

Hat Lab: Design a Sun Hat to a Client's Brief

Ages 9-14 · about 45 minutes, in one sitting

A summer camp sends back the ball cap it ordered, because the counselors' necks and ears burn by lunch. Your child reads the camp's brief, four requirements with numbers in them, and designs a 3D sun hat that meets every one. They find out that a design is done when the numbers say so, not when it looks finished.

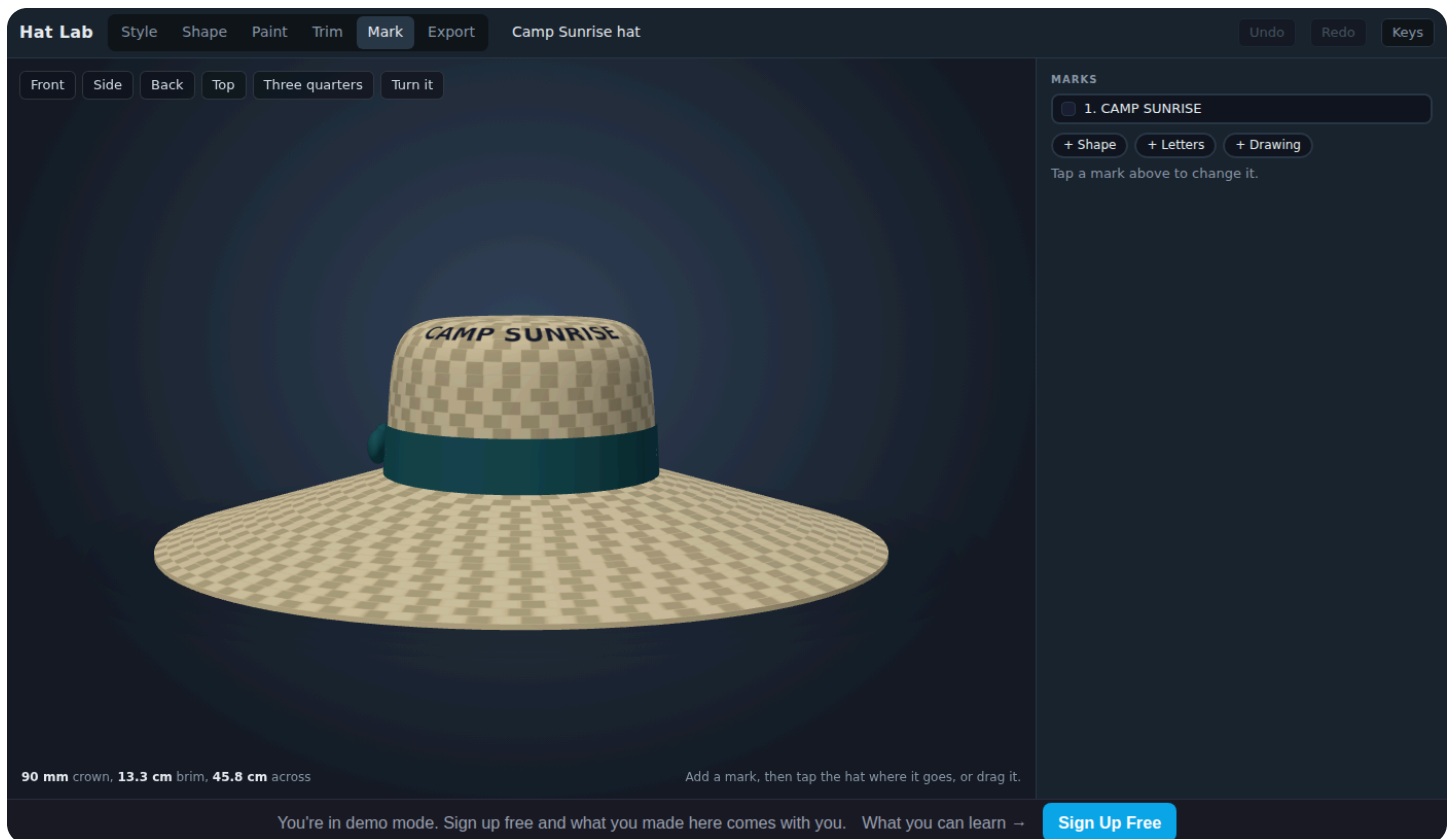
What you need

- A computer or Chromebook with a current browser. The hat is drawn in 3D, so an older computer may turn it more slowly.
- The lesson link: mytekdev.com/try/hatlab?lesson=design-a-sun-hat-to-a-brief&ref=fam-hatlab-1. No account, no email and nothing to install.
- Optional: the activity sheet at the end of this plan, printed, and a pencil. It has the camp's brief on it.

Before you start: try it once yourself

Meet the brief yourself once before you start, about ten minutes.

1. **Open the lesson.** Go to mytekdev.com/try/hatlab?lesson=design-a-sun-hat-to-a-brief&ref=fam-hatlab-1. The navy ball cap named Camp hat opens, with **Style** open. Press **Back** above the hat: the cap from behind, with nothing shading the neck. The line under the hat says 10.4 cm crown, 72 mm bill, 34.3 cm across.
2. **Size first.** In **Style**, pick **Bucket hat**. Open **Shape** and drag the size slider under Size to 56 cm. It says US 7, with 56 cm, UK 6 7/8, about M under it. **Brim width** reads 54 mm.
3. **Widen the brim.** Drag **Brim width** until it reads 76 mm or more. The brim number in the line under the hat changes with it.
4. **Try two more.** Pick **Cowboy hat**: the size stays at 56 cm, but **Crown height** reads 12.6 cm, over the limit, so drag it lower. Then pick **Sun hat**: 90 mm crown and 13.3 cm brim as it comes.
5. **Add the name.** Open **Mark** and press **+ Letters**. A mark that says ABC appears; type **CAMP SUNRISE** in the Letters box, then tap the front of the hat. Press **Front** to check it.



The Sun hat at 56 cm with the camp's name: the line under the hat is where you read the crown and the brim.

