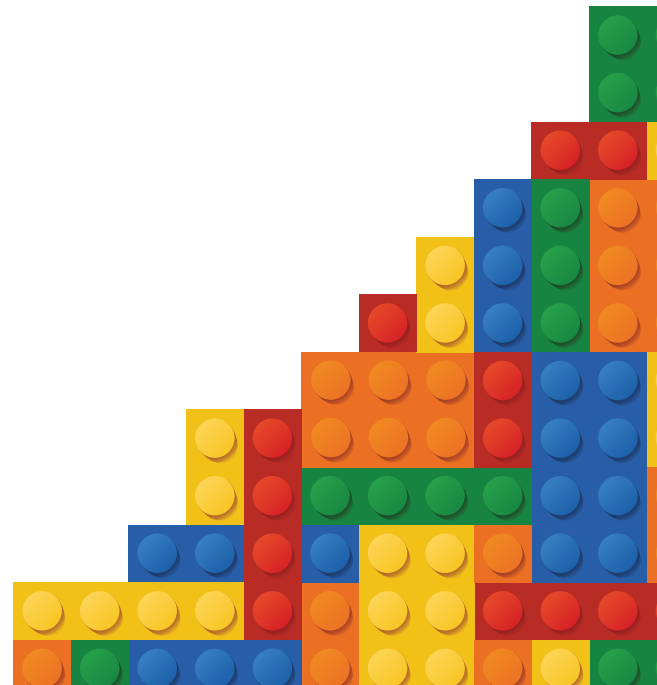


B U I L D I N G

Challenges



Building Challenges for STEM/STEAM

Encourage children of all ages to engage in creative and playful interpretations of building with blocks that add in a mixture of other toys such as people (with and without disabilities) and animals, colorful pattern blocks for details, other kinds of blocks, and even recycled materials. Encourage families to do research for challenges as needed.

Directions for adults, as well as prompts and questions to ask are included with each card to help support facilitators. Minimal help should be provided. Copy the first and second pages for families to use. Offer the third page in full format for varied ages, or cut them apart for specified age groups. Everyone can do “hard” work. Sometimes it’s best not to assign specific age groups and allow children to really challenge themselves. Please feel free to add more Block Challenge Cards for children and families who visit your library!

Challenges Color Coding

PreK- Early Elementary – **HARD**

Upper Elementary – **HARDER**

Tweens & Teens – **HARDEST**

More on leveled block play and designing from this NAEYC article [Q&A: What the Research Tells us About Block Play and STEM Learning](#).

Challenge Card Topics **Have nonfiction books and computer devices on hand for research!*

#1 Playgrounds

#2 Zoos and Parks

#3 Communities: Cities, Suburbs and Farms

#4 Architecture

- Print these resources on a color printer!
- Tower architecture FREE download
<https://fun-a-day.com/book-structures-block-center/>

#5 Throughout Time

#6 Ramps and Pathways (Have a few protractors on hand for tweens/teens challenges.)

- Provide cove molding pieces with ping-pong balls or various sized marbles. Be sure to get the flat-bottomed trim cove molding. Sample:
<https://www.lowes.com/pd/EverTrue-1-63-in-x-144-in-Pine-Cove-Moulding/1000445191>
- See these references
 - YouTube videos
 - [Ramps and Pathways University of Northern Iowa](#) 1:43
 - [Ramps and Pathways posted by studiooakroad](#) 2:43
 - Activity Lesson Resource: Recommendations –18 each 1’, 2’, 3’ and 4-6 4’ lengths
 - <http://jlancaster.pbworks.com/f/Ramps%20lesson%202.pdf>

#7 People, Plants, and Animals

More Ideas

<https://lifeovercs.com/building-block-stem-challenge-cards>

<https://www.playdoughtoplato.com/product/stem-challenge-4-seasons-building-cards>

Building with blocks of all kinds is essential for young STEM learners!

Block building helps learners develop gross and fine motor skills, collaboration/sharing, and emotional/social skills through role play.

A major benefit of using block play to promote science, technology, engineering, and mathematics is the versatile learning opportunities it presents. Children can learn a variety of skills and gain a more comprehensive understanding of the concepts they are learning in school by playing with blocks. Block play helps children nurture and develop skills in each of the four STEM disciplines: science, technology, engineering, arts and math.

Sharon MacDonald explains in *Block Play: The Complete Guide to Learning and Playing with Blocks* that children can explore cause and effect and learn about gravity, stability, weight, and balance as they play with blocks in the classroom. Inductive thinking, experimentation, properties of matter, and inclined planes can be incorporated into block play with older children.

For math, block play helps children learn to express quantities and measurements, sort and match objects based on similarities and differences, and understand basic math concepts (numbers, shapes, counting, addition, subtraction, etc.). You can also use block play to help older children learn about fractions, symmetry, graphing, classification, and other mathematical concepts.

