Optometry and lenses

- terms to be familiar with:

- Near Point → Farsightedness
  - Farsighted (hyperopic) people cannot see close objects clearly
  - People with far points greater then 25 cm are said to be farsighted
  - when we say "near point too far" → farsighted
  - converging

- Far Point → Nearsightedness
  - Nearsighted (myopic) people cannot see distant objects clearly
  - People with far points less than infinite are said to be nearsighted
  - diverging

- diopters

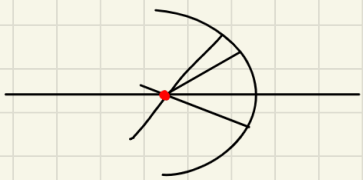
- lens perscription are often given in units of diopters
- a diopter is a unit of inverse focal length ($1/f$) f (focal length) must be in meters

- So when a question asks for lens perscription the unit should be in diopters

$$\text{diopters} = \frac{1}{f}$$

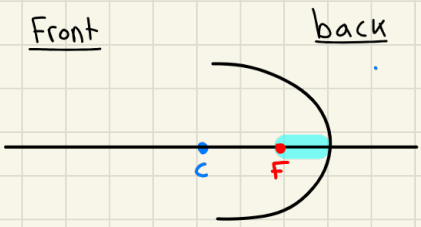
- Spherical mirrors

- we call that dot the Focal Point of the Mirror
  - this is called a concave mirror
  - Concave mirrors are converging



- the rays all intercept at the Focal Point

- Concave mirrors look like the ")" they are like a Fliped around letter C



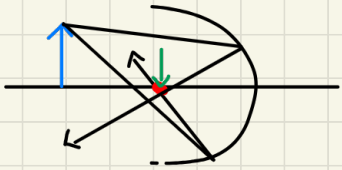
- we call the distance between the mirror and the Focal Point the Focal length

the "C" is the radius of curvature which can be defined as:

$$C = 2f$$

↖ Focal length

the radius of curvature is 2 times the Focal length



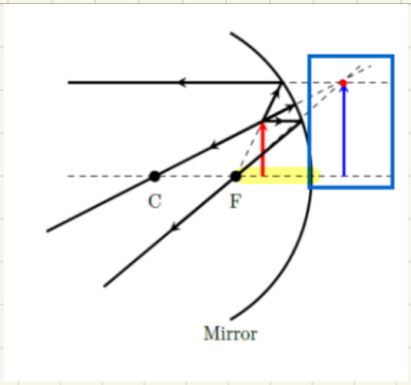
- Notice all the reflected rays meet at a single point the intersecting rays will form an image at this spot and this will be a real image

⚠ a real image will be on the same spot as the object the real image will also have a arrow pointing down (↓)

- Making a virtual image will a concave mirror:

⚠ remember a concave mirror is converging

- to make a virtual image you place the object in the focal length



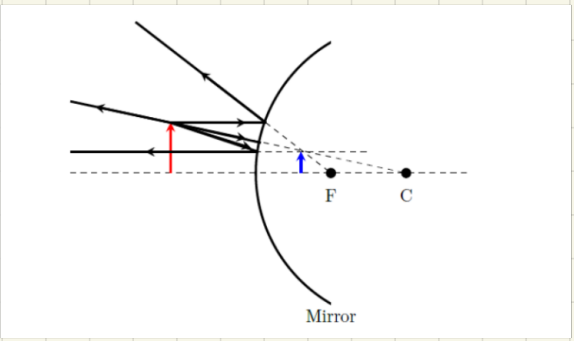
- that intersection is where the virtual image will be and it will be on the opposite side of the mirror (or "in the mirror"
- the image is in the focal length

- if the object is in front of the mirror the object distance
- the image distance will be negitive if the image is virtual

- Convex mirrors

- Convex mirrors are diverging and will always produce virtual images

Front back



- the object is in front of the mirror but not in the mirror inside the mirror the blue is the virtual image

- the i here for convex is negitive

Summary / equations

- $F > 0$ for concave mirrors
- $F < 0$ for convex mirrors
- $i > 0$ for images on the same side of the mirror as the object
- $i < 0$ for images on oppisite side of the mirror

diopters $= \frac{1}{f}$

$\frac{1}{f} = \frac{1}{o} + \frac{1}{i}$

$C = 2f$

$M = \left(\frac{-i_1}{o_1}\right)\left(\frac{-i_2}{o_2}\right)$

$M = \frac{h_i}{h_o} = \frac{-i}{o}$

Lens and mirrors

Lens/Mirrors	Focal length Sign	Object Distance	Image Type	Image Side	Image Height
Converging Lens ()	Positive	Away from Focal Point	Real (i > 0)	Opposite side of the object	Always Inverted
Converging Lens ()	Positive	Within Focal length	Virtual (i < 0)	Same side as the object	Always larger than the object
Diverging Lens)(	Negative	Neglected	Virtual (i < 0)	Same side as the object	Always smaller than the object
Concave Mirror)	Positive	Away from Focal	Real (i > 0)	Same side as the object	Always Inverted
Concave Mirror)	Positive	Within Focal length	Virtual (i < 0)	Opposite side of the object	Always larger than the object
Convex Mirror (	Negative	Neglected	Virtual (i < 0)	Opposite side of the object	Always smaller than the object

- More info to know

✡ Precription lenses For vision correction usally have a negitive image distance (i) remember From lenses virtual images are closer to the lens

- For myopia (near sightedness): concave => Virtual image
- For hyperopia (Farsighted ness): Convex => Virtual image

- So when you Face a problem that includes Fixing sight the nearpoint will be the image distance also will be negitive