8

DepED
DEPARTMENT OF EDUCATION

Lesson Exemplar for Science

Quarter 4
Lesson
7

Lesson Exemplar for Science Grade 8
Quarter 4: Lesson 7 of 8 (Week 7)
SY 2025-2026

Development Team

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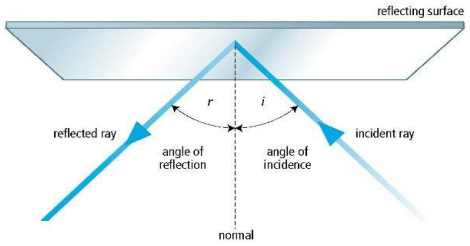
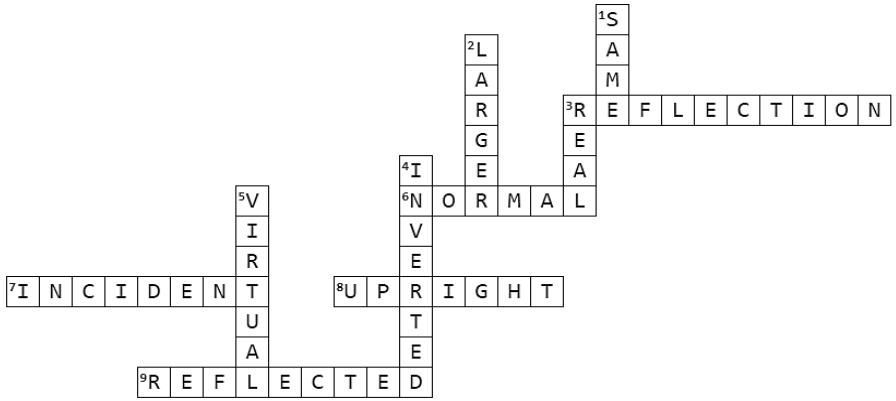
SCIENCE (PHYSICS)/QUARTER 4/ GRADE 8

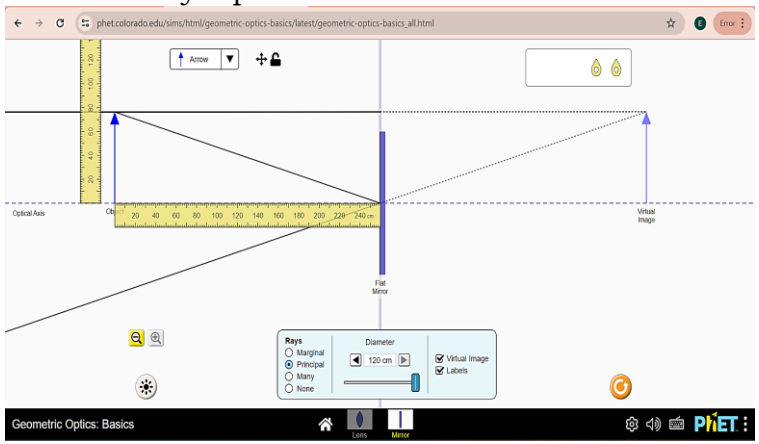
I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	Scientists and engineers analyze forces to predict their effects on movement.
B. Performance Standards	By the end of the Quarter, learners employ scientific techniques, concepts, and models to investigate forces and motion and represent their understanding using scientific language, force diagrams, and distance-time graphs. They use their curiosity, knowledge and understanding, and skills to propose solutions to problems related to motion and energy. They explore how modern technologies might be used to overcome current global energy concerns.
C. Learning Competencies and Objectives	*Carry out guided investigations to describe and illustrate the reflection of light using plane and curved mirrors and the refraction of light using transparent blocks, lenses, and prisms with examples from everyday applications.* *Lesson Objective 1:* state and verify the law of reflection *Lesson Objective 2:* determine the characteristics of images formed by a plane, concave and convex mirrors *Lesson Objective 3:* make ray diagrams following the law of reflection to locate the image.
D. Content	**Reflection of Light** a. Law of Reflection: The angle of incidence is equal to the angle of reflection.  Image Source: brainly.in b. The image formed by a plane mirror is always upright, virtual and same size as the object. The image formed by a convex mirror is always upright, virtual and smaller while the image formed by a concave mirror varies depending on the distance of the object from it.
E. Integration	Real world applications of reflection of light