If you follow the STEAM philosophy, designing and building block structures also provides various art opportunities for children by encouraging them to think creatively. Natural architecture concepts are integrated in all block play.

Reference: Kaplan Early Learning Company

<https://www.kaplanco.com/ii/block-play-stem>

Engineering is at the heart of building play. Young builders learn about aligning walls, walkways, and roads. They practice spatial understanding as they imagine what they want to build and then make it a reality. They add playful and realistic architectural components.

Record how your child creates with simple technology including your cell phone camera or videos. Use the online program Seesaw to record images and journal writings.

Photo Citation

Developed by: Peney E. Wright, Tuscarora Intermediate Unit 11, McVeytown, PA, September 2018

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<https://creativecommons.org/about/downloads/>

Directions

To create two-sided cards with common fronts (like a deck of cards) print page 4 of this PDF on the opposite side of all challenge cards on pages 5-25. Then cut apart.

Playgrounds

Encourage and allow children to imagine, innovate, and create all on their own. Give positive feedback but keep any help to a minimum. Prompts to use: "Tell me what happens here." "Which ones are the most fun?" Questions to ask include: "How does this part work?" "What makes this area safe or comfortable?" "Which part was the easiest to build and why?" "Which part was the most challenging and why?"

Zoos and Parks

Directions: Encourage and allow children to imagine, innovate, and create all on their own. Give positive feedback but keep any help to a minimum. Prompts to use: "Tell me what happens here." Questions to ask include: "How does this part work?" "Why is this such a good plan for the animals who live there?" "Which part was the easiest to build and why?" Which part was the most challenging and why?"

Communities: Cities, Suburbs and Farms

Encourage and allow children to imagine, innovate, and create all on their own. Give positive feedback but keep any help to a minimum. Prompts to use: "Tell me what happens here." "What should your buildings have to make them comfortable and work well for the people who use them?" Questions to ask include: "How will you advertise so people will know what your building is?" "What makes this area so useful/comfortable?" "Which part was the easiest to build and why?" "Which part was the most challenging and why?"

Architecture

Encourage and allow children to imagine, innovate, and create all on their own. Give positive feedback but keep any help to a minimum. Refer to various structures from around the world! Prompts to use: "Tell me what happens here." "How did you decide to build this part?" Questions to ask include: "How does this part work?" "Which flat or 3-D shapes did you use?" "Which part was the easiest to build and why?" "Which part was the most challenging and why?"

Throughout Time

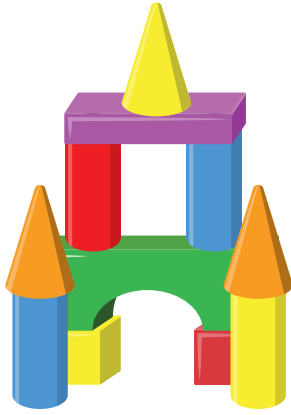
Encourage and allow children to imagine, innovate, and create all on their own. Add in colorful pattern blocks and some recyclable supplies, as designed. Give positive feedback but keep any help to a minimum. Prompts to use: "Tell me what happens here." "How does your building compare to structures you see today?" Questions to ask include: "What time period is your building from?" "What makes this area so interesting?" "Which part was the easiest to build and why?" "Which part was the most challenging and why?"

Ramps and Pathways

Encourage and allow children to imagine, innovate, and create all on their own. Give positive feedback but keep any help to a minimum. Prompts to use: "Tell me what happens here." "How did you get your ball to move from up to down or side to side?" Questions to ask include: "How does this part work?" "What makes this area so fun?" "Which part was the easiest to build and why?" "Which part was the most challenging and why?" "How did you end your creation?"

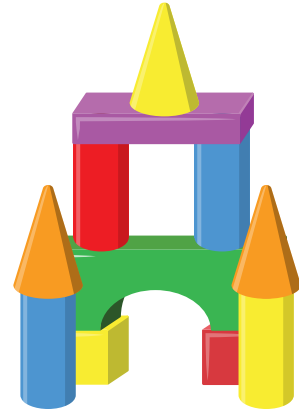
People, Plants, and Animals

Encourage and allow children to imagine, innovate, and create all on their own. Give positive feedback but keep any help to a minimum. Prompts to use: "Tell me what happens here." "How did you get these parts to move?" Questions to ask include: "How does this part work?" "Which part was the easiest to build and why?" "Which part was the most challenging and why?"



