1. p D	A. Magnification of the lens.	Which side of a lens is real? Right Side Why? Image is inverted & projected
2. q C	B. Height of the image.	
3. h E	C. Distance from lens or mirror to the image.	Which side of a mirror is real? Left Side
4. h' B	D. Distance from lens or mirror to object.	Why? projected & inverted
5. M A	E. Height of the object.	

When is f negative? divergent devices

When is q negative? if on virtual side
mirrors: R Lens: L

When is p negative? never

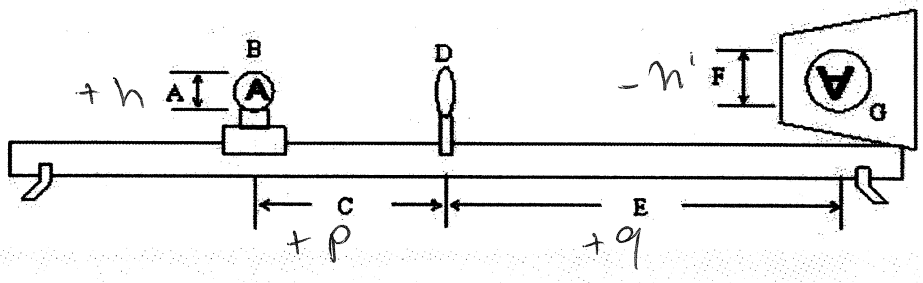
When is h' negative? inverted (on real side)

When is h negative? never

When is M negative? h' is inverted (real)

Positive (+) or negative (–)?

A. + Object distance (p).
B. ~~+~~ – Right side of a mirror.
C. – Left side of a lens.
D. – f for divergent devices.
E. + q for a real image.
F. + Left side of a mirror.
G. + h.
H. + Right side of a lens.
I. + f for convergent devices.
J. – f for a convex mirror.
K. – f for a concave lens.
L. – q for a virtual object.
M. – h' for a real object.



Label the above diagram with p, q, h, and h'. Be sure to mark them with + or –.

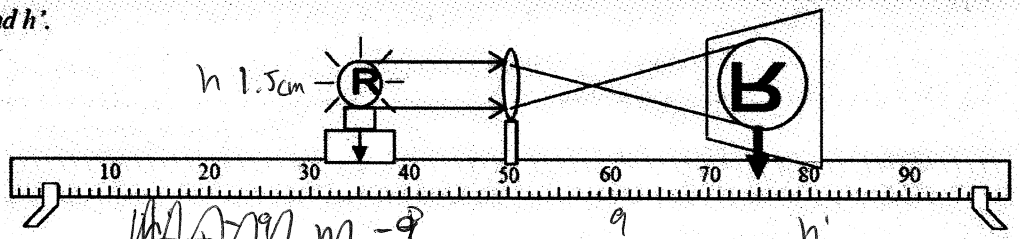
Is the image real or virtual? Why? Inverted & projected

Will the magnification be a positive or negative number? neg

Will the magnification be greater than or less than 1? greater than

On the diagram, label p, q, f, h, and h'.

Variables:
p = 15cm
q = 20cm
f = 9.37cm



$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$

Calculate the focal length.

$\frac{1}{15} + \frac{1}{20} = \frac{1}{f}$

$.0667 + .04 = \frac{1}{0.1067} = 9.37\text{cm}$

Calculate the magnification.

$M = \frac{-q}{p}$

$M = -\frac{25\text{cm}}{15\text{cm}} = -1.67$

If the object is 1.5 cm tall, calculate h'.

$M = \frac{h'}{h}$

$-1.67 = \frac{h'}{1.5\text{cm}} = -2.5\text{cm}$

The object is 12 cm from a convex lens that has a focal length of 5 cm.

Is the lens convergent or divergent?

Real or virtual focal point? Positive or negative focal length?

Find the distance to the image.

$\frac{1}{12} + \frac{1}{q} = \frac{1}{5}$

$.083 + \frac{1}{q} = .2$

$\frac{1}{q} = .2 - .083 = .117$

$q = \frac{1}{.117} = 8.55\text{cm}$

The magnification of a convex mirror is 5. The object is 3 cm tall. How tall is the image?

$M = \frac{h'}{h}$

$5 = \frac{h'}{3\text{cm}}$ $5 \cdot 3\text{cm} = 15\text{cm}$

Is the image real or virtual?

Is the image on the left or right side of the mirror?