If you see something else: picking a new style puts every Shape slider back to that style's start, so a brim you widened is gone; the size, the name and the marks stay. The starter is 57 cm, not 56: a brim widened to 76 mm before the size is set reads 75 mm once the size drops to 56 cm.

The ideas, in plain words

Designers work for a client, and the client's needs are written down before anyone designs: that is the brief. Each requirement in a good brief can be checked with a yes or no, which usually means it has a number in it. A constraint is a requirement that sets a limit, like no taller than 12 cm. Anything the brief does not mention, such as color or pattern, is the designer's choice.

A design is done when it meets every requirement, not when it looks finished. That is why your child reads the app's numbers instead of judging by eye, and why the order matters: Hat Lab grows the whole hat with the head size, so every other number has to be read after the size is set. The camp's problem is a good example of a requirement ruling out a whole kind of design: a ball cap's bill shades only the front, so no bill length can shade the neck.

YOUR CHILD MIGHT ASK

A GOOD ANSWER

Can I make it purple?

Yes. The brief does not say the color, so that is your choice. Choices are where the hat becomes yours.

It looks done. Is it?

Only if every requirement on the brief has a number next to it that meets it.

YOUR CHILD MIGHT ASK	A GOOD ANSWER
Why 76 mm?	The Skin Cancer Foundation recommends a brim of at least 3 inches all the way around. 3 inches is $3 \times 25.4 = 76.2$ mm.
Isn't a wider brim always better?	It gives more shade, but it takes more material. The brief sets the smallest brim that does the job; past that, it is a trade-off.

Do it together

1. Open mytekdev.com/try/hatlab?lesson=design-a-sun-hat-to-a-brief&ref=fam-hatlab-1 together. Hat Lab opens on the camp's navy ball cap, and a short guide runs along the bottom; follow it together. Do its first step, pressing **Back** above the hat to see the cap from behind, then stop and read the camp's note: "The caps you sent shade our eyes, but our counselors' necks and ears are burned by lunch." Ask why.

