Gizmo - Ray Tracing (Lenses)

Name: _____

www.explorelearning.com login, and select 'launch gizmo'

The Gizmo shows a side view of light coming from a candle on the left. Three light rays are shown coming from the tip of the candle. The rays pass through a converging (convex) lens, are bent by the lens, and form a focused image of the candle on the right side of the lens. The image shown is what would be seen in focus, but upside down, if a screen or piece of paper were placed in this location. Select the '**Colourize lines**' option in the bottom left of the work area.

The blue dots on the principle axis represent the **primary focus** (F - right) and **secondary focus** (F' - left). For a converging lens the focal length (**10 units** at the start) is the distance from the center of the lens to each focal point. Drag the secondary focus left and right along the axis.

a) When you move the secondary focus 10 units to the left, what happens to the primary focus on the right?

b) When you move the secondary focus 5 units to the right, what happens to the primary focus on the right?

c) As you move the secondary focus to the left what happens to the size of the lens and the image of the candle?

d) The dark blue ray is the **parallel incident ray,** which shines parallel to the principle axis and hits the lens "straight on". After this ray is bent by the lens where does it intersect the principle axis?

e) Adjust the height of the candle by grabbing the flame and pulling up or down. How does the location of the parallel ray change when you move the candle upwards?

f) Where does it intersect the principle axis as you move the candle upwards?

2. Move the candle to the left and the right along the principle axis.
   a) What is always true about the **central red line**?

   b) What happens to the **green line (which always passes through F', the secondary focus)** after it comes out the other side of the lens?

   c) What do you observe where the **Central line, Parallel line and Line through the secondary focus** intersect?

3. For the following table set the secondary focus to **10 units** and make the candle on the left side short. Remember 2F' is located at 20 units on the left hand side of the lens. Determine the SALT for all of the following scenarios relative to the original candle:

Location of Candle	Size	Attitude	Location (Be Specific – use Units)	Type
Beyond 2F' (25 units)				
At 2F' (20 units)				
Between 2F' and F' (15 units)				
At F' (10 units)				
Between F' and O (6 units)				

4. Select **Concave lens (diverging lens).** A diverging lens bends light away from the principal axis. A person standing to the right of the lens would see a virtual image of the candle, which in this case is smaller than the actual candle.
    a) Move a large candle to the far left and bring it back close to the mirror

Location of Candle	Size	Attitude	Location	Type
Anywhere on the left				

5. A converging lens has a focal length of 15cm. A candle is located 35 cm from the lens. Draw a diagram to represent this scenario. What type of image will be formed, and where will it be located?

6. A diverging lens has a focal length of 24 cm. A virtual image of a marble is located 12 cm in front of the lens. Where is the marble located?

7. Next, complete the 5 assessment questions below the Gizmo.