

**Week 1: Hardware**

For a class of 12 students, grades 6-9

**Materials Needed**

Check In Sheet

Pre-Course Surveys

Student Booklets

Student Nametags (different appearance than volunteer nametags)

Week 1 Slides displayed on projector

For classroom portion: **HP 6000s**

1 computer per student, to disassemble and reassemble

 13 + 1 instructor machine, total

For workshop portion: **HP 6000s**

13+ of the same machine, ready to disassemble

other computers on palettes, normal scrapping procedure

**2:45 - Volunteer Assistants Arrive**

* Volunteers should sign in to timeclock and wear name badges

**3:15 - 3:30 - Student Check In**

* Students arrive by bus

**3:30 - Classroom Portion Begins**

--------------------------------------------Start Week 1 Slides presentation------------------------------------------------

**Pre-Course Surveys**

Students complete

**Welcome**

to Kramden Institute

Give a quick overview of Kramden Institute

Introductions - Instructors and Volunteers

**What is Tech Trailblazers?**

Overview of Tech Trailblazers program

* learn about computer technology
* learn in the classroom and practice in the workshop
* build your own computer
* help build computers for other kids
* think about computer technology careers

Classroom rules

 Be respectful of instructors and students

Questions are encouraged

Introductions - Students

* Have students give their name, grade, and school, and ask them some questions:
	+ Have you ever taken apart something?
	+ Have you ever built or repaired something? (like toys, legos, gadgets, electronics/appliances)
	+ What’s the coolest thing you’ve done on a computer?

**This Week: Inside the Computer**

Learning Objectives for the day

* Computers are all around us and come in many shapes and sizes
* Components are the parts inside a computer
* Every component needs a power connection to turn on and a data connections to talk to the other parts
* Old computers and parts can often be refurbished or reused. Otherwise they should be recycled, not thrown away.

**History of Computers (2 slides)**

Additional Info

One of the first ideas for a computer was Charles Babbage’s Difference Engine in 1823 and the Analytical Engine in 1837, neither of which was ever completely built.

Computers started off very simple and very huge. They took a lot of space and electricity to do even simple tasks. ENIAC, the first computer, was built in 1946. (ENIAC stands for Electronic Numerical Integrator And Computer). It filled a 50-foot long basement room and weighed 30 tons.

But they changed the world because they could do complex math calculations quickly and accurately, better than any human.

**Today’s Computers - Fast and Small**

Miniaturization makes things faster, smaller, and more energy efficient (Murphy’s ‘Law’)

Additional Info

In the last 70 years, computers have become tinier and much more powerful. They are almost everywhere you look. Even a digital watch is a computer.

One example of how computers have gotten so small and so powerful: the average smartphone

If you wanted a computer only just as powerful as ENIAC, it would be a single chip the size of your pinkie finger nail.

**Computers are Everywhere**

* Quiz students on where you might find computers. Encourage them to think of the non-obvious examples like microwaves, kids toys, etc.

Additional Info

Other computers all around us: TVs, cash registers, cell phones, gas pumps, game consoles, cable boxes, alarm clocks, and more.

**Personal Computers**

The computers we use everyday to do work are called personal computers.

**All computers work the same way**

You give it commands/instructions/information which it will calculate. The calculate part is the “computer” part. Then it gives an output, (display is an example of output).

**What’s Inside A Computer**

* Quiz students on what parts they may know

Additional Info

“Components” are the parts inside a computer

Each component does a specific function

**Slides**

**Computer Components**

**Motherboard**

**Power Supply**

**Cables**

\* the individual slides for other components were deleted for Cycle 2

* **In-Classroom Disassembly of Computer**
* ***Instructor Note: The order of these items might need to be adjusted depending on the computer the class is disassembling.***
* **Handout as reference**

Additional Info

*Drives*

Drives are a computer’s long-term memory, or storage. This is where the computer saves files, and they don’t forget what they saved when the computer is turned off.

There are many different types of drives.

*CD and DVD are Optical Disk Drives*. They’re called optical because a laser light is shined onto the spinning disc to read and write data.

