Crystal Clash
Teacher Guide

Summary

- Web address: **tynker.com/hour-of-code/crystal-clash**
- Coding skill level: **Intermediate**
- Recommended grade level: **Grades 5-8**
- Time required: **60 minutes**
- Number of modules: **1 module with 3 tutorials**
- Coding Language: **Block-based**

Teacher Guide Outline

Welcome!
- How to Prepare

Activity
- Overview
- Complete Tutorials (20 minutes)
- Enter the 4-Player Competition Mode (40 minutes)
- Extended Activities

Going Beyond an Hour
- Do More With Tynker
- Tynker for Schools

Help

Welcome!

Welcome to Hour of Code! Crystal Clash is Tynker's newest multiplayer coding game where students code a hero to compete in a 4-player free-for-all arena with other Tynker users! Your students will program their hero beforehand to tell it what to do, but in order to win, they must outthink and outplay their opponents by writing better code. Through friendly competition, students will be intrinsically motivated to continually improve their code as they strive to make it to the top of the leaderboard and defend their ranking amongst other players.

How to Prepare

This activity is designed for self-directed learning. Your role will be to help students individually and facilitate as students complete the coding activities on their own. The best way to prepare is to:

1. **Familiarize yourself with the material.** After selecting your Hour of Code lesson (e.g., Crystal Clash), read through the teacher guide and complete the activity before assigning it to students. This will allow you to troubleshoot anything in advance and plan for potential questions from your students.
2. **Get students excited about coding.** Inspire students and get them excited for the Hour of Code event. Here is a link to resources such as inspirational videos and posters from the Hour of Code website: https://hourofcode.com/us/promote/resources#videos
3. **OPTIONAL: Sign Up for a teacher account.** Although an account is NOT required, creating a free teacher account will allow you to access teacher guides, answer keys, and tons of additional resources. You'll also be able to create free accounts for your students, monitor their progress, and see their projects.
4. **OPTIONAL: Create student accounts.** From your teacher account, you can easily create free student accounts for all your students. This will allow them to save their projects and progress, so they can continue coding when they get home! Again, this is not necessary to complete an Hour of Code.
5. **OPTIONAL: Print certificates to hand out.** While signed in to your Tynker teacher account, you can print certificates by clicking on a classroom from your teacher dashboard, clicking the "Gradebook" tab, going to "Hour of Code," and clicking the "Print All Certificates" button. This will only print certificates for student accounts assigned to the selected classroom.

Activity

To begin Crystal Clash, have your students open a browser tab to this URL:
tynker.com/hour-of-code/crystal-clash

Overview

Objectives
Students will...
- Apply coding knowledge to program a hero in a multiplayer game
- Define different player strategies with code
- Use "trial-and-error" techniques for iterative problem solving and debugging

Materials
- **For web:** Computers, laptops, or Chromebooks (1 per student)
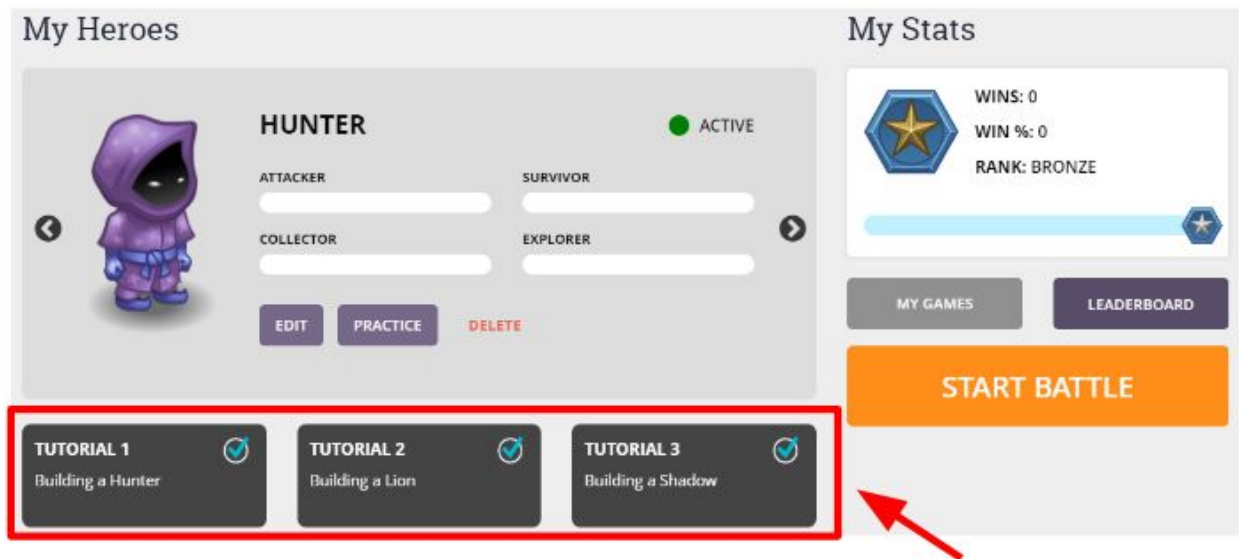- **For mobile:** iPads or Android tablets (1 per student)

