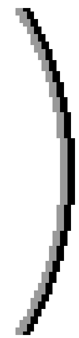
This is pages 6 –8. It is Reflection, Honors level – curved mirrors

Normally I would hand out a curved mirror and we'd look at the images. If we ever make it back to school, I will let you play with a curved mirror for a few minutes to see what we're about the describe.

Curved Mirrors

- Image is:
  - Inverted
  - Smaller
  - Upright when very close
  - Can be reflected onto a piece of paper



Concave Mirror

Imagine a little stick figure person could walk into the “cave” created by a concave mirror. (Cheesy trick)

The image is upside down and smaller. Look into a shiny spoon and you’ll see yourself upside down. If you get close enough, you’re larger and upright.

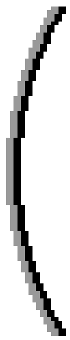
Curved Mirrors

A convex mirror bumps outward.

The image is ALWAYS upright and smaller, you get an enlarged field of view.

This is a security mirror in a store, or the side mirror of your car.

- Image is:
  - Upright
  - Smaller
  - Enlarged field of view

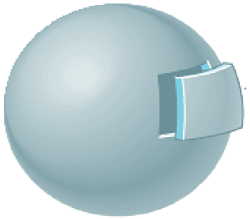


Convex Mirror

Parts of a Curved Mirror

Spherical Mirror – specifically curved mirrors which have the shape of spheres.

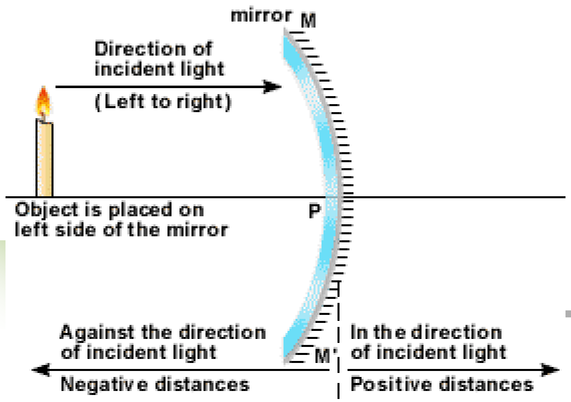
Principal Axis – a straight line perpendicular to the surface of the mirror at its center.

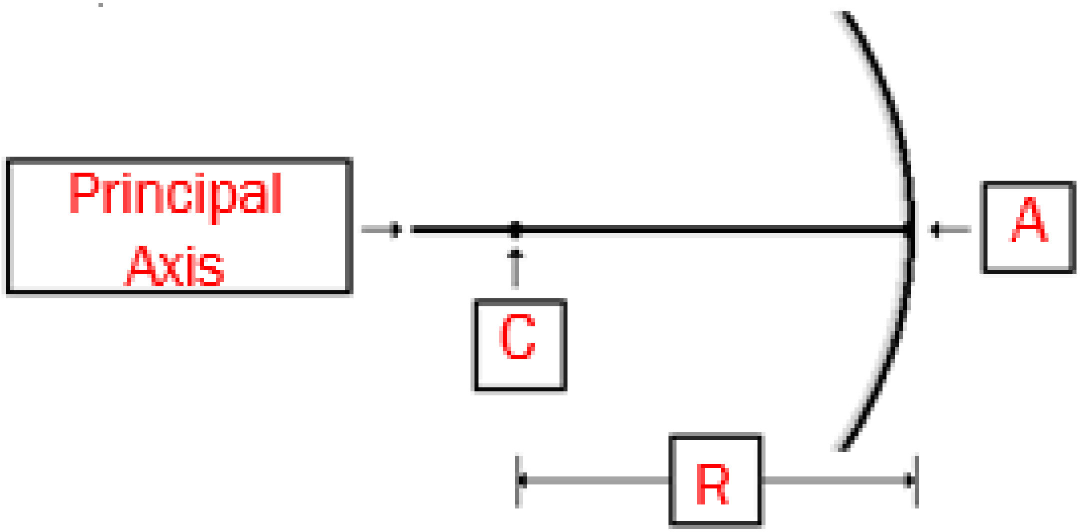


Vertex (A) - the point on the mirror's surface where the principal axis meets the mirror.

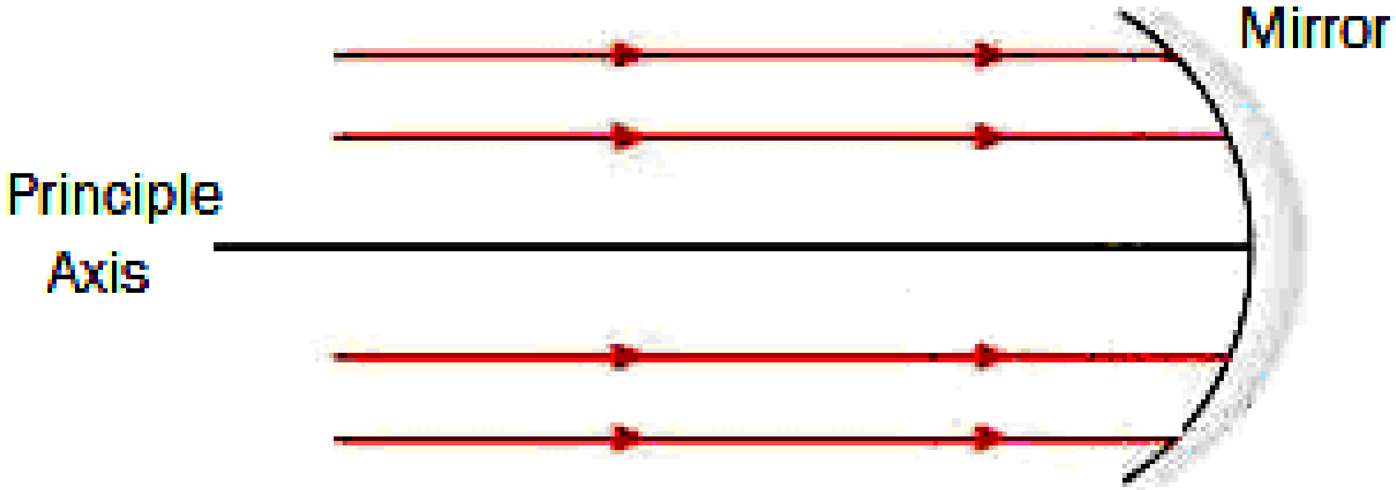
Center of Curvature (C) - the point in the center of the sphere from which the mirror was sliced.

Radius of Curvature (R) – the distance from the vertex to the center of curvature.


mirror
M
Direction of
incident light
(Left to right)
Object is placed on
left side of the mirror
P
M'
Against the direction
of incident light
Negative distances
In the direction
of incident light
Positive distances

