Convex Lens Practice Worksheet   Name: ___Key___
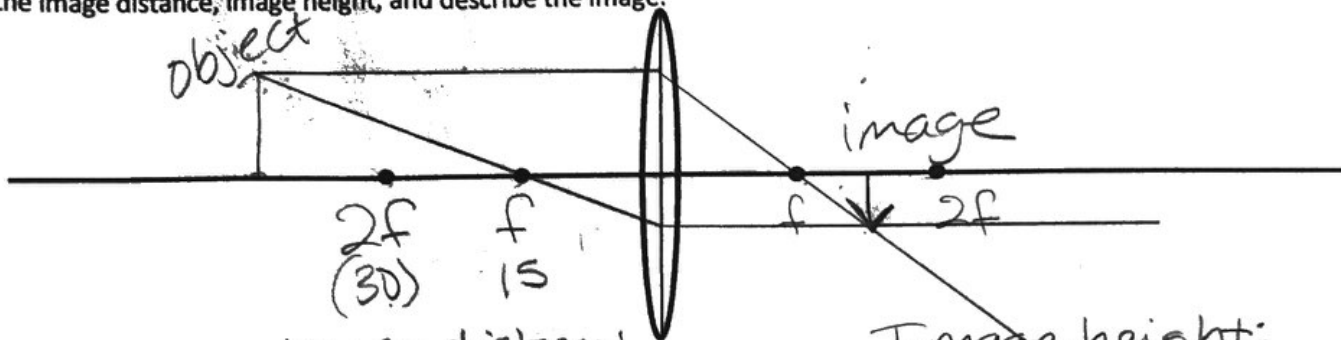
ho   do   f

1. A 15 cm object is placed 45 cm from a convex lens, which has a focal length of 15 cm. Draw a ray diagram and solve for the image distance, image height, and describe the image.

object

image

2f   f
(30)   15

Find the image distance:

Image distance:

$$\frac{1}{f} = \frac{1}{di} + \frac{1}{do}$$

$$\frac{1}{15} = \frac{1}{di} + \frac{1}{45}$$

Find the image height:

$$.067 = \frac{1}{di} + .022$$

$$\frac{-.022 \quad\quad -.022}{dix \quad .045 = \frac{1}{di} \times di}$$

$$di(.045) = 1$$

$$\frac{di(.045)}{.045} = \frac{1}{.045}$$ $$\boxed{di = 22.2 cm}$$

Image height:

$$\frac{hi}{ho} = \frac{-di}{do}$$

