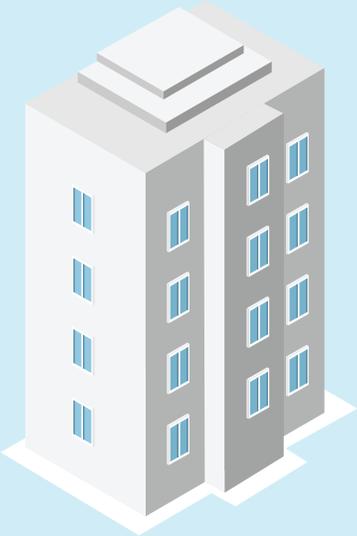


Juniors Who Build



Everywhere you go, there are so many buildings big and small all around you! But how exactly does a building get—well—built? Many people work together to construct each building that you see, and there are so many different jobs and roles in the construction process! First the building is designed, then resources are bought, before finally creating a construction plan! After all of that is done, you have to ensure that you have a safe way to construct whatever it is that you dream of!



Developed in partnership with



- Steps:**
1. Design and Coordination
 2. Cost and Estimation
 3. Planning
 4. Safety and Site Management
 5. Trades

Purpose:

When I have earned this badge, I will understand the steps of the construction process, different construction careers, and how I might go about building something myself.

Step 1: Design and Coordination

Before you start construction on your building, first figure out what it is that you want to build! The first step in construction is to brainstorm your building's **design**. Designers think about ideas for what a building could look like, where everything in the building should go, and how they could make a building better. Engineers and architects also help in this step.

You can show off your design by creating a **model**! A model can be anything that lays out parts of the design, like where things go or what they look like. Many designers use computer programs to make digital models of their buildings.

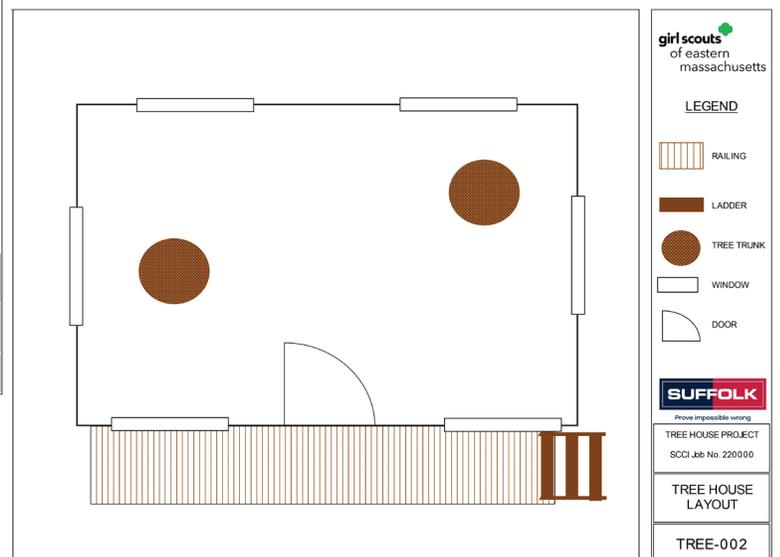
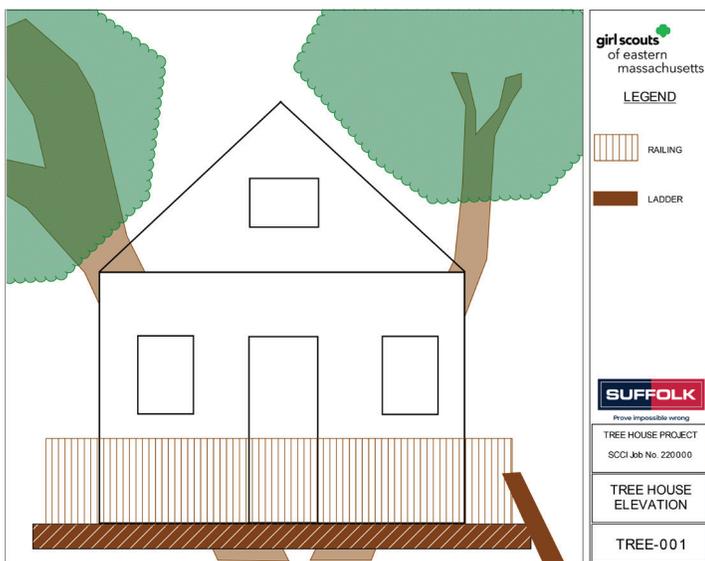
Coordination helps to make sure the design of our buildings make sense. Models can help us see that everything looks good and is where it's supposed to be!

