Monsters! Ink!

Lesson One

Are you a monster, or of a monstrous persuasion? It's time to start a tale as old as slime and create our own 3D 'pulp fiction'! We'll be crafting perfectly monstrous characters and fantastic beasts and then crafting tales with 3D settings and flippable 'story boards' that will keep 'bored' far from these stories! Students will truly be able to visualize their monsters and dive into their world as they quite literally build them.

Storytellers were our first magicians, our first history keepers, society builders, culture shapers and spiritual and emotional filters, making sense of the world long before written communication.

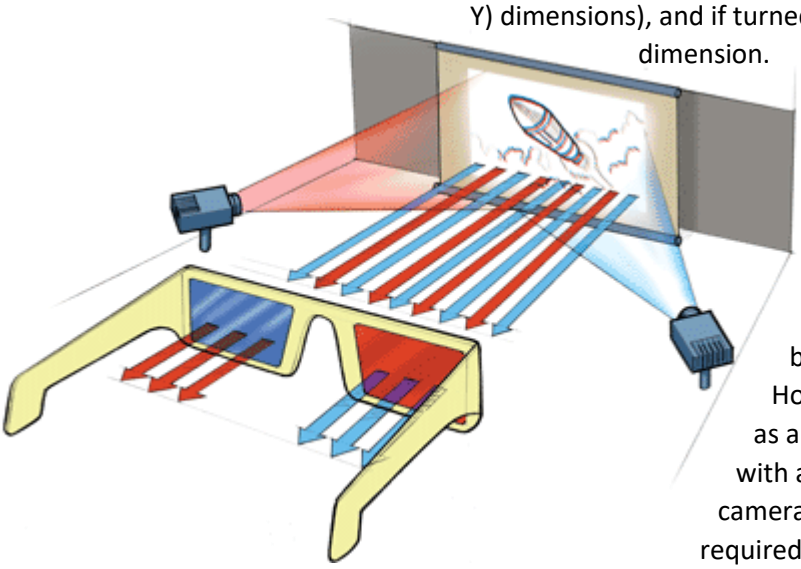
For all our sophisticated technology and mass electronic entertainment, we still need those voices in the dark, by the fire, in the hall.

But first of all, we must begin with our quest with a question.

What is 3D?

3D means three-dimensional, i.e. something that has width, height and depth (length). Our physical environment is three-dimensional and we move around in 3D every day.

If something is 2D, a common example is a piece of paper, you can only measure the width and height. The image, or object has only two dimensions ("flat", using the horizontal and vertical (X and Y) dimensions), and if turned to the side becomes a line. 3D adds the depth (Z) dimension.



The term "three-dimensional" also is sometimes used to describe a physical item such as a sculpture or mobile, which could be described as three-dimensional art, in comparison with a two-dimensional painting.

The terms 3D and 2D first came into popular use because of the film industry. During the 1950s, Hollywood filmmakers experimented with 3D movies as a marketing gimmick. These movies were filmed with a variation on the stereoscopic dual-camera (two-camera) setups. They were expensive to produce and required viewers to wear special glasses to experience the

3D effect. Only a few of these movies became lasting classics, most in the horror/suspense genre, such as *House of Wax*, *Creature from the Black Lagoon* and Alfred Hitchcock's *Dial M for Murder*.

A second wave of 3D films in the 1980s had similar results. The earliest video games, meanwhile, also had 2D graphics, but in the 1980s and 1990s, rapid advances in computer processing and memory made more realistic images possible. By the 21st century, computer-generated imagery (CGI) could create 3D and 2D effects for big and small screens alike. In 2009, James Cameron's film *Avatar* pioneered a new wave of cinematic 3D by combining cutting-edge CGI and digital filmmaking technology. Soon, many of Hollywood's big-budget effects films were following suit (some more successfully than others according to viewers and critics.)

In real life, there is another crucial difference between 3D and 2D vision. Three-dimensional vision contributes to depth perception, or the ability to estimate an object's distance. This fact has been humorously pointed out on the science fiction television series *Futurama* because one of the show's main characters, Leela, has only one eye. Despite being the pilot of an interstellar space ship, Leela often complains that she has no depth perception. Ironically, Andre de Toth, the director of the famous 3D film *House of Wax*, also had only one eye, and he could not see in 3D.

3D Vision?

Tip: You may wish to have some View Masters available for students to try, as many students have never experienced one. Find them here. Option, you may want to compare the retro style with the modern iteration, View-Master Virtual Reality.

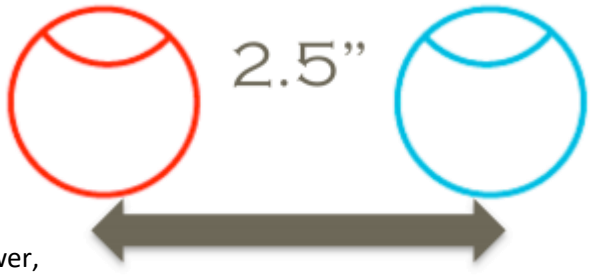
In order to see things in **3D** each eye must see a slightly different picture (which is why people with only one working eye have trouble seeing in 3D). This is done in the real world by your eyes being spaced apart so each eye has its own slightly different view. The brain then puts the two pictures together to form one **3D** image that has depth to it.

