Name: _____

Optics Mini-Unit Classwork

Conceptual Example #1: Light

You are playing baseball and playing Center Field (Position 8). Your friend is the Short Stop (Position 6). If the opponent hits the ball, who will notice the ball being hit first?

A. You

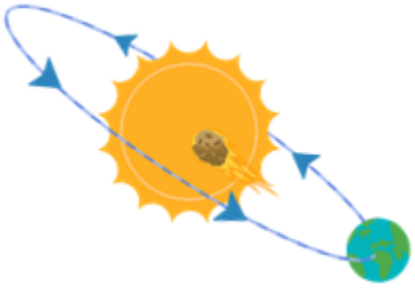
B. Your Friend

C. Both will see the ball hit at the same time.

D. Impossible to tell.

Example #1: Light

An astronomer is looking at the sun which is 150,000,000,000 meters away. While looking at the sun, an asteroid crashes into the sun. How long will it take before the astronomer sees with her own eyes that this crash happened? (Speed of light is 300,000,000 m/s)



Conceptual Example #2: Reflection

How does the image of an object appear when placed in front of a plane mirror?

A. Upright, larger than the object, and real

B. Upright, same size as the object, and virtual

C. Inverted, smaller than the object, and real

D. Inverted, larger than the object, and virtual

E. Upright, larger than the object, and virtual

Conceptual Example #3: Reflection

An object is placed in front of a plane mirror. Where does the image appear in the mirror?

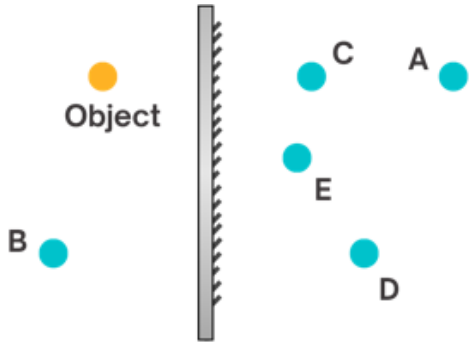
A. A

B. B

C. C

D. D

E. E



Conceptual Example #4: Spherical Mirrors

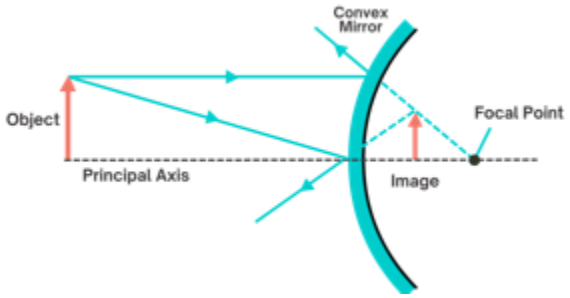
Looking at the diagram below, select all that apply about the image:

A. Real

B. Virtual

C. Upright

D. Inverted



Conceptual Example #5: Spherical Mirrors

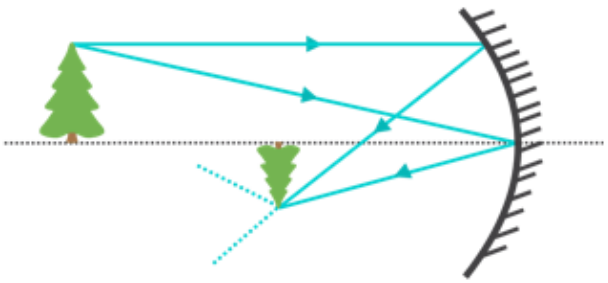
Looking at the diagram below, select all that apply about the image:

A. Real

B. Virtual

C. Upright

D. Inverted



Conceptual Example #6: Spherical Mirrors

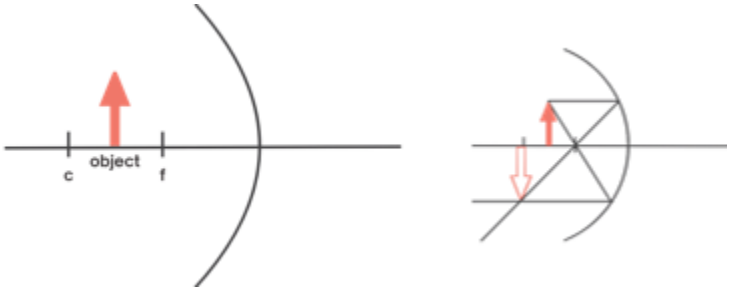
Looking at the diagram below, select all that apply about the image:

A. Real

B. Virtual

C. Upright

D. Inverted



Conceptual Example #7: Spherical Mirrors

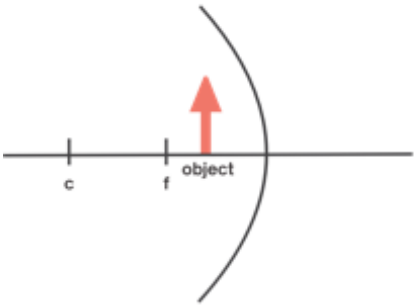
Looking at the diagram below, select all that apply about the image:

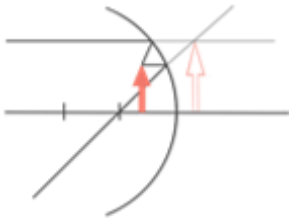
A. Real

B. Virtual

C. Upright

D. Inverted





Conceptual Example #8: Spherical Mirrors

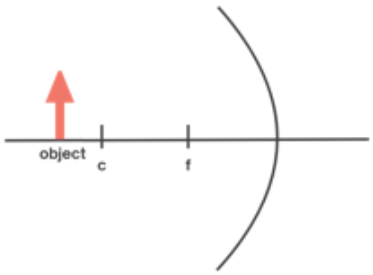
Looking at the diagram below, select all that apply about the image:

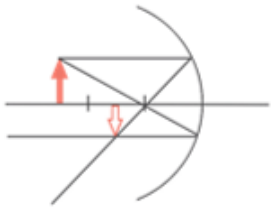
A. Real

B. Virtual

C. Upright

D. Inverted





Conceptual Example #9: Spherical Mirrors

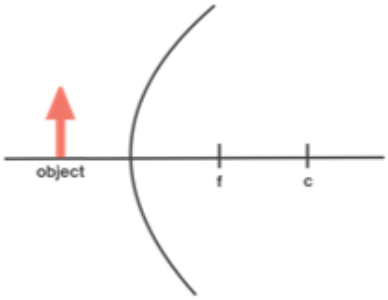
Looking at the diagram below, select all that apply about the image:

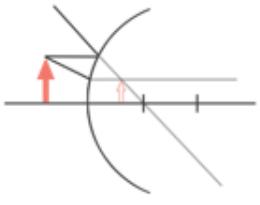
A. Real

B. Virtual

C. Upright

D. Inverted

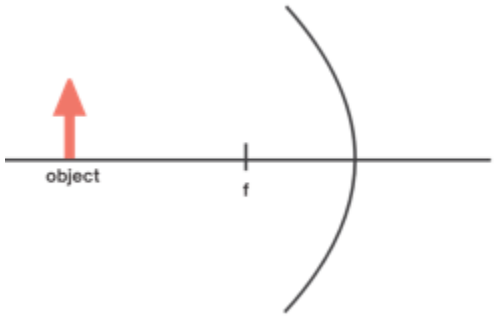




Example #2: Spherical Mirrors

A small lightbulb is placed 18 cm in front of a concave mirror that has a focal length of 6 cm.

A. How far from the mirror will the image form? And will it be on the right or the left of the mirror?

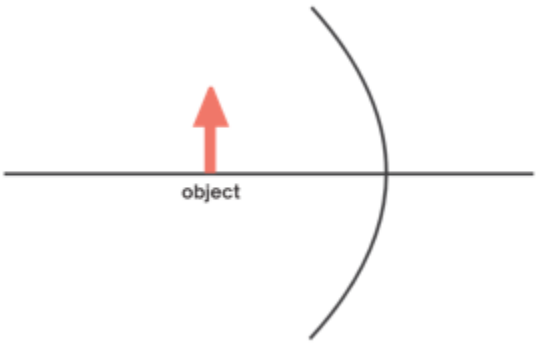


B. What is the magnification of the image? Is it inverted or upright?

Example #3: Spherical Mirrors

A 5 cm tall cup is placed 10 cm in front of a concave mirror with a focal length of 15 cm.

A. Find the image distance.

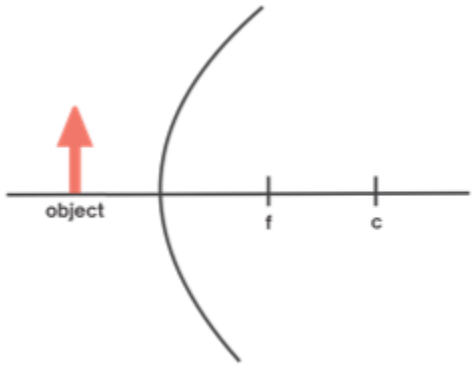


B. Calculate the image height using magnification.

Example #4: Spherical Mirrors

A convex mirror has a focal length of –20 cm. A tool box is located 40 cm in front of the mirror.