Activity

Treehouse 2D Model

Let's put your design skills in action by modeling your dream treehouse!

Floor plans are a type of 2D model. They include parts of a building like the outside and inside walls, windows and doors, and furniture. Look at the example below of a treehouse 2D model. It shows how the building is shaped and what it has inside of it. It also shows how the design solves problems; like how to work around the tree or where to put the ladder.





Now, draw your own treehouse! Use your creativity to make sure your treehouse design is truly *yours*!

While you draw, think about these questions:

- What do you want your treehouse to look like?
- What do you want to put inside of it?
- What kind of things do you want to be able to do in your treehouse?
- Where does the tree actually go *through* your treehouse?
- Where is the ladder to go up to the treehouse?

Activity

Choices – do one:



Scale up your treehouse.

Work together with your troop to combine your 2D models into one, big troop treehouse! Or, design extra rooms you would like to add on to your own treehouse. What new coordination challenges do you see? Are there windows against walls? Are there too many ladders? Brainstorm ways to redesign your treehouse.



Create a physical model.

One way to make your 2D model come to life is to build it in 3D. Use blocks, clay, paper, recycled materials, or anything you can find to take your treehouse to the next dimension! While you build, keep track of any changes you have to make to your design. Can you build every part of your treehouse with the materials you chose?



Create a digital model.

People in construction use 3D modeling all the time! Technology can help move parts of the design around, predict what construction challenges you'll face, and keep track of every detail of a build! Use a modeling program or favorite video game to take your treehouse digital! What did you learn about your design once you saw it in 3D?



Step 2: Cost and Estimation

Big buildings can cost a lot of money because construction companies have to purchase resources and hire people to work on the building. The guitar-shaped hotel pictured below cost more than 300,000,000 boxes of Girl Scout cookies to build!

In **estimation**, the cost of everything needed to build a project is calculated. Then a budget is used to help keep track of where money is spent. This way, companies always know if they have enough left in their budget to finish the construction project.

You can figure out the cost of materials using **unit** prices and the total amount of each material you'll need. For example, if you need eight gallons of paint, and each gallon of paint costs \$20, then your total paint cost will be \$160. If you are working on a big construction project, you may need to hire a contractor to help you. It's always good to make sure you're staying under budget and getting the best value out of your money!

Activity

Choices – do one:



Estimate the expense of your treehouse.

The same project can be built for a low cost or can be very expensive depending on what materials you use. Use the **Treehouse Estimation worksheet (Worksheet 2)** to estimate how much your treehouse would cost to build! Imagine having both a low budget and a high budget, what different materials would you need to use? What changes would you need to make?



Do a material cost scavenger hunt.

At a hardware store or on a hardware store website, explore how much materials cost. Some materials are priced by measurements like inches, feet, or gallons. Lumber can be more expensive depending on which type of tree was used. Go on a **Treehouse Material Cost Scavenger Hunt (Worksheet 3)**, and see how much money you would need to buy everything! What can you do to save money and “cut” costs?



Hire a treehouse contractor.

There are many people and companies you could hire to help build your treehouse! You could hire contractors for carpentry, insulation, electrical, painting, landscaping, and much more! Use the **Bid Tab worksheet (Worksheet 4)** to decide which of the three contractors is best for your job. Does the lowest cost contractor do everything you need them to? Is the highest cost worth the price?



Step 3: Planning

In construction projects, some things need to be built before other things can be. If you want to paint your walls, you first need to build your walls! The order between these two things is logic. Builders use logic in **planning** to figure out how a structure should be built.



Planners figure out what parts of a project need to be built before other parts do by stringing together a long sequence of activities. If anything in that sequence gets delayed—like a bad rainstorm stopping you from building your treehouse floor—then the steps that come after it will also be delayed. Then, the whole project will be off schedule! This string of steps is called a **Critical Path**.

Planners want a building to be completed on time, by the initial date scheduled or deadline. They keep track of **float**, which is the amount of time a step in the building process can be delayed before the deadline gets pushed!

Activity



Choices – do one:

Identify your treehouse critical path.