The mode of 3D presentation you

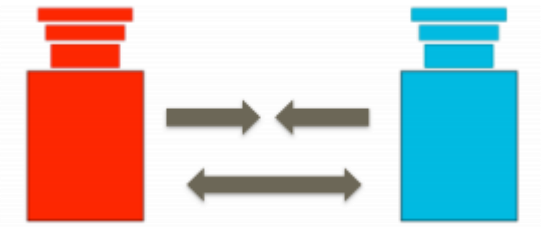
are most familiar with are the paper glasses with red and blue lenses. The technology and science behind 3D, or stereoscopic, movies is actually pretty simple. They simply recreate the way humans see normally.

Stereoscopic: Concerned with, or relating to, seeing space three-dimensionally because of binocular disparity.

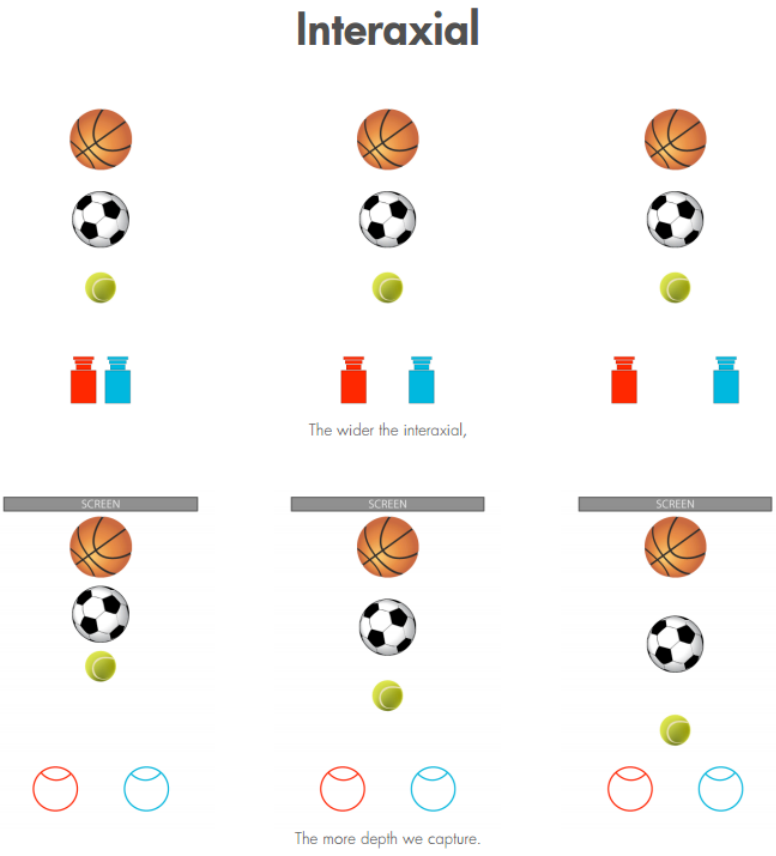
Since your eyes are about two inches apart, they see the same picture from slightly different angles. Your brain then blends these two images in order to gauge distance. This is called binocular vision - ViewMasters™ and binoculars mimic this process by presenting each eye with a slightly different image.



If you've ever used a ViewMaster™ or a stereoscopic viewer, you have seen your binocular vision system in action. In a View-Master, each eye is presented with an image. Two cameras photograph the same image from slightly different positions to create these images. Your eyes can correlate (blend-or recognize that they go together) these images automatically because each eye sees only one of the images.



When shooting a 3D image, two cameras are used to capture separate images of the same object from slightly different angles at one fixed viewpoint.



Interaxial: The distance between the left and right camera is called the ‘interaxial’. By adjusting the interaxial distance (the space) between cameras, we can dynamically increase and decrease the apparent depth in a scene.

A 3D film viewed without glasses is a very strange sight and may appear to be out of focus, fuzzy or out of register (and gives some people a headache).

3D glasses make the movie or television show you're watching look the events are happening right in front of you. With objects flying off the screen and careening in your direction, and creepy characters

reaching out to grab you, wearing 3-D glasses makes you feel like you're a part of the action - not just someone sitting there watching a movie. Considering they have such high entertainment value, 3-D glasses are amazingly simple.

The reason why you wear 3-D glasses in a movie theater is to feed different images into your eyes just like a View-Master does. So, the screen actually displays two images projected simultaneously from two different angles in two different colors, red and cyan (or blue or green). When played back, (with the help of the glasses which act like filters-- the colored filters separate the two different images so each image only enters one eye) the left image is shown only to your left eye and the right image only to your right eye. Your brain then fuses these two images to give you a perception of depth. Your brain puts the two pictures back together and now you're dodging a flying meteor!

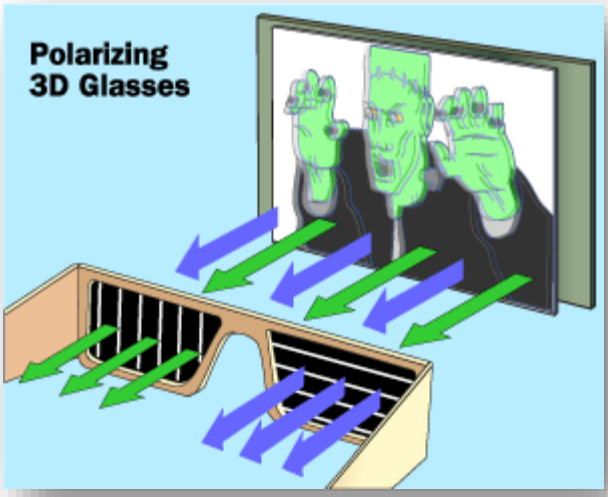
There are two common systems for doing this: The Red/Blue system and the Polarized system.

