Getting Started with Cybersecurity Challenges

A Guide for Schools, Teachers & Cybersecurity Education Partners

Overview

Capture The Flag (CTF) competitions are a powerful, engaging way for students to learn and apply cybersecurity concepts — from cryptography and digital forensics to web security and binary exploitation.

This guide introduces high school (and some middle school) educators to the most appropriate, free CTF environments, the tools students might use, and helpful resources for decoding and problem-solving. It's designed to support independent learning, classroom integration, and team-based competition prep.

How to Recruit and Prepare Students for Their First Cybersecurity Competition

You don't need a class full of hackers to get started — just a few curious minds and a supportive environment. Here's how to build your first student team and get them ready for a CTF event:

Step 1: Recruit Interested Students

Look for students who:

- Enjoy solving puzzles, brain teasers, or logic games
- Are already into tech, gaming, or coding
- Are involved in STEM clubs, robotics, coding classes, or esports

You can recruit by:

- Announcing at STEM or CS classes
- Presenting a simple "What is a CTF?" demo in class or club
- Hosting a "Cyber Challenge Lunch & Learn" with a sample challenge

Step 2: Introduce CTFs in a Fun, Low-Stress Way

Start with beginner-friendly, browser-based platforms like:

- PicoCTF Practice Challenges
- Hack The Box Academy's Intro Modules
- EnterpriseKC's CTF Demo Page
- CYBER.ORG's National Cyber Cup Practice Site

Pick one or two challenges and work through them *together* as a team.

Step 3: Set Up a Simple Toolkit

Ensure students can access:

- A laptop or Chromebook with internet access
- A code/text editor (like VS Code)
- Access to online tools like CyberChef, Cryptii, or dcode.fr

No downloads are necessary for most beginner platforms.

Step 4: Encourage Practice and Teamwork

- Set aside a regular time each week (even 30–45 minutes works)
- Use a shared doc or notebook to track progress and flag "unsolved" problems
- Celebrate small wins — even solving one challenge is a big confidence boost!

Step 5: Sign Up for a Live or Local Competition

Once students are comfortable solving challenges, look for a school-friendly CTF event. Many are free, virtual, and open to beginners. These events:

- Foster collaboration and time management
- Offer a friendly intro to real-world cybersecurity topics
- Build confidence in technical problem-solving

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CTF Platforms for Middle & High School Learners

These free platforms offer educational cybersecurity challenges suitable for a wide range of student ages and experience levels.

Platform	Best For	Level	Description
PicoCTF	Self-paced challenges	Middle & High School	Developed by Carnegie Mellon. Gamified puzzles in cryptography, forensics, reverse engineering, web, etc. Includes hints and tutorials.
Hack The Box Academy	Structured curriculum	High School	Beginner-friendly modules (Linux, Bash, Hashcat, traffic analysis). Browser-based, no installs needed.
TryHackMe	Guided labs	High School	Step-by-step cybersecurity labs in the cloud. The "Intro to Cyber Security" path is great for newcomers.
National Cyber Cup	Self-paced challenges	Middle & High School	Developed by CYBER.ORG. Jeopardy-style national competition. Two divisions: 4-8 grade and 9-12. Includes a practice site to test types of challenges and the platform.

Middle School Recommendation: Start with **PicoCTF** or **KC7Cyber**. They provide structured challenges with age-appropriate language and safety guardrails.

What Tools Might Students Need?

Most environments work in the browser. However, for offline work or deeper challenges, the following tools can be helpful:

Tool	Purpose	Notes
CyberChef	Data transformations, encodings, ciphers, hashes	Browser-based, no install needed
Cryptii	Live cipher chain editor – base, rot, xor, morse, etc.	Browser-based, highly visual
Python (3.x)	Write scripts to solve crypto/math problems	Optional for advanced learners
Notepad++	Beginner code and text editor	Simple interface, syntax highlighting, and vertical selection by holding the Alt key
VS Code / Sublime Text	Advanced code and text editing	Free and lightweight
Wireshark	Analyze network packets	Used in network/forensics challenges
Hashcat	Password cracking (hash reversal)	Used in advanced modules or CTFs
VirtualBox/ VMware	Run practice VMs (like Kali Linux)	Optional; only needed for advanced labs

Note: If you're using browser-based platforms like PicoCTF or Hack The Box Academy, nothing needs to be installed.

