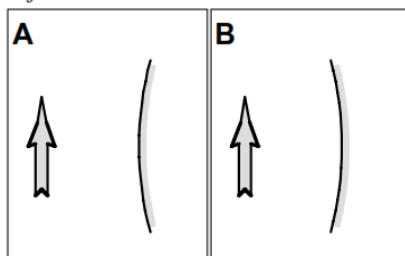


## AP Physics 2 – Mirrors and Lenses

### E2-CT13: OBJECTS INSIDE FOCAL LENGTH OF CURVED MIRRORS—IMAGE DISTANCE

In the two situations shown, the mirrors have the same focal lengths, and the object distance from the mirror to the arrow is the same. In both cases, the object distance is less than the focal distance.

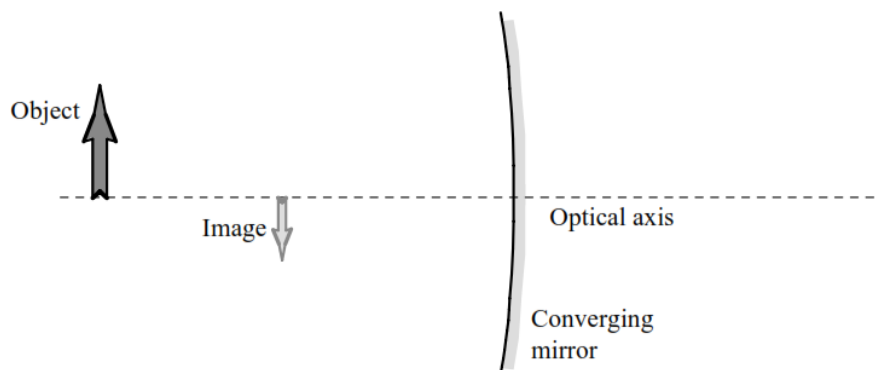


Will the image distance for Case A be (i) *greater than*, (ii) *less than*, or (iii) *equal to* the image distance for Case B? \_\_\_\_\_

Explain your reasoning.

### E2-WBT14: OBJECT AND INVERTED IMAGE FOR A CONVERGING MIRROR—FOCAL POINT

An object is placed in front of a converging mirror. An inverted image of the object is formed at the location shown.

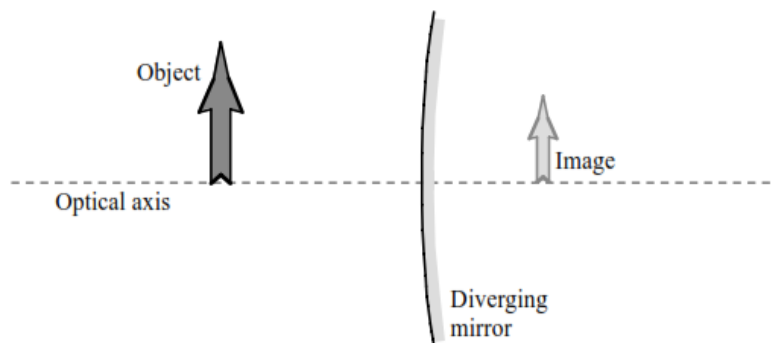


Based on the image and object locations above, find the focal point for this mirror.

Explain your reasoning.

### E2-WBT16: OBJECT AND UPRIGHT IMAGE FOR A DIVERGING MIRROR—FOCAL POINT

An object is placed in front of a diverging mirror. An upright image of the object is formed behind the mirror at the location shown.

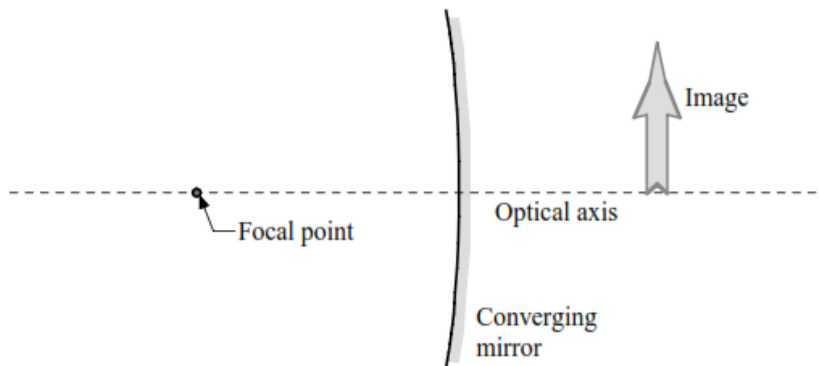


Based on the image and object locations, find the focal point for this mirror.

Explain your reasoning.