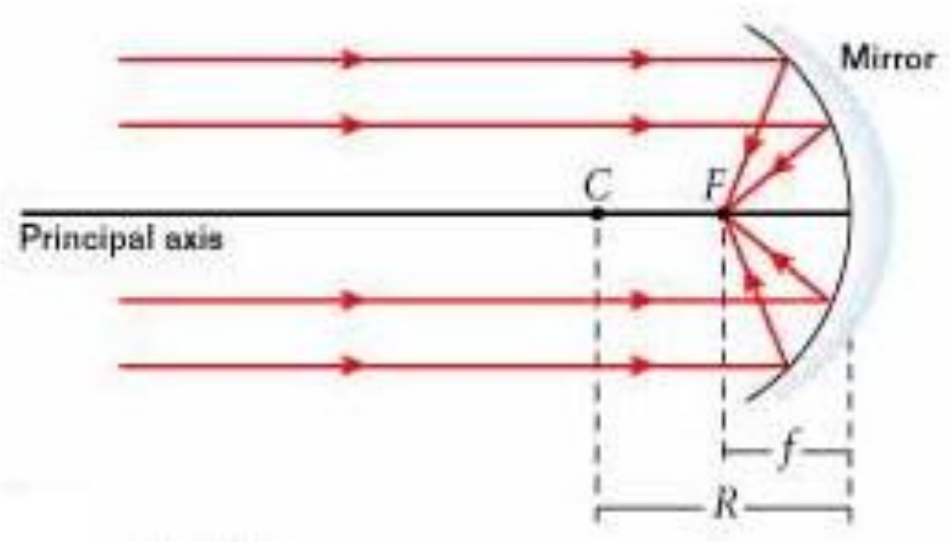

Principal
Axis
A
C
R

Focal Point



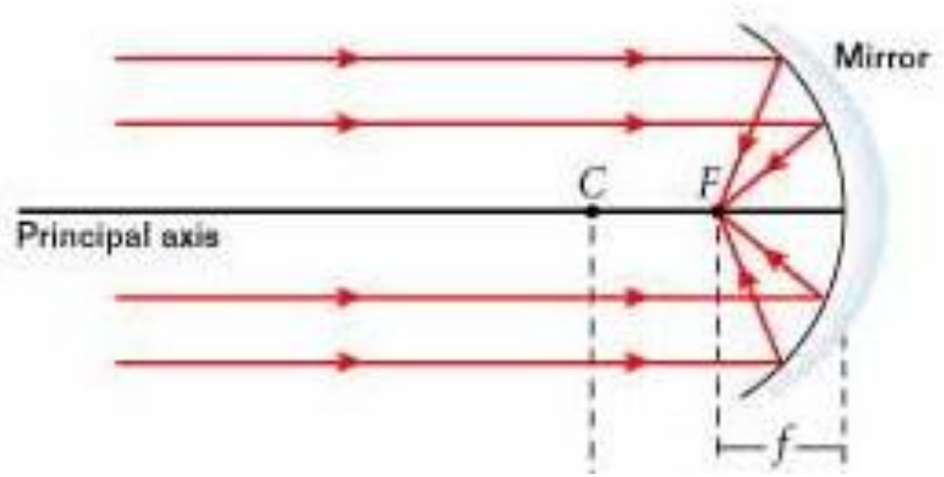
In class I would aim a parallel light source at the mirror and it would reflect and converge at a single point.

Focal Point



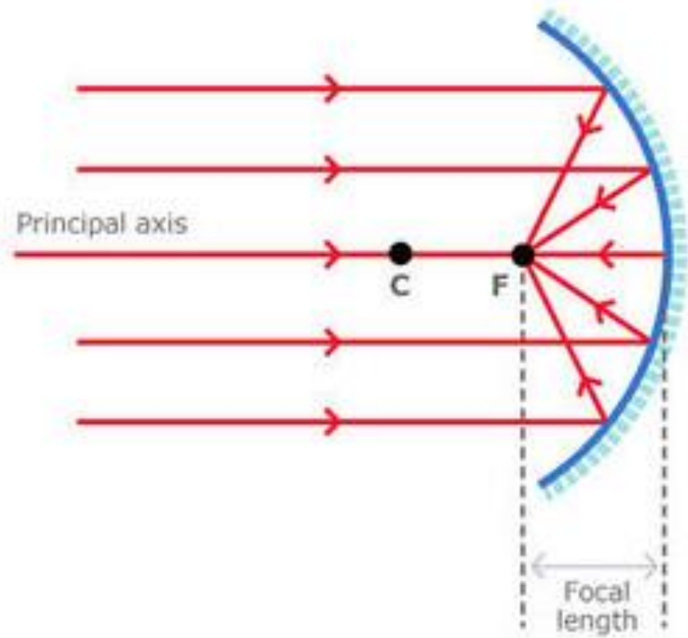
The single point where the lights converge is called the focal point or focal length, it is half the radius of curvature.

Focal Point



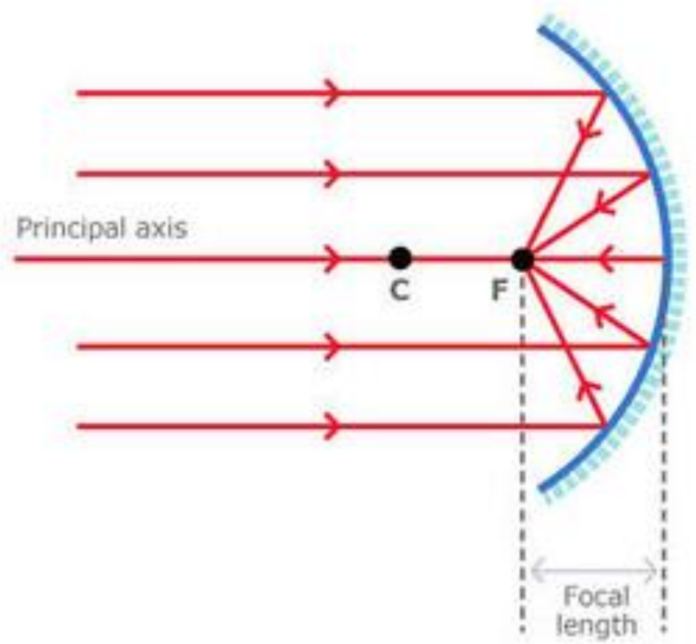
- Focal point (F) - the midpoint of the line segment adjoining the vertex and the center of curvature, the focal length would be one-half the radius of curvature.

Curved Mirrors



I would aim a light source at a concave mirror and we'd sketch the path. Sketch some parallel lines coming in, reflecting and meeting up.

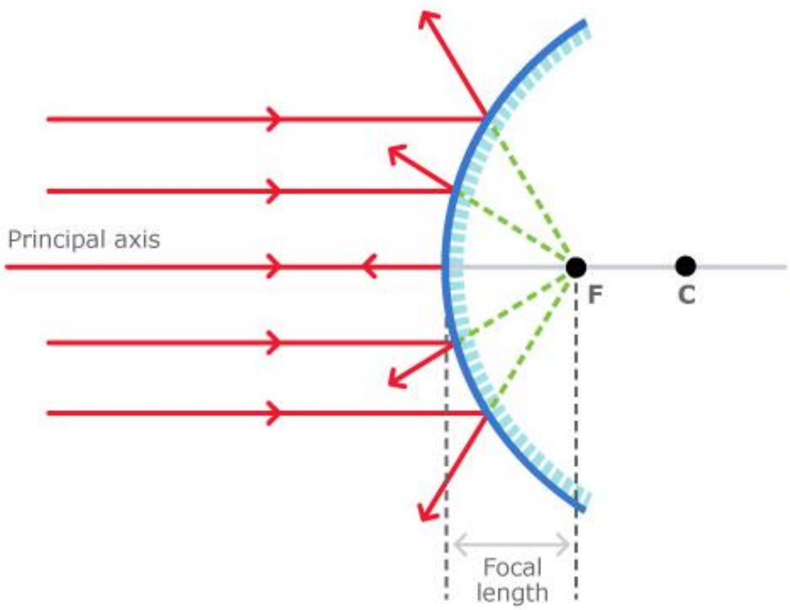
Curved Mirrors



The light converges.

