

# DIY smart ← PHONE PROJECTOR

Included in your kit (items in red are not included):

- A magnifying glass or card magnifying lens
- Construction paper pieces for decorating
- Washi tape
- A small cardboard box
- Scissors, serrated knife, or exacto knife
- Pens, pencil, or markers
- Smartphone



**Estimated build time for  
Projector: 30-45 minutes**

## Making the Projector

1) Place the magnifying card lens on the front of the box and trace it.

2) Use the scissors, serrated knife or exacto knife to cut a hole in the box that is slightly smaller than the traced magnifying lens. Use a spare piece of cardboard and fold it to make a stand for the phone. Secure it with tape.

**\* Adult supervision with use of sharp cutting tools is required.**



3) Slide the phone stand into the box, under a cardboard flap in the bottom of the box.

4) Next, tape the magnifying card lens inside the box so that the lens aligns with the hole in the box. At this point, you may decorate the outside of your projector in any way you wish. When finished, add the smart phone on the stand.

5) You will immediately notice that the media you choose to play will be upside down. You can fix the problem by locking the phone onto landscape orientation. Then place the phone back in the projector, upside down this time.

6) Point the projector at a white or light colored wall and focus the picture by moving the phone away from or toward the lens until the picture looks clear. When the picture is focused, turn down the lights, and let the show begin!



### The Science Behind It

How did the magnifying glass make the picture bigger? The answer is in the shape of the lens.

The lens is convex, meaning its sides bend outwards. This allows it to catch, bend, and focus all of the light from inside the box and project it onto the wall.

But why is the image upside down? The human eye has a lens similar to the magnifying glass attached to the projector. What the eye sees comes through the eye's lens upside down but the brain learns to flip the image right side up. The magnifying lens flips the image by refracting the light from the phone's screen just like your eye flips the light from the world.

Without a brain to flip the image for us, we have to set our phone in the box upside down.