**E2-WBT17: IMAGE FOR A CONVERGING MIRROR—OBJECT**

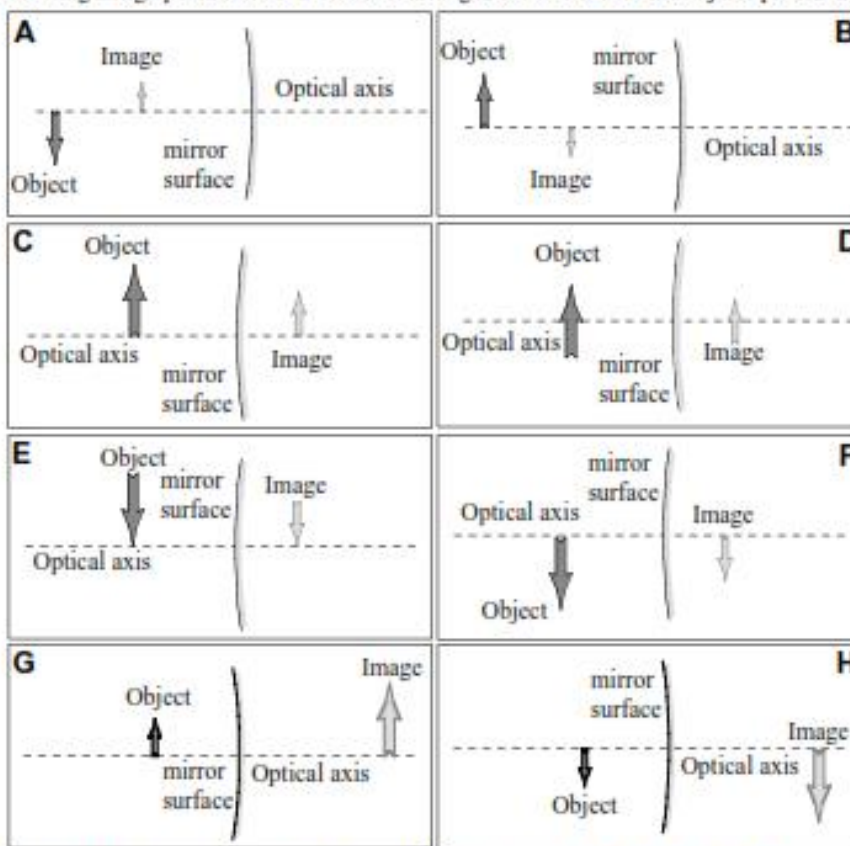
An arrow is placed in front of a converging mirror. An upright image of the arrow is formed to the right of the mirror at the location shown.



Based on the location of its image, find the location of the arrow.  
Explain your reasoning.

**E2-QRT21: IMAGE AND OBJECT LOCATIONS RELATIVE TO MIRRORS—IMAGE TYPES**

Consider the following image positions for the mirrors arranged as shown with the objects placed on the left side.

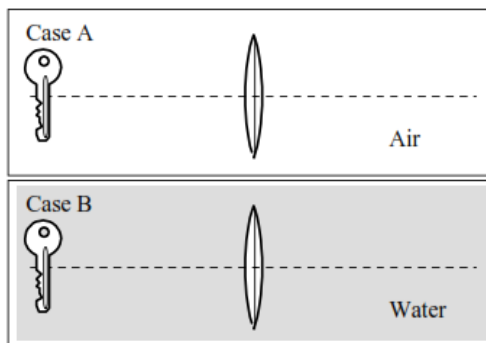


(a) List all the cases that produced a virtual image of the object:  
Explain your reasoning.

(b) List all the cases that produced a reduced size image of the object:  
Explain your reasoning.

**E2-CT24: IMAGE FORMED IN AIR AND IN WATER—DISTANCE FROM LENS OR MIRROR**

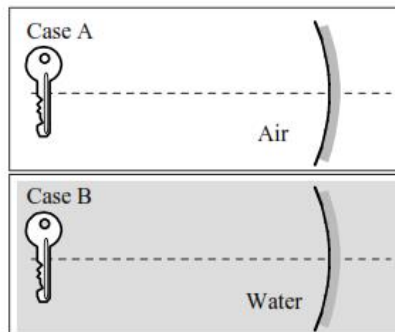
(a) In each case, a key is placed in front of a converging lens so that an inverted image of the key is formed on the other side of the lens. (The object distance is greater than the focal distance.) The two cases are identical except that the key and lens are in air in Case A and in water in Case B.



Is the distance from the lens to the image of the key (the image distance) (i) *greater in Case A*, (ii) *greater in Case B*, or (iii) *the same in both cases*? \_\_\_\_\_

Explain your reasoning.

(b) In each case, a key is placed in front of a converging mirror so that an inverted image of the key is formed on the same side of the mirror. (The object distance is greater than the focal distance.) The two cases are identical except that the key and mirror are in air in Case A, and in water in Case B.



Is the distance from the mirror to the image of the key (the image distance) (i) *greater in Case A*, (ii) *greater in Case B*, or (iii) *the same in both cases*? \_\_\_\_\_

Explain your reasoning.