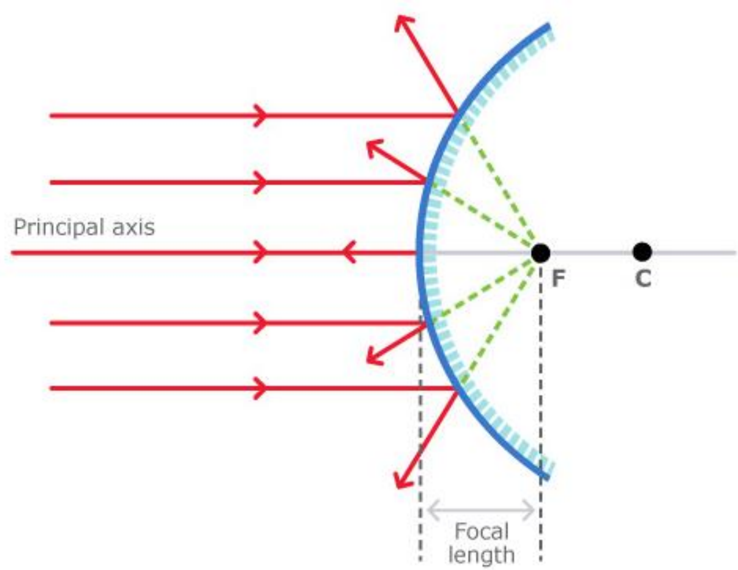
Positive focus (light really meets after reflecting off mirror)

Curved Mirrors



I would aim a light source at a convex mirror and we'd sketch the path. Sketch some parallel lines coming in, reflecting and diverging, then trace back to see where they appear to come from.

Curved Mirrors



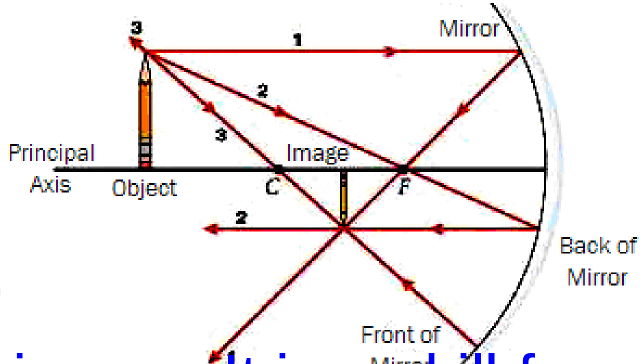
The light diverges.

Negative focus (light appears to meet in “mirrorland”)

Real vs. Virtual Images

Real	Virtual
▪ Rays actually converge and pass through the image. ▪ Can be seen on a piece of paper, or projected on a screen.	▪ Rays do not converge. ▪ Can not be projected on a piece of paper.

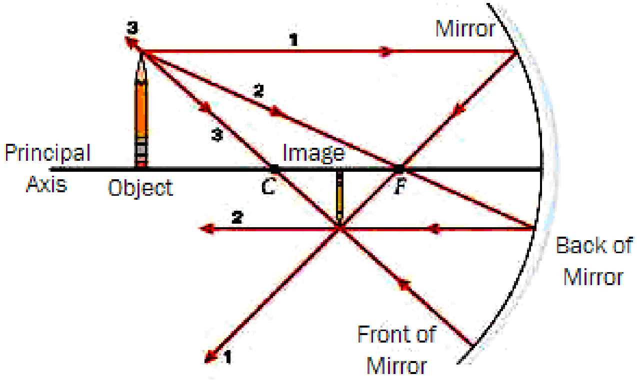
Locating Images



We need to draw ray diagram to find the image. It is a skill for the SAT II and next year in AP. There are three sets of lines that we draw.

Ray	Draw a Line from object to mirror	After reflection the ray will travel
1		
2		
3		

Locating Images

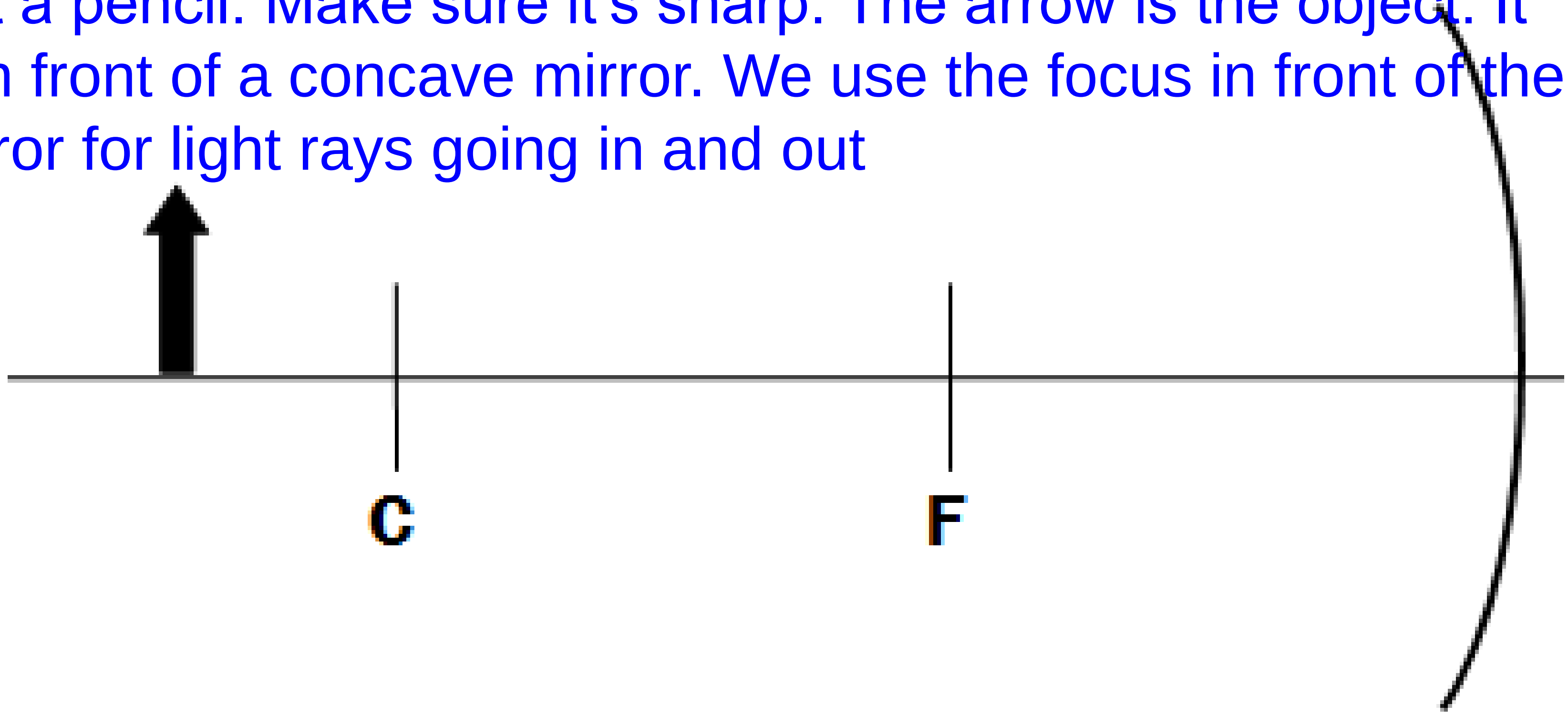


Ray	Draw a line from object to mirror...	After reflection the ray will travel...
1	parallel to principal axis	through focal point F
2	through focal point	parallel to principal axis
3	through center of curvature C	back along itself through C
	to vertex	equal and opposite angle

