

Mirrors

Jean Brainard, Ph.D.

Say Thanks to the Authors

Click <http://www.ck12.org/saythanks>

(No sign in required)



AUTHOR

Jean Brainard, Ph.D.

To access a customizable version of this book, as well as other interactive content, visit www.ck12.org

CK-12 Foundation is a non-profit organization with a mission to reduce the cost of textbook materials for the K-12 market both in the U.S. and worldwide. Using an open-source, collaborative, and web-based compilation model, CK-12 pioneers and promotes the creation and distribution of high-quality, adaptive online textbooks that can be mixed, modified and printed (i.e., the FlexBook® textbooks).

Copyright © 2018 CK-12 Foundation, www.ck12.org

The names “CK-12” and “CK12” and associated logos and the terms “**FlexBook®**” and “**FlexBook Platform®**” (collectively “CK-12 Marks”) are trademarks and service marks of CK-12 Foundation and are protected by federal, state, and international laws.

Any form of reproduction of this book in any format or medium, in whole or in sections must include the referral attribution link <http://www.ck12.org/saythanks> (placed in a visible location) in addition to the following terms.

Except as otherwise noted, all CK-12 Content (including CK-12 Curriculum Material) is made available to Users in accordance with the Creative Commons Attribution-Non-Commercial 3.0 Unported (CC BY-NC 3.0) License (<http://creativecommons.org/licenses/by-nc/3.0/>), as amended and updated by Creative Commons from time to time (the “CC License”), which is incorporated herein by this reference.

Complete terms can be found at <http://www.ck12.org/about/terms-of-use>.

Printed: November 5, 2018

flexbook
next generation textbooks



CHAPTER 1

Mirrors

Learning Objectives

- Explain how mirrors form images.
- Distinguish between real and virtual images.
- Describe the images formed by plane, concave, and convex mirrors.



What does this picture show? Is it a photo of identical twin sisters, or is it just one girl looking in a mirror? The picture shows a single girl and her mirror image.

How Mirrors Form Images

A mirror is typically made of glass with a shiny metal backing that reflects all the light that strikes it. When a mirror reflects light, it forms an image. An image is a copy of an object that is formed by reflection or refraction. Mirrors may have flat or curved surfaces. The shape of a mirror's surface determines the type of image it forms. For example, some mirrors form real images, and other mirrors form virtual images. What's the difference between real and virtual images?

- A real image forms in front of a mirror where reflected light rays actually meet. It is a true image that could be projected on a screen.
- A virtual image appears to be on the other side of the mirror. Of course, reflected rays don't actually go through the mirror to the other side, so a virtual image doesn't really exist. It just appears to exist to the human brain.

Q: Look back at the image of the girl pointing at her image in the mirror. Which type of image is it, real or virtual?

A: The image of the girl is a virtual image. It appears to be on the other side of the mirror from the girl.

Plane Mirror

The mirror in the opening photo is a plane mirror. This is the most common type of mirror. It has a flat reflective surface and forms only virtual images. The image formed by a plane mirror is also right-side up and life sized. But something is different about the image compared with the real object in front of the mirror. Left and right are reversed. Look at the girl brushing her teeth in the **Figure 1.1**. She is using her left hand to brush her teeth, but her image (on the left) appears to be brushing her teeth with the right hand. All plane mirrors reverse left and right in this way. The term *mirror image* refers to how left and right are reversed in an image compared with the object.



FIGURE 1.1

Concave Mirror

Some mirrors have a curved rather than flat surface. Curved mirrors can be concave or convex. A **concave** mirror is shaped like the inside of a bowl. This type of mirror forms either real or virtual images, depending on where the object is placed relative to the focal point. The focal point is the point in front of the mirror where the reflected rays meet. You can see how concave mirrors form images in the **Figure 1.2**. Concave mirrors are used behind car headlights. They focus the light and make it brighter. Concave mirrors are also used in some telescopes.