Vocabulary
- **Code:** The language that tells a computer what to do
- **Sequence:** The order in which steps or events happen
- **Command:** A specific action or instruction that tells the computer to do something
- **Condition:** A logical expression that evaluates to true or false
- **Conditional statement:** A type of statement that executes different parts of the code based on whether a logical expression evaluates to true or false

Standards
- **CCSS-ELA:** SL.5.1, RF.5.4.A, SL.6.1, SL.7.1, SL.8.1
- **CCSS-Math:** MP.1, MP.7
- **CSTA:** 1B-AP-10, 1B-AP-12, 1B-AP-15, 1B-AP-17, 2-AP-15, 2-AP-16, 2-AP-17
- **CS CA:** 3-5.AP.10, 3-5.AP.11, 3-5.AP.12, 6-8.AP.12, 6-8.AP.17
- **ISTE:** 1.c, 1.d, 5.d, 6.b, 7.c

1. Complete Tutorials (20 minutes)

Crystal Clash has three hero tutorials: Building a Hunter, Building a Lion, and Building a Shadow. Facilitate as students complete each hero tutorial on their own:

1. **Hero Tutorial: Hunter**
   - In this tutorial, students will code a hero that hunts down enemies.
2. **Hero Tutorial: Lion**
   - In this tutorial, students will code a hero that switches between collecting power-ups and tracking enemies.
3. **Hero Tutorial: Shadow**
   - In this tutorial, students will code a hero that evades enemies and plays defensively until the very end.

2. Enter the 4-Player Competition Mode (40 minutes)

- To participate in the 4-player competition mode, students will need to sign into their Tynker account. Students don't have a Tynker account? Please refer to the "FAQ" section of this teacher guide to learn how to get started.
- If students want to build a stronger hero...
  - Encourage them to combine parts of their code from the three tutorials. What happens?
  - Tell students to slightly modify part of their code from the tutorial. For example, change the Lion hero's parameters from "distance between me and powerup" to "distance between me and enemy." Students can also increase or decrease the values inside the code block to make their hero more or less likely to move towards a Powerup or move towards an enemy. This slight modification will allow your students to control a lot of their hero's behavior.

- If students are interested in the creative side of coding...
  - Encourage students to make a variety of custom bots. How many different strategies can they come up with?
  - Tell students to try new strategies and new combinations of code blocks to see how it affects the way their hero acts in the arena.

3. Extended Activities

Reflect on today's coding adventure by leading a discussion with your students:
- What is code? (The language that tells a computer what to do)
- What is a command? (A specific action or instruction that tells the computer to do something)
- Who can give an example of a command they used today on Tynker? (attack, move forward, move to nearest enemy…)
- What was their favorite hero: Hunter, Lion, or Shadow? Why?
- Encourage students to describe some of the strategies they coded.
- Ask students to explain if their strategies worked. If not, why not?

Going Beyond an Hour

If your students enjoyed an Hour of Code, they're sure to enjoy the rest of what Tynker has to offer! Tynker offers a complete premium solution for schools to teach Computer Science. Over 400 hours of lessons are available to take K-8 students from block coding to advanced text coding. We offer tons of resources for teachers, including comprehensive guides, free webinars, and a forum to connect with other educators.