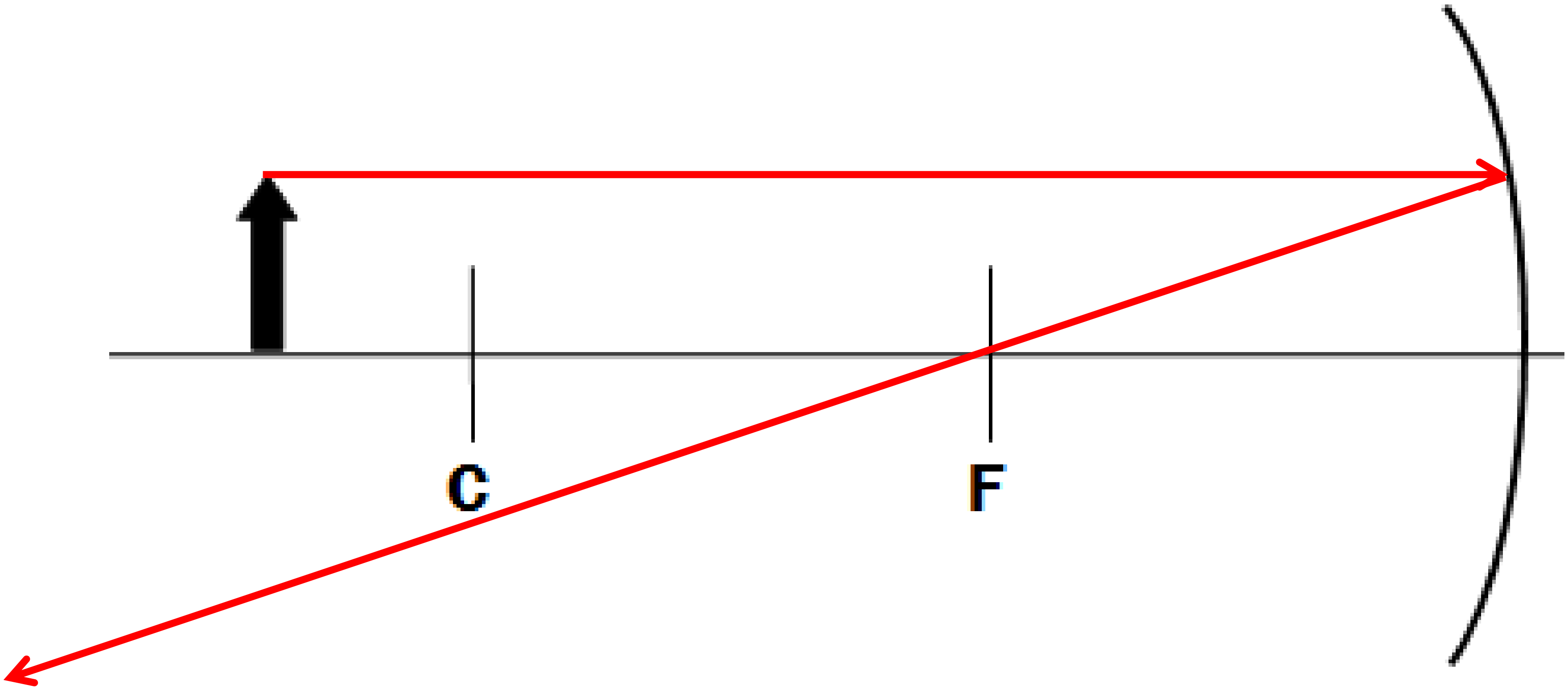
See the clipart in the picture for an example

Ray Diagrams for Concave Mirrors

Get a pencil. Make sure it's sharp. The arrow is the object. It is in front of a concave mirror. We use the focus in front of the mirror for light rays going in and out

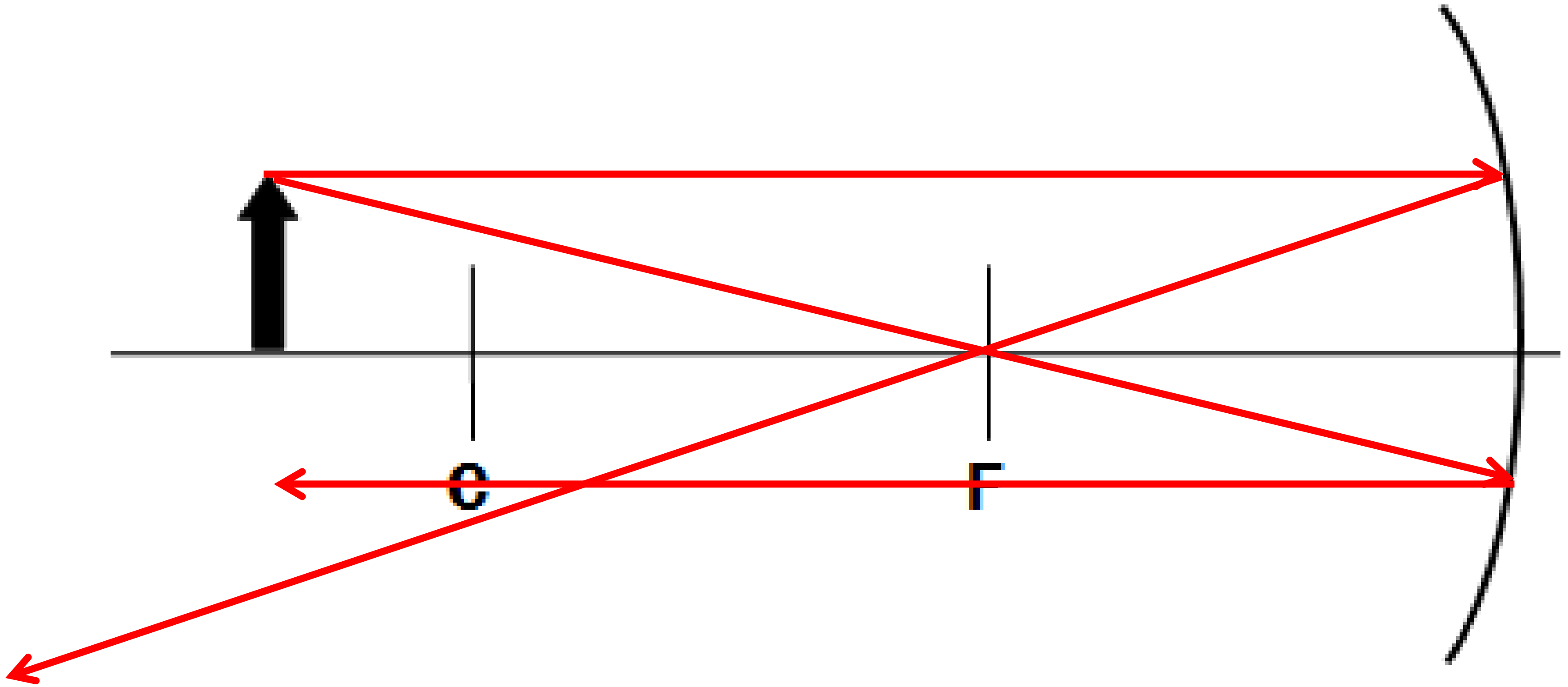


First go in parallel. The trick it to measure the arrow, place a dot at the same height and connect them. Then out through the focus.



