

## Cautionary and Warning Statement

- This kit is designed and intended for educational purposes only.
- Use only under the direct supervision of an adult who has read and understood the instructions provided in this user guide.
- Read warnings on packaging and in manual carefully.
- Safety glasses required.
- Do not aim at people.
- Always exercise caution when using sharp tools.

## How It Works

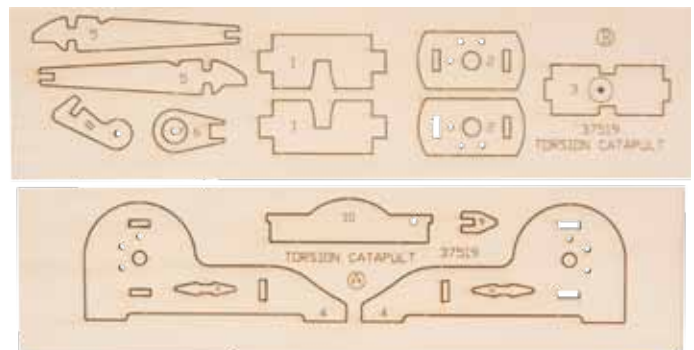
In the middle ages, people used torsion as the force needed to operate a catapult. Torsion is the strain in a material that is twisted – when the material is released, it resists this strain by unwinding itself. Operators twisted ropes very tightly around the catapult arm and then released them. When the twisted ropes were released, the catapult's arm reacted by springing up and releasing the ammunition. This same principle is used in this kit designed for modern students.

## Materials Included

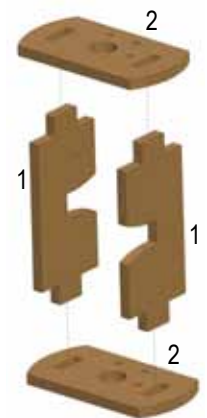
- 2 basswood sheets with laser-cut parts
- 3 screws
- Paper clip
- String

## Items Required (not included)

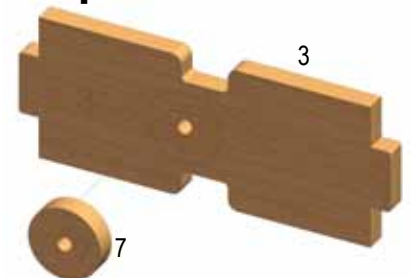
- Small screwdriver
- White glue (such as HD Bond II)
- Scissors
- Needle-nose pliers (optional)
- Projectiles (such as clay, Styrofoam balls, mini marshmallows, or Whopper candies)



### Steps 2-3



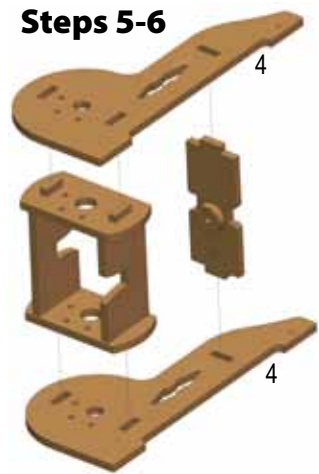
### Step 4



## Build the Catapult Frame

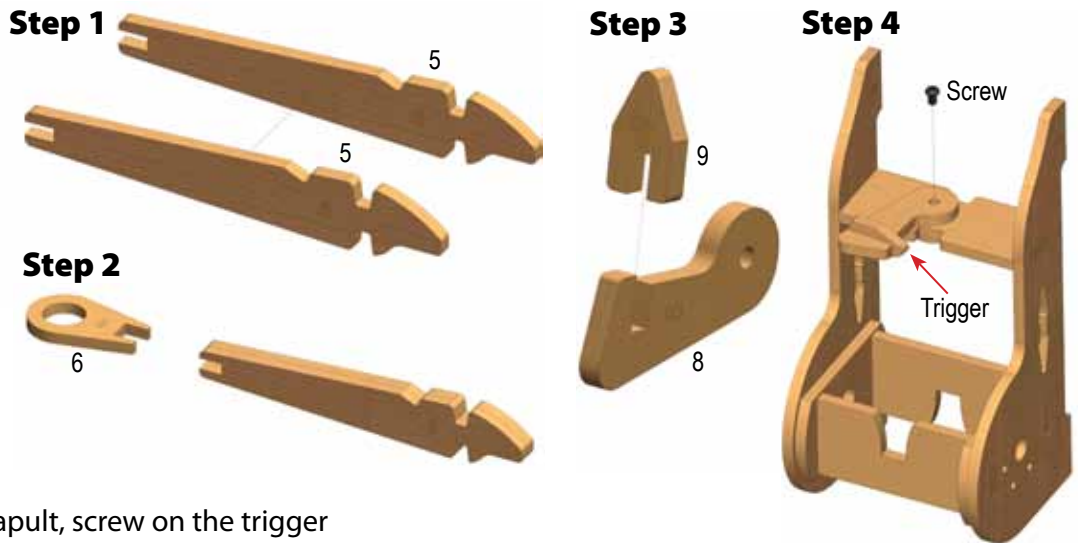
1. Pop out the parts from the basswood sheets. Keep the numbered pieces and dispose of the rest.
2. Place a Part 2 facedown and glue the notches of the Part 1 pieces into the Part 2 as shown - make sure the grooves on the Part 1s are facing in opposite directions and the Part 1 close to three small holes is facing away from the small holes as shown.
3. Glue the other Part 2 on top of the Part 1s. The small holes on the Part 2 pieces should be mirror images. Let dry.
4. Glue Part 7 over Part 3 where the circle indicates. Be careful not to get glue in the small hole in the middle of the two parts. Let dry.