**E2-WWT32: SINGLE LENS—FOCAL LENGTH**

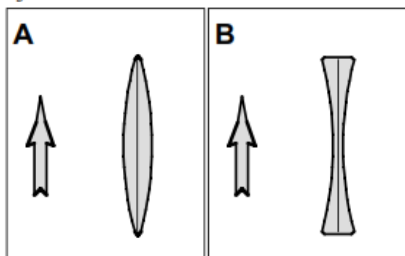
A student makes the following contention:

*“If a single lens can only produce images that are smaller than the objects involved, then the lens is a negative focal length lens.”*

What, if anything, is wrong with this statement? If something is wrong, identify it and explain how to correct all errors. If this statement is correct, explain why.

**E2-CT34: OBJECTS INSIDE FOCAL LENGTH OF LENSES—IMAGE DISTANCE I**

In the two situations shown, the lenses have the same focal lengths, and the object distance from the lens to the arrow is the same. In both cases the object distance is less than the focal distance.

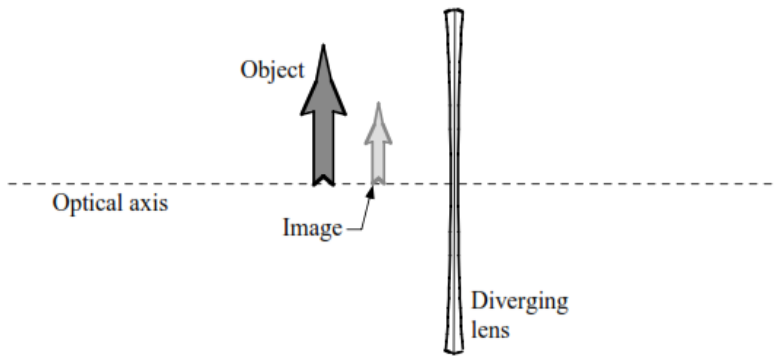


Will the image distance for Case A be (i) *greater than*, (ii) *less than*, or (iii) *equal* to the image distance for Case B? \_\_\_\_\_

Explain your reasoning.

**E2-WBT36: OBJECT AND UPRIGHT IMAGE FOR A DIVERGING LENS—FOCAL POINT**

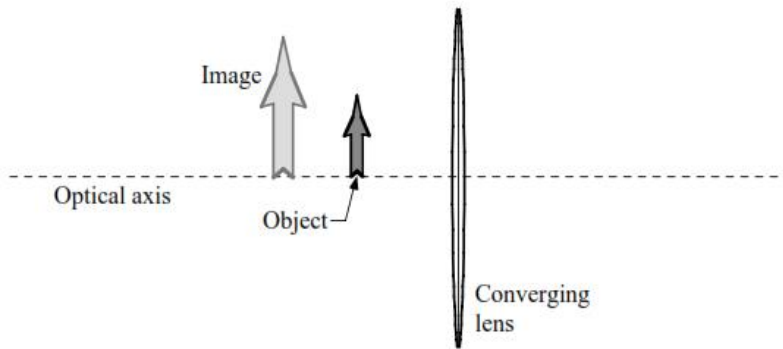
An object is placed in front of a diverging lens. An upright image of the object is formed to the left of the lens at the location shown.



Based on the image and object locations, find the two focal points for this lens.  
Explain your reasoning.

**E2-WBT38: OBJECT AND UPRIGHT IMAGE FOR A CONVERGING LENS—FOCAL POINT**

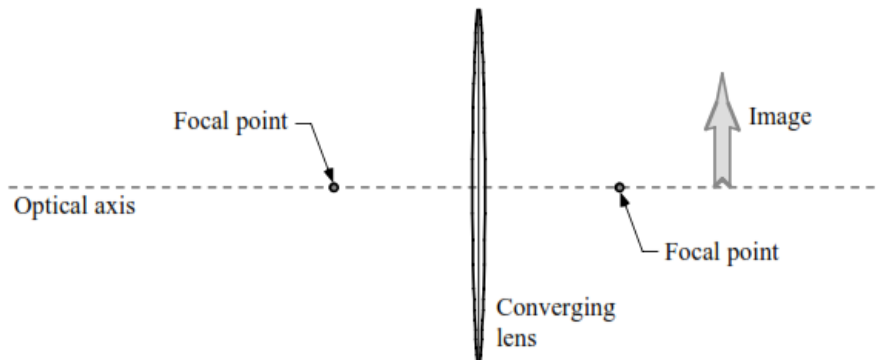
An object is placed in front of a converging lens. An upright image of the object is formed to the left of the lens at the location shown.



Based on the image and object locations, find the two focal points for this lens.  
Explain your reasoning.

**E2-WBT41: IMAGE FOR A CONVERGING LENS—OBJECT**

An arrow is placed to the left of a converging lens. An inverted image of the arrow is formed to the right of the mirror at the location shown.



Based on the location of its image, find the location of the arrow.  
Explain your reasoning.