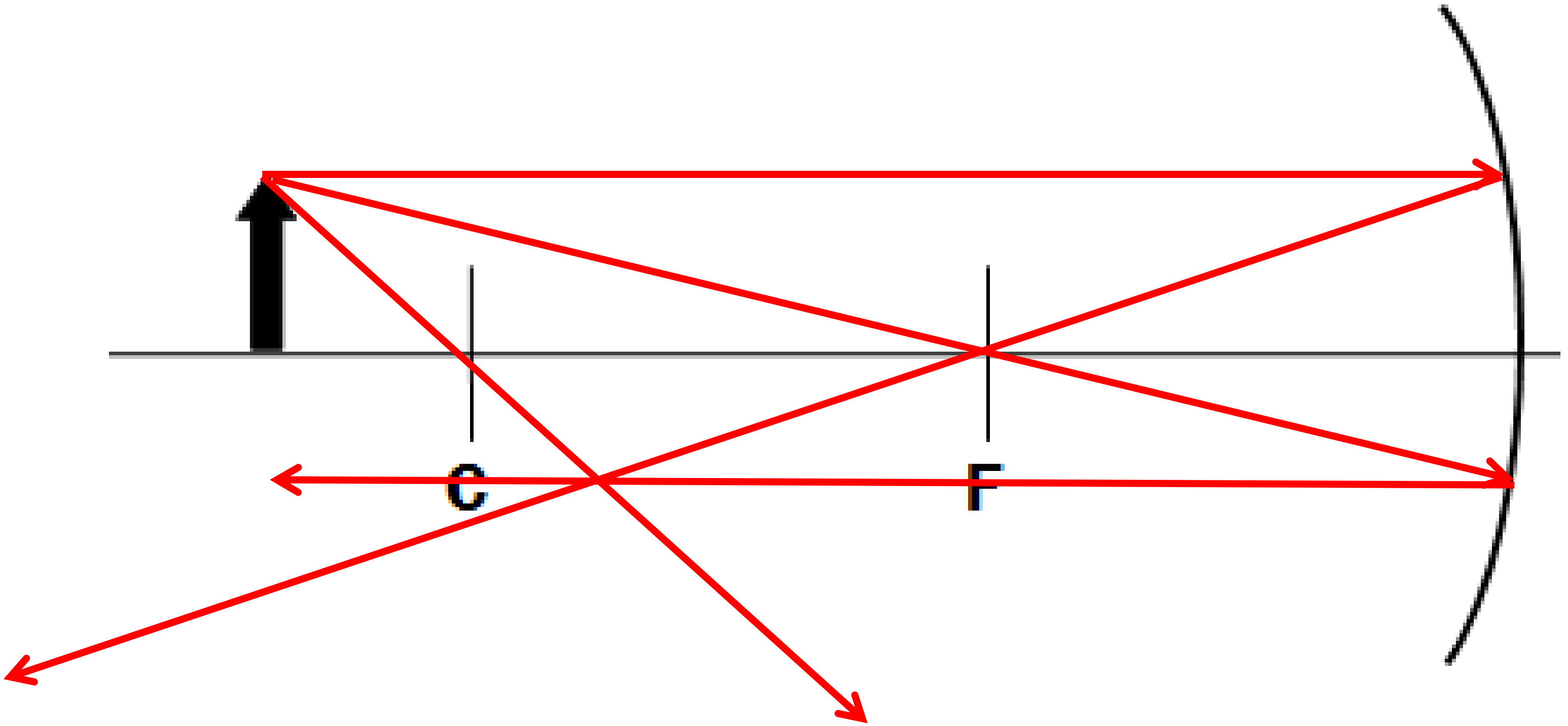
Step 1

Second go in through focus and come out parallel. No, you don’t need arrowheads.



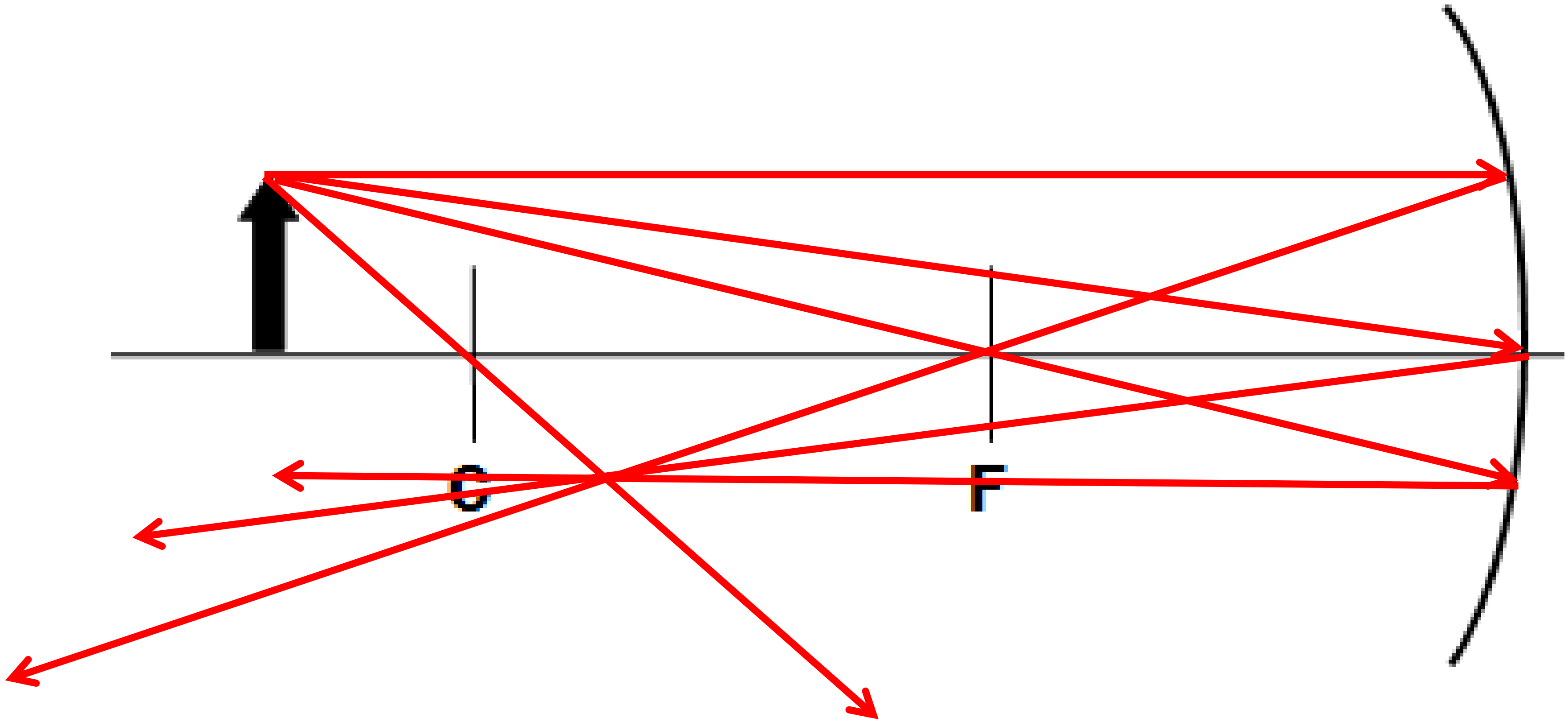
Step 2

Third go through the center of curvature.