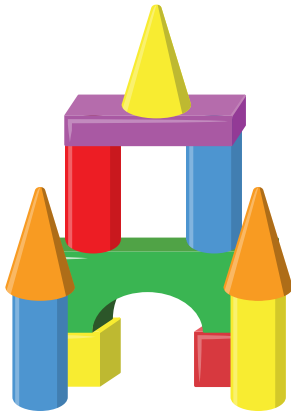
B U I L D I N G

Challenges



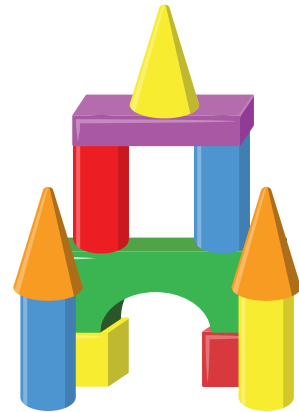
B U I L D I N G

Challenges



B U I L D I N G

Challenges



B U I L D I N G

Challenges

Playground

HARD

Design and build a playground in your neighborhood for your friends.

Design and build a play area that has underground and tunnel parts.

Design and build a playground with fun areas for the whole family and their dogs.

Playground

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Playground

HARDER

Design and build a playground with at least four to six fun areas in which you and your friends can play. Include one water and one climbing area.

Design and build a playground with tall areas where people can move up, out, and down. Add wide areas where people can go over, under, and through.

Playground

HARDER

Design and build a playground with at least four to six fun areas in which you and your friends can play. Include one water and one climbing area.

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Design and build a playground with tall areas where people can move up, out, and down. Add wide areas where people can go over, under, and through.

Playground

HARDEST

Design and build a playground climbing challenge. It should have at least six fun areas, with only three ways to climb on and off. It can be tall and wide.

Design and build a large play park with areas where people can do many different things they like. Include an active climbing, swinging, and running area, a relaxing and talking area, a place where friends can play their games or talk on their phones, and a spot where anyone could comfortably share a picnic.

Playground

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Zoos and Parks



HARD

Design and build zoo exhibits for two of your favorite animals.

Design and build one zoo exhibit for a predator and one for a plant eater.

Design and build a dinosaur zoo!

Design and build a park with trees, a pond, walking paths, a skateboard mini park, food vendors, and other fun ideas.

Zoos and Parks



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Design and build zoo exhibits for two of your favorite animals.

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Zoos and Parks



HARDER

Design and build a small zoo with walkways for people to see their favorite animals.

Design and build a zoo for some of your favorite animals that also has snack shops, gift shops, and entertainment for visitors.

Design and build a water park with different slides and pools.

Zoos and Parks



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Design and build a small zoo with walkways for people to see their favorite animals.

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Design and build a water park with different slides and pools.

Zoos and Parks



HARDEST

Design and build a zoo with exhibits for multiple ecosystems: rain forest, temperate forest, mountainous, tundra, plains, desert, wetland ... Be sure to plan for ways the zookeepers and veterinarians can enter to feed, assist, and care for the animals.

Design and build an amusement park with rides for everyone in the family. Include rides that could be fun, silly, wet, a little scary, easy for little kids, big, long, tall, short, exciting, and have a theme (like a volcano-eruption roller coaster).

Zoos and Parks



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Design and build an amusement park with rides for everyone in the family. Include rides that could be fun, silly, wet, a little scary, easy for little kids, big, long, tall, short, exciting, and have a theme (like a volcano-eruption roller coaster).

Communities: Cities, Suburbs and Farms



HARD

Design and build your house.

Design and build your favorite place to go.

Design and build your favorite restaurant.

Communities: Cities, Suburbs and Farms



HARD

Design and build your house.

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Communities: Cities, Suburbs and Farms



HARD

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Communities: Cities, Suburbs and Farms



HARD

Design and build your house.

Design and build your favorite place to go.

Design and build your favorite restaurant.

Communities: Cities, Suburbs and Farms

HARDER

Design and build your house and your yard.

Design and build any building or farm of your choice with exactly 40 blocks.

Design and build your favorite place to go. Be sure to include safe ways for everyone to get in and out.

Design and build your favorite restaurant. Be sure to include safe ways for everyone to get in and out.

Communities: Cities, Suburbs and Farms

HARDER

Design and build your house and your yard.

Design and build any building or farm of your choice with exactly 40 blocks.

Design and build your favorite place to go. Be sure to include safe ways for everyone to get in and out.

Design and build your favorite restaurant. Be sure to include safe ways for everyone to get in and out.

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Communities: Cities, Suburbs and Farms

HARDEST

Design and build your house, yard, driveway/ nearby road, and sidewalks.

Design and build your favorite place to go. Be sure to include safe ways for everyone to get in and out, even if they use a cane, walker, wheelchair, or guide dog.

Design and build your favorite restaurant. Be sure to include safe ways for everyone to get in and out, even if they use a cane, walker, wheelchair, or guide dog.

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Architecture



HARD

Design and build your favorite fancy building.

Design and build a tower as tall as you that stands for at least 30 seconds.