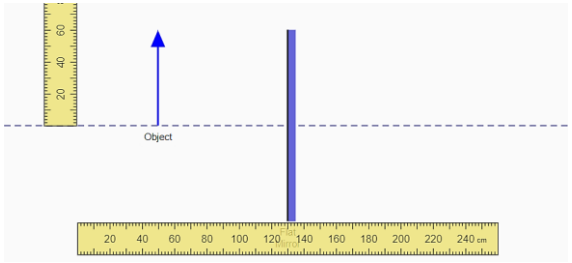
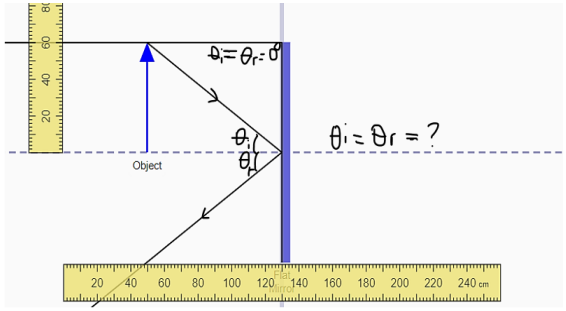
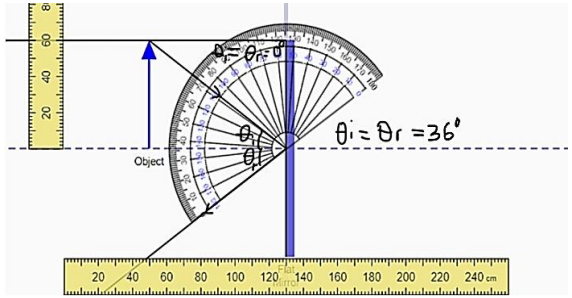
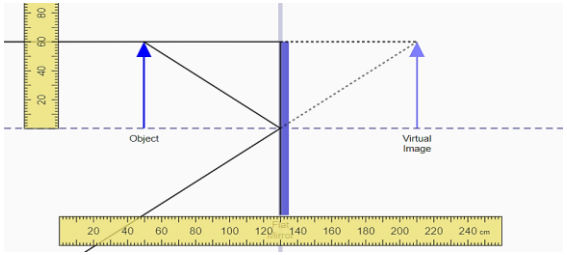
II. LEARNING RESOURCES

The Physics Classroom. (n.d.). Rocket Sled Interactive. Retrieved from The Physics Classroom
https://www.physicsclassroom.com/Physics-Interactives/Reflection-and-Mirrors/Optics-Bench/Optics-Bench-Interactive
University of Colorado Boulder, licensed under CC-BY-4.0. (n.d.). Simulation by PhET Interactive Simulations.
https://phet.colorado.edu/sims/html/forces-and-motion-basics/latest/forces-and-motion-basics_en.html
University of Colorado Boulder, licensed under CC-BY-4.0. (n.d.). Simulation by PhET Interactive Simulations.
https://phet.colorado.edu
https://hi-static.z-dn.net/files/dc8/d36c78f30a5f087b6cd59d2a03933681.jpg
http://boson.physics.sc.edu/~rjones/phys153/Mirror1.jpg
https://cdn.shopify.com/s/files/1/0473/7168/1945/products/product-image-1412487688_1024x1024.jpg?v=1609179085
https://saundersonsecurity.co.uk/media/catalog/product/cache/4/image/600x/040ec09b1e35df139433887a97daa66f/m/1/m18021a_07_4.jpg
https://images.twinkl.co.uk/tw1n/image/private/t_630/u/ux/shadows_ver_1.png
https://pressbooks.bccampus.ca/collegephysics/wp-content/uploads/sites/29/2016/04/Figure-26_02_06.jpg

III. TEACHING AND LEARNING PROCEDURE		NOTES TO TEACHERS
A. Activating Prior Knowledge	**DAY 1** **Images and Path of Light** **Activity 1.** Analyze the different pictures provided. Encourage students to observe and describe what they see, paying attention to the path and behavior of light. *Use the learning activity sheet for this activity (see page 1).* **KEY to Activity 1.** Situation 1 — Shadow was formed when light hits an opaque object. Situation 2 — A bigger image is observed using a dental mirror. Situation 3 — You can see a wider view and smaller images in a convenience store.	The teacher should encourage the learners to observe and describe the picture. See Learning Activity Sheet: *Activity #1: Images and Path of Light* Ask student volunteers to discuss and explain their observations. Connect their observations to the behavior of light. Then, facilitate a class discussion to process their observations. **KEY to Guide Questions** 1. Light cannot pass through an opaque barrier which results in the formation of the shadow.

	<table><tr><td>Situation 4</td><td>You can see your reflection in front of a mirror, and you don't need a big mirror to see your full image.</td></tr></table> *Note: choose photo not showing the light rays*	This indicates that light travels in a straight-line path. 2. The image formed depends on the kind of mirror used and the object's location from the mirror. 3. Based on the illustration, the minimum length of the mirror for you to see your full image is just half your size.
B. Establishing Lesson Purpose	**1. Lesson Purpose** **Activity 2.** *Use the learning activity sheet for this activity (see page 2).* **KEY to Activity 2 Guide Questions** 1. Smooth surfaces produced clearer images 2. Different reflecting surfaces formed different kinds of images. Flat surfaces produced the same images while the images produced by curved surfaces vary depending on the object's distance from the surface. **2. Unlocking Content Area Vocabulary** **Activity 3.** See Learning Activity Sheet: *Activity #3: Reflect Vocabulary (see page 4).* **KEY to Activity 3:** 	On the day of the activity, the teacher may divide the class into groups to perform this simple activity. See Learning Activity Sheet: *Activity #2: Images Formed by Reflecting Surfaces* The teacher may consider conducting a simple interactive discussion to know the learners' reflections related to activity 2. The teacher can ask for volunteers to share their observations and answers to guide questions. The learner should answer this unlocking activity before the interactive discussion. The teacher may explain further the meaning of the different terms/ vocabulary.