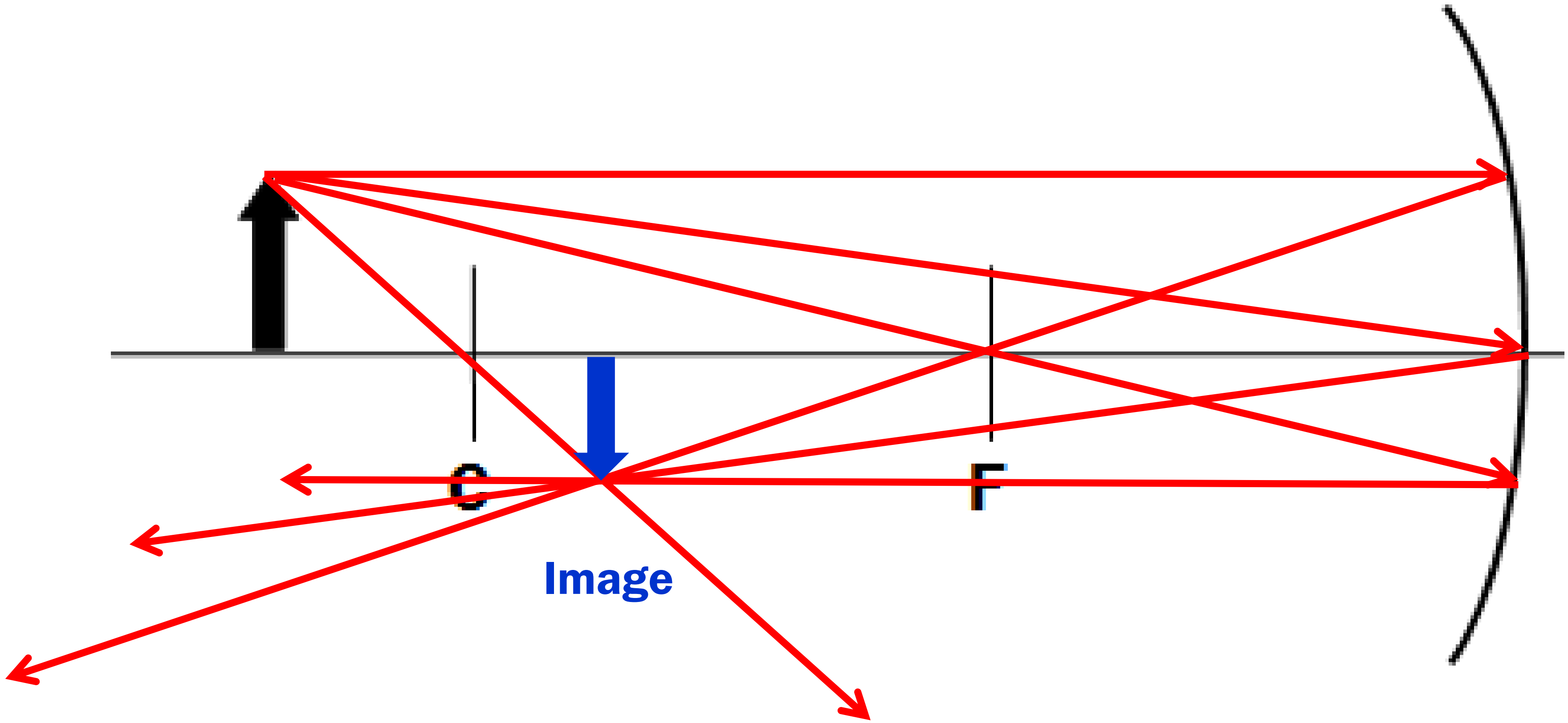
Step 3 - Option 1

OR go to the vertex, measure the angle above the line and draw the same angle below the line.



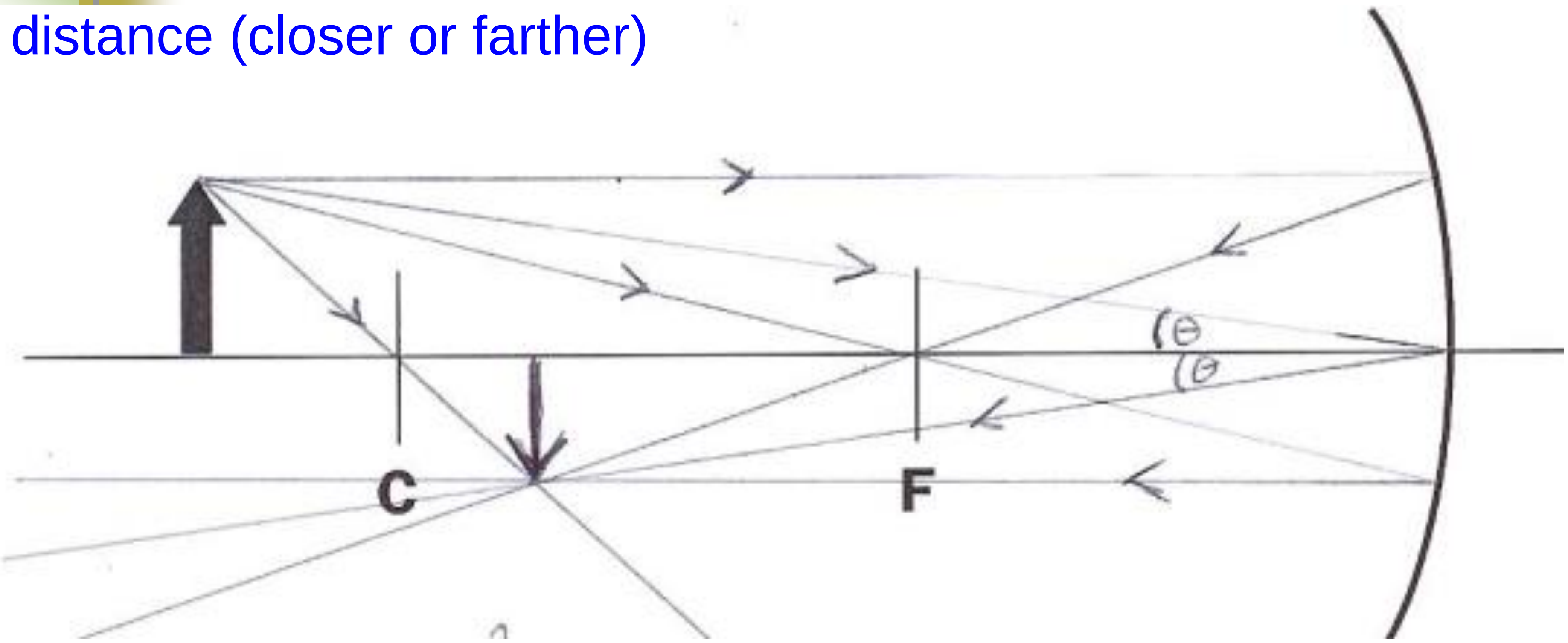
Step 3 - Option 2

Where the light rays meet is the top of the image. Draw an arrow from the principal axis to the spot where they rays meet. Include an arrowhead on the image.



