

PC Workshop: Build a Computer and Boot It

Ages 10-14 · about 45 minutes, in one sitting

Your child builds a computer from real parts on a 3D workbench, from the CPU and its cooler to the cables, and turns it on. Then they take one part out at a time, guess what the computer will say, and turn it on to find out. By the end they can tell what each part does from what goes wrong without it.

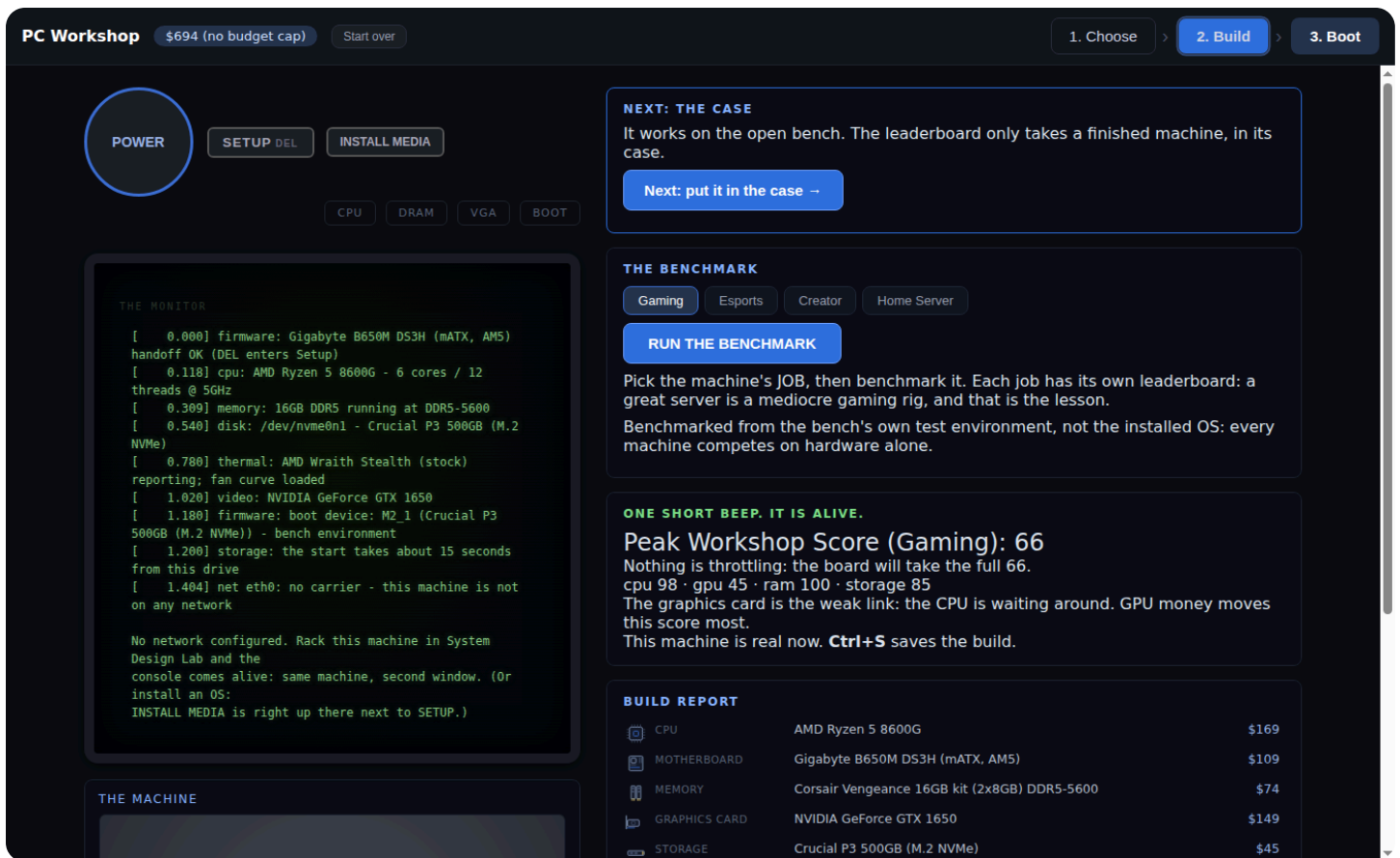
What you need

- A computer with a current browser and a mouse, with the sound on: the beeps are real sounds. The workbench is 3D, so a mouse is easier than a trackpad, and a very old or slow computer may run it slowly.
- The lesson link: mytekdev.com/try/pcworkshop?lesson=build-a-computer-and-boot-it&ref=fam-pcworkshop-1. No account, no email and nothing to install.
- Optional: the activity sheet at the end of this plan, printed, and a pencil.