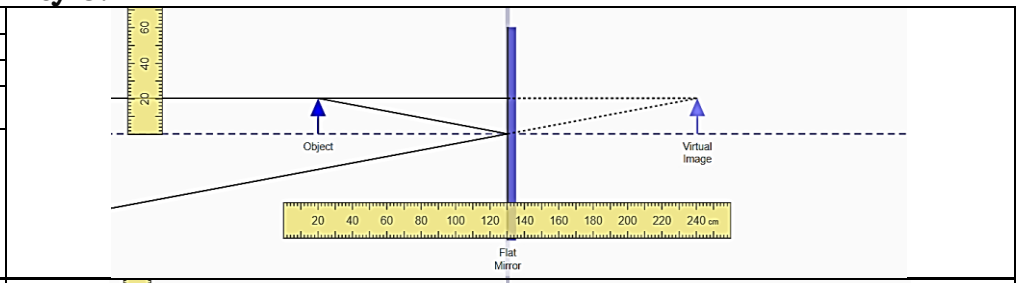
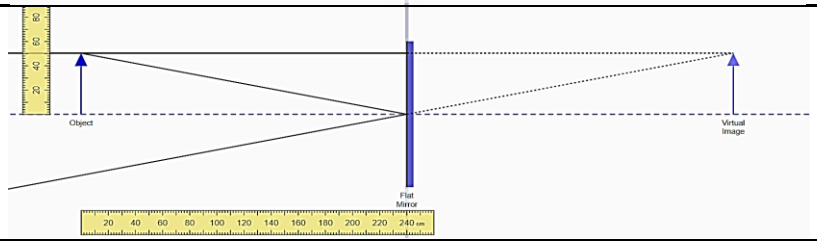
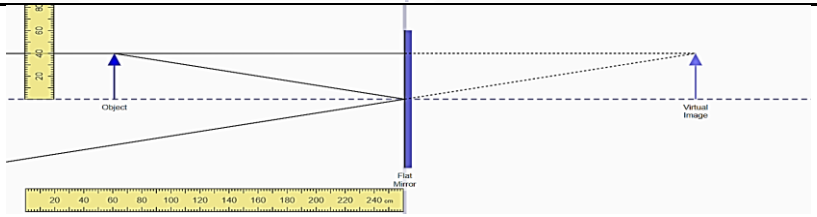
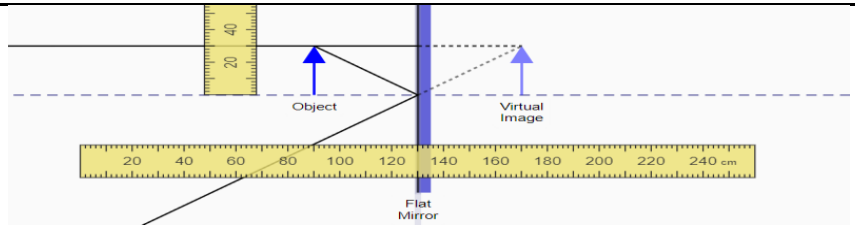
C. Developing and Deepening Understanding	**SUB-TOPIC 1: Reflection of Light in Plane Mirror** **1. Explicitation** **Activity 4.** Set up a simple demonstration following the instructions below. Introduce the concepts of incident ray, reflected ray, and the normal line. Then, let the learners explore the activity about the **Law of Reflection**. *Use the learning activity sheet for this activity (see page 5).* **KEY to Activity 4:** Table: Answers may vary. ***(Note: Angle of incidence = Angle of reflection)*** Guide Questions: 1. The angle of incidence is always equal to the angle of reflection. 2. The law of reflection states that the angle of incidence is equal to the angle of reflection. 3. The angle of incidence and reflection is equal to zero. **DAY 2** **2. Worked Example** **Pre-activity: Image Formation by a Plane Mirror** Using the PhET interactive simulation, demonstrate the law of reflection in terms of image formation by a plane mirror.  *Link: phet.colorado.edu*	Note to Teacher: After the activity, the teacher will facilitate the discussion about the **Law of Reflection**. See Learning Activity Sheet: *Activity #4: Law of Reflection* The teacher's role is to facilitate the discussion while learners actively engage / participate in doing the following tasks in the worked example: 1. Use the Law of Reflection to make incident and reflected rays 2. Locate the image formed by a plane mirror. 3. Measure the distance and size of the object and image formed (in cm). 4. Describe the characteristics of an image formed as real or virtual, inverted or upright, smaller, larger or same size. The teacher should encourage the learners to think how they can make ray diagrams using the Law of Reflection to determine the location of the image formed in front of a plane mirror. Ask a volunteer to use a ruler to measure the size of the object and its distance from the plane mirror. Ask another volunteer to use a protractor to measure the angle of incidence and angle of reflection.

1. A 60 cm object is 80 cm in front of a plane mirror  	2. Using the Law of Reflection, the first incident and reflected rays are along the normal line. Thus, the angle of incidence and reflection is zero.  	Based on the measured angle, ask another volunteer to state the Law of Reflection. The teacher should only facilitate the learning process by encouraging more volunteers to do the remaining tasks: 1. extend the reflected rays 2. draw the image 3. measure the size and distance of the image from the plane mirror. 4. compare the size of the image and the object 5. compare the distance of the image and the object. 6. determine the characteristics of an image formed by a plane mirror: <u>erect or inverted</u>, <u>real or virtual</u>, <u>diminished, maximized or same in size</u>. You may ask learners to reflect about the topic, if they really understood the process of Image Formation by a Plane Mirror. Learners will first answer the provided worksheet before the short interactive discussion facilitated by the teacher in order to assess their understanding about the topic.
3. Another incident and reflected rays were created applying the Law of Reflection. Using a protractor, the angle of incidence and reflection is 36 degrees.  	4. Check if the reflected rays will intersect in front of the mirror. If not, extend the reflected rays behind the mirror using dashed lines. The intersection of at least two reflected rays will be the tip of the image.  	

