



Empire State Building



STEM CONNECTIONS

Technology: Innovative Design & Global Collaboration
Engineering: Defining Problems & Developing Solutions
Math: Ratios & Proportional Relationships



DURATION

60 Minutes Lesson



MATERIALS

- BrickLAB Bricks
- Build Books

SCHEDULE

- Introduction (10 min)
- Empire State Building Build (20 min)
- Engineering Challenge (25 min)
- Extensions - optional
- Wrap Up (5 min)

OBJECTIVE

Channel your inner ape and take New York City by storm with the Empire State Building Build!

ALIGNED STANDARDS

- ISTE-S.4.d Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
- ISTE-S.7.c Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.
- NGSS 3-5 ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- NGSS 3-5 ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- CCSS.MATH.CONTENT.6.RP.A Understand ratio concepts and use ratio reasoning to solve problems.

21ST CENTURY SKILLS

- Communication and Collaboration
- Social and Cross-Cultural Skills
- Critical Thinking and Problem Solving

HABITS OF MIND

- Striving for Accuracy
- Creating, Imagining, Innovating
- Thinking Interdependently

DAILY PREP

Today you'll head to New York City just in time for the unveiling of the Empire State Building. Read through the Background information, today's lesson and extensions and prepare to hand out Build Books and BrickLAB Bricks.

BRICK MANAGEMENT

- **Number of Builds:** The BrickLAB Set included in this program supports up to 14 rainbow-colored Empire State Building builds or 8 monochromatic builds (1 Pink, 1 Purple, 1 Lime Green, 1 Teal, 1 Red, 1 Yellow, 1 Blue and 1 White).
- **Recommended Learner Build Groups:** Pairs.
- **Color Considerations:** Allow builders to choose their own color schemes for rainbow-colored builds, or assign monochromatic colors to each pair as outlined above.
- **Additional Considerations:** To account for consecutive lessons, learners will need to disassemble their builds at the end of every session.

BACKGROUND INFORMATION

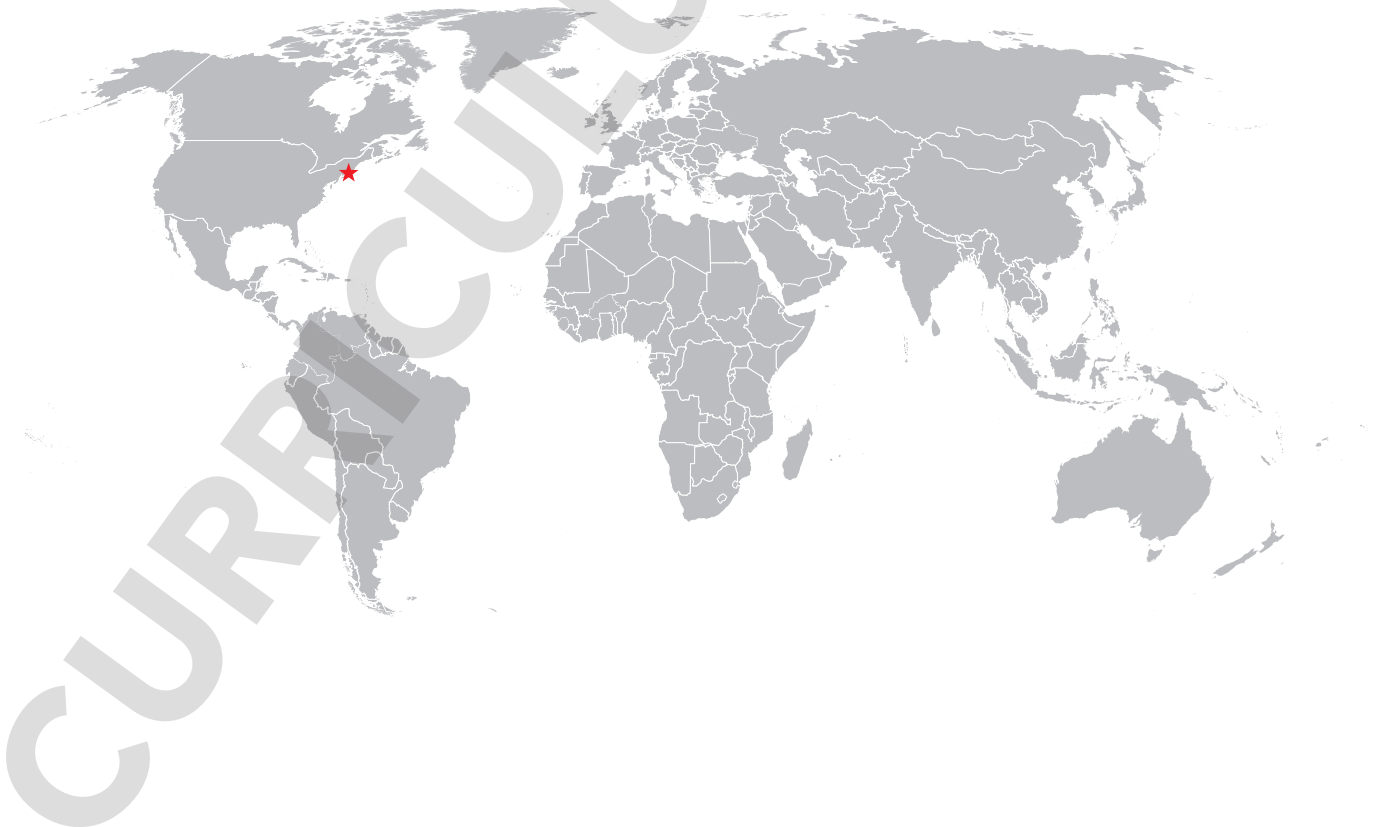
Take a look around, everyone! Do you notice anything familiar? It's 1931 and we're smack-dab in the middle of New York City. The buildings are starting to climb higher and higher into the sky, the streets are full of cars, like the boxy Buicks and Plymouth family cars, and The Great Depression is in