The red/green or red/blue system, which we just explored, is now mainly used for books and television 3-D effects, and was used in many older 3-D movies. One issue with this system is that you cannot truly have a full color movie when you are using color to provide the separation, so the image quality is not nearly as good as with a different style-called the polarized system.

At Disney World, Universal Studios and other 3-D venues, the preferred method uses polarized lenses because they allow color viewing. Two synchronized projectors project two respective views onto the screen, each with a different polarization (the phenomenon in which waves of light are restricted in direction of vibration, ex. one might be vertical and the other horizontal). The glasses allow only one of the images into each eye because they contain lenses with different polarization.

Think of the polarizing filter as a window with bars across it: light oriented (polarized) vertically easily passes between the bars and reaches your eye, while light oriented horizontally can't get through the bars and gets reflected away. With the "bars" over each eye pointing in different directions, each eye picks up a different image, and your brain interprets the two images as a single 3D image. Unlike the red-blue glasses, this image can contain any number of colors so you can have a fully and realistically colored movie—just like the real world.

Which method would students prefer to watch? Why? Which might be more/less expensive to make? Why do they think that?



Brainstuff—Did You Know?

To say 3D has made a comeback would be an understatement. The onset of 3D televisions, networks, and gaming systems has brought theatre thrills to the comforts of home. But how does 3D impact our eyes?

Many people who go to see a 3D movie get a headache about 20 minutes into the movie (some even get eye fatigue & nausea too!) And even if you don't get a headache, you may notice that your eyes don't feel right. It could be anything from excessive tearing to an achiness that makes you take off the glasses and rub your eyes every 10 minutes. Have you ever wondered what causes this problem? Here is one possible answer.

"One of the biggest problems with 3D is the "convergence/focus" issue. A couple of the other issues -- darkness and "smallness" -- are at least theoretically solvable. But the deeper problem is that the audience must **focus** their eyes at the plane of the screen -- say it is 80 feet away. This is constant no matter what.

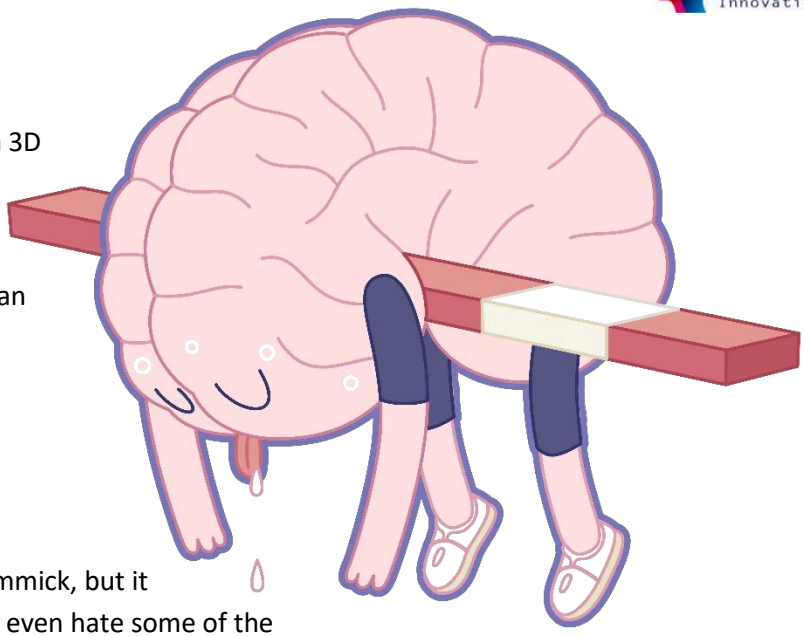
But their eyes must **converge** at perhaps 10 feet away, then 60 feet, then 120 feet, and so on, depending on what the illusion is. So 3D films require us to focus at one distance and converge at another."

This is a nice, succinct summary of the problem. You can understand the problem in the following way. Hold your hand about three inches away from your nose and look at it. Two things are happening.

- First, the muscles that control your eyeballs are rotating your eyeball so your pupils are pointing toward your nose. If you were to look at someone who is looking at his/her hand three inches away from his/her face, the person would look cross-eyed. **The point of convergence is the distance of the object away from your face.**
- Second, the muscles that control the lenses in your eyes are manipulating the lenses so that you can focus on something so close to your face.

That is completely normal. Anytime you look at anything in the real world, the muscles controlling the convergence point of your eyeballs and the muscles controlling the lenses are working in harmony. The two distances are the same.