3. Activity
Activity 5.
Use the learning activity sheet for this activity (see page 7).

See Learning Activity Sheet: *Activity #5: Image Formation by a Plane Mirror*

KEY to Activity 5:

d_o = 110 cm d_i =-110 cm s_o = 20 cm s_i = 20 cm Characteristics of Image Formed: same size, upright, & virtual image	
d_o = 240 cm d_i = -240 cm s_o = 50 cm s_i = 50 cm Characteristics of Image Formed: same size, upright & virtual image	
d_o = 200 cm d_i = - 200 cm s_o = 40 cm s_i = 40 cm Characteristics of Image Formed: same size, upright, & virtual image	
d_o =40 cm d_i =-40 cm s_o = 30 cm s_i = 30 cm Characteristics of Image Formed: same size, upright, & virtual image	

DAY 3

SUB-TOPIC 2: Reflection of Light in Concave Mirrors

1. Explicitation

Set up a simple demonstration following the instructions below. Let the learners explore the activity about the Law of Reflection in Concave mirrors.

This can be done individually, by pair, or by group.

The teacher may emphasize the tasks of the learners in this virtual activity such as determine the ff.:

1. Use the Law of Reflection to make incident and reflected rays
2. Locate the image formed by a plane mirror.
3. Measure the focal length, distance and size of the object and image formed (in cm).
4. Describe the characteristics of an image formed as real or virtual, inverted or upright, smaller, larger or same size.

KEY to Activity 5 Guide Questions

1. To locate the image formed by a plane mirror, there must be at least two intersecting reflected rays. The intersection of these reflected rays indicates the tip of the image. If the reflected rays do not intersect in front of a plane mirror, it can be extended behind the mirror.
2. The image formed by a plane mirror is always upright, SAME in SIZE and VIRTUAL. The distance of the object is the same as the distance of the image and it is formed behind the mirror.

Activity 6.

Use the learning activity sheet for this activity (see page 9).

KEY to Activity 6:

Table: Answers may vary. ***(Note: Angle of incidence = Angle of reflection)***

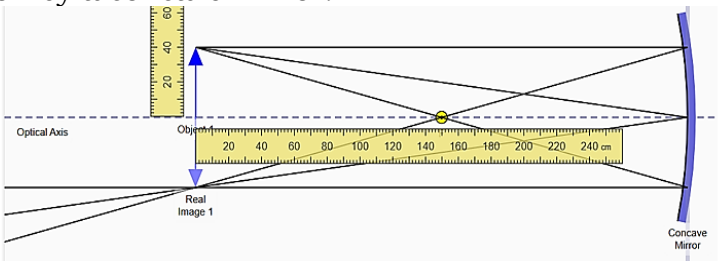
Guide Questions:

1. The angle of incidence is the same as the angle of reflection (law of reflection).
2. The angle of reflection is zero degree since the incident ray is along the optical/ principal axis. The optical axis is also along the normal line of the concave mirror.

2. Worked Example

Pre-activity: Image Formation by a Concave Mirror

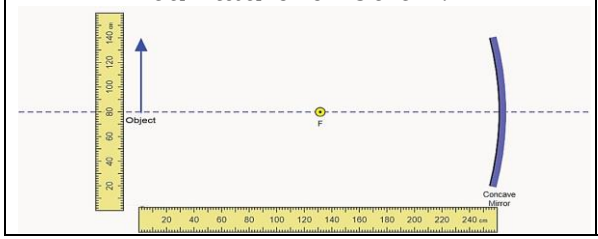
Using the PhET interactive simulation, demonstrate the law of reflection in terms of image formation by a concave mirror.



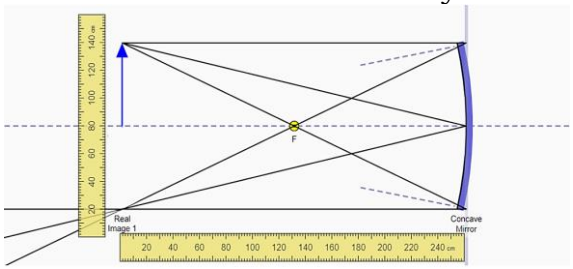
Link: *https://phet.colorado.edu/sims/html/geometric-optics/latest/geometric-optics_all.html*

How can we determine the location of the image formed by a concave mirror? What are the characteristics of the image formed?

1. A 60 cm object is placed 130 cm in front of a concave mirror. The focal length, which is half of the radius of curvature is 130 cm.



