Ray diagrams & Lenses:

In the following diagram, the object is on the LHS of a convex lens, to the LHS of its focal point. Focal points are marked with a small dash.

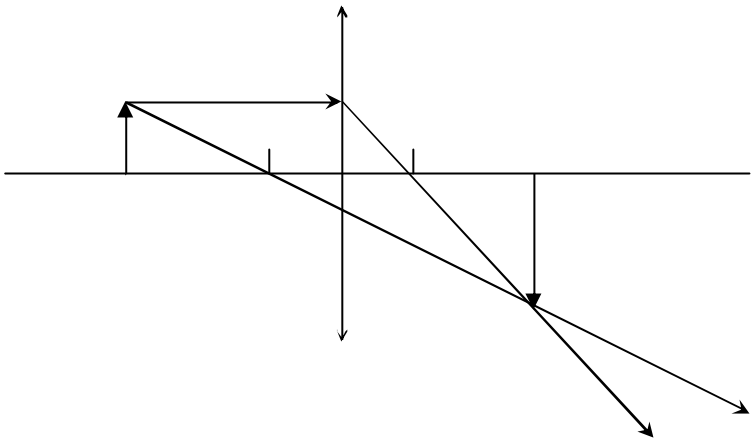

Figure 1. Ray diagram for a converging, convex lens. Notice rays leave the top of the object. One goes directly through the focal point undeflected. One travels parallel to the axis, hits the lens, then goes through the focal point on the other side (distance between the lens & focal points are the same). Where the two rays meet is the image.

If the image is on the other side of the lens, it is a "real" image.
If image on the same side of the lens to the object, then "virtual" image.

The distance from object to lens is u. Distance from image to lens is v. The focal length of the lens is denoted f. The relationship between these quantities can be derived to be:

$$\frac{1}{u}+\frac{1}{u}=\frac{1}{f}$$

The conventions for the signs of these quantities:

Quantity	*Positive when…*
Object distance: u	To the LHS of vertex of lens
Image distance: v	To the RHS of vertex of lens
Focal length : f	Convex, thus converging. Negative when concave, thus diverging.

Hence, in Figure 1, all quantities are positive.

Different types of lenses:

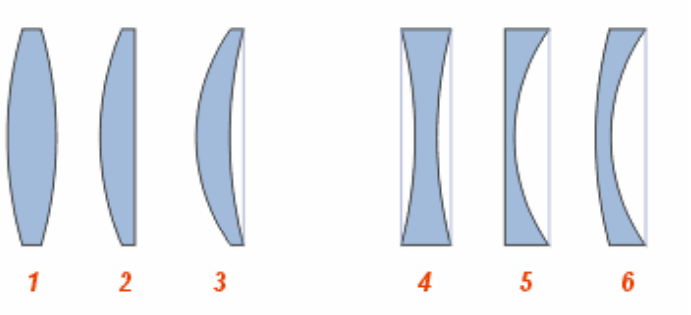

Figure 2. different types of lenses.

The types of lenses in Figure 2 are:

1) Biconvex;
2) Plano-convex;
3) Meniscus-convex;
4) Biconcave;
5) Plano-concave;
6) Meniscus-concave

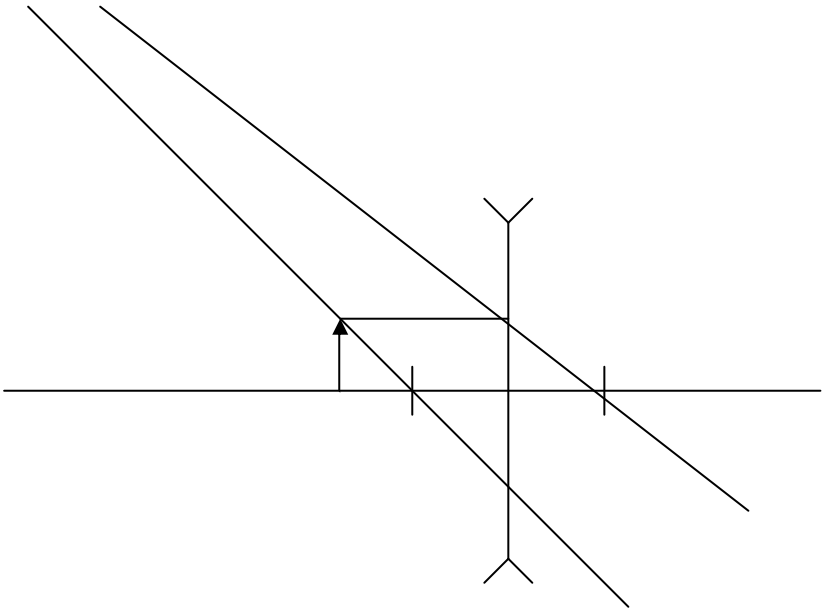

Figure 3. Ray diagram for concave lens. Should be able to see that the two rays will converge, although the point of convergence has not been drawn here. The image will be upright and virtual.

When drawing ray diagrams, two rays always need to be drawn:

From top of object, parallel to axis, then a line drawn from that point to the focal point;
From top of object, through focal point, undeflected.

And the crossing point of these two rays will be the position & height of the image.