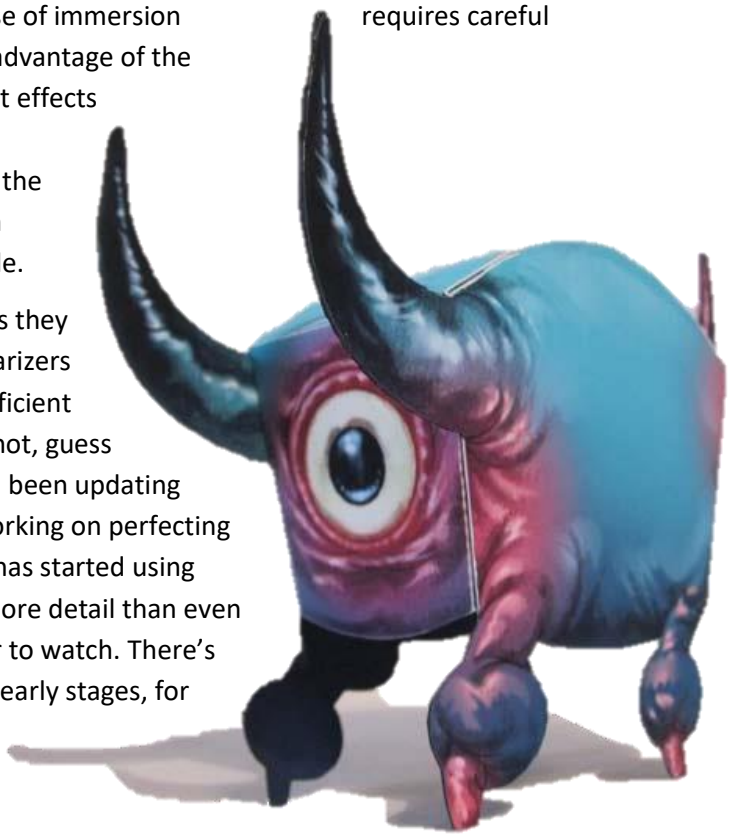
In the 3D movie however, you have to do something different. The focal length is constant, as mentioned in the quote. Your eyes have to stay focused on the plane of the screen. Meanwhile, you have to change the convergence angle constantly to get the 3D effect to work. This is not the way the system expects the world to be, and it takes extra effort. And sometimes that effort makes your brain hurt.



There are two ways to make a 3D movie: film with 3D cameras, or film in 2D and convert to 3D after. Conversion is cheaper, but leaves room for human error — lag time between frames that our eyes pick up. And less-than-seamless results can leave us with headaches.

Working to make things better...

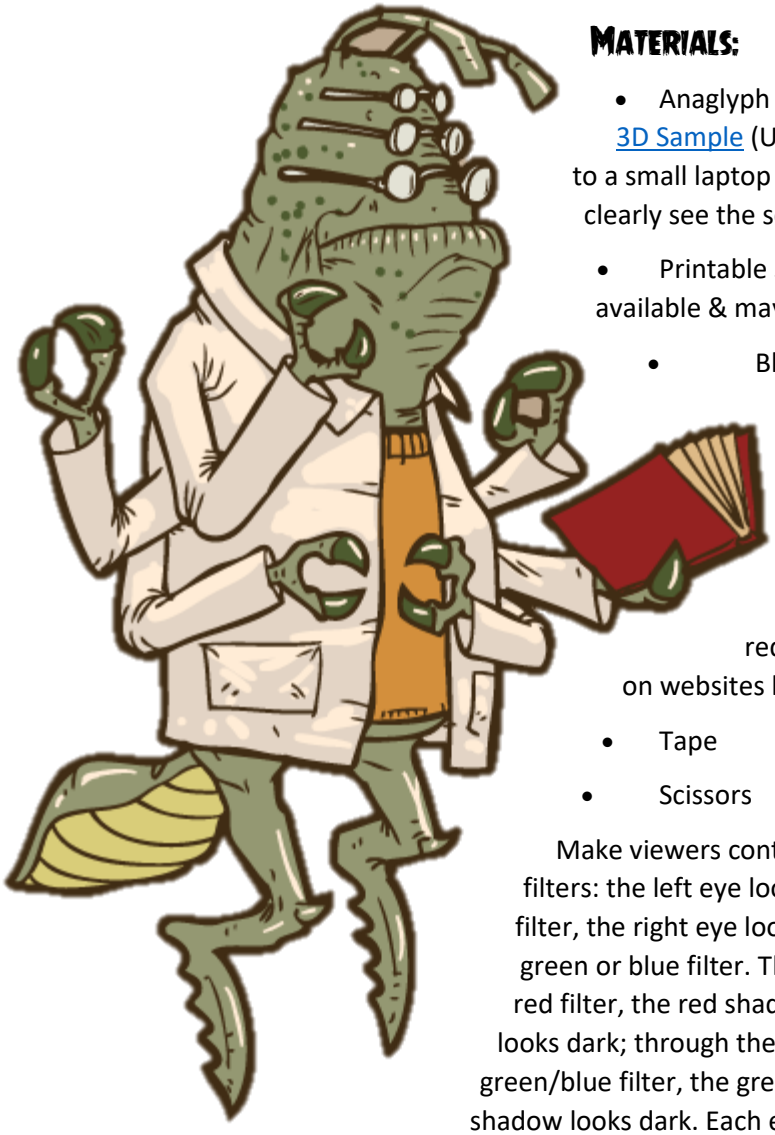
Hollywood knows you think 3D is just a novelty gimmick, but it wants you to know it's working on it. You may not even hate some of the 3D movies coming out these days — if only because the technology is less headache-inducing. The format, he said, is at its best when it helps to immerse an audience in some fantastical location, like Pandora, Mars or Neverland. Creating that sense of immersion requires careful consideration from the outset for how to take advantage of the technology without creating the clumsy pop-out effects that strain our eyes and give us headaches. The goal now is not to jolt you out of your seat, à la the 3D rendition of "Jurassic Park," but to create an experience that is more organic and comfortable.