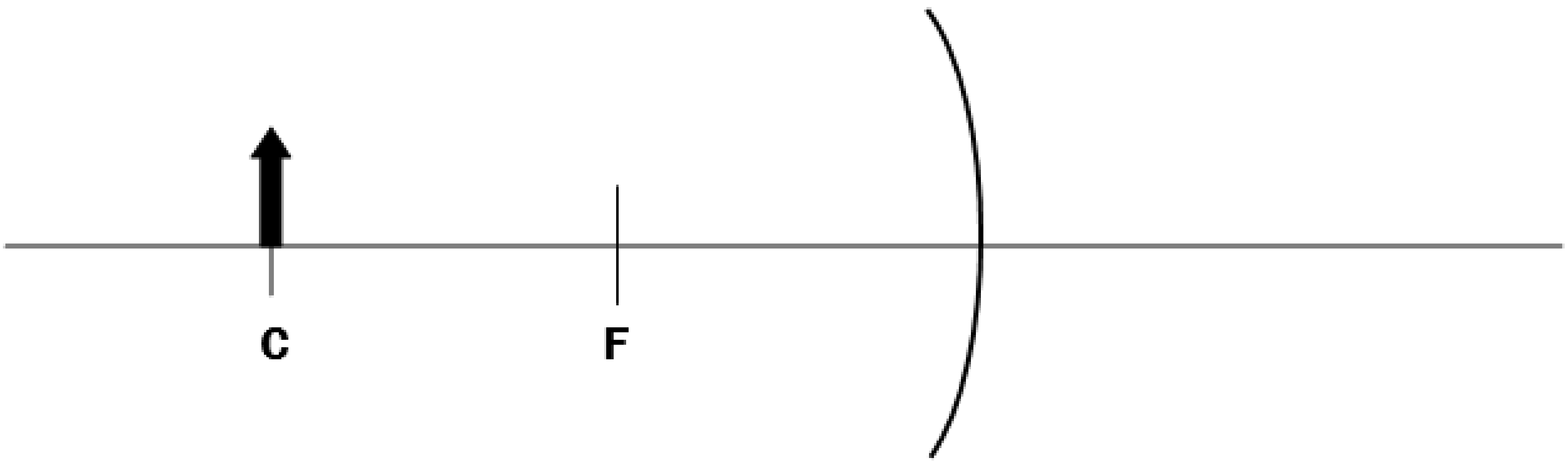
Final Picture

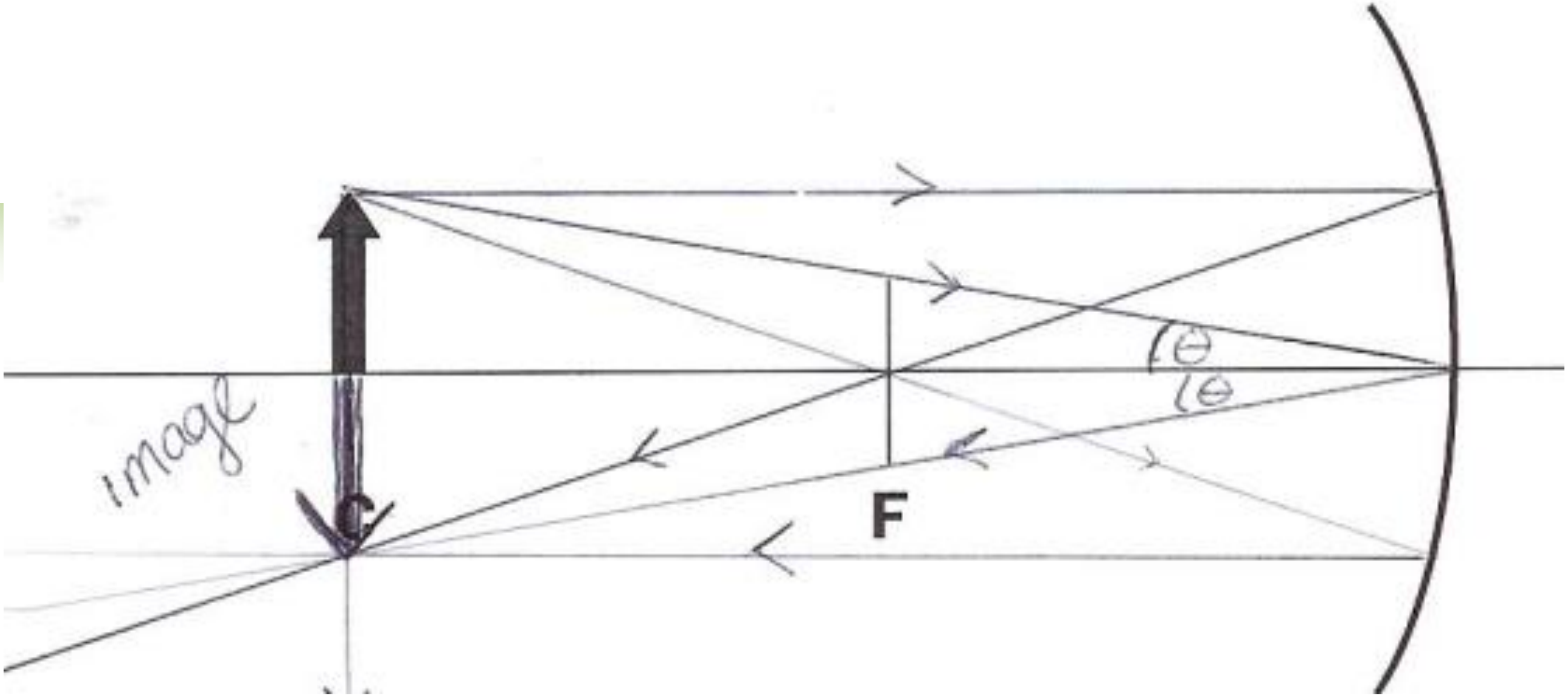
Here is my version. No you don't need arrowheads. For properties we identify the type (real or virtual), the position (upright or inverted), the size (larger or smaller), and the distance (closer or farther)



Real (because the light meets in the real world)
Inverted (because it is upside down)
Smaller (than the object)
Closer (to the mirror than the object)

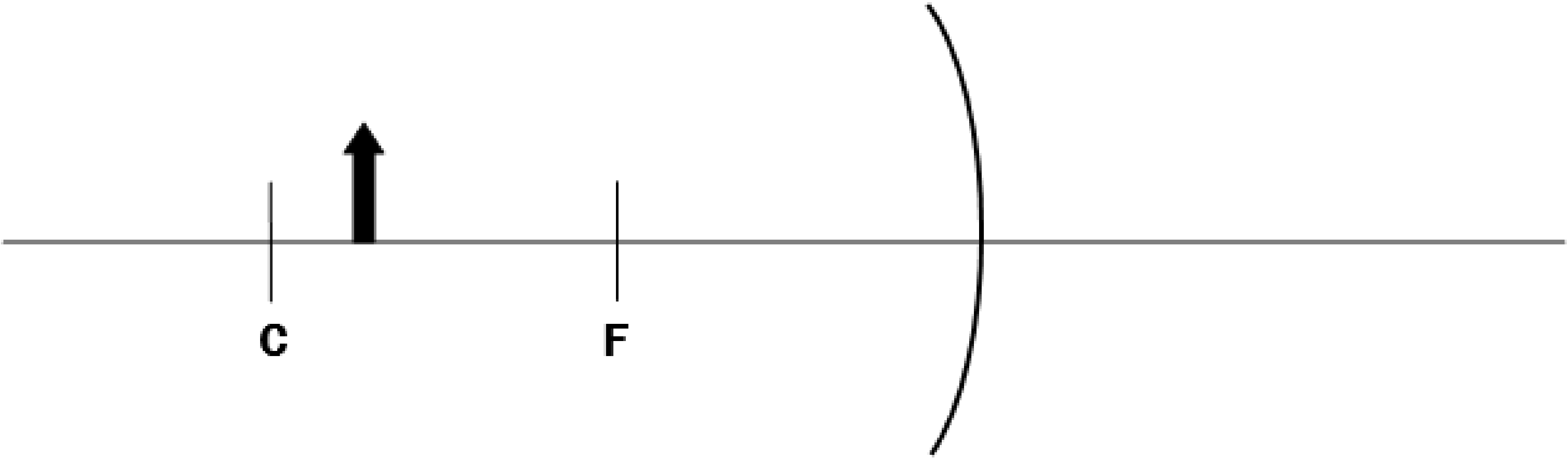
1. In parallel, out through focus
2. In through focus, out parallel
3. Through C or to vertex and out at equal angle.