Other Hour of Code Activities

Tynker offers many other tutorials for the Hour of Code, including two other battle bot adventures: Code Monsters and Code Commander. Tynker also provides STEM Hour of Code lessons that you can integrate into the subjects you already teach. Check out the main Tynker Hour of Code page to see all the tutorials!

Do More with Tynker

With Tynker, kids don't just acquire programming skills--they can explore the world of possibilities that coding opens up. Tynker has several interest-driven learning paths that make coding fun, both inside and outside the classroom:
- **Coding and Game Design:** Your students can use Tynker Workshop, a powerful tool for crafting original programs to make games, stories, animations, and other projects. They can even share their work with other kids in the Tynker Community.

- **Drones and Robotics:** Tynker integrates with connected toys, including Parrot drones and Lego WeDo robotics kits, so kids can see their code come to life.
- **Minecraft:** Tynker integrates with Minecraft so your students can learn coding through a game they love. Tynker offers skin and texture editing, as well as a custom Mod Workshop that lets kids try their original code in Minecraft.

Tynker for Schools

Used in over 80,000 schools, our award-winning platform has flexible plans to meet your classroom, school, or district needs. All solutions include:

- Grade-specific courses that teach visual coding, JavaScript, Python, robotics and drones
- A library of NGSS and Common Core compliant STEM courses that are great for project-based learning
- Automatic assessment and mastery charts for whole schools and individual classes and students
- Easy classroom management with Google Classroom and Clever integration
- Professional training, free webinars and other teacher training resources

Need help getting Tynker started at your school? Contact us to learn more about teaching programming at your school with Tynker!

Help

Need help? Below you'll find answers to frequently asked questions about Hour of Code and using Crystal Clash.

What is Hour of Code?

The Hour of Code is a global learning event in which schools and other organizations set aside an hour to teach coding. No prior coding experience from you or your students is needed! The event is held every December during Computer Science Education Week. You can also organize an Hour of Code year-round. The goal of the Hour of Code is to expand access to computer science education for people of all backgrounds. Learning computer science helps students develop logic and creativity, and prepares them for the changing demands of the 21st century. Tynker has been a leading provider of lessons for the Hour of Code since the event began in 2013. Since then, millions of students have completed an Hour of Code.

How do I prepare for Hour of Code?

1. **Familiarize yourself with the material.** After selecting your Hour of Code lesson (e.g., Crystal Clash), read through the teacher guide and complete the

activity before assigning it to students. This will allow you
to troubleshoot anything in advance and plan for potential questions from your
students.

2. **Get students excited about coding.** Inspire students and get them excited
about the Hour of Code event. Here is a link to resources such as inspirational
videos and posters from the Hour of Code website:
https://hourofcode.com/us/promote/resources#videos

3. **OPTIONAL: Sign Up for a teacher account.** Although an account is NOT
required, creating a free teacher account will allow you to access teacher guides,
answer keys, and tons of additional resources. You'll also be able to create free
accounts for your students, monitor their progress, and see their projects.

4. **OPTIONAL: Create student accounts.** From your teacher account, you can
easily create free student accounts for all your students. This will allow them to
save their projects and progress, so they can continue coding when they get
home! Again, this is not necessary to complete an Hour of Code.

5. **OPTIONAL: Print out certificates to hand out.** While signed in to your Tynker
teacher account, you can print certificates by clicking on a classroom from your
teacher dashboard, clicking the "Gradebook" tab, going to "Hour of Code," and
clicking the "Print All Certificates" button. This will only print certificates for
student accounts assigned to the selected classroom.

How do I open Crystal Clash?
Have your students open a browser tab to this URL:
tynker.com/hour-of-code/crystal-clash

Who is this activity for?
Crystal Clash is intended for students in grades 5-8 with some prior coding experience.
The advanced nature of the game requires students to analyze their code, code a
variety of custom bots, and experiment with code to try different battle strategies.

How do my students play Crystal Clash?
Students will begin by completing three self-guided tutorials to create heroes with
different battle strategies; from there, students can continue to use programming to
influence the behavior of their heroes in the game. The programming language has
been specifically designed with code blocks for movement, collecting power-ups,
attacking, as well as a variety of conditions.