2. Using the Law of Reflection, make incident and reflected rays.



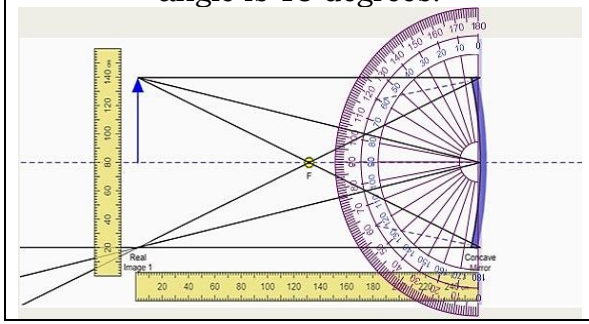
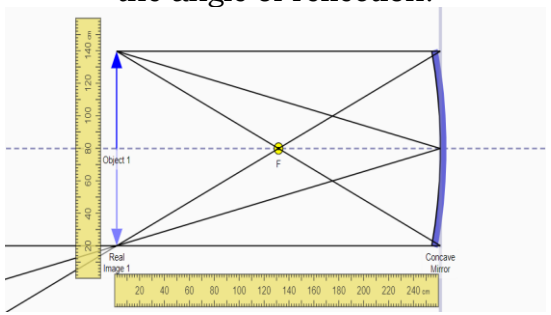
See Learning Activity Sheet: *Activity #6: Law of Reflection in Concave Mirror*

Notes to Teacher:
After the activity, the teacher will facilitate the discussion about the Law of Reflection in Concave Mirror

The teacher's role is to facilitate the discussion while learners actively engage / participate in doing the following tasks in the worked example:

1. Use the Law of Reflection to make incident and reflected rays
2. Locate the image formed by a concave mirror.
3. Measure the distance and size of the object and image formed (in cm).
4. Describe the characteristics of image formed as real or virtual, inverted or upright, smaller, larger, or same in size.

The teacher should encourage the learners to think how they can make ray diagrams using the Law of Reflection to determine the location of the image formed in front of a concave mirror.
Ask a volunteer to use a ruler to measure focal length of the mirror, the size of the object and its distance from the concave mirror.

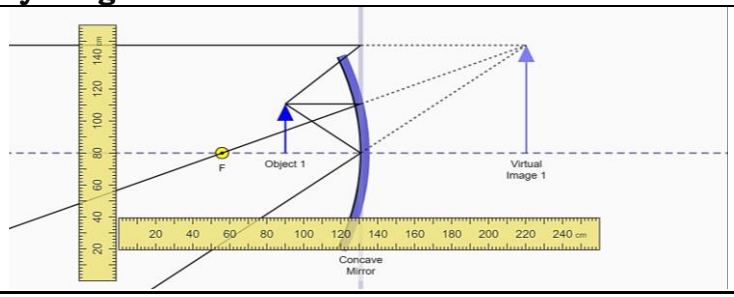
3. Using the protractor, the measured angle is 13 degrees.	4. The angle of incidence is equal to the angle of reflection.
	

3. Lesson Activity

Activity 7.

Use the learning activity sheet for this activity (see page 11).

KEY to Activity 7.7 Ray Diagrams

$f = 75$ cm $d_o = 40$ cm $d_i = -90$ cm $s_o = 30$ cm $s_i = 68$ cm Characteristics of Image Formed: Larger, upright, & virtual image	
$f = 75\ cm$ $d_o = 185$ cm	

Ask another volunteer to make a normal line and use a protractor to measure the angle of incidence and angle of reflection in order to verify the law of reflection.

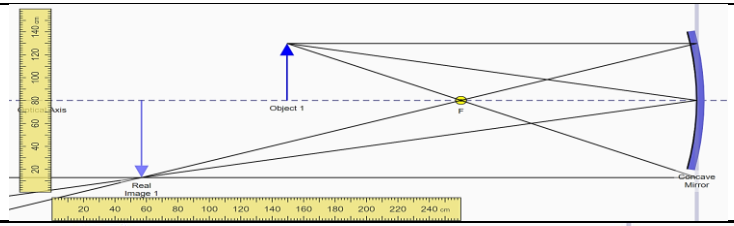
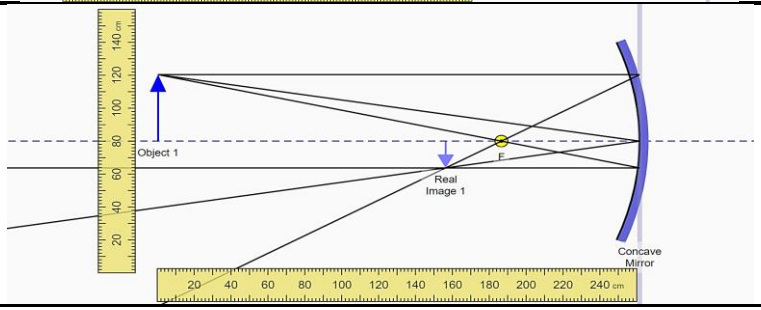
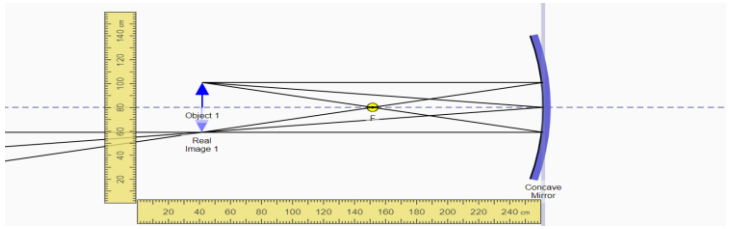
Based on the measured angle, ask another volunteer to state the Law of Reflection.