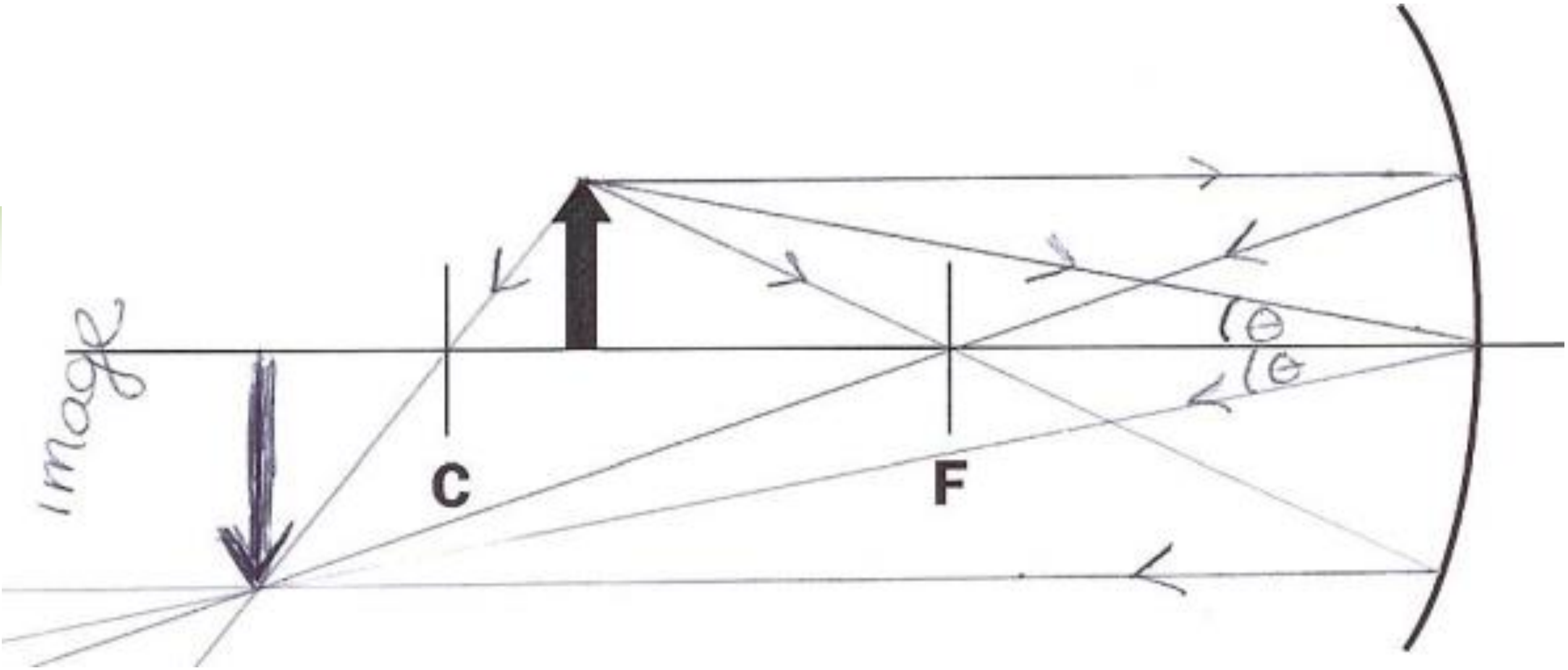




Real (because the light meets in the real world)
Inverted (because it is upside down)
Same size (as the object)
Same distance (to the mirror as the object)

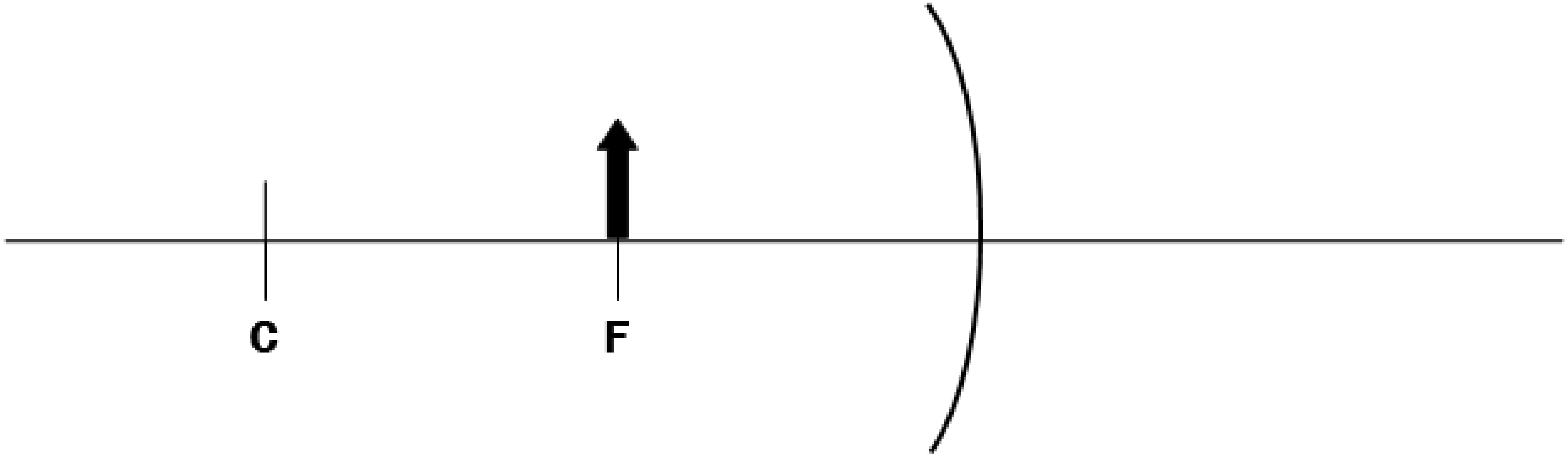
1. In parallel, out through focus
2. In through focus, out parallel
3. Through C or to vertex and out at equal angle.





Real (because the light meets in the real world)
Inverted (because it is upside down)
Larger (than the object)
Farther (to the mirror than the object)

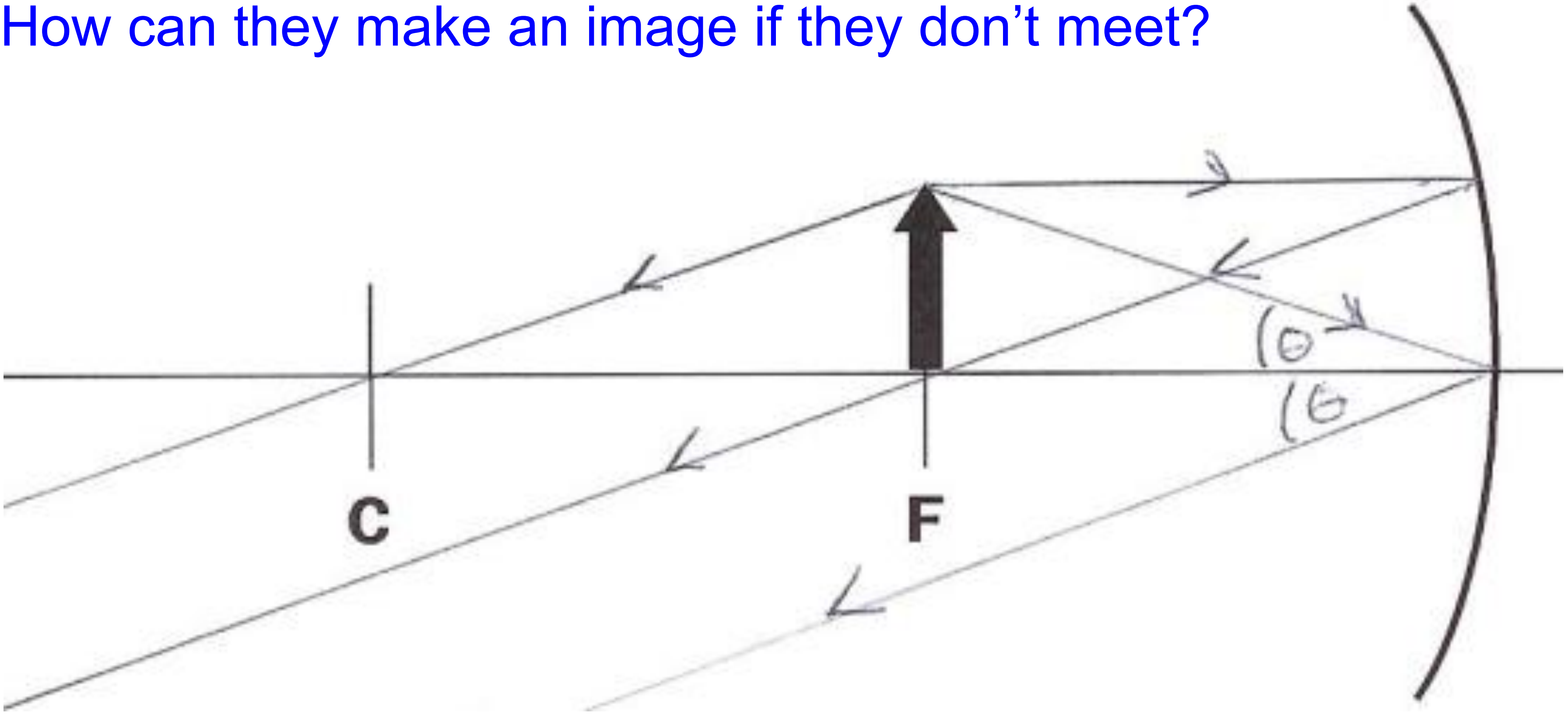
1. In parallel, out through focus
2. Through C
3. To vertex and out at equal angle.



Ray Diagrams for Concave Mirrors

These light rays NEVER meet!

How can they make an image if they don't meet?



Ray Diagrams for Concave Mirrors

They can't. It's called an infinite image or DNE (does not exist)

Car headlights will put the light at the focus of the reflective dome to create a parallel beam of light