In the 4-player competition mode, up to four players can compete in battles that are
happening in real-time. There are endless strategies to win a game of Crystal Clash,
and by playing against other Tynker players, students can adapt their strategies by
learning from others' successes. Players are awarded points based on how they
perform and the player that survives the longest is the winner!

What will my students learn?

As students complete the three tutorials, they learn how to program their heroes with their own strategies and compete with others in the arena. Between games, students will be able to improve their code so that they can win and improve their ranking amongst their peers. In this process, students will develop critical thinking skills, debugging and logical reasoning skills, and build resilience as they persevere through losses and coding challenges.

What devices do I need?

- **For web:** Computers, laptops, or Chromebooks (1 per student) with an internet connection and an up-to-date browser
- **For mobile:** iPads or Android tablets (1 per student) with an internet connection
- If not enough devices are available, students can work in pairs on the same device

Do I need to create a Tynker Account for my students?

No, you do not need a to create a Tynker account for your students to complete the three Crystal Clash tutorials. However, to use the 4-player competition mode, you will need to create free student accounts for all your students using your Tynker teacher account OR if your school uses Google Education login accounts for students, they can sign in via Google logins.

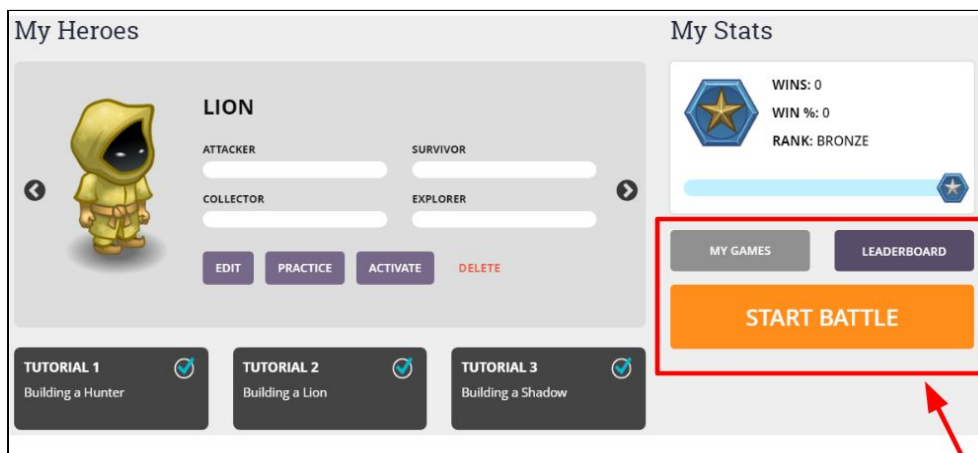# How do my students code their hero?

Each tutorial will have a workspace for students to code their hero. The section on the left is a tutorial tab that provides step-by-step directions to code a hero, describes what is happening for each step, and provides the necessary code blocks. Tell students to...

- Select the "Next" button at the bottom of the tutorial tab to navigate through each step.
- Drag code blocks from the tutorial tab and drop them onto the dark coding area on the right.
- Click (tap if using a mobile device) the orange play button on the bottom right of the workspace to run their code.
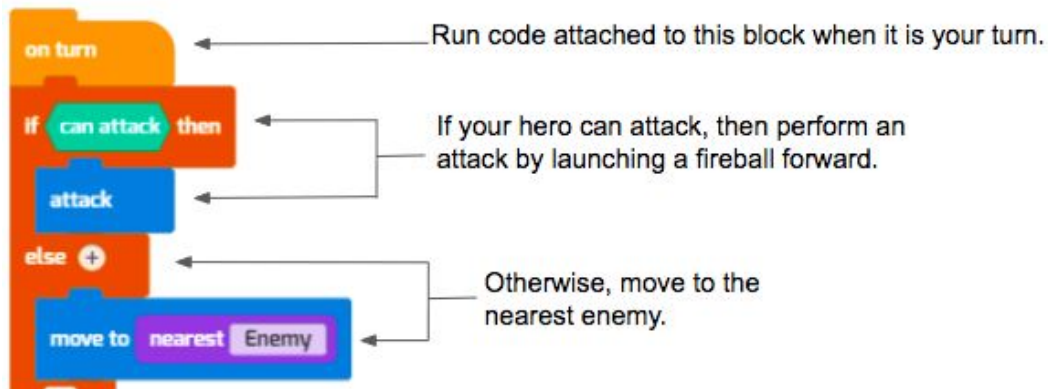
What do the buttons on the main screen do?

