The Tech
Challenge
Presented by Amazon

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Rules
The Tech Challenge 2022: Kinetic Commotion

The Tech
Challenge
**KINETIC COMMOTION**
Presented by
amazon
2022

Scenario

Engineering isn't just about launching satellites, building bridges or designing computers. Engineering also helps create things like movies, sound effects and art.

2022 Challenge

Create a device that uses stored energy to make five different and distinct sounds within a set operating time.

STORED ENERGY → KINETIC ENERGY → SOUNDS
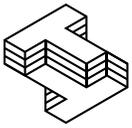
OPERATING TIME →
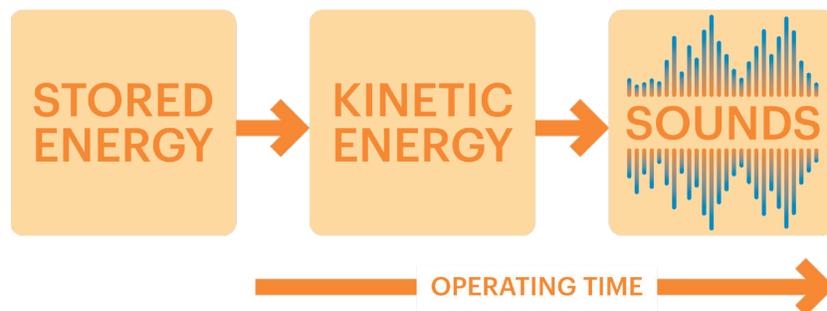
A Message From the Judges

Before you start this year's challenge, consider the following:

- Work together, test lots of ideas, and keep trying when the going gets tough. Be ready to tell us about your journey, even the times when you felt like quitting.

- We value original thinking. We encourage you to pursue surprising solutions that are better than anything we might imagine.

- If you find a simple and elegant solution, that's also wonderful.

- We admire every team that takes on the challenge. Your solution does not need to be perfect to be amazing.

- We are looking for teams that model outstanding creativity, critical thinking, communication and collaboration. The Tech Challenge is about challenging yourself. Show us what you can do.

Teamwork

We want teams to show cooperation, communication and planning. All team members should participate during performance and interview through device demonstration, narration, etc. It is up to your team to show teamwork to the judges.

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General Specifications

This is a stored energy and energy transfer challenge and your device(s) will use that energy to generate sound.

1. Materials:

    a. Electrical and electronic components are not allowed.

    b. All other materials are allowed, as long as they are safe.

2. Trigger:

    a. A trigger mechanism must be built into your device and used during Test Trials and Showcase.

    b. The trigger must be activated in a safe manner. Make sure no body parts get in the way of the device in motion.

    c. Human power can only be used to load, ready and trigger the device to start. Then the device must run on its own for the set time.

3. Each team must have their own devices. Teams may not share their devices or any part of their devices with other teams.

4. Store-bought solutions are not in the Spirit of the Challenge. We are looking for teams to design and build devices using their own creativity.

Want to "see" your sounds? Check out the free **Arduino Science Journal app**. It let's you see both pitch and sound intensity. Pitch shows the waves your sound makes and sound intensity shows volume.

What is a trigger?

It's a built-in release mechanism that starts your stored energy device.
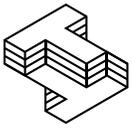
Examples of triggers include:
- pulling a string
- pressing a button
- flipping a latch
- opening a clip
- removing a stick

Performance: During Showcase, your device will be judged during a performance period.

1. The total performance period, including setup, is six minutes maximum.
    - A judge will let the team know when to start the performance.

2. Team members who are not actively involved in setup should provide narration.
    - Narration should not interfere with hearing the device sounds during performance.

3. Do not preload devices with stored energy before starting the performance period.

4. Once the performance period starts, one or more team members will load the stored, or potential, energy for the device and set the trigger.