Helpful Resources for Solving Challenges

These student-safe tools and communities support problem-solving in CTFs:

Resource	Use
CyberChef	Encodings, data parsing, logic, crypto
Cryptii	Chainable cipher tools – ideal for experimentation
dcode.fr	Solvers for classic ciphers, math, and logic puzzles
PicoCTF Primer	Student-friendly CTF topic explanations
CTFTime Writeups	Solution guides from past events

Preparing Students for Cybersecurity Competitions

- Start small with CTF practice platforms (e.g., PicoCTF).
- Integrate challenges into IT/Cyber curriculum or form a club/team.
- Encourage regular problem-solving and team collaboration.
- Gradually introduce tools like CyberChef or Python scripting.
- Track progress and celebrate solving even small challenges.

Contact & Program Updates

This guide is maintained by the **Enterprise KC** team as part of the Heartland Cyber Range initiative.
To receive updates on:

- Educator onboarding sessions
- CTF challenge announcements
- Classroom-ready cyber curriculum

Please visit: **enterprise-kc.com** or send an email: **info@enterprise-kc.com**

Links to Platforms, Tools, and Resources Listed Above

Name	Link
Cryptii	https://cryptii.com/
CTFTime Writeups	https://ctftime.org/writeups
CyberChef	https://gchq.github.io/CyberChef/
dcode.fr	https://www.dcode.fr/en
EnterpriseKC's CTF Demo Page	https://ekcdemo.heartlandctf.com
Hack The Box Academy	https://academy.hackthebox.com/
Hashcat	https://hashcat.net/hashcat/
National Cyber Cup	https://cyber.org/national-cyber-cup
Notepad++	https://notepad-plus-plus.org/
PicoCTF	https://play.picoctf.org/
PicoCTF Practice Challenges	https://play.picoctf.org/practice
PicoCTF Primer	https://primer.picoctf.org/
Python	https://www.python.org/downloads/
Sublime Text	https://www.sublimetext.com/
TryHackMe	https://tryhackme.com/
VirtualBox	https://www.virtualbox.org/
VMware Workstation Player	https://www.vmware.com/products/workstation-player.html
VS Code	https://code.visualstudio.com/
Wireshark	https://www.wireshark.org/

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Supplemental CTF Resource List

(*Curated by Reagan Hazell – Cybersecurity & Infrastructure Associate*)

PicoCTF:
- CTF Technical Topic Table of Contents - https://primer.picoctf.org/
- CTF Question General Practice - https://play.picoctf.org/practice
- Cryptograph and picoGym Learning Intro - https://play.picoctf.org/playlists/17?m=131

Hack the Box:
- Linux Fundamentals - https://academy.hackthebox.com/module/details/18
- Network Enumeration with NMAP - https://academy.hackthebox.com/module/details/19
- Intro to Network Traffic Analysis - https://academy.hackthebox.com/module/details/81
- Intermediate Traffic Analysis - https://academy.hackthebox.com/module/details/229
- Introduction to Networking - https://academy.hackthebox.com/module/details/34
- Windows Fundamentals - https://academy.hackthebox.com/module/details/49
- Password Cracking with Hashcat - https://academy.hackthebox.com/module/details/20
- Introduction to Bash scripting - https://academy.hackthebox.com/module/details/21
- Introduction to Malware Analysis - https://academy.hackthebox.com/module/details/227
- LLM Output Attacks - https://academy.hackthebox.com/module/details/307

OvertheWire Bandit: https://overthewire.org/wargames/bandit/

OWASP WebGoat: https://owasp.org/www-project-webgoat/

OWASP Juice Shop: https://owasp.org/www-project-juice-shop/

TryHackMe: https://tryhackme.com/

KC7 Cyber : https://kc7cyber.com/

pnw.college:
- Linux Luminarium - https://pwn.college/linux-luminarium/
- Computing 101 - https://pwn.college/computing-101/
- Playing with Programs - https://pwn.college/fundamentals/

Vim Text Editor:
- OpenVim - https://openvim.com/
- Vim Adventures - https://vim-adventures.com/
- Vim Hero - https://www.vim-hero.com/

SANS Free Trainings & Events: https://www.sans.org/free-cybersecurity-events

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