In construction, it's important to know what needs to be built before you can work on other parts of the project. You need walls before you can paint, and you need to paint before you can hang up pictures of you and your friends. Think about all of the parts of your treehouse and the logical relationships between building them. If the weather is bad, what wouldn't you be able to build? What parts of the project would that delay?

Plan your campsite.

A campsite has so many functions it needs to accomplish. You need a cozy place to sleep, enough space to cook, and a safe area for a fire. And, you only have until the sun goes down to set it up – oh no! Don't worry, you can get it all done using the same techniques that planners use! Talk with your troop to decide what you would need to set up at a campsite, who is best for each job, and how you would get it done in time for s'mores!

Plan your day.

Planning can help you keep track of any type of goal you might want to achieve. Think about goals you might have for a day at home or a special occasion. Maybe you want to throw a party, read a book, go somewhere exciting, or practice a hobby. The **Day Planning worksheet (Worksheet 5)** will help you figure out what you want to accomplish, an adult at home can help you track your progress, and evaluate how you did!

Step 4: Site Management and Safety

Think about construction workers. When you imagine them, what are they wearing? And what do you imagine a construction site looks like?

A construction project of any size can be dangerous if safety isn't the top priority. That's why construction workers wear **personal protective equipment (PPE)**, such as hard hats, gloves, goggles, and high visibility safety vests. Site safety managers help make sure that all the work on a construction site is being done on time and, most importantly, done safely. However, it's everyone's responsibility to look out for each other and make sure everyone remains unharmed.

Activity



Choices – do one:

Observe a construction site.

You pass by construction sites all the time, but there's so much more to see! Behind the scenes, site managers are making sure everything gets done well, on time, and safely! What helps keep everyone safe? Is it barriers and fences or PPE? Can anyone operate a bulldozer, or do you need a special license? Observe a construction site from a safe distance, and record what you see by taking notes or drawing pictures. What do you see that is helping to keep everyone stay safe?

Think about how your troop stays safe.

When you and your troop are setting up a campsite, going on a trip, or even just eating a snack—there are so many ways you help keep each other safe. What plans would you put in place to help keep everyone safe around a campfire? What if someone got sick at a troop meeting, or if you were going on an adventure somewhere new together? Talk with your fellow Juniors to come up with a list of situations where you can put safety rules or plans in place!

Learn tool safety from an adult.

You probably know that it's really bad to run with scissors, right? Well, there are rules like that for construction tools, too! Think about what you might want to build if someone showed you how to safely hammer nails, cut wood with a saw, or glue PVC pipes together. Ask an adult to teach you how to safely use a tool—and if you should wear any PPE while you do! Adults: Please review a list of approved hand and power tools in GSEMA's [Safety Activity Checkpoints](#) (page 187).

Step 5: Trades

What are you an expert on? Is it something you learned by yourself? In school? Or maybe by helping someone else?

People with **trades** are experts with special knowledge on part of a construction project! An electrician is just one example of a tradesperson—there are so many different skills and types of expertise that you can learn! If you can name a part of a building, there's probably a tradesperson with special knowledge whose job it is to build it.

Every trade works with different materials and tools. Some use a hammer and nails, some work in machines high above the ground, and some create the parts of buildings that make them beautiful! Explore some of these trades with the **Trades Matchup worksheet (Worksheet 6)**!

Activity



Choices – do one:



Build a picture frame for your house.

After learning about so many different trades, are you in the mood to build something yourself? Build a picture frame for your house and think about something special you want to display inside. Will you use recycled materials, supplies from nature, or maybe wood? Be sure to get an adult's help with any large tools. After you build your picture frame - decorate it how you'd like and add your picture inside.



Perform a skit or write a story about building your treehouse.

Use tradespeople as your characters and think about how everyone's special skills help them build their treehouse. Does everything go smoothly - or does your building team face challenges along the way? How does everyone stay safe, and how do you stay under your budget? Most importantly, did you remember to have all the tradespeople you need? You wouldn't want to forget to have a roofer - that'd be a pretty rainy treehouse!



Interview a tradesperson.

There are so many trades, but there's also so much to learn about each one! Every tradesperson faces different challenges, uses different tools and materials, and knows a lot about their trade. Every part of a building is important, and everyone's special knowledge helps complete the building process. Ask questions that help you learn what part your tradesperson plays, or write out a list of questions you would like to know more about and research the answers.



Congratulations
on becoming
Juniors Who Build!

Thank you for your feedback.