full swing. Everyone we pass has a thick, New York accent. The women are in long dresses and hats, and the men wear wool jackets, slacks and newsboy caps — there's certainly no one running around in their gym clothes like we're so used to seeing today!

As we make our way down the street, look at the buildings we pass. The closer we get to the center of the city, the taller they get! Finally, there it is. Do you see it? It's hard to miss... It's the Empire State Building, the world's tallest skyscraper! Built in just over a year, this behemoth of a building was designed to resemble a pencil standing on its end. Taking up a full city block, the structure stands over 1,250 feet tall, or, 103 stories. Once you add in the lightning rod on top of the building, another 204 feet of height, the Empire State Building is actually 1,454 feet tall — that's 79 yellow taxicabs lined up end to end!

Now, it's said that the building was originally built because of a competition between two of the most influential figures of the time. Walter Chrysler of the Chrysler Corporation and John Jakob Raskob of General Motors wanted to see who could build the taller building. Construction on the Chrysler Building had already begun, but measuring only 1,046 feet, it falls short to the Empire State Building.

While it held the title of The World's Tallest Building until 1972, the Empire State Building meant more than that to the people of New York City. Shortly before it was built, The Great Depression had taken the wind out of America's sails. The nation was hungry, cold and penniless, with, at times, 25% of the population out of work. Tent cities, known as Hoovervilles, were popping up all over major cities. These villages of makeshift tents held thousands of families who couldn't afford to pay for their homes anymore. It was a very challenging time to be alive. But, with the construction of the Empire State Building, over 3,400 workers had well-paying jobs, and New York showed people the light at the end of the tunnel!



STEP-BY-STEP DIRECTIONS FOR INSTRUCTORS

INTRODUCTION

Welcome campers back to *Famous Architecture Around the World* Camp! From giant gorillas to The Great Depression, today is all about the Empire State Building. Start off by reading the Background Information to the class. Developed as an immersion story, the short narrative allows campers to visualize the history, geography and culture surrounding the structure they're building before they head into the day's activities.

After diving into the background information, lead a short discussion by posing these questions:

- Would you want to take the elevator to the top of the Empire State Building?
- What do you think it was like to be one of the construction workers who built it?

THE EMPIRE STATE BUILDING BUILD

After standing in the shadow of New York's giant pencil, pass out Build Books and BrickLAB Bricks and have pairs assemble an entourage of Empire State Buildings!

ENGINEERING CHALLENGE

Tall structures like skyscrapers are prone to wobbling and falling apart from wind and earthquakes. Modern buildings have some high tech measures to prevent this, but one way that has been used for centuries is to make the base wider than the rest, just like a buttress. In fact, the current tallest building in the world (the Burj Khalifa in Dubai) has many tiers of buttresses built into its structure, allowing it to reach high into the clouds! Work in pairs to deconstruct your Empire State Building. Your next challenge? Work with the same bricks to construct your own wind and earthquake proof skyscraper. Test your build by huffing, puffing and trying to blow it down, and by shaking the table like an earthquake.

MATH EXTENSION

How does the area of the base of the tower affect its stability? Calculate the area of the base of your tower (if you used buttresses, measure the length and width from the farthest reach of the buttress), and then compare that to its total height with a ratio (a numerical comparison of two numbers): Area of Base:Total Height.