The teacher should only facilitate the learning process by encouraging more volunteers to do the remaining tasks:
1. extend the reflected rays
2. draw the image
3. measure the size and distance of the image from the plane mirror.
4. compare the size of the image and the object
5. compare the distance of the image and the object.
6. determine the characteristics of image formed by a plane mirror: upright or inverted, real or virtual, smaller, larger or same in size.

See Learning Activity Sheet: *Activity #7: Image Formation by a Concave Mirror*

You may ask learners to reflect on the topic, if they really understood the process for the Image Formation by a Plane Mirror.

Learners will first answer the provided worksheet before the short interactive discussion

$d_i = 278$ cm $s_o = 50$ cm $s_i = -67$ cm Characteristics of Image Formed: same size, upright, & virtual image	
$f = 75$ cm $d_o = 40$ cm $d_i = 103$ cm $s_o = 40$ cm $s_i = -16$ cm Characteristics of Image Formed: Smaller, inverted & real image	
$f = 110$ cm $d_o = 220$ cm $d_i = 220$ cm $s_o = 20$ cm $s_i = -20$ cm Characteristics of Image Formed: same size, inverted, & real image	

Guide Questions:

1. To locate the image formed by a concave mirror, there must be at least two intersecting reflected rays. The intersection of these reflected rays indicates the tip of the image. If the reflected rays do not intersect in front of a concave mirror, it can be extended behind the mirror.
2. The image formed by a concave mirror depends on the distance of the object. For example, the image is upright, larger and virtual if the object is less than the focal length. The image is the same in size, inverted and real if the distance of the object is the same as the focal length.

facilitated by the teacher in order to assess their understanding about the topic.

This can be done individually, by pair, or by group.

The teacher may emphasize the tasks of the learners in this virtual activity such as determine the ff.:

1. Use the Law of Reflection to make incident and reflected rays
2. Locate the image formed by a concave mirror.
3. Measure the focal length, distance and size of the object and image formed (in cm).
4. Describe the characteristics of an image formed as real or virtual, inverted or upright, smaller, larger or same in size.

Note to Teacher:
If possible, provide several setups for all groups.

After the activity, the teacher will facilitate the discussion about the Law of Reflection in Concave Mirror

DAY 4
SUB-TOPIC 3: Reflection of Light in Convex Mirrors
1. Explicitation
Activity 8.

Use the learning activity sheet (see page 14).

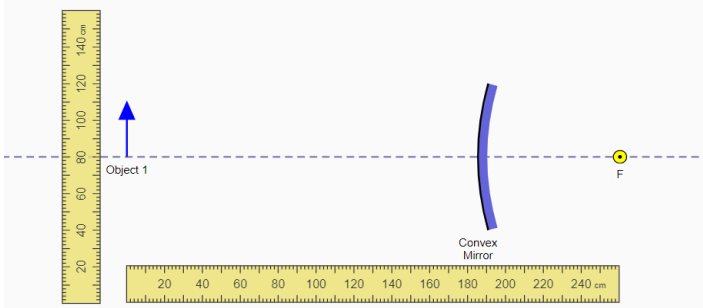
KEY to Activity 8Distance of the Object	Location of the image	Characteristics of the image
30 cm	*Behind the mirror*	*Virtual, upright, smaller*
25 cm	*Behind the mirror*	*Virtual, upright, smaller*
20 cm	*Behind the mirror*	*Virtual, upright, smaller*
15 cm	*Behind the mirror*	*Virtual, upright, smaller*
10 cm	*Behind the mirror*	*Virtual, upright, smaller*

Guide Questions:

1. The image formed by a convex mirror is always upright, virtual and. smaller.
2. Anywhere you place the object in front of a convex mirror, you cannot produce a larger image.
3. Image is formed from the intersecting reflecting rays behind the convex mirror.

2. Worked Example
Pre-activity: Image Formation by a Convex Mirror

Using the PhET interactive simulation, demonstrate the law of reflection in terms of image formation by a convex mirror.



Link: phet.colorado.edu

How can we determine the location of the image formed by a convex mirror? What are the characteristics of the image formed?

See Learning Activity Sheet: *Activity #8: Images of a Convex Mirror*

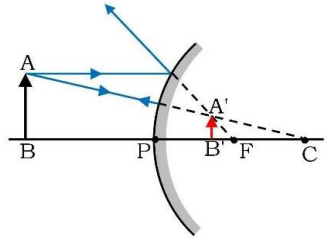


Image Source: sathee.prutor.ai

The teacher's role is to facilitate the discussion while learners actively engage / participate in doing the following tasks in the worked example:

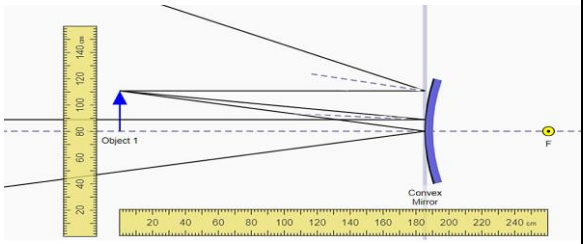
1. Use the Law of Reflection to make incident and reflected rays
2. Locate the image formed by a convex mirror.
3. Measure the distance and size of the object and image formed (in cm).
4. Describe the characteristics of image formed as real or virtual, inverted or upright smaller, larger or same in size.