Even screening 3D films requires special care, as they need a lot more light than regular 2D reels. Polarizers and 3D glasses dampen light, requiring more efficient digital projectors to make up the difference. If not, guess what, it's harder on the eyes. But theaters have been updating equipment for a few years now. And they're working on perfecting something even better: laser projectors. IMAX has started using lasers to provide brighter, sharper colors and more detail than even digital projectors can, making the picture easier to watch. There's also talk of glasses-free projectors, now in very early stages, for people who are turned off by 3D specs.

EXPERIMENTAL?

We're going to put our theories to the test and see what our brains can see when we try and see 3D!

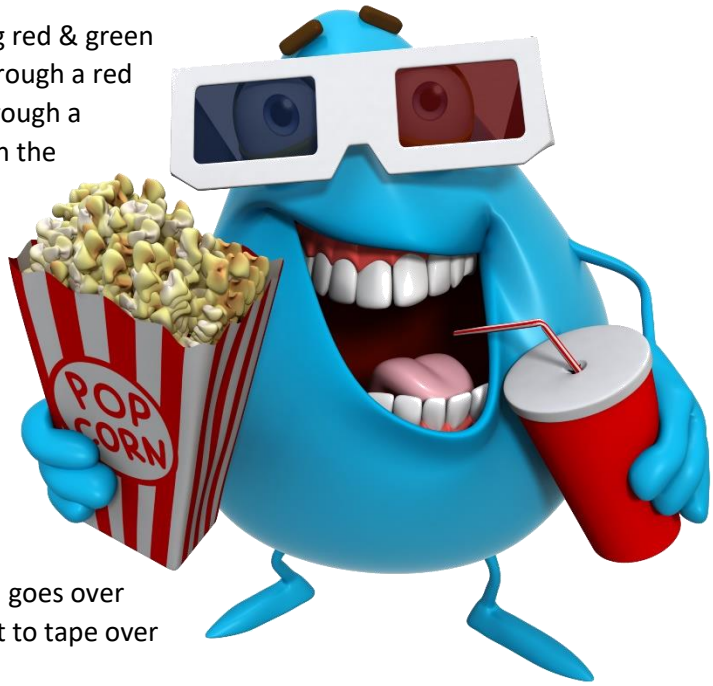


Materials:

- Anaglyph films & images, ex. Big Buck Bunny or Monsters, Inc 3D Sample (Use a large projector or tv screen if possible as opposed to a small laptop or tablet screen to enable all students to be able to clearly see the screen.)
- Printable 3D Drawing paper (included, or 3D drawing pads are available & may be cost-effective depending on printing costs)
- Black markers or thick black pens

Per student

- 3D glasses template
- 1 small square of red and 1 small square of blue color filter/lighting gels approx. 40 mm x 30 mm (e.g. www.mutr.co.uk CS6020A and CS6020B) Note: red and blue lighting gels are also available in 12 packs on websites like Amazon.com.
- Tape
- Scissors



Make viewers containing red & green filters: the left eye looks through a red filter, the right eye looks through a green or blue filter. Through the red filter, the red shadow looks dark; through the green/blue filter, the green shadow looks dark. Each eye sees a differently placed shadow of an object. The brain combines these two shadows and sees a single, fused image in 3-D space. Thus, all the objects between the projectors and the screen are reproduced as shadows floating in space between the viewer. Did it work?

Remember! Red goes over the **LEFT** eye, and blue (cyan) goes over the **RIGHT**. Tape the lens to the frame, and take care not to tape over the lenses themselves, or you'll get a fuzzy image.

I Spy with my little eye!

Have students use the printable 3D paper with anaglyph red-cyan 3D glasses: Have them draw on it with a thick black pen, and their drawing will appear to float above the paper. *The included 3D paper features a five line-per-inch grid (and there is also a 2nd sheet with a 10 line per inch) with a relatively large offset between the two different colored grids. The large offset can create the deepest 3-D effect (compared to the small and medium offset variations) but for some viewers is less enjoyable and causes more eyestrain.*

It relies on very simple, but effective idea to get the kids attention and interest them in 3D technology.