A. Find the image distance.



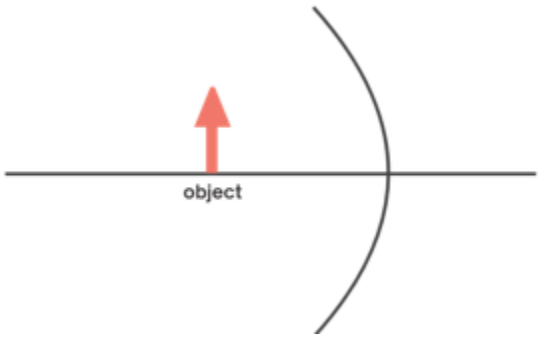
B. Determine if the image is real or virtual.

Example #5: Spherical Mirrors

An apple is placed 25 cm in front of a concave mirror. The image is formed 50 cm in front of the mirror

A. What is the focal length of the mirror?

B. Is the image real or virtual?

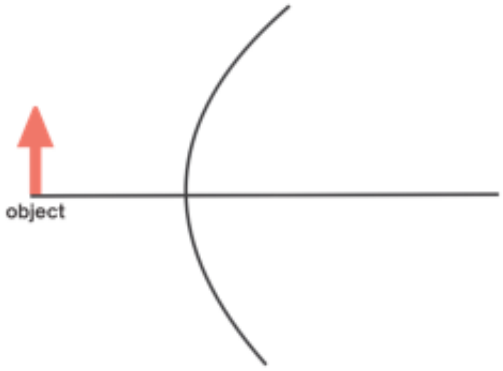


Example #6: Spherical Mirrors

A convex mirror produces an image 10 cm behind the mirror for an object placed 30 cm in front of it

A. Calculate the focal length of the mirror.

B. Determine the magnification.



Conceptual Example #10: Refraction

A Sun ray is racing toward earth from space. As the ray reaches Earth's atmosphere, what happens to the speed of the ray?

A. It slightly increases.

B. It slightly decreases.

C. It stays the same.

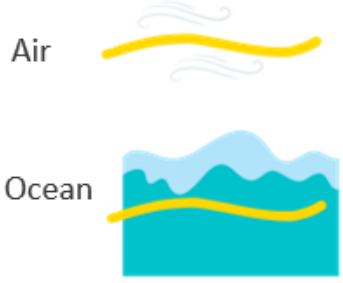
Conceptual Example #11: Refraction

Two rays of light are traveling through different mediums. Light ray 1 is moving through air, while light ray 2 is traveling through the ocean. Which light ray is faster?

A. Light ray 1

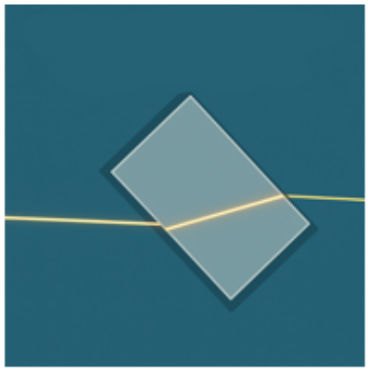
B. Light ray 2

C. Both are the same speed.



Example #7: Refraction

The speed of light in a certain glass is 2.00×10^8 m/s. What is the index of refraction of this glass?



Example #8: Refraction

A transparent material has an index of refraction of 1.70. What is the speed of light in this material?

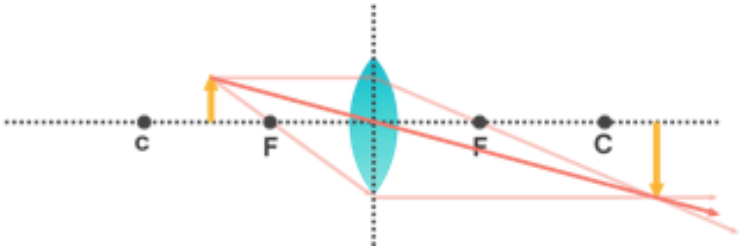
Conceptual Example #15: Thin Lenses (Converging)

Looking at the diagram below of an object that is placed between the curvature and focal point, tell me:

A. Is the image: shrunk or magnified?

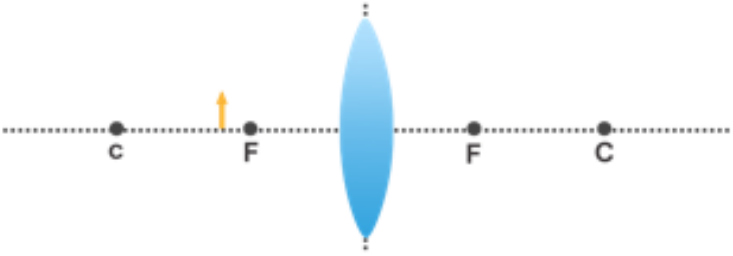
B. Is the image: virtual or real?

C. Is the image: inverted or upright?



Example #9: Thin Lenses (Converging)

Trace the Follow Diagram to find the location of the image.