*Floppy drive*. Older computers had these drives before there were USB drives you could plug in. They didn’t hold very much, and they were pretty fragile. But even though they’re not used anymore, we still see them all the time - a picture of a floppy disk is often used as a Save icon!

*Hard Drive or Hard Disk Drive*. This is the main storage of your computer. It looks like a simple metal box, but inside there are actually spinning metal disks and tiny lightweight magnetic needles that move around to read and write data.

*Cables*

Remember how everything inside a computer needs to be connected by electrical wires? That’s what cables do - they make sure that the power and data (both of which are electricity) go to and from every part.

*RAM (temporary memory)*

While the CPU is thinking, it needs to keep track of what it is working on. Like what programs are running. The RAM is the short-term memory of the computer. When you turn off the power, the RAM forgets everything.

*Heatsink and Fan*

Helps the hottest part of the computer, the CPU, keep cool by moving heat away.

*CPU (processor, chip)*

The CPU is the brain of the computer. It does most of the hard work. It’s fast and powerful, but that means it needs a lot of electricity. Using electricity makes it heat up. If it gets too hot, it will destroy itself!

*Motherboard*

The motherboard is what everything inside the computer is connected it. It allows all the other parts to talk to each other.

Many parts are connected directly to the motherboard. There are tiny wires (called “traces”) that move electricity between the parts on the motherboard. Each part has a specific job.

*Power Supply (or PSU)*

This is where the power cord from the power outlet connects.

Front Panel Connectors Board (USB, sound, power button)

**Challenge! Reassemble the computer**

Don’t need to use screws, just place the parts back in the case so everything is where it should be. Reattach cables, but drives back in bays, reseat RAM and CPU and Heatsink and Fan.

Instructors can talk again about how components inside are connected.

**Reuse and Recycling (2 slides)**

* As students are putting their computers back together, talk about how old and broken computers don’t have to be thrown away.

Additional Info

Old parts might still be useful (like RAM and hard drives)

Parts that can’t be reused can be recycled, so they are used to make new things instead of going

into a landfill

Computer parts that are thrown away, called **e-waste**, will hurt the environment by polluting it and

will never break down.

Computers contain valuable metals like aluminum, copper, and even gold. These metals are worth

money -- not a lot of money per computer, but it adds up.

So recycling old computers helps Kramden Institute give out free computers and helps the

environment

------------------------------------------------------End Presentation----------------------------------------------------------

**4:30 - Break time**

Snacks and Bathroom break

**4:45 - Workshop Portion begins**

Lead class to Warehouse Scrapping/Recycling area

**(5:00 - Wednesday Work Night volunteers will enter work area)**

Instructors will lead students through disassembling several computers

* Key Points:
	+ show how to remove processors, fans, heatsinks
	+ ask students to name the components as they are removed
	+ Ask students to describe what the components do and why they are important

**Disassemble first computer**

Take it apart carefully so that you can put it back it together

* Keep track of the parts
* Even the tiniest screws are important, especially if you want to repair a computer -- everything needs to go back together right after you find the problem!

Instructors will review components as they are removed.

During the disassembly, make sure students keep all the components, cables, screws, and other parts at their work station. Do not have them put away the parts.

**Reuse and Recycling**

Now students will pull the parts back out of their reassembled computer and put them in the correct bins and boxes for reuse and recycling.

As each part is removed and put in the right place, instructors will again talk about reuse and recycling.

Recycling old computers helps Kramden Institute give out free computers and helps the environment.

Kramden uses old but still good parts for newer computers

Kramden sells the old and broken parts to a recycling company to help pay for computers for kids and classes like this one.

**Disassemble second and third computer**

The second computer should be the same or very similar to the first.

This time, the removed parts can be placed in the proper reuse and recycling bins as they are removed.

Take apart a third computer (small form factor if possible, or at least a different make/model of computer than the first two). Since this computer will be different, it will be slower and students will again require specific tips to remove all the parts.Skip this if class is running long.

At the end of class, tell students they can each take home a processor (clean them first)

**6:10 - Re-group in classroom, quick review/questions**

**6:25 - Students loaded onto bus**