Please complete the evaluations below to provide feedback on your experience and receive verification to get your Juniors Who Build patches:



Adult Survey:
bit.ly/jwbsurvey1



Youth Survey:
bit.ly/jwbsurvey2



Words to Know

Allowance	to cover cost that you know will be a part of the project, but the scope is currently undefined or still being designed
Model	a physical or digital representation of the building or the idea of the building
Design	a detailed solution showing your ideas or intentions
Coordination	making sure everyone's design solutions fit and work together
2D	when something is flat or has just length and width, like a square
3D	when something has length and width but also depth, like a cube
Estimation	a calculation of how much a construction project will cost in total
Contractor	someone hired to work on a specific project for an agreed upon amount of money
Unit	a way of measuring quantities of materials needed for building – for example using length, weight, or capacity
Schedule of Values	a breakdown of the budget based on each material type
Planning	the process of identifying the steps needed to build a structure, splitting them into activities, and ordering them logically
Critical Path	the sequence of activities in a schedule which must be completed on time for the project to stay on schedule; or the longest string of parts of a building that must be constructed before other things
Float	the amount of time that an activity can be delayed without affecting the project completion date
Logic	in planning, the order that activities must occur because some things must be built before other things
Milestone	a significant event that occurs during the project
PPE	personal protective equipment; anything someone wears to keep them safe
Scope of Work	a list of all of the activities, tasks, deliverables that are part of a specific project
Trade	a job with a special skillset and specific training

Treehouse Estimation Worksheet

Treehouse #1:

You are designing your dream treehouse! There are lots of decisions to make. Circle the elements you want included in your treehouse. At the end, count how many BUILDING BUCKS your treehouse costs to build.

Size—How many friends will you be able to fit in your treehouse?

- Three people— 1 Building Buck
- Six people— 2 Building Bucks

Openings—How will you enter and exit your treehouse?

- Ladder— 1 Building Buck
- Rock Climbing Wall— 2 Building Bucks

Power—How will your treehouse use electricity? Think about what you want to do in your treehouse and which things need electricity.

- Off-the-Grid— 1 Building Buck
- Solar Power— 2 Building Bucks

Insulation—Will your treehouse be warm enough for all seasons or only the summer?

- No Insulation (Summer Only)—1 Building Buck
- Insulation (All Seasons)—2 Building Bucks

Floors—What material will the floors of your treehouse be?

- Wood—1 Building Buck
- Carpet—2 Building Bucks

Paint—How will you decorate the inside and outside of your treehouse?

- One Color—1 Building Buck
- Three Colors— 2 Building Bucks

Bed—How will you relax in your treehouse?

- Sleeping Bag—1 Building Buck
- Hammock—2 Building Bucks

Total Number of BUILDING BUCKS needed to Build Treehouse #1: _____

Treehouse Estimation Worksheet (p.2)

Treehouse #2:

The costs of material and labor have increased! Now it takes more to make certain decisions. This is called inflation and happens every year—but sometimes prices increase more than others. With inflation, how many BUILDING BUCKS does it cost to build the same treehouse?

Size—How many friends will you be able to fit in your treehouse?

- Three people—2 Building Bucks
- Six people—3 Building Bucks

Openings—How will you enter and exit your treehouse?

- Ladder— 1 Building Bucks
- Rock Climbing Wall—3 Building Bucks

Power—How will your treehouse use electricity? Think about what you want to do in your treehouse and which things need electricity.

- Off-the-Grid—1 Building Buck
- Solar Power—3 Building Bucks

Insulation—Will your treehouse be warm enough for all seasons or only the summer?

- No Insulation (Summer Only)—1 Building Buck
- Insulation (All Seasons)—3 Building Bucks

Floors—What material will the floors of your treehouse be?

- Wood—2 Building Bucks
- Carpet—3 Building Bucks

Paint—How will you decorate the inside and outside of your treehouse?

- One Color—1 Building Buck
- Three Colors—2 Building Bucks

Bed—How will you relax in your treehouse?

- Sleeping Bag— 1 Building Buck
- Hammock— 3 Building Bucks

Total Number of BUILDING BUCKS to Build Treehouse #2: _____

Treehouse Estimation Worksheet (p.3)

Treehouse #3:

Your family decides to set a budget of 12 Building Bucks to build your treehouse. You must choose one option from each category. Cut out the Building Bucks and use the Budget Sheet to make sure you don't spend too much! What decisions will you make to stay within your budget and why?