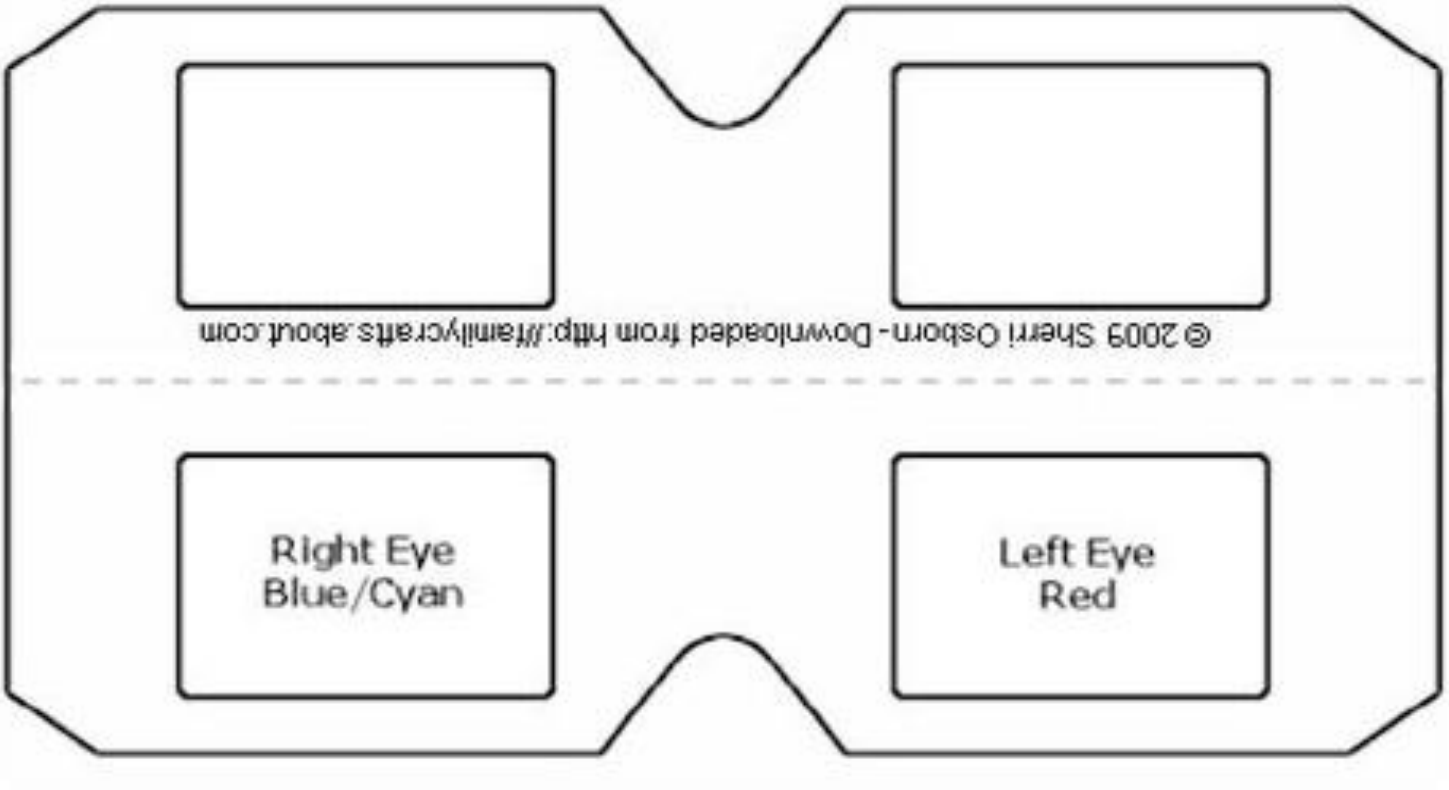
Keep Both Eyes on the Screen and Your Glasses in Place!

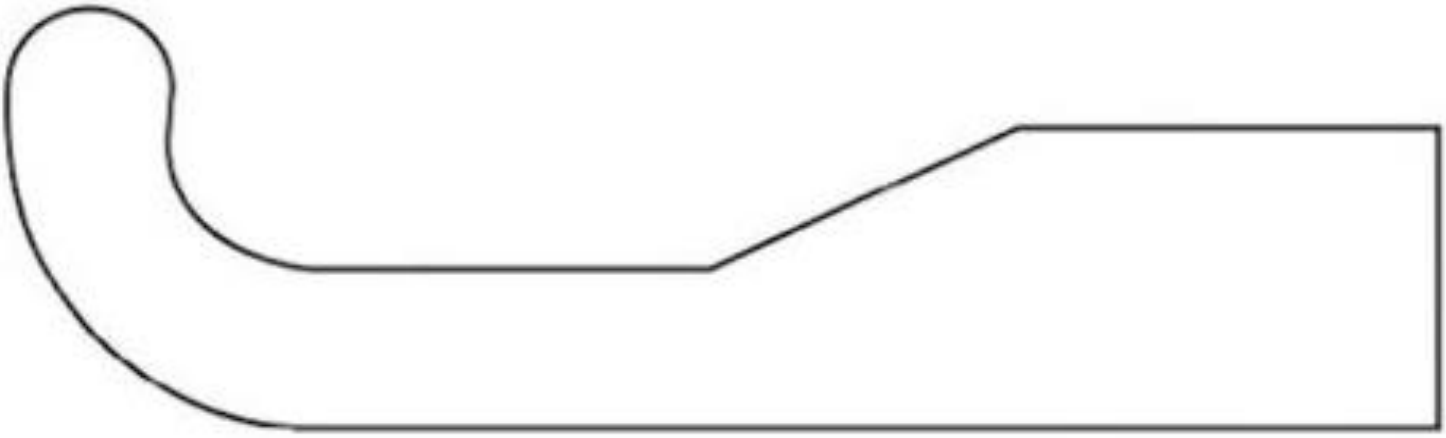
Watch clips of an anaglyph movie such as Big Buck Bunny with and without the 3D glasses. Do the students notice a 3D effect? When and what appears different? How does the movie look without the glasses?