Design and build a structure with at least six triangles and two arcs or half circles.

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Architecture

HARDER

Design and build a tower as tall as you that stands for at least 1 minute.

Design and build any building with a staircase in front, in back, or in the middle.

Design and build a structure that has only one block as its base.

Choose a famous building with whimsical architecture, and build a close model.

Architecture

HARDER

Design and build a tower as tall as you that stands for at least 1 minute.

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Architecture

HARDEST

Design and build a tower as tall as you that stands for at least 5 minutes.

Design and build a famous building from a country you have never visited. Find one with surprisingly innovative architecture.

Design and build any building with a domed top.

Design and build a structure that starts with an inverted pyramid as part of its base.

Architecture

HARDEST

Design and build a tower as tall as you that stands for at least 5 minutes.

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Throughout Time

HARD

Design and build a castle.

Design and build a cabin or campsite.

Design and build a maze.

Design and build your favorite book character or setting from a story long ago. (Could be a fairy tale or legend)

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Throughout Time

HARDER

Design and build a pentagonal-shaped castle.

Design and build a building by ancient architects.

Choose your favorite *Magic Tree House* book, fiction or nonfiction, and create a scene from the story.

Throughout Time

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Throughout Time

HARDEST

Design and build a castle with a working gate or portcullis.

Design and build an underground labyrinth with six ways in or out. (Use large flat cardboard as your “ground” model.)

Choose your favorite historical fiction book and build a character, scene, or setting based on the book.

Throughout Time

HARDEST

Design and build a castle with a working gate or portcullis.

Design and build an underground labyrinth with six ways in or out. (Use large flat cardboard as your “ground” model.)

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Design and build an underground labyrinth with six ways in or out. (Use large flat cardboard as your “ground” model.)

Choose your favorite historical fiction book and build a character, scene, or setting based on the book.

Ramps and Pathways

HARD

Design and build a long ping-pong ball run.

Design and build ramps and pathways to move a ping-pong ball from the top front of a table down and around to the back of the table.

Design and build ramps and pathways that move a ping-pong ball left to right then right and back to the left! Make signs for these left and right turns.

Ramps and Pathways

HARD

Design and build a long ping-pong ball run.

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Ramps and Pathways

HARDER

Design and build a marble run with at least four turns, labeling them left or right.

Design and build a roller coaster that uses only gravity to complete a “marble car’s” trip from the beginning to the end.

Ramps and Pathways

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Design and build a roller coaster that uses only gravity to complete a “marble car’s” trip from the beginning to the end.

Ramps and Pathways

HARDEST

Design and build a set of ramps and pathways with at least one of each of these angles: 45° , 90° , 120° , and one 360° over/under turn. Mark all of your angles.

Design and build a spiral marble run that begins at the top of a table, making all left turns to the back of the table, ending on the floor.

Design and build a double racetrack for two marbles traveling simultaneously. Begin on a table and then wind around onto the floor. Make your racetracks mirror images of each other so the race is fair. Choose marbles that are the same size and weight.

Ramps and Pathways

HARDEST

Design and build a set of ramps and pathways with at least one of each of these angles: 45° , 90° , 120° , and one 360° over/under turn. Mark all of your angles.

Design and build a spiral marble run that begins at the top of a table, making all left turns to the back of the table, ending on the floor.

Design and build a double racetrack for two marbles traveling simultaneously. Begin on a table and then wind around onto the floor. Make your racetracks mirror images of each other so the race is fair. Choose marbles that are the same size and weight.

Ramps and Pathways

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People, Plants, and Animals



HARD

With a partner, design and build a model of yourself lying on the floor.

With a partner, design and build a moving robot with different tools in its right and left hands.

Design and build a flowering plant with roots, a stem, leaves, and a flower.

Design and build one of your favorite animals with moving body parts.

People, Plants, and Animals



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People, Plants, and Animals

HARDER

With a partner, design and build a model of yourself, with at least three body systems, lying flat on the floor. (Body systems: bones, breathing, heart and circulation, intestines ...)

With a partner, design and build a moving robot with different designs on or equipment in its right and left hands and feet.

Design and build a budding tree with roots, a trunk, branches and stems, and small spring buds.

Design and build a predator and prey in chase.

People, Plants, and Animals

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People, Plants, and Animals



HARDEST

With a partner, design and build a model of yourself with at least four body systems, lying flat on the floor. (Body systems: skeletal, respiratory, circulatory, digestive, neurological ...)

With a partner, design and build a moving robot with specialized components on its right and left hands, feet, limbs, chest, and head.

Design and build a small flowering garden with taller plants and others that spread out.

Design and build a tree with animals living in it that depend on the tree for survival or a home. (Choose a tree from a specific habitat – rain forest, woodland, mountain, desert, or wetland.)

People, Plants, and Animals



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