MILK-CARTON PERISCOPE

WHAT IS A PERISCOPE?

It's a cool device that helps you spy around, up, and through things. They have been around for a reallllllllly long time. Johannes Gutenberg invented the first periscope in 1430 so he could see over crowds of people at religious festivals. Over time periscopes have been used in different ways, like on submarines! They can help you look above the water, while staying deep under the sea. But the one I built so my brother, Luck, and I could keep a lookout on Mr. Samuelson's fishing boat from our lobstertrap fort was super easy and fun.

HOW DOES IT WORK?

When we look at an object straight on, we see it because light travels in a straight line either from the object or bouncing off it and then hits our eyes. When we add two mirrors, they change the direction of the light, which lets us see things that aren't directly in front of us.

If you want to learn more about the science and history of periscopes, we have a whole podcast episode about it over on

PENNY & LUCK: INVENTING STUFF

Here's how to build a PERISCOPE JUST LIKE MINE

MATERIALS

2 flat square mirrors (2x2" or 3x3")

2 quart-sized (or liter) cardboard milk or juice cartons (washed and dried)

Scissors

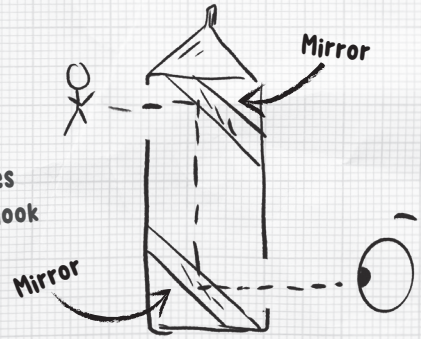
Ruler or straight edge

Marker

Tape

Decorations such as markers, paint, stickers, or whatever you like! Googly eyes are my favourite. Add them to anything and **BOOYAH!** instantly funny.

Great for spying because you can keep a lookout without being seen! The mirrors reflect the images back to you, so you can look round different objects.



DK flip

By Claire Karwowski
Illustrated by Siân Roberts

INSTRUCTIONS

STEP ONE: Cut the tops off each milk carton, so they form a rectangular prism (fancy way to say a 3D Rectangle)

STEP TWO: The carton now has an open end and a closed end. Go to the closed end and cut out a square on the front of the carton near the base. Do the same for the second carton.

STEP THREE: To make the slits that hold the mirrors, place each carton on its side so that the cut out squares face to the left. Next, measure the width of the carton base. In other words, measure how wide the bottom of the carton is with the ruler. Now place your ruler at the bottom corner of the right hand side and measure straight up. When you reach the same number as the base width, make a mark.

STEP FOUR: For both cartons, use your ruler or straight edge to draw a diagonal line that connects the bottom left corner of the carton to the mark you made on the right, near the base.

STEP FIVE: Flip your carton so that the cut out square is facing the right side. Repeat steps 3 and 4.

STEP SIX: Carefully cut along the diagonal lines you just drew, but only as long as one side of your mirror. Do not cut to the edge of the carton.

STEP SEVEN: Hold your mirrors at an angle and slide them into the diagonal cuts, making sure the shiny, reflective side is facing down (toward the cutout squares). Tape them into place.

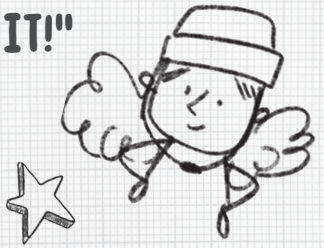
STEP EIGHT: Stop to test!! Are your mirrors in the right place? You'll know if it's right when you hold up the carton, look through the square opening, and can see the ceiling (or sky or top of your fort . . . wherever you are building this!) If the reflection in the mirror seems off—tilted or not centered—adjust the mirrors until they are.

STEP NINE: Now it's time to connect the cartons! Place one carton with the opening facing up and the mirror facing you, and the other carton with the opening facing down and the mirror facing away from you.

BONUS STEPS!

What happens if you add an extra mirrored carton? What changes if you use a different kind of container? Or different shape mirrors? What if there were colors on the mirrors? Or stickers? What would you see then? Remember inventing isn't about making things the "right way"—it's about exploring questions, testing different possible solutions, and more often than not, getting things all wrong until you try a way that makes you stop and say

"BOOOOYAAAAHH!!! THAT'S IT!"



Happy building!

Penny

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