More Than Meets The Eye
Telescopes | Student Investigation

Introduction:
Telescopes are tools that allow us to explore the sky in exquisite detail. They do this by collecting a large amount of light and focusing this light into our eyes (or a camera). Because stars are very far away, a lot of light must be collected so we can see them clearly. Telescopes are sometimes called "light buckets;" like a bucket collects water, a telescope collects light. The more light that is collected, the fainter and farther the telescope will be able to "see."

In this series of experiments, you will explore reflection and refraction using mirrors and lenses to discover how telescopes work.

Research telescopes and answer the following questions:

1. How do telescopes work?

2. Why are telescopes used and why are they important?

3. Watch a video on the James Webb Telescope. What did you learn about this telescope?

4. Define reflection:

5. Define refraction:

Activity 1 | **Exploring Reflection**

Safety first:
NEVER use mirrors or lenses to shine light from any source into your eyes or the eyes of another person.

1. Were you able to create a spot on the index card using the mirror and the light in the room? How bright were you able to make the spot? How could you make the spot brighter?

2. Use additional mirrors to create a bright spot on the index card. How many mirrors created the brightest spot? How were you able to create the spot using the mirrors?

3. Was the number of light sources in the room the same or did the light sources change?

4. Did the mirror reflect or refract the light?

Activity 2 | **Exploring Refraction**

Safety first:
NEVER use sunlight as the source of light with magnifying glasses, as it may cause a fire.

1. Were you able to create a spot on the index card using the magnifying glass and the light in the room? How bright were you able to make the spot?

2. At what distance was the magnifying glass from the index card that produced the sharpest spot of light? Measure this distance using a ruler and record your results.

Focal length *is the distance from the magnifying lens to the* ***focal point****, which is the point at which all the light passing through the lens meets at one spot.*

3. Did the magnifying glass reflect or refract the light?

4. What is the difference between reflection and refraction?

Discussion:

1. How are mirrors, lenses, and light used in telescopes?

2. What type of telescope is the James Webb Telescope?

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Telescopes | Extension Activities

Activity 3 | **Exploring Reflection and Refraction**

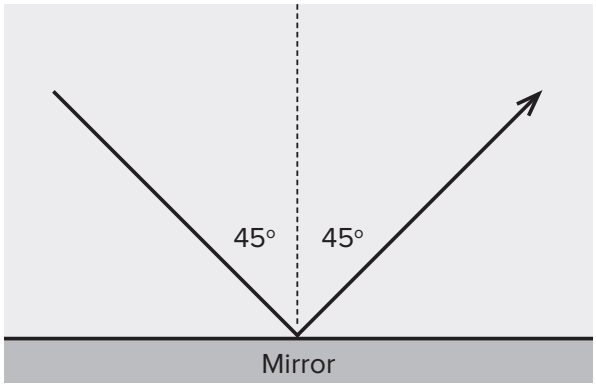
The law of reflection states that that angle at which a beam of light hits a flat mirror (angle of incidence) and the angle at which the light bounces off the mirror (angle of reflection) will be the same. For example, if the angle of incidence is 45°, the angle of reflection will also be 45°.

Safety first
Never point a laser beam into your eyes or another person's eyes.

On a piece of paper, draw the diagram on the right. Label the angle of incidence, the angle of reflection, the line of incidence, and the line of reflection.

After observing the line of reflection of the laser beam, what is the angle of reflection?

Is this angle of reflection what you expected? Explain.



Activity 4 | **Exploring Magnifying Lenses and Refraction**

Explore how magnifying lenses refract light.

Safety first
DO NOT concentrate sunlight onto paper, as this may cause a fire. Experiment under adult supervision.

1. What did you see on the paper? Describe in detail.

2. Is the image right side up or upside down?

3. Is this reflection or refraction?