Conceptual Example #16: Thin Lenses (Converging)

What type of image does a converging lens create when the object is placed beyond the curvature?

A. Virtual, upright, magnified

B. Real, inverted, reduced

C. Real, upright, reduced

D. Virtual, inverted, magnified

Conceptual Example #17: Thin Lenses (Converging)

When an object is placed between F and the lens, the image formed by a converging lens is:

A. Real, inverted, and reduced

B. Virtual, upright, and magnified

C. Virtual, inverted, and reduced

D. Real, upright, and magnified

Conceptual Example #18: Thin Lenses (Converging)

If a converging lens forms a real and inverted image, where must the object be located?

A. Between F and the lens

B. At F

C. Beyond F

D. No image is formed

Conceptual Example #19: Thin Lenses (Converging)

What happens to the image size when an object moves from beyond the curvature to just beyond F?

A. The image gets smaller

B. The image gets larger

C. The image remains the same size

D. No image forms

Conceptual Example #20: Thin Lenses (Converging)

Which lens would create a magnified, upright image?

A. A converging lens with the object beyond Curvature

B. A converging lens with the object between F and the lens

C. A converging lens with the object at Curvature

D. No converging lens can produce a magnified, upright image

Conceptual Example #21: Thin Lenses (Diverging)

Where does the image appear when an object is placed between F and the Curvature in front of a diverging lens?

A. On the far side of the lens, beyond the Curvature

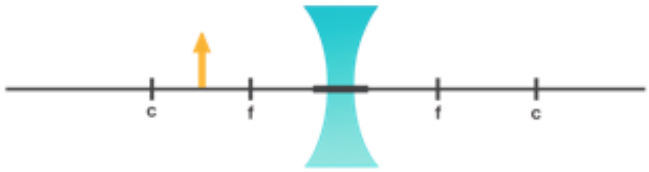
B. At the focal point on the far side

C. On the same side as the object, between the lens and F

D. No image is formed

Example #10: Thin Lenses (Diverging)

Trace the Follow Diagram to find the location of the image.



Conceptual Example #22: Thin Lenses (Diverging)

What type of image does a diverging lens always produce?

A. Real and inverted

B. Virtual and upright

C. Real and upright

D. Virtual and inverted

Conceptual Example #23: Thin Lenses (Diverging)

Where is the image formed by a diverging lens?

A. On the far side of the lens

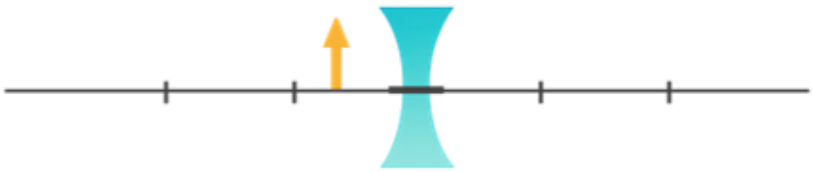
B. At the focal point

C. On the same side as the object

D. No image is formed

Example #11: Thin Lenses (Diverging)

Trace the Follow Diagram to find the location of the image.



Example #12: Thin Lenses (Diverging)

Trace the Follow Diagram to find the location of the image.

Conceptual Example #24: Thin Lenses (Diverging)

What happens to the image size as the object moves farther from a diverging lens?

A. It gets larger

B. It gets smaller

C. It remains the same

D. It becomes inverted

Example #13: Thin Lenses (Converging)

An object is 20 cm in front of a converging lens with focal length of 10 cm.

A. Find the Image distance.

B. What is the magnification of the image?

C. Is the image upright or inverted?

D. Is the image real or virtual?

Example #14: Thin Lenses (Diverging)

An object is 30 cm in front of a diverging lens with focal length of 15 cm.

A. Find the Image distance.

B. What is the magnification of the image?

C. Is the image upright or inverted?

D. Is the image real or virtual?

Example #15: Thin Lenses (Converging)

A converging lens forms an image 30 cm on the opposite side of the object. The object is placed 60 cm from the lens.

A. What is the focal length?

B. What is the magnification of the image?

C. Is the image upright or inverted?

D. Is the image real or virtual?

Example #16: Thin Lenses (Converging)

A converging lens with focal length 12 cm forms an image 18 cm on the opposite side of a 10 cm tall object.

A. What is the object distance from the lens?

B. What is the height of the image?

C. Is the image upright or inverted?

D. Is the image real or virtual?

Example #17: Thin Lenses (Diverging)

A 14 cm tall object is placed 20 cm in front of a diverging lens. The lens forms an image 10 cm away from the lens on the same side as the object.

A. What is the focal length?

B. What is the height of the image?

C. Is the image upright or inverted?

D. Is the image real or virtual?