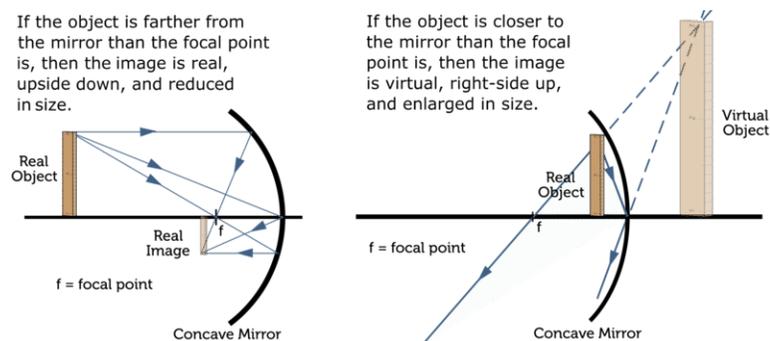


FIGURE 1.2

Convex Mirror

The other type of curved mirror, a **convex** mirror, is shaped like the outside of a bowl. Because of its shape, it can gather and reflect light from a wide area. As you can see in the **Figure 1.3**, a convex mirror forms only virtual images that are right-side up and smaller than the actual object.

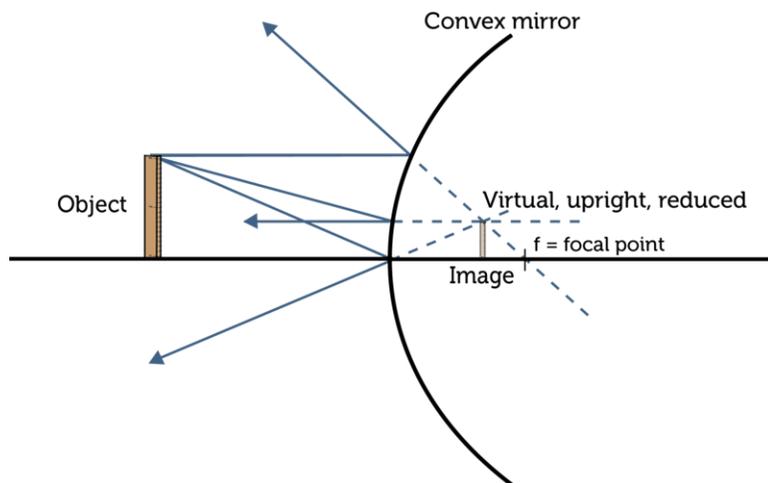


FIGURE 1.3

Q: Convex mirrors are used as side mirrors on cars. You can see one in the **Figure 1.4**. Why is a convex mirror good for this purpose?

A: Because it gathers light over a wide area, a convex mirror gives the driver a wider view of the area around the vehicle than a plane mirror would.



FIGURE 1.4

Summary

- When a mirror reflects light, it forms an image. An image is a copy of an object formed by reflection (or refraction). A real image is a true image that forms in front of a mirror where reflected light rays actually meet. A virtual image appears to be on the other side of the mirror and doesn't really exist.

- Most mirrors are plane mirrors that have a flat reflective surface. A plane mirror forms only virtual, right-side up, and life-sized images.
- A concave mirror is shaped like the inside of a bowl. The type of image it forms depends on where the object is relative to the focal point. The image may be real, upside down, and reduced in size; or it may be virtual, right-side up, and enlarged.
- A convex mirror is shaped like the outside of a bowl. It forms only virtual images that are right-side up and reduced in size relative to the object.

Review

1. What is an image? How do real and virtual images differ?
2. Define the focal point of a mirror.
3. Describe the image formed by a plane mirror.
4. What type of image is formed by a concave mirror if the object is between the mirror and the focal point?
5. Mirrors like the one in the **Figure 1.5** are sometimes placed at street intersections so drivers can see around blind corners. What type of mirror is used for this purpose? What type of image does it form?



FIGURE 1.5

References

1. Image copyright Rob Marmion, 2014. [Photo of a girl and her image in a plane mirror, with left and right reversed](#) . Used under license from Shutterstock.com
2. Christopher Auyeung. [Diagram of concave mirror](#) . CC BY-NC 3.0
3. Christopher Auyeung. [Diagram of convex mirror](#) . CC BY-NC 3.0
4. Marcin Wichary. [Car mirrors are convex mirrors](#) . CC BY 2.0
5. Magnus Akselvoll. [Traffic mirror](#) . CC BY 2.0