Before you start: try it once yourself

Build the computer and boot it yourself once before you start, about fifteen minutes. Keep the steps under Do it together beside you, and turn the sound on: the beeps are real sounds.

1. **Open the lesson.** Go to mytekdev.com/try/pcworkshop?lesson=build-a-computer-and-boot-it&ref=fam-pcworkshop-1. Open **1. Choose** and click a part name on the left: one sentence says what that part does. Leave the cards on the right alone, since they change the parts.
2. **The first two steps.** Open **2. Build**. Pick up the CPU, press **Rotate / flip** until the two gold triangles are in the same corner, and click the socket; close the load plate and press the lever down; then the paste, the cooler, its four screws and the fan cable into **CPU_FAN**.
3. **The other six.** Follow the steps under Do it together for the memory, the drive, the graphics card, the power cables, the monitor and the wall power. When the monitor cable asks which port, choose the graphics card.
4. **Boot it.** With all 8 steps ticked, press **Next: turn it on**, then **POWER**. You hear one short beep, and the card on the right says One short beep. It is ALIVE.
5. **Break it once.** Press **Take a part out** and click a memory stick, then do the same for the second. Open **3. Boot** and press **POWER**: three beeps, and the DRAM light is on.



A working build. None of the four lights is on.

If you see something else: a part that will not go in is turned the wrong way, so press **Rotate / flip** and click again (a memory stick's notch has to line up with the bump in the slot). If the monitor cable went into the motherboard, the graphics card experiment still shows a picture, because this CPU can draw one by itself. **Fix a machine** in the top bar opens the repair shelf, which is for another day; press **Back**.

The ideas, in plain words

A computer is a team of parts on one board, the motherboard. The CPU runs every instruction. Memory holds what the CPU is working on right now, and is emptied when the power goes off. Storage, the drive, keeps programs and files with the power off, and the computer starts from it. The graphics card draws the picture on the monitor, the power supply turns wall power into the power each part needs, and the cooler carries heat away from the CPU. Thermal paste fills the tiny air gaps between the CPU and the cooler, so the heat can cross.

Each time a computer starts, it checks its own parts in order: the CPU, the memory, the graphics, a drive to start from, then the cooler. This is POST, the power-on self-test. It stops at the first check that fails and says so with beeps, a light or a message; one short beep means every check passed. A missing cooler shows up later, when the CPU gets too hot and the computer shuts itself off. That is why a technician can work backward from a symptom: three beeps and the DRAM light point at the memory, "No boot device found" points at the drive. Taking one part out at a time, as your child does today, is how they learn what each symptom means.

YOUR CHILD MIGHT ASK	A GOOD ANSWER
What is the difference between memory and storage?	Memory is the CPU's desk: what it is working on right now, gone when the power goes off. Storage is where everything lives, even with the power off.
It started without the cooler. Why does it need one?	The CPU gets hot in seconds. Without the cooler it gets too hot, so the computer shuts itself off to protect it.
I took out one memory stick and it still worked. Why?	One stick is enough to start. The second one makes the memory faster, not possible.
Are these real parts?	Yes, they are real products with their real names. The app simplifies their numbers so they are easier to compare.

Do it together

- Before opening anything, ask: you press the power button and the computer does not start. What could be wrong? Write down every guess and keep the list. Then open mytekdev.com/try/pcworkshop?lesson=build-a-computer-and-boot-it&ref=fam-pcworkshop-1. A short guide opens over the app; follow it together. It has your child open **1. Choose** and click the part names on the left, then open **2. Build**. When it says to stop, do the next two steps together.