You'll know it worked when: Your child says the bill shades only the front, so nothing shades the neck.

2. Read the brief together. The hat must fit a head 56 cm around, have a brim of at least 76 mm all the way around, be no taller than 12 cm, and say CAMP SUNRISE on the front. Each one has something you can check. The brief says nothing about color or style: those are your child's choices.

You'll know it worked when: Your child can say which things the brief decides and which are theirs, and why a longer bill would still not pass: the line under the cap says bill, and a bill only sticks out at the front.

3. Go on with the guide: in **Style**, pick a hat with a brim all the way around (the **Bucket hat** is a good start), then open **Shape** and drag the size slider to 56 cm. Set the size first, because the whole hat grows and shrinks with the head.

If you get stuck: If the brim was widened before the size was set, it reads 75 mm once the size drops from the starter's 57 cm to 56 cm. Set the size, then read the brim again.

You'll know it worked when: The size says US 7, with 56 cm under it.

4. On **Shape**, read **Brim width**. On the bucket hat it is about 54 mm, not enough. Drag it until it reads 76 mm or more, and watch the brim number in the line under the hat change with it. The app says mm up to 99 mm, then cm: 13.3 cm is 133 mm.

You'll know it worked when: **Brim width** reads 76 mm or more, with the size still at 56 cm.

5. Check the height: the crown number in the line under the hat must be 12 cm or less. A few styles fail here. The

Cowboy hat's crown is 12.6 cm at this size, and **Crown height** on **Shape** has to be dragged lower.

If you get stuck: Picking a new style puts every **Shape** slider back to that style's start, so a widened brim or a lowered crown is gone. The size and the name stay. After any style change, read every number again.

You'll know it worked when: The crown reads 12 cm or less, and the brim still reads 76 mm or more.

6. Add the camp's name: open **Mark**, press **+ Letters**, type CAMP SUNRISE in the Letters box (up to 12 letters, and spaces count), then tap the front of the hat. Press **Front** to check it.

If you get stuck: A new Letters mark says ABC. The camp's name goes in the Letters box, not in the hat's name at the top.

You'll know it worked when: Seen from the front, the hat says CAMP SUNRISE.

7. Now the hat becomes theirs: colors in **Paint**, trims in **Trim**. Then write the number read from the app next to each requirement on the activity sheet, or say them out loud.

You'll know it worked when: Every requirement has a number next to it that meets it.

8. Trade seats. In a second browser tab, open mytekdev.com/try/hatlab?lesson=design-a-sun-hat-to-a-brief&ref=fam-hatlab-1 again and make a hat of your own: pick the Boater in **Style** and set the size to 56 cm on **Shape**. It looks finished. Ask your child: does it meet the brief? How do you know?

If you get stuck: Dragging a slider while checking changes the hat's numbers. **Undo** at the top right puts it back.

You'll know it worked when: Your child reads the numbers instead of trusting the look, and finds two misses: the brim at 69 mm, short of 76 mm, and no CAMP SUNRISE on the front, with a fix for each.

Talk about it

Ask these while you work together. A child who has understood the lesson can answer them without help:

- Which requirements have you met? Show me the number for each.
- Your crown says 90 mm. Is that under 12 cm?
- Why can the ball cap never meet the brief?
- Which parts of your hat are your choice, and which does the brief decide?
- You changed the size and the brim number changed too. Why?
- My hat looks great. Does it meet the brief? How do you know?

The last one is the real test. A child who checks the numbers instead of trusting how the hat looks understands that a design is done when it meets its requirements, not when it looks finished.

For younger and older kids

Younger: For ages 7 and 8, do every step side by side and start on the Sun hat, which meets the brim and height requirements as soon as the size is 56 cm. Call it done when the size and the brim are right.

Older: For teens, add a cost requirement: each centimeter of brim takes more material, so ask for the narrowest brim that still reads 76 mm, and a short note on the trade-off between shade and material.

