PhET Name	Geometric Optics : Basics
PhET Simulation Link	https://phet.colorado.edu/en/simulations/geometric-optics-basics
Topic Covered using the Simulation	Light: Refraction and Reflection
Class	10
Learning Focus	Reflection of light Refraction of light Ray diagrams Image formation Focal length Object/image position Convex and concave lenses Relationship between object position and image formation

Task 1: Investigate a Concave Mirror

Set up a **concave mirror**.

Ask teachers to:

1. Place an object beyond the centre of curvature.
2. Predict where the image will form.
3. Observe the image in the simulation.
4. Move the object between **C and F**.
5. Move the object between **F and the mirror/pole**.
6. Record what happens to:
   - Image position
   - Image size
   - Image orientation
   - Nature of image

Object position	Prediction	Observation	Image nature
Beyond C			
At C			
Between C and F			
At F			
Between F and P			

Task 2: Investigate a Convex Mirror

Now change the mirror to a convex mirror, keeping the object similar.

Questions to think:

1. Where does the reflected light appear to come from?
2. Is the image formed in front of or behind the mirror?
3. Is the image real or virtual?
4. Is the image enlarged or diminished?
5. Does changing the object distance change the nature of the image?

Task 3: (Convex Mirror)

Misconception :

A student says, *"The image in a plane mirror or convex mirror is virtual, so we cannot see it." How would you use the simulation to challenge this statement?*

Simulation-based investigation

1. Place an object in front of the mirror.
2. Observe the image.
3. Trace/observe the reflected rays.
4. Extend the reflected rays backwards.
5. Notice where they **appear to meet**.

Question :

Are the rays actually meeting behind the mirror?

Then:

If they are not actually meeting, why does the observer see an image there?

Task 3: Investigate a Convex Mirror

If the reflected rays do not actually meet, how can an image still be seen?

This is an excellent question for addressing the **real/virtual image misconception**.

Now change the mirror to a **convex mirror**, keeping the object similar.

Questions:

1. Where does the reflected light appear to come from?
2. Is the image formed in front of or behind the mirror?
3. Is the image real or virtual?
4. Is the image enlarged or diminished?

5. Does changing the object distance change the nature of the image?

Task 4 :

Misconception: "A virtual image cannot be seen."

A student says, *“The image in a plane mirror or convex mirror is virtual, so we cannot see it.” How would you use the simulation to challenge this statement?*

Simulation-based investigation

1. Place an object in front of the mirror.
2. Observe the image.
3. Trace/observe the reflected rays.
4. Extend the reflected rays backwards.
5. Notice where they **appear to meet**.
6. Ask teachers:

Are the rays actually meeting behind the mirror?

Then:

If they are not actually meeting, why does the observer see an image there?

Task 5 :

Misconception : "The focus is where the image is always formed."

This is particularly useful for **concave mirrors and lenses**.

Prediction task

Place an object at different positions and predict where the image will form. Do not move the object until you have made your prediction.

Test:

Object beyond C
Object at C
Object between C and F
Object at F
Object between F and the mirror

Then ask:

Does the image always form at F?

Task 4: Convex Lens

Misconception : The focus is where the image is always formed.

Use the lens formula:

$1/f = 1/v - 1/u$

Object distance (u)	Focal length (f)	Calculated image distance (v)	Prove

Explore this Misconceptions:

Changing the focal length does not affect image formation if the object position remains the same.

A larger object always produces a proportionally larger image.

A virtual image cannot be seen because the light rays do not actually meet.