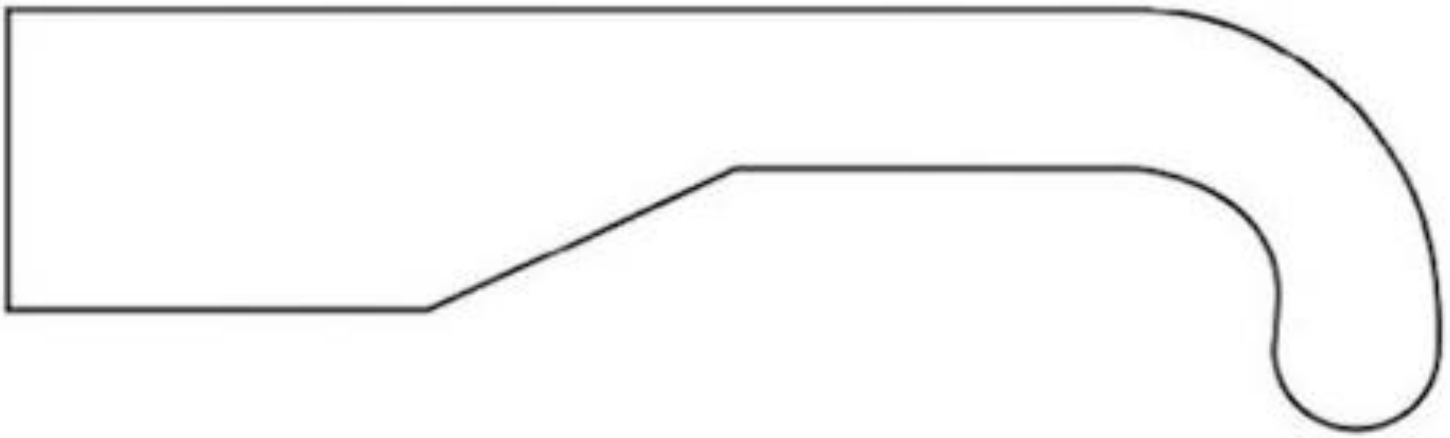
Note:

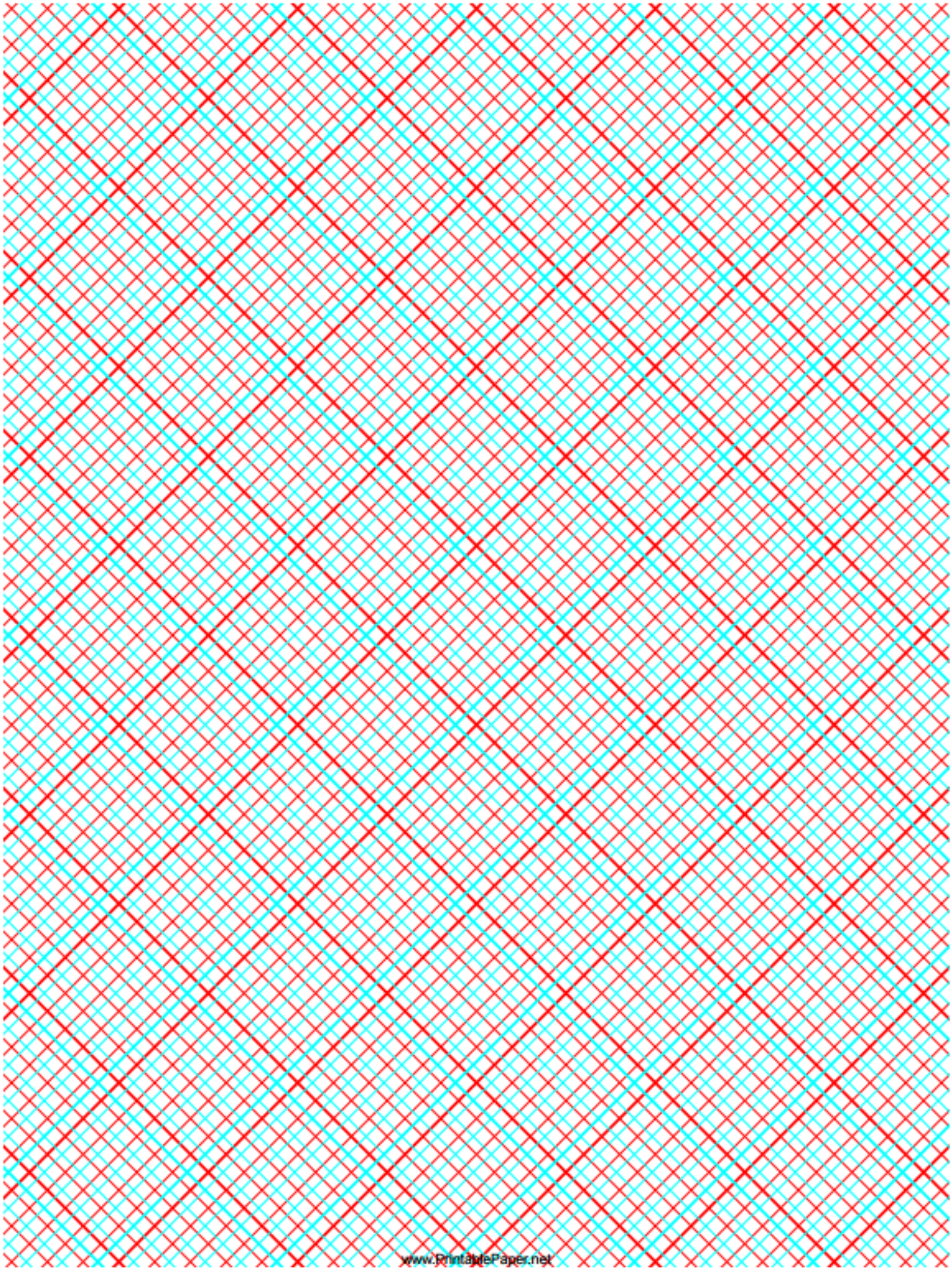
Colored filters from educational catalogues produce the correct shade of red and blue light. These filters can also be cut up and used for the students' 3D glasses.