The teacher should encourage the learners to think how they can make ray diagrams using the Law of Reflection to determine the location of the image formed in front of a convex mirror.

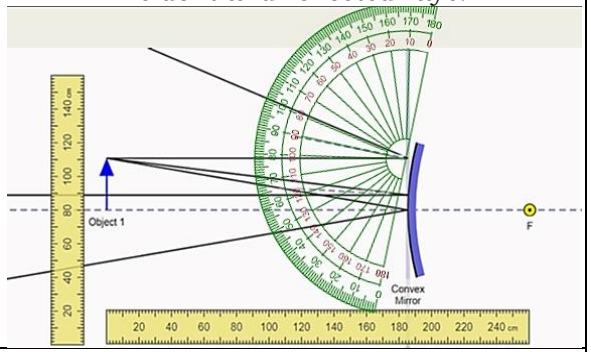
Ask a volunteer to use a ruler to measure focal length of the mirror,

Using the Law of Reflection, make incidents and reflected rays.

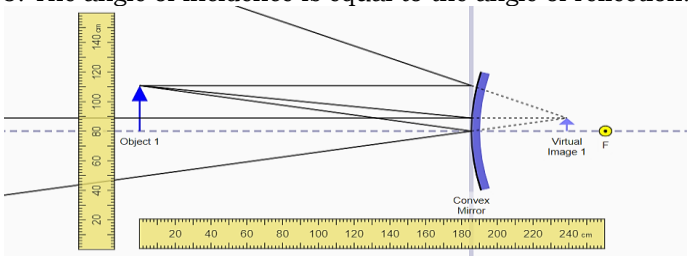
1. 30 cm object is placed 185 cm in front of a convex mirror. The focal length which is half of the radius of curvature is 75 cm.



2. Using the Law of Reflection, make incident and reflected rays.



3. The angle of incidence is equal to the angle of reflection.

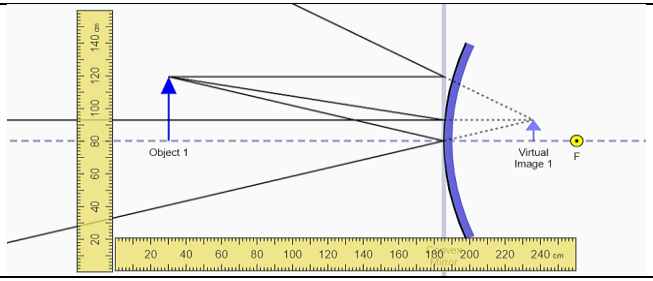


1. Lesson Activity

Activity 9.

See Learning Activity Sheet: Activity *9: Image Formation by a Convex Mirror (see page 15).*

f = 75 cm
d_o = 40 cm
d_i = 103 cm
s_o = 40 cm
s_i =-16 cm
Characteristics of Image Formed: Smaller, inverted & real image



the size of the object and its distance from the convex mirror.

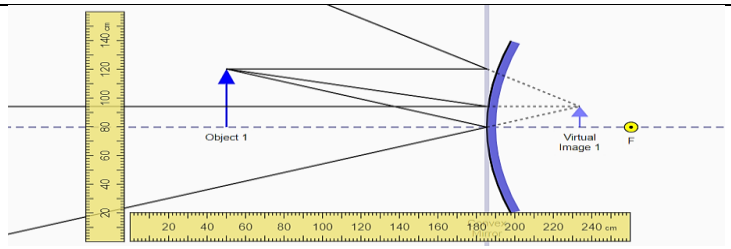
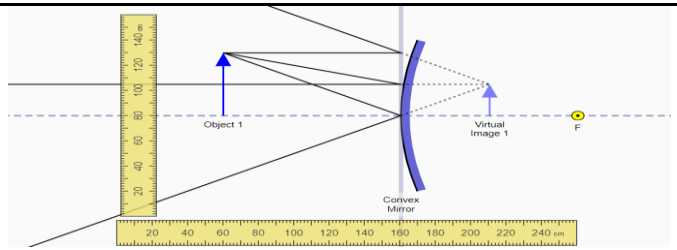
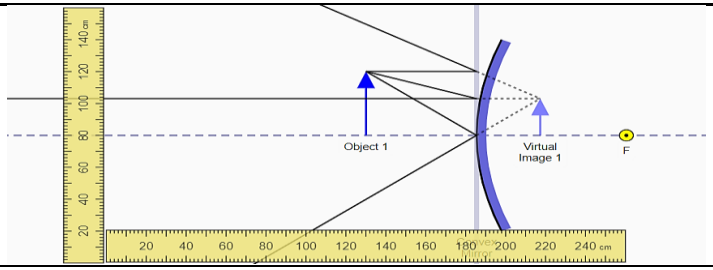
Ask another volunteer to draw a normal line and use a protractor to measure the angle of incidence and angle of reflection in order to verify the law of reflection.

Based on the measured angle, ask another volunteer to state the Law of Reflection.

The teacher should only facilitate the learning process by encouraging more volunteers to do the remaining tasks:
1. extend the reflected rays
2. draw the image
3. measure the size and distance of the image from the plane mirror.
4. compare the size of the image and the object
5. compare the distance of the image and the object.
6. determine the characteristics of image formed by a plane mirror: upright or inverted, real or virtual, smaller, larger or same size.