What do you notice about the ratios of the sturdiest towers? Towers with a greater base to height ratio will generally be more stable, while towers with a lower base to height ratio will be at risk of toppling over.

ENGLISH LANGUAGE ARTS EXTENSION

As one of the toughest times in American history, The Great Depression actually had a few great impacts — it fueled the fire of artistic creativity. From chilling photo collections to incredible works of literature, it inspired creative minds from New York to California. One such author to harness the power of this time period was John Steinbeck. With over 27 books written, Steinbeck's won the Pulitzer Prize and the Nobel Prize in Literature. Perhaps his most famous novel, *The Grapes of Wrath*, centers around a farming family living during The Great Depression.

Now, most of us have never experienced anything as challenging as The Great Depression, but that same type of inspiration can be found in the challenges we face daily. Take some time to reflect on something hard you've had to do recently — sports, games, family, chores, friends — and how you worked through it. Then, write a flash fiction story about it. Flash fiction is all about being concise. You only have a single sheet of paper to tell a story, so choose your words wisely!

WRAP UP QUESTIONS

- What architecture basics allow architects to design such ground-breaking skyscrapers? *(With their post and lintel backbones, skyscrapers are modern day pagodas, often supported with some form of buttresses for stability.)*
- Which style do you think looks better: the 20th century look of the Empire State building or the 21st century look of the Burj Khalifa?
- Where do you think the next tallest building in the world will be? Where would you build it if you were the architect in charge?

CURRICULUM SAMPLE



DID YOU KNOW?

From street level to the 103rd floor, there are 1,872 steps. A race up the stairs to the 86th floor is held annually, where athletes must climb a total of 1,576 steps.

Because so many businesses are housed there, the Empire State Building has its own zip code, 10118.

The Empire State Building has a lightning rod near the top which is struck by lightning around 23 times every year.

DAY

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
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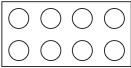
EMPIRE STATE BUILDING

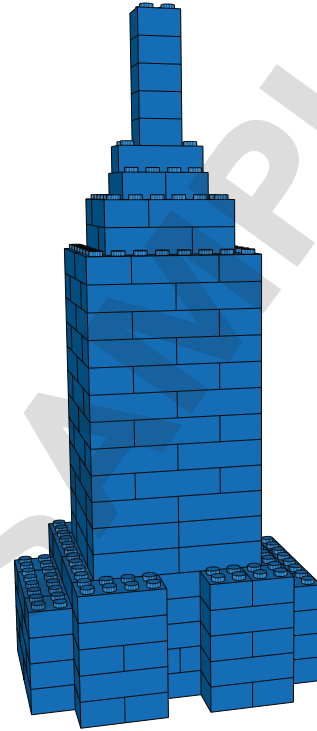
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Materials

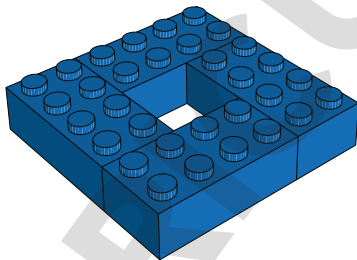
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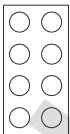
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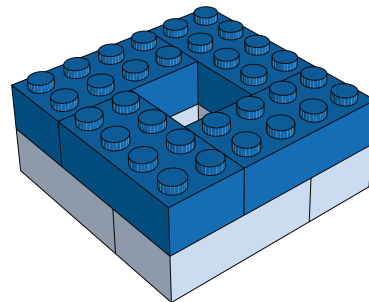


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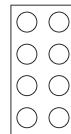


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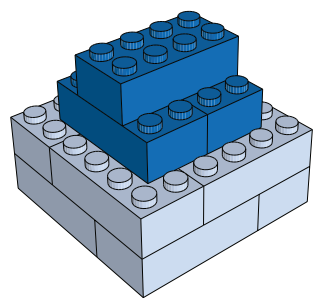


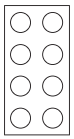
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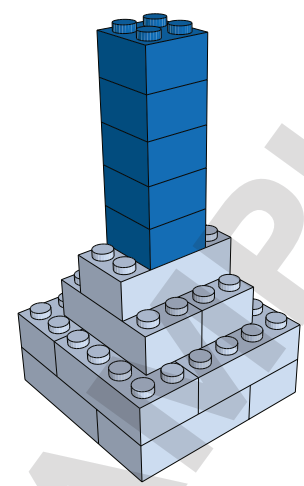
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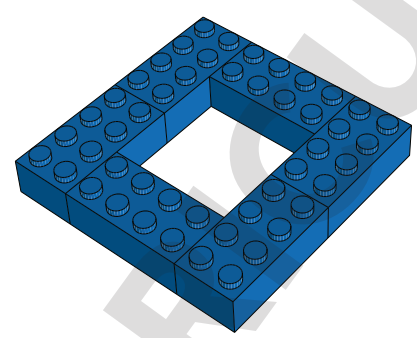