If you get stuck: On **1. Choose**, click only the names on the left. The cards on the right change the parts.

You'll know it worked when: Your child can say what a few parts do: the CPU is the brain, memory is the CPU's desk, and storage is where everything lives.

- Seat the CPU. Pick it up, press **Rotate / flip** until the two gold triangles are in the same corner, and click the socket. Close the load plate (the steel frame), then press the lever down. From here on, the gold ring marks the next thing to click.

If you get stuck: A part that will not go in is turned the wrong way: press **Rotate / flip** and click again. If the gold ring is gone, press **Help me** once to bring it back.

You'll know it worked when: The first step in The build list on the left has a tick.

- The paste and the cooler. Pick up the paste tube, press and hold on the middle of the CPU, and let go at a pea-sized dot. Click the socket to set the cooler on, tighten its four screws a little each, corner to corner, and plug the small fan cable into the four pins labeled **CPU_FAN**. Ask why the paste goes on first.

You'll know it worked when: Two ticks, and your child can say why: the paste fills the tiny air gaps so heat can reach the cooler.

4. Memory, drive and graphics card. Pick up a memory stick, press **Rotate / flip** until its notch lines up with the bump in the slot, click one of the two lighter slots, then click the stick to press both ends down until the clips snap. The second stick goes in the other lighter slot. Then the drive goes in the M.2 slot, to the right of the CPU and below the memory, and the graphics card's gold edge lines up with the long slot; click the slot.

If you get stuck: If you cannot see a part, **Reset view** puts the camera back. Drag to turn the view, scroll to zoom, and hold Space and drag to move it sideways.

You'll know it worked when: Five steps ticked.

5. The cables. The 24-pin motherboard cable goes into its socket on the board, and the 8-pin CPU power cable (EPS) into its socket near the top-left corner. Pick up the monitor cable, and when it asks which port, choose the graphics card. Last, click the power cable into the inlet on the back of the power supply and flip the switch beside it from 0 to I.

If you get stuck: If the monitor cable went into the motherboard, the graphics card test later still shows a picture, because this CPU can draw one by itself.

You'll know it worked when: All 8 steps in The build list have a tick.

6. Press **Next: turn it on**, then **POWER**, and listen. After this first start, the list grows by the INTO THE CASE steps; skip them for now.

You'll know it worked when: One short beep, and the card on the right says One short beep. It is ALIVE.

7. Break it, one part at a time. Press **Take a part out** (bottom right, beside **Reset view**) and click a part. Your child says what they think will happen, then opens **3. Boot** and presses **POWER**. Put each part back before the next test. A good order: the drive, then both memory sticks (press **Take a part out** once for each), then the graphics card, and the cooler last, since putting it back means new paste, the cooler, four screws and the fan cable.

You'll know it worked when: The drive out gives "No boot device found". Both memory sticks out give three beeps and the DRAM light. The graphics card out gives NO SIGNAL. The cooler out lets it start, then it shuts itself off because it is too hot.

8. The real test: take out only one of the two memory sticks and boot. It still starts. Ask why.

You'll know it worked when: Your child says one stick is enough to start: the second one makes the memory faster, not possible. They understand that a symptom points at what is missing, not at what was changed.

9. Go back to the list of guesses from the start. For each one, ask which part your child would check first now, and what the computer would show.

You'll know it worked when: Your child matches guesses to parts and symptoms, such as three beeps and the DRAM light pointing at the memory.

Talk about it

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

- Why does the thermal paste go on before the cooler?
- What is the difference between memory and storage?
- Before you press POWER: what do you predict, and why?
- Three beeps and the DRAM light. Which part do you check first?
- You took out one memory stick and it still booted. Why?

The last one is the real test. A child who says the computer needs memory, and still has one stick, understands that a symptom points at what is missing, not at what was changed. The second stick makes the memory faster, not possible.