5. Next, one or more team members must activate the trigger safely, starting the device.

6. Once the device has started, no team member may touch it until the device stops.

7. The device must run on its own and stop no more than 90 seconds from activating the trigger.

8. While operating, the device is to create at least five different and distinct sounds. By different, we mean the sounds do not sound alike. By distinct, we mean each sound must be distinguishable from the previous/next sound. To clarify, simultaneous sounds will be considered one sound.

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9. Each different and distinct sound must be heard at least once, but each sound can be repeated multiple times during device operation.

10. The sounds must be loud enough for judges to hear over Zoom.

11. At least one sound needs to start after the minimum operation time and before 90 seconds elapses.
    - Sounds that start during operation may continue after the 90-second period. For example, once a bell is struck, you may continue to hear it until it is dampened or fades away.

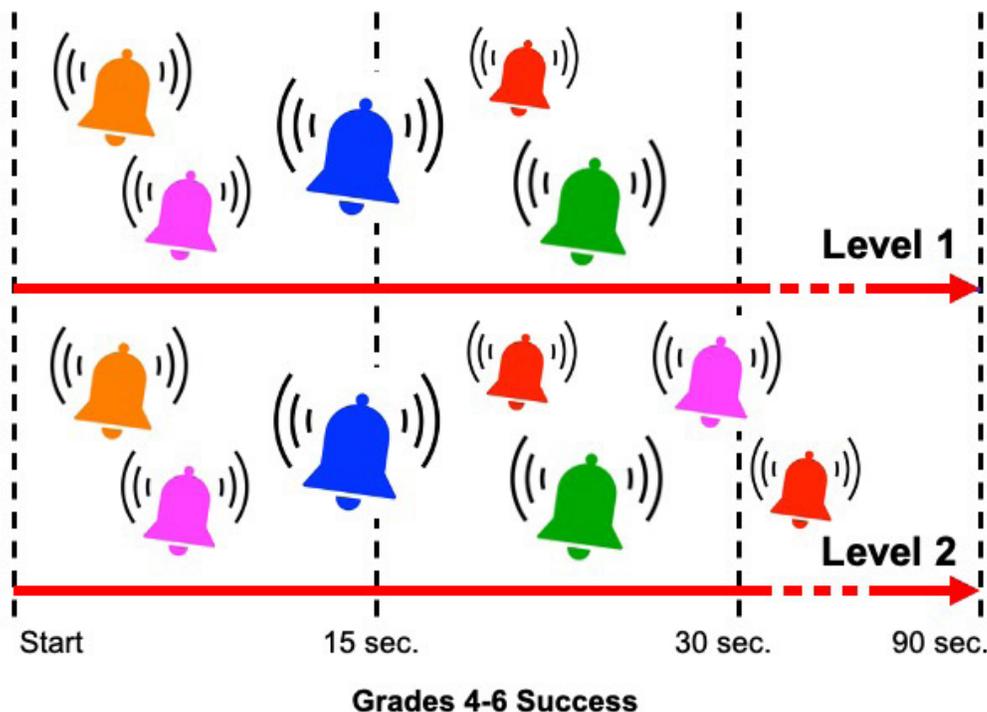12. There are two levels of success possible for each grade range. See Table 1.
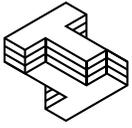
Table 1: Grade Success Levels

Grades	Minimum Operation Time **Success Level 1**	Minimum Operation Time **Success Level 2**
4-6	15 seconds	30 seconds
7-8	30 seconds	45 seconds
9-12	45 seconds	60 seconds

- For example, for Grades 4-6, in order to meet success level 1, the device must make at least 5 distinct sounds with at least one sound starting after 15 seconds. See Figure 1.

13. If the device does not work as planned, then steps 2 through 11 may be repeated as long as the total performance period of six minutes is not exceeded. The number of repeated attempts may be considered during judging.

Figure 1

Grades 4-6 Success

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Success Criteria

1. Device must make at least 5 different and distinct sounds.

2. At least one sound needs to start after the minimum operation time and before 90 seconds elapses.

What may set your team apart from other teams?