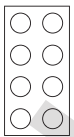
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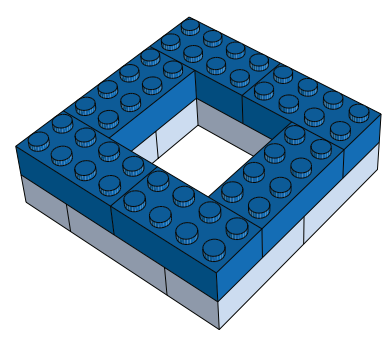
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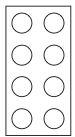
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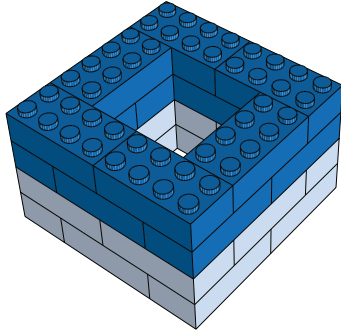
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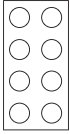


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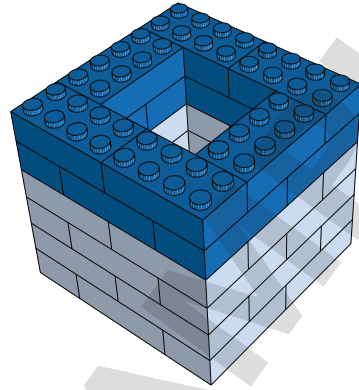


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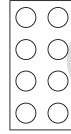


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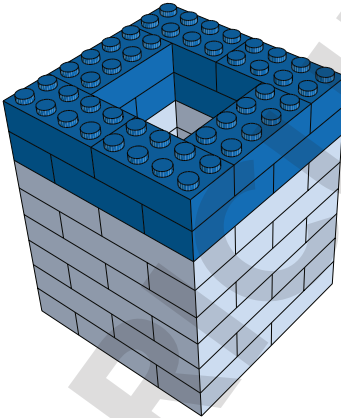


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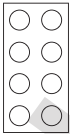


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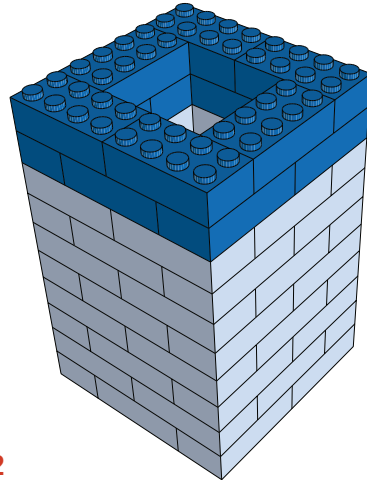


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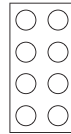


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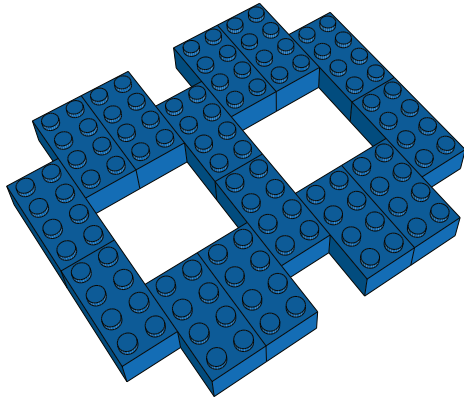


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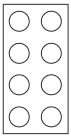


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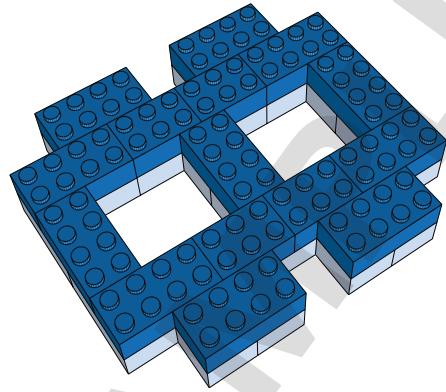


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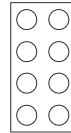