What each experiment shows, from the app: both memory sticks out gives three beeps and the DRAM light; the drive out gives "No boot device found"; the cooler out lets it start, then it shuts itself off because it is too hot; the graphics card out gives NO SIGNAL, because the monitor cable was plugged into the card. Moving the monitor cable to the motherboard brings the picture back, since this CPU can draw a picture by itself. Taking a part off the cooler wipes the paste: before the cooler goes back on, it needs fresh paste. After the first boot the list adds the case steps: they are the extension, not today's work.

For younger and older kids

Younger: For ages 8 and 9, build side by side, one step at a time, and do just one test together: both memory sticks out.

Older: For teens, press `Next: put it in the case`, move the build into the case and boot it again. Then ask them to explain the order of the startup checks using the symptoms they caused.

Keep going

- Take out only one of the two memory sticks and boot. Explain why the computer still starts.
- Take out the graphics card and boot. The screen says NO SIGNAL. Find a way to get a picture without putting the card back.
- Press Next: put it in the case, move the build into the case, and boot it again.

Bring it into other subjects

- Science: heat moves from hot to cold. Explain, with the words conduction and gap, why thermal paste helps the cooler take heat from the CPU.
- English: write a short help guide for a friend whose computer gives three beeps. Use steps, one action a line.
- Math: the memory in this build is 16 GB in two sticks. How much is each stick? With one stick out, how much memory does the computer have?
- Careers: list three jobs that use these skills, such as computer repair technician, IT support and network technician.

For your records

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

LESSON	PC Workshop: Build a Computer and Boot It
SUBJECTS	Computer science, Technology
TIME	45 minutes
WHAT WE DID	Built a computer on a 3D workbench, from seating the CPU and its cooler to plugging in the cables, and turned it on. Took out one part at a time, predicted what the computer would do, and tested it to work out what each part does from the symptom it leaves.
SKILLS PRACTICED	naming computer parts and their jobs; following a technical procedure in order; predicting and testing; troubleshooting from symptoms

Activity sheet (optional)

Name: _____ Date: _____



Open the app: scan the QR code, or go to mytekdev.com/try/pcworkshop?lesson=build-a-computer-and-boot-it

Essential question: How do the parts of a computer work together, and how can you tell what each part does?

- 1. **Learn the parts.** Open **1. Choose** and click the part names on the left. Memory is where the CPU _____. Storage is where _____.
- 2. **Build it.** Open **2. Build**. Finish all 8 steps. Plug the monitor into the graphics card.
- 3. **Boot it.** Press **Next: turn it on**, then **POWER**. What did the computer say?

- 4. **Break it, one part at a time.** Press **Take a part out** and click a part. Predict, then open **3. Boot** and press **POWER**. Put the part back before the next one.

PART I TOOK OUT	I PREDICT	WHAT THE COMPUTER DID	SO THIS PART'S JOB IS

Which prediction was wrong? What did you learn from it?

Quick check

Name: _____

1. A computer gives three beeps, and the DRAM light is on. Which part should you check first? (A) the drive, (B) the memory, (C) the graphics card.
 2. A computer starts, then says "No boot device found." What is missing? (A) the drive the computer starts from, (B) the CPU, (C) the power cable.
 3. The cooler was taken off. The computer starts, then shuts itself off a few seconds later. Explain what the cooler does, and why the computer turned itself off.
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Answers

QUESTION	ANSWER	WHY
1	B	DRAM is the memory. The board checks the memory early, and when no memory answers it beeps three times and lights the DRAM light.
2	A	The computer passed its checks (it POSTs), then found nothing to start from. Programs and the operating system are kept on the drive.
3	The cooler carries heat away from the CPU. Without it the CPU gets too hot, so the computer shuts itself off to protect it.	A full answer has both parts: what the cooler does (moves heat away from the CPU), and why the computer turned off (it got too hot, and shutting off protects the CPU).

If your state or umbrella school asks, this lesson covers CSTA 2017 1B-CS-01, CSTA 2017 1B-CS-03, CSTA 2017 2-CS-03, CSTA 2026 E5-SYS-HW-12, CSTA 2026 E4-SYS-HW-12, Common Core Literacy RST.6-8.3.

Product names in PC Workshop are trademarks of their owners. They are used so learners see what real parts are called; the app gives the parts simplified teaching specifications.

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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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