1. Device should work as the team intends.

2. Show us your team's amazing creativity and engineering skills! These may include:
   - Use interesting and distinct mechanisms
   - Make interesting sounds
   - Find innovative ways to make things repeatable
   - Build creative homemade sound-makers
   - Be entertaining to watch and hear
   - Demonstrate fabulous teamwork

Engineering Journal

As part of the challenge, teams record their process and submit a team journal which is reviewed by judges.

1. Start the journal when you first start thinking about and working on the Challenge.

2. How the team works together to research, brainstorm, build, test, evaluate, document, revise and repeat (iterate) is as important as the solution itself. The engineering journal is a record of this process.

3. What types of problems did you have and how did you fix them?

4. Great journals show someone exactly how to build your final solution.

5. Organized records should be kept of all team activities. The team's engineering journal is a living document.

6. Journals may be typed or handwritten. Legibility and organization are important.

7. For the Showcase, each team must submit only one PDF file for their engineering journal.

8. More information on engineering journal requirements can be found on The Tech Challenge website in the Team Guide (**https://www.thetech.org/sites/default/files/ttc_teamguide_2022.pdf**).

Safety

Safety is the top priority during the entire Tech Challenge.

1. Teams will be judged on safe design, construction, testing and operation.

2. Judges have full authority to stop any activity they view as unsafe. The judges' word is final.

3. Each team will identify a team Safety Officer who will ensure safety throughout the project. All team members are responsible for safety.
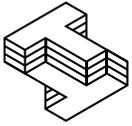
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4. Safety gear must be worn during use of tools, device assembly, etc. as appropriate.
    - When eye protection is needed, teams should use ANSI-approved eye protection (e.g., glasses, goggles, mask). Regular eyeglasses do not provide the necessary level of eye protection and are not an acceptable substitute for ANSI-approved eye protection.

5. Teams may not use flammable liquids or gases.

6. For safety reasons, no fire is allowed.

7. Teams may not use pressurized gases greater than 5 psi. Teams using pressurized gas must be able to demonstrate to judges by using a gauge that the pressure does not exceed 5 psi.

8. No pressurized tanks/cylinders.

9. No use of animals allowed.

10. Closed-toe shoes are highly recommended during tool use, building, testing and showcase.

11. For more information on safety, see The Tech Challenge Resources Page (**https://www.thetech.org/studentresources**) and refer to the California Department of Education Science Safety Handbook 2014 (**https://www.cde.ca.gov/pd/ca/sc/documents/scisafebook2014.pdf**).

Adviser

Teams must have an adult adviser. Team solutions must be designed, built and tested by team members, not the adviser.

1. The adviser's role is to guide, facilitate and encourage.
2. The adviser may not be a Tech Challenge judge.
3. An adviser may work with more than one team. However, it is important that advisers ensure each team receives the necessary level of attention.
4. See the Adviser Guide (**https://www.thetech.org/sites/default/files/ttc_adviserguide_2022.pdf**).

Spirit of the Challenge

The Tech Challenge generally emphasizes the importance of developing engineering solutions that would be practical in real life, otherwise known as the Spirit of the Challenge. Engineering is not just about building structures, aircraft or rovers. Creative, expressive, entertaining things are real-world. Things that bring joy and delight have real-world value. For this challenge, engineering is used to design and build devices for entertainment.

Store-bought solutions are not in the Spirit of the Challenge. We want to see your team's creativity. Teams are encouraged to design and build devices using their own ideas. Use of existing plans for reference and inspiration is allowed. All plans, and the source of those plans, must be documented in the engineering journal.

Important Note Regarding the Rules

Clarifications and additions to the rules may occur. Teams are encouraged to check the website for changes. When changes are made, registered Tech Challenge teams will be alerted by email. Changes will also be noted in the rules on The Tech Challenge website in **red** type.

The website also includes answers to frequently asked questions (FAQs) which are posted and updated periodically. (**https://www.thetech.org/thetechchallenge/faq**)