Keep going

- Pick the Cowboy hat and lower its crown until it meets the height limit. What else changed?
- The camp also wants a hat for the campers, whose heads are about 53 cm around. Change the size and check the brief again: does your hat still pass?
- Write a fifth requirement for the camp, with a number in it, and design to it.

Bring it into other subjects

- Math: 1 inch is 2.54 cm. The Skin Cancer Foundation's 3 inches is how many millimeters? ($3 \times 25.4 = 76.2$ mm, which the brief writes as 76 mm.)
- Science: the sun is high at noon and low in the evening. Which part of a counselor does a 76 mm brim shade at noon, and which does it miss in the evening? (At noon the face, ears and neck; in the evening low light comes in under the brim onto the face.)
- English: write the camp a three-sentence letter that explains how your hat meets their brief.
- Hat sizes: what does US 7 measure? (The head's width if it were a perfect circle, in inches.)

For your records

Ready to copy into an hour log, a portfolio or a transcript.

LESSON	Hat Lab: Design a Sun Hat to a Client's Brief
SUBJECTS	Engineering, Math
TIME	45 minutes
WHAT WE DID	Read a client's design brief with four measurable requirements and designed a 3D sun hat in Hat Lab to meet it. Checked each requirement against the app's measurements, then checked another person's hat the same way.
SKILLS PRACTICED	requirements and constraints; reading measurements in mm and cm; scale: the whole design changes with the head size; checking a design against a brief

Activity sheet (optional)

Name: _____ Date: _____



Open the app: scan the QR code, or go to mytekdev.com/try/hatlab?lesson=design-a-sun-hat-to-a-brief

Essential question: How do designers know when a design is done?

From Camp Sunrise: "The caps you sent shade our eyes, but our counselors' necks and ears are burned by lunch. Please design us a new hat."

WHAT THE BRIEF NEEDS	MY NUMBER, READ FROM THE APP	MET?
Fits a head with a 56 cm circumference		
A brim of at least 76 mm, all the way around		
No taller than 12 cm (the crown)		
The camp's name on the front		

- Pick a style.** Open **Style**. Pick a hat with a brim all the way around.
- Size first.** Open **Shape**. Drag the size slider to 56 cm. Then read **Brim width** and the crown under the hat. The app says mm up to 99 mm, then cm: 13.3 cm is 133 mm.
- Add the name.** Open **Mark**, press **+ Letters**, type the camp's name (up to 12 letters: CAMP SUNRISE fits), then tap the front of the hat.

1. Why could the ball cap never meet the brief?

Signed off by: _____ Missed requirement, if any: _____

Quick check

Name: _____

- 1. Which hat can never meet a brief that asks for a brim all the way around? (A) a bucket hat, (B) a ball cap, (C) a sun hat.
- 2. The brief asks for a brim of at least 76 mm. The app says Brim width 68 mm. The hat: (A) meets it, (B) misses it: widen the brim, (C) misses it: make the crown shorter.
- 3. You change the size from 56 cm to 60 cm, and the brim number gets bigger. Why?

Answers

From the app's own measurements at 56 cm: the Sun hat meets the brim and height requirements as made (13.3 cm brim, 90 mm crown); the Bucket hat's brim reads 54 mm and passes once Brim width reads 76 mm; the Boater reads 69 mm; the Cowboy hat's brim passes (90 mm) but its crown is 12.6 cm, over the limit.

QUESTION	ANSWER	WHY
1	B	A ball cap has a bill, which sticks out at the front only. The brief asks for shade all the way around.
2	B	68 mm is less than 76 mm, so the brim requirement is missed. The fix is a wider brim; the crown has nothing to do with it.
3	The whole hat grows with the head, so every part, the brim too, gets bigger in proportion	Saying the hat scales with the size, or that a bigger head needs a bigger hat, both count.

If your state or umbrella school asks, this lesson covers NGSS 3-5-ETS1-1, NGSS MS-ETS1-2, Common Core Math 5.MD.A.1.

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The app this lesson uses is free and runs in the browser, with nothing to install and no account needed. It is at mytekdev.com.

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