You may ask learners to reflect about the topic, if they really understood the process for the Image Formation by a Plane Mirror.

Learners will first answer the provided worksheet before the short interactive discussion facilitated by the teacher in order

	f = 75 cm d_o = 40 cm d_i = 103 cm s_o = 40 cm s_i =-16 cm Characteristics of Image Formed: Smaller, inverted & real image f = 75 cm d_o = 40 cm d_i = 103 cm s_o = 40 cm s_i =-16 cm Characteristics of Image Formed: Smaller, inverted & real image f = 75 cm d_o = 40 cm d_i = 103 cm s_o = 40 cm s_i =-16 cm Characteristics of Image Formed: Smaller, inverted & real image	  	to assess their understanding about the topic. This can be done individually, by pair, or by group. The teacher may emphasize the tasks of the learners in this virtual activity such as determine the ff.: 1. Use the Law of Reflection to make incident and reflected rays 2. Locate the image formed by a concave mirror. 3. Measure the focal length, distance and size of the object and image formed (in cm). 4. Describe the characteristics of an image formed as real or virtual, inverted or upright, smaller, larger, or same in size.

D. Making Generalizations

1. Learners' Takeaways

Complete the table for the characteristics of images formed by a plane, concave and convex mirror.

Type of Mirror	Size of the image	Location of the image	Characteristics of the image
Plane	Same size as the object	behind the mirror	Virtual, upright and same size

To make generalization of the lessons learned, the teacher may call volunteers to complete the table about the different images formed by a plane, concave and convex mirror.

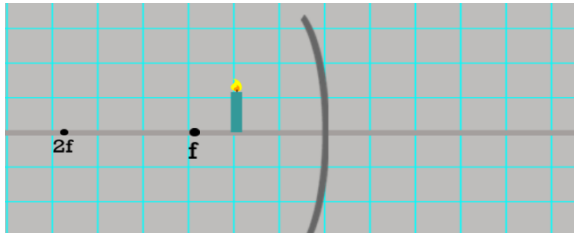
Concave	larger - Same size larger smaller	behind the mirror at infinity in front of the mirror in front of the mirror in front of the mirror in front of the mirror	Virtual, upright & larger ($d_o < f$) Real, Inverted & Same in size ($d_o = f$) Real, Inverted & Same in size ($d_o = 2f$) Real, Inverted & larger ($2f > d_o > f$) Real, Inverted & smaller ($d_o > 2f$) Real, Inverted & smaller (d_o *at infinity*)	
Convex	smaller	Behind the mirror	Virtual, upright, and smaller	

2. Reflection on Learning

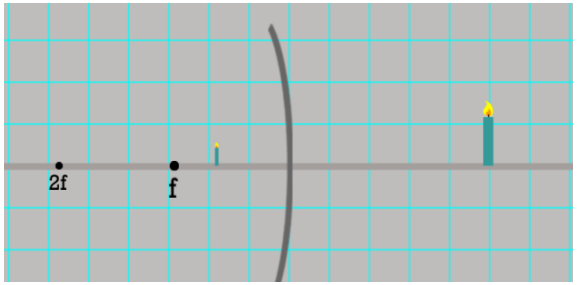
One-Page Reflection

Compose a one-page reflection discussing the real-life applications of balanced and unbalanced forces. Explain how these applications deepen your understanding of physics.

Answers may vary for the One-page reflection.

IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION		NOTES TO TEACHERS
A. Evaluating Learning	**1. Formative Assessment** This assessment evaluates learners' understanding of the topics discussed. 1. Make ray diagrams and draw the image formed by a concave mirror. Describe the image formed.  	The teacher may ask student volunteers to share and discuss their answers to the assignment. The sharing process can enhance the overall learning experience of the learners.

2. Make ray diagrams and draw the image formed by a convex mirror. Describe the image formed.



2. Homework (Optional)
Make an infographic about the different applications of plane, concave and convex mirrors related to Navigation and Energy Generation.

B. Teacher's Remarks

Note observations on any of the following areas:	**Effective Practices**	**Problems Encountered**
strategies explored		
materials used		
learner engagement/ interaction		
others		

This lesson design component prompts the teacher to record relevant observations and/or critical teaching events that he/she can reflect on to assess the achievement of objectives. The documenting of experiences is guided by possible areas for observation including teaching strategies employed, instructional materials used, learners' engagement in the tasks, and other notable instructional areas.

Notes here can also be on tasks that will be continued the next day or additional activities needed.

C. Teacher's Reflection	*Reflection guide or prompt can be on:* ▪ *principles behind the teaching* *What principles and beliefs informed my lesson?* *Why did I teach the lesson the way I did?* ▪ *learners* *What roles did my learners play in my lesson?* *What did my learners learn? How did they learn?* ▪ *ways forward* *What could I have done differently?* *What can I explore in the next lesson?*	This lesson design component guides the teacher in reflecting on and for practice. Entries on this component will serve as inputs for the LAC sessions, which can center on sharing the best practices discussing problems encountered and actions to be taken; and identifying anticipated challenges and intended solutions. Guide questions or prompts may be provided here.