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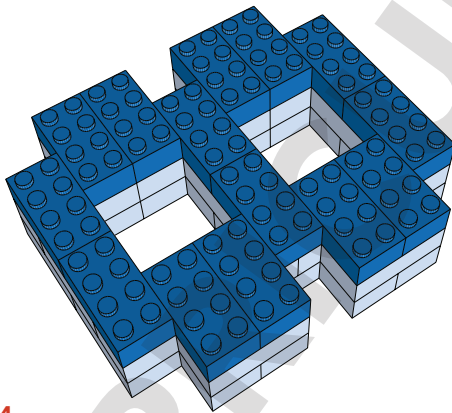
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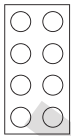


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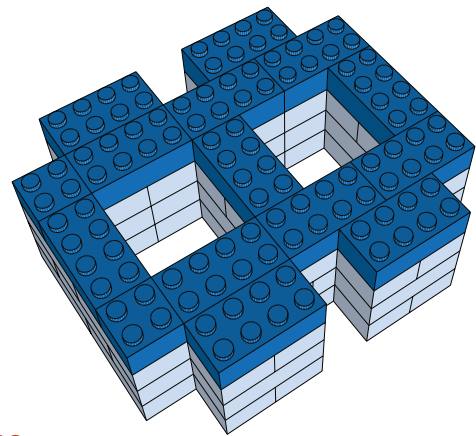


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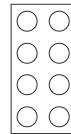


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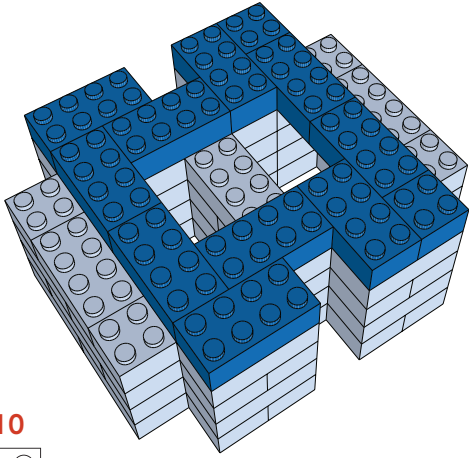
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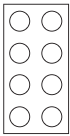

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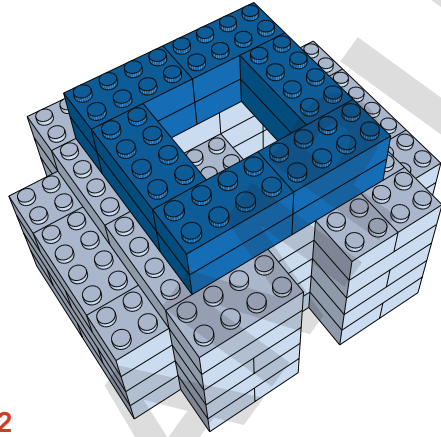
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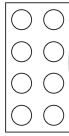
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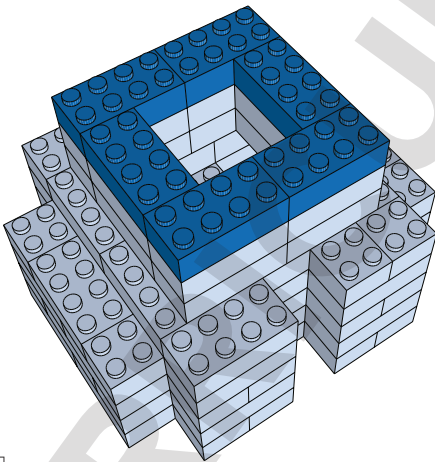
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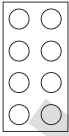
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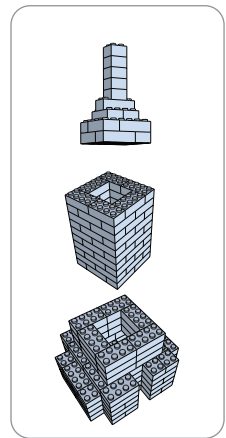
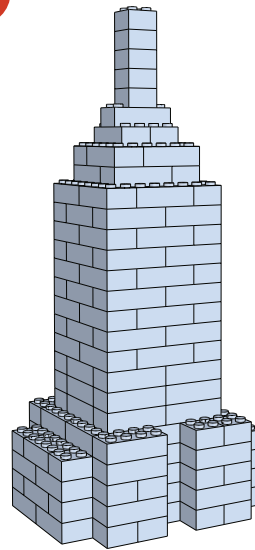
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**CONGRATS!
YOU BUILT THE
EMPIRE STATE BUILDING!**