Size—How many friends will you be able to fit in your treehouse?

- Three people—2 Building Bucks
- Six people—3 Building Bucks

Openings—How will you enter and exit your treehouse?

- Ladder— 1 Building Bucks
- Rock Climbing Wall—3 Building Bucks

Power—How will your treehouse use electricity? Think about what you want to do in your treehouse and which things need electricity.

- Off-the-Grid—1 Building Buck
- Solar Power—3 Building Bucks

Insulation—Will your treehouse be warm enough for all seasons or only the summer?

- No Insulation (Summer Only)—1 Building Buck
- Insulation (All Seasons)—3 Building Bucks

Floors—What material will the floors of your treehouse be?

- Wood—2 Building Bucks
- Carpet—3 Building Bucks

Paint—How will you decorate the inside and outside of your treehouse?

- One Color—1 Building Buck
- Three Colors—2 Building Bucks

Bed—How will you relax in your treehouse?

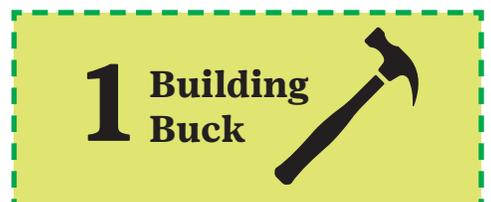
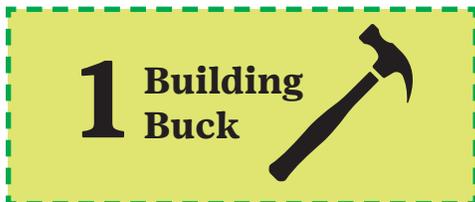
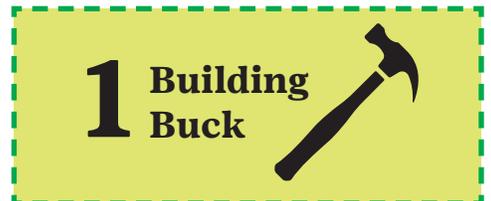
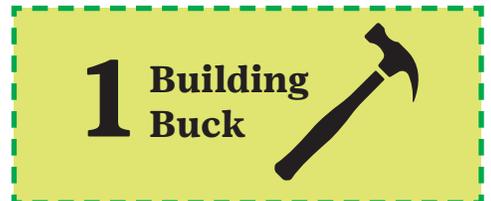
- Sleeping Bag— 1 Building Buck
- Hammock— 3 Building Bucks

Total Number of BUILDING BUCKS to Build Treehouse #3: _____

Explain your reasoning: _____

Basic Budget for Treehouse Estimation Activity

Expense Category	Choice	Cost in Building Bucks
Size		
Openings		
Power		
Insulation		
Floors		
Paint		
Bed		
		Total:



Day Planning Worksheet

Example

Goal: I want to learn how to play chess. I would like to achieve my goal by Saturday.

- Plan:*
1. Borrow my brother's chess set.
 2. Learn the names of the different chess pieces.
 3. Learn how the chess pieces move on the game board.
 4. Invite my friend with chess knowledge to come over for a chess match.

I will know I have reached my goal when I have played my first chess match!

Planning your Day

Think about a goal you have that might take a few steps. Here are some ideas:

- Make a painting
- Practice piano scales
- Juggle a soccer ball
- Clean up my bedroom
- Have a sleepover
- Bake some cookies

What goal do I want to reach? _____

What day will I work on my goal? My Goal Day will be: _____

What are the steps that I need to take in order to reach my goal? Write a minimum of four steps:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

I will know I have reached my goal when: _____

Fill out the rest of this worksheet after your Goal Day! Now that I have had my Goal Day...

Did I reach my goal? Yes / No / Sort Of

What obstacles did I face while trying to achieve my goal? _____

I was/was not able to meet all of my goal's steps because _____

Fill in the blank: If I tried to achieve this goal again, I would do _____, differently.

Trades Matchup Worksheet

Write the letter of the photo that depicts the trade person listed.



A



B



C



D



E



F



G



H



I



J



K



L

Electrician _____

Welder _____

Landscaper _____

Glazier _____

Insulator _____

Carpenter _____

Mason _____

Roofer _____

Painter _____

Ironworker _____

Pipefitter _____

Operating Engineer _____