- **Start Battle**- After completing at least 1 hero tutorial, students can click (tap if using mobile) the orange "Start Battle" button from the main screen to activate their hero and join other players' games.
- **My Games**- This button allows students to get updates on how their hero performs.
- **Leaderboard**- This button allows students to see their battle rating, rank position, number of wins, win percentage, and watch recent games.
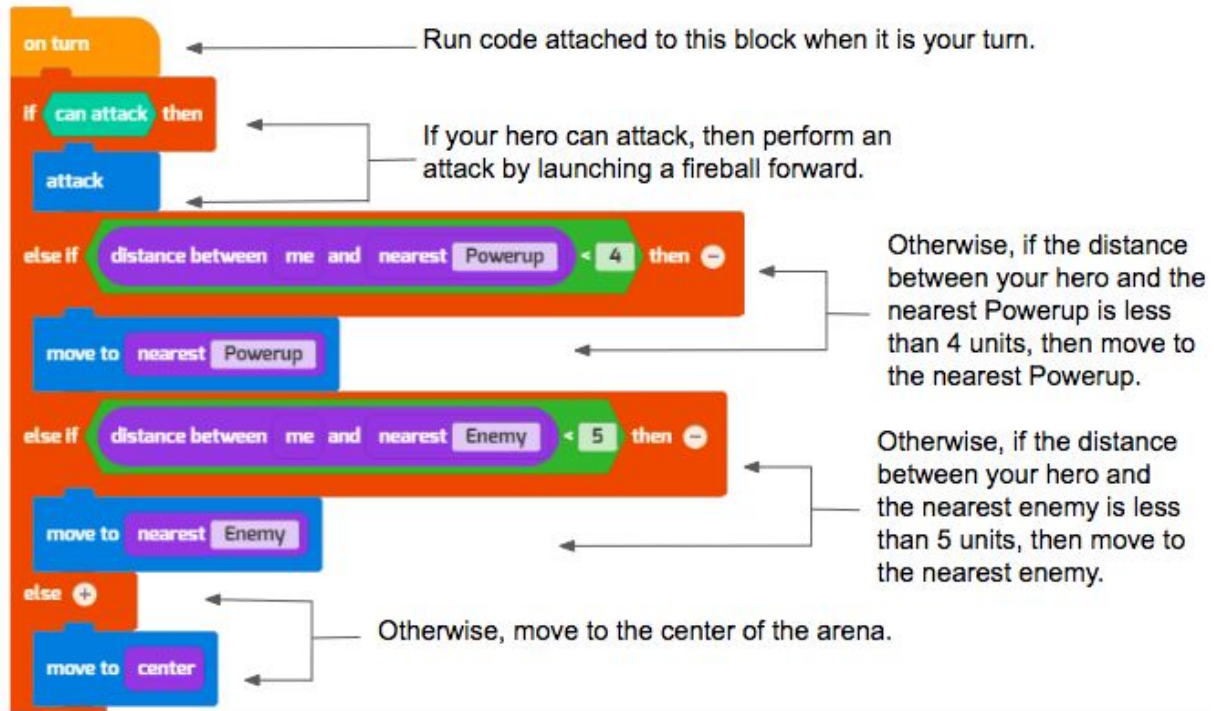
What do the code blocks from the tutorials do?

Below is pseudocode for each hero tutorial:

Tutorial 1: Building a Hunter

Tutorial 2: Building a Lion

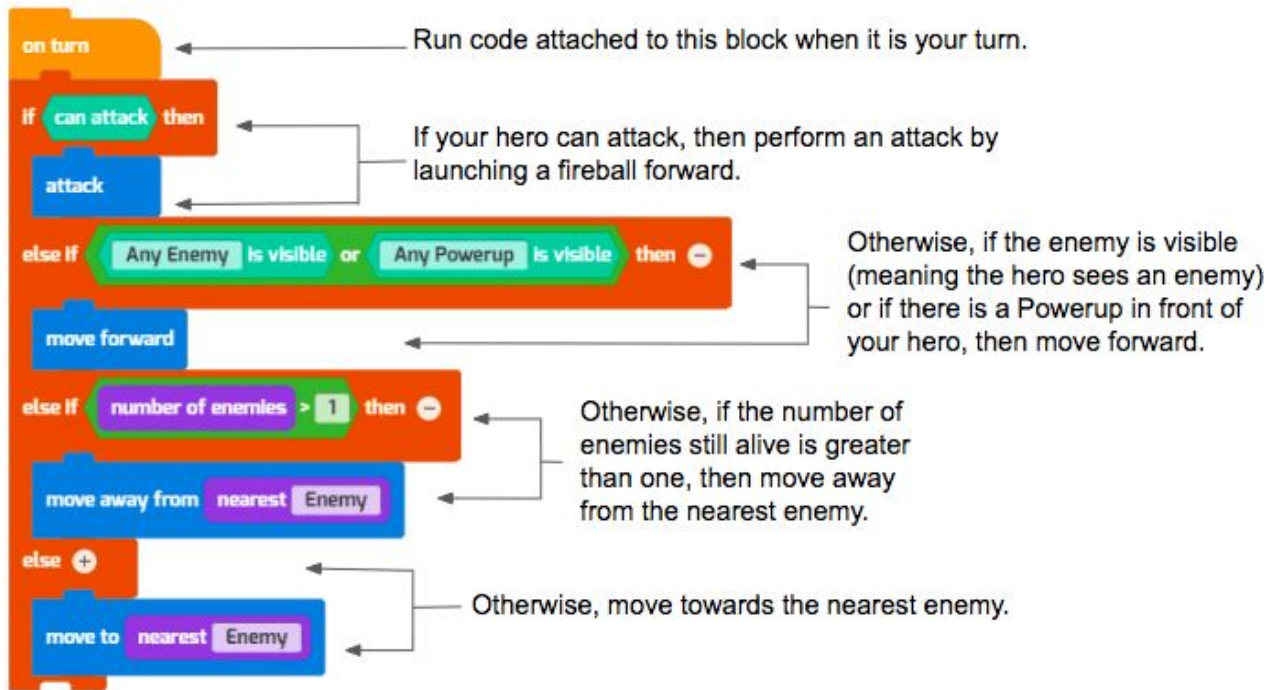**on turn** — Run code attached to this block when it is your turn.

if can attack **then**
  attack — If your hero can attack, then perform an attack by launching a fireball forward.

else if distance between me and nearest Powerup < 4 **then**
  move to nearest Powerup — Otherwise, if the distance between your hero and the nearest Powerup is less than 4 units, then move to the nearest Powerup.

else if distance between me and nearest Enemy < 5 **then**
  move to nearest Enemy — Otherwise, if the distance between your hero and the nearest enemy is less than 5 units, then move to the nearest enemy.

else
  move to center — Otherwise, move to the center of the arena.

Tutorial 3: Building a Shadow

on turn — Run code attached to this block when it is your turn.

if can attack **then**
  attack — If your hero can attack, then perform an attack by launching a fireball forward.

else if Any Enemy is visible or Any Powerup is visible **then**
  move forward — Otherwise, if the enemy is visible (meaning the hero sees an enemy) or if there is a Powerup in front of your hero, then move forward.

else if number of enemies > 1 **then**
  move away from nearest Enemy — Otherwise, if the number of enemies still alive is greater than one, then move away from the nearest enemy.

else
  move to nearest Enemy — Otherwise, move towards the nearest enemy.

How can Tynker help me manage my Hour of Code?

Tynker has several free features for registered teachers that will help you manage your Hour of Code. If you set your students up with a Tynker classroom, you will be able to track their progress and print Hour of Code completion certificates for them to keep.

How can I contact the Tynker support team?

If you have any issues or questions, send us an email at support@tynker.com.