Make your room as dark as possible to get the full effect of the 3D movies.





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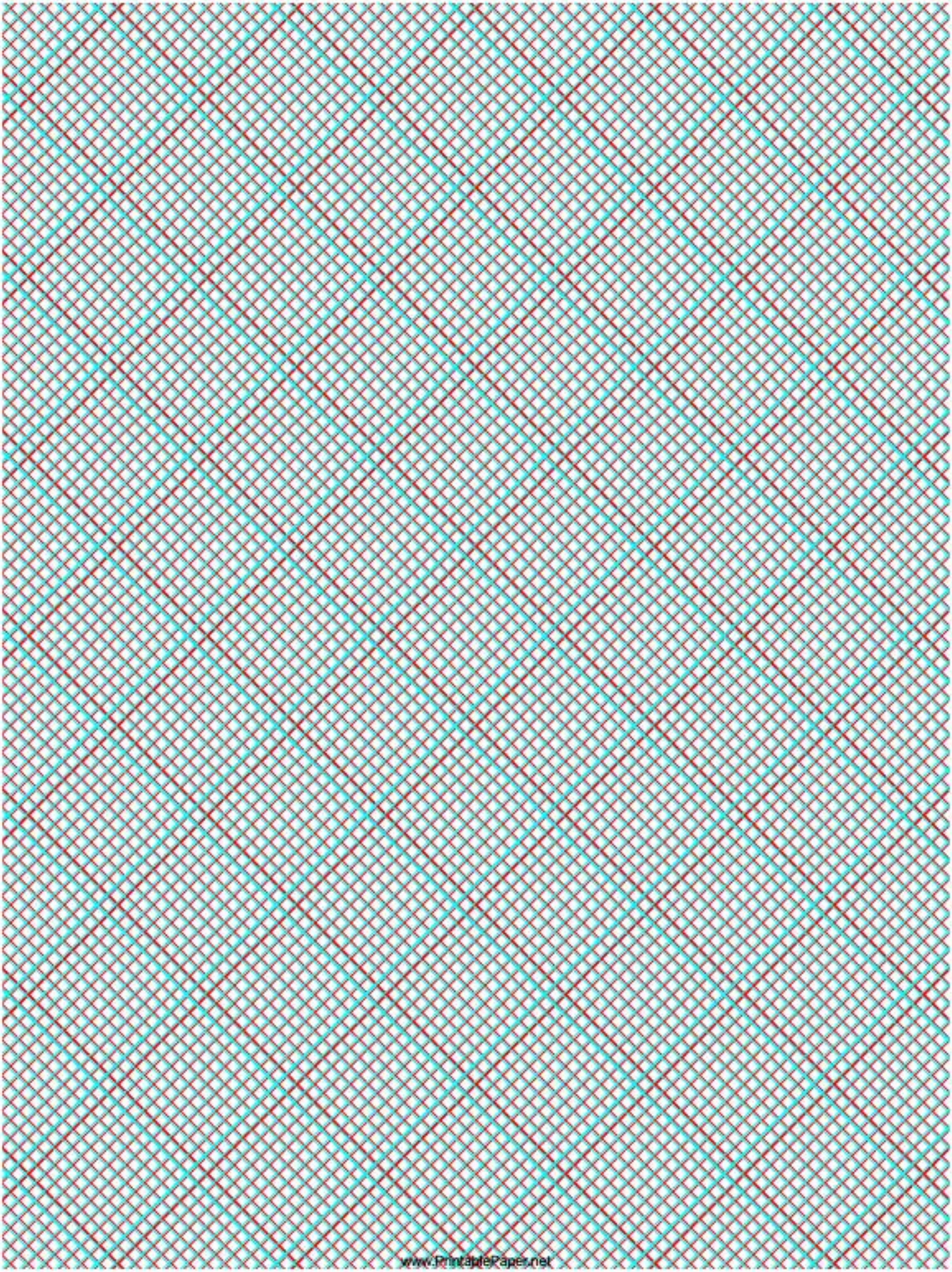
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Monsters! Ink! Lesson 1 Supply List

Lesson One

Materials:

- 1 red and 1 blue color gel/ Color Effects Lighting Filters (e.g. www.mutr.co.uk CS6020A and CS6020B)
- Printable 3D drawing paper
- Dark black, ex. felt tipped, pens
- Access to anaglyph films and images and a way to show them, ex. projector and laptop
- Tip: You may wish to have some View Masters available for students to try, as many students have never experienced one. Find them here. Option, you may want to compare the retro style with the modern iteration, View-Master Virtual Reality.

Per student

- 3D glasses template
- 1 small square of red and 1 small square of blue color filter approx. 40 mm x 30 mm
- Tape
- Scissors

Pacing Guide:

This lesson has been designed to take one 75-minute session to complete. It may take more or less depending on the needs of your classroom and the abilities of your students.