- Lay one Part 4 faceup. Glue the Part 1 notches that extend from one side of Part 2 into the slots of Part 4. Be sure the small circles on Part 2 are matched to the small circles on Part 4. Also make sure the groove on the bottom Part 1 is facing forward.
- Now glue the notch on one end of Part 3 into the single slot on the narrow end of a Part 4. Part 7 on the assembly should face the center of the catapult.
- Glue the other Part 4 on top of the two assemblies so the two Part 4s are even.



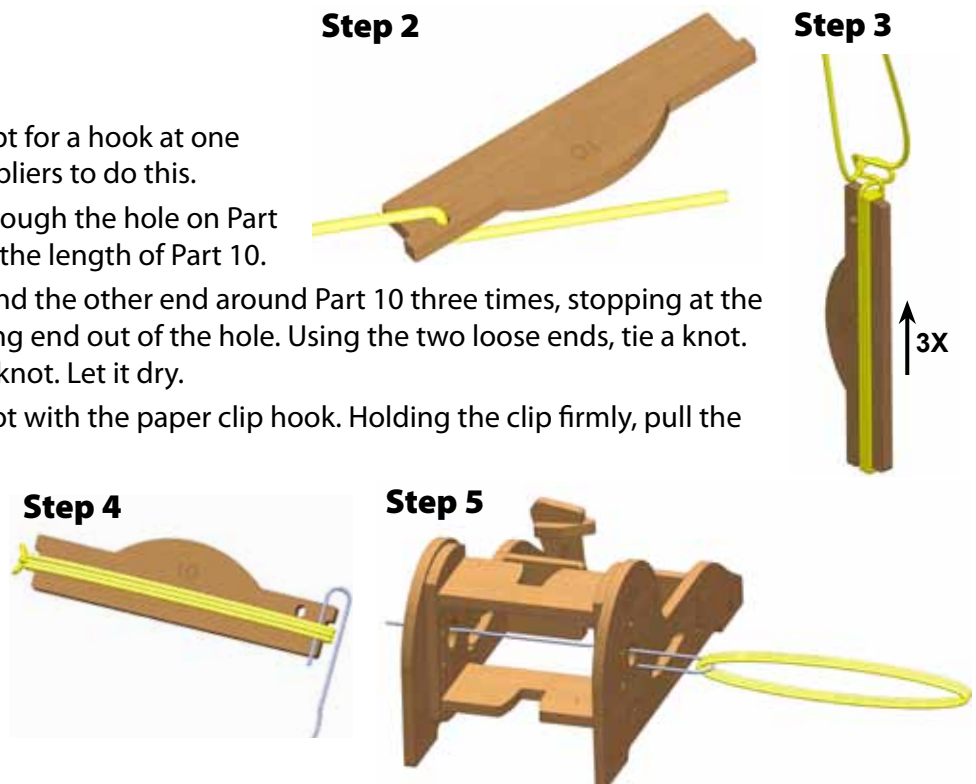
### Make the Launch Arm & Trigger

- Parts 5 and 6 make the launch arm. Glue the two Part 5s back-to-back.
- Glue Part 6 into the notch on the end of the Part 5s. Let dry.
- Parts 8 and 9 make the trigger. Glue them together by fitting the slot in Part 9 into the slot on Part 8. Let dry.
- On the back of the catapult, screw on the trigger so it points toward the center of Part 3.

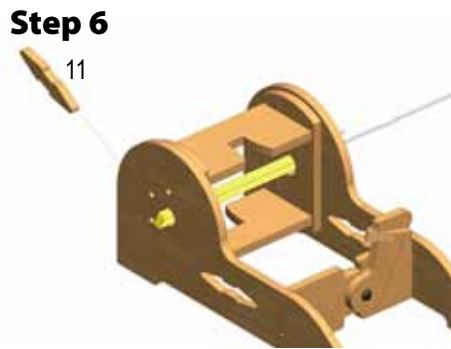


### Add the String

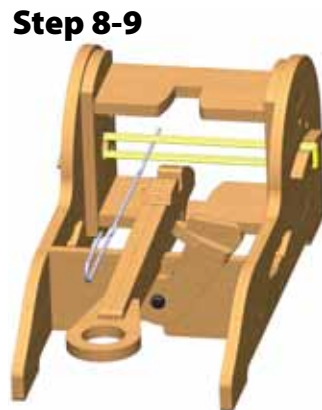
- Straighten the paper clip except for a hook at one end. You can use needle-nose pliers to do this.
- Insert one end of the string through the hole on Part 10. Pull out the string equal to the length of Part 10.
- Holding this string in place, wind the other end around Part 10 three times, stopping at the end with the hole. Pull the string end out of the hole. Using the two loose ends, tie a knot. Put a small dab of glue on the knot. Let it dry.
- Hook the end opposite the knot with the paper clip hook. Holding the clip firmly, pull the end off of Part 10.
- Using the clip, thread the string through the big hole on one side of the catapult, taking the paper clip out the opposite hole. Do not pull it all the way through – leave a loop of string hanging out the end.



6. Insert a Part 11 (keeper) into the loop.
7. Pull the string tight. Under the loop with the paper clip, insert another keeper. Remove the paper clip. Trim the string ends.



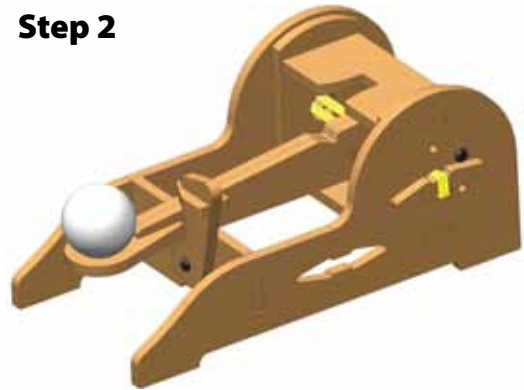
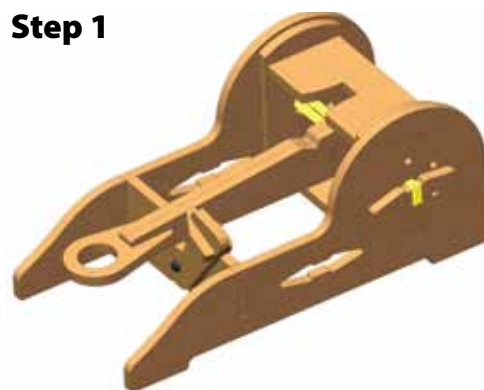
8. Separate the strings in the middle of the catapult into two sections, keeping an opening between them.
9. From the back of the catapult, insert the launch arm into this opening as shown. The other end should rest on the back of the catapult body.
10. Place the catapult so the front is away from you. Holding the keeper and string on the right side still, give the keeper on the left side one turn counterclockwise.



11. Now hold the left side still and turn the keeper on the right one turn clockwise. Note that these go in the opposite direction – that is what twists the string, providing torsion.
12. Now repeat this procedure, but just give each side a half turn. Place a screw into the hole on each side that will enable the screw to best hold the keeper in place. This will vary depending on how tight the string is wound.

## Operate the Catapult

1. Place the catapult where you wish to launch it. Pull the launch arm back and secure it with the trigger.
2. Place a projectile on the hole of the launch arm.
3. To launch, pull down the trigger. **Tip:** Use more tension for heavier projectiles and less tension for lighter ones.



## Safety

- Anyone operating the Torsion Catapult or nearby during its operation should wear safety glasses.
- Never use a sharp object as a projectile. Never fire at a living thing.
- Use this device only in the manner discussed and illustrated within this guide. Misuse of this product can cause serious injury.

