clear day, they might see Windsor Castle. That is the Queen's weekend home.



Windsor Castle

The tall clock tower seen from the Eye is famous, too. Its name is the Elizabeth Tower. Most people call the tower Big Ben. But Big Ben is only the name of the bell in the tower. The clock tower stands next to the Palace of Westminster. That is where members of the British government meet and work. Many laws are made there.



the Elizabeth Tower

An Eye on the Future

One day, the London Eye may no longer rise high above the Thames. The Eye is on a 25-year **lease**. After the lease ends, the Eye may be torn down. But most people do not think it will leave any time soon.

It was not easy for Julia and David to get their wheel up and running. But the Eye is now a landmark. It gives people a new way to see the city. It lights up the London skyline.

Problem Solving

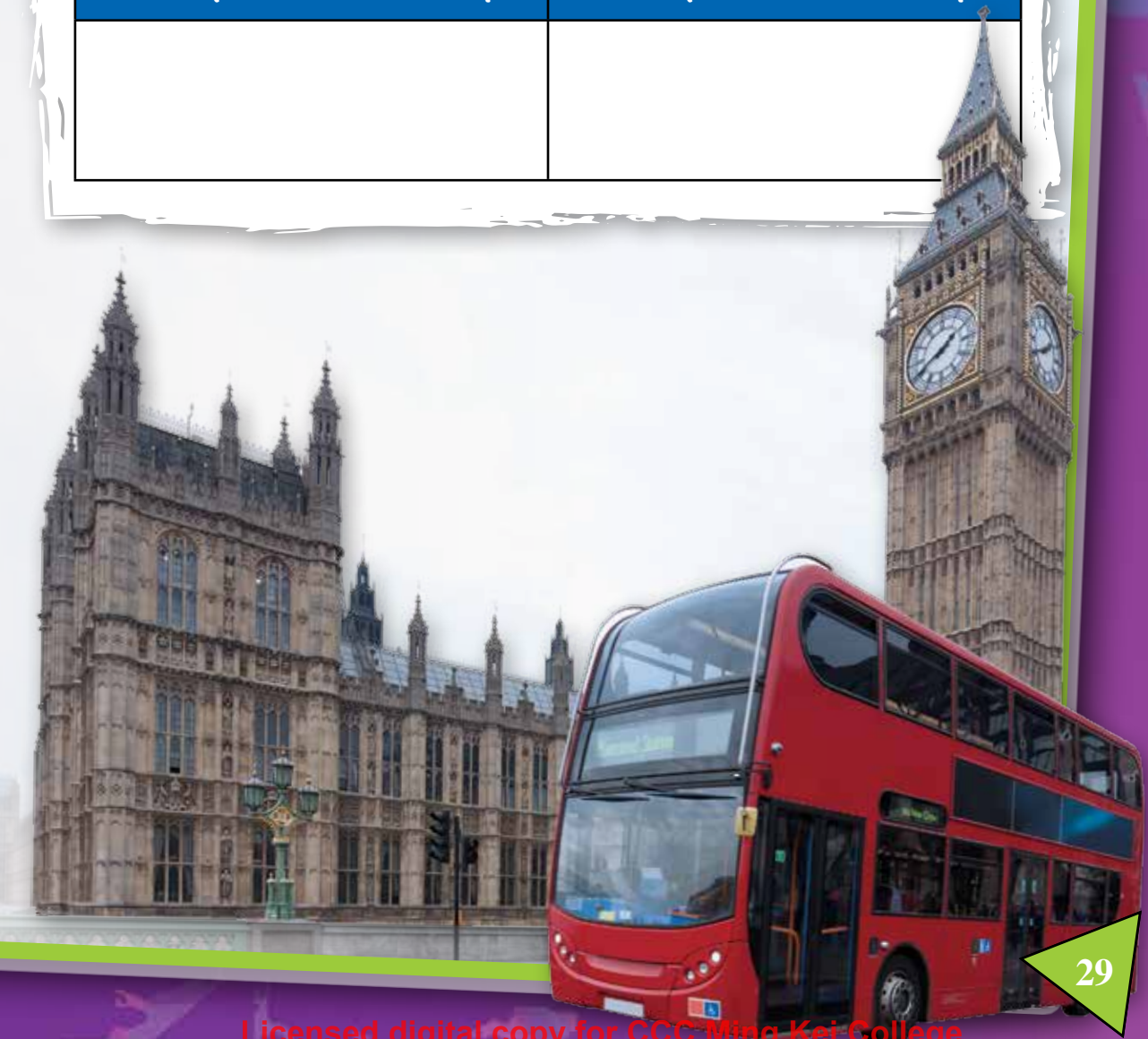
After viewing Buckingham Palace and the Elizabeth Tower from the London Eye, several tour groups decide to visit them. Each group must split into two smaller, equal-sized groups. Help the tour leaders organize the groups by answering the questions.

1. Draw a table similar to the one on page 29. Sort the tourists into two categories: those able to travel in two equal groups and those not able to travel in two equal groups.
2. Of the tourists who can travel in two equal groups, how many are in each group?
3. Of the tourists who cannot travel in two equal groups, how many are in each group if the groups must be as close to equal-sized as possible?
4. How can a tour leader immediately tell if a group can or cannot travel in two equal groups?

Tourists in Each Large Group

4 9 11 13 15 19 20

Able to Travel in Two Equal Smaller Groups	Not Able to Travel in Two Equal Smaller Groups



Glossary

architects—people who design and draw plans for buildings

beloved—dearly loved

boroughs—small sections of larger cities

debut—the first appearance of an object to the public

landmark—an object or structure that is easy to see and can mark a location

lease—an agreement to use something, such as a piece of land, for a period of time in return for payment

observation—designed to be used for looking at things

rotation—one complete turn

tourists—people who travel for fun

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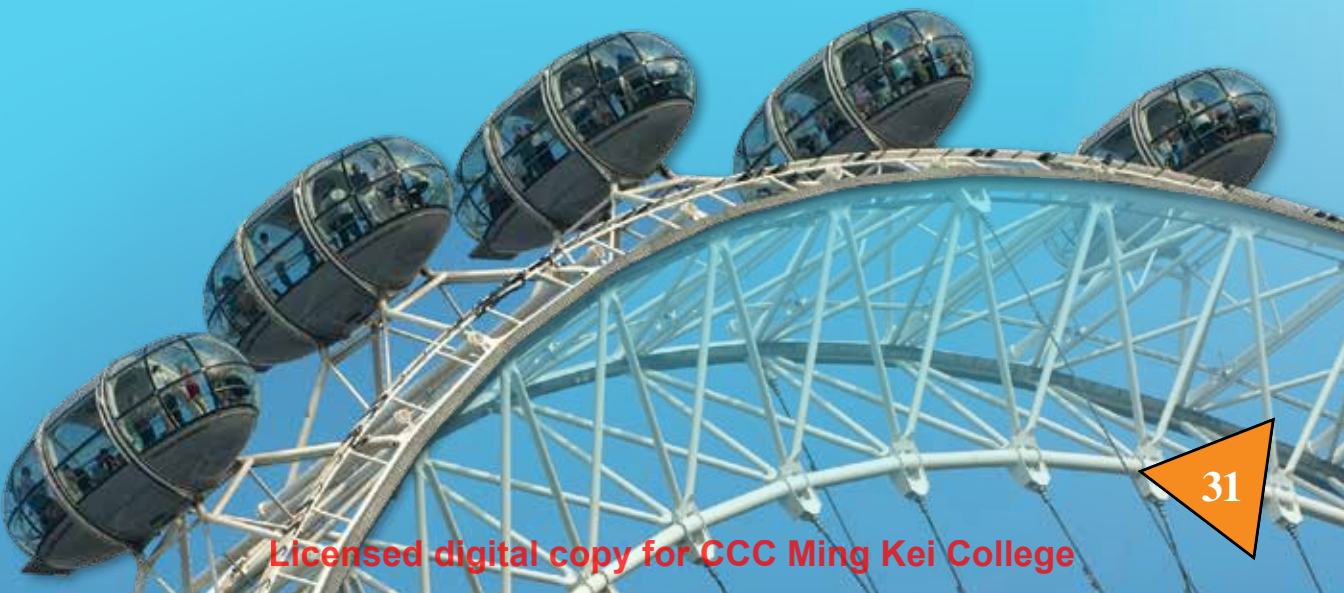

Answer Key

Let's Explore Math

page 13:

1. 14 students; Each student will have a partner because 14 has 7 pairs.
2. 17 students; There will be one student without a partner because 17 has 8 pairs with 1 student leftover.

page 15:

East—5 tickets total; 1 leftover

West—8 tickets total; 0 leftover

North—10 tickets total; 0 leftover

South—7 tickets total; 1 leftover

1. West (8 tickets) and North (10 tickets) are even because they can be sorted into pairs with none leftover.
2. East (5 tickets) and South (7 tickets) are odd because they cannot be sorted into pairs without any leftover.

page 19:

12 = 6 + 6; 16 = 8 + 8; 18 = 9 + 9

1. Even; Answers will vary but should show that they are even because they all can be split into two equal groups with none leftover.
2. Answers will vary but can include any odd number of riders where equal groups cannot be made without having a rider leftover.

Problem Solving

1. Able to Travel in Two Equal Groups: 4, 20; Not Able to Travel in Two Equal Groups: 9, 11, 13, 15, 19
2. Group of 4: 2 in each group; Group of 20: 10 in each group
3. Group of 9: groups of 4 and 5; Group of 11: groups of 6 and 5; Group of 13: groups of 6 and 7; Group of 15: groups of 8 and 7; Group of 19: groups of 10 and 9
4. Answers will vary but may include skip counting by 2s to see if the group has an odd or even number of tourists.

Math Talk

1. How is pairing objects similar to counting by 2s?
2. Can all numbers be broken into pairs with no leftovers? Why or why not?
3. How can you use a drawing to prove whether a number is odd or even?
4. What kinds of numbers can be represented with a "doubles" addition fact, such as 2 + 2, 3 + 3, or 4 + 4? Why does this happen?
5. Is zero odd or even? Support your argument with words, numbers, or pictures.
6. Other than breaking a number into pairs, how can you tell if a number is even or odd? Prove that your strategy can work for all numbers.

"Thank you for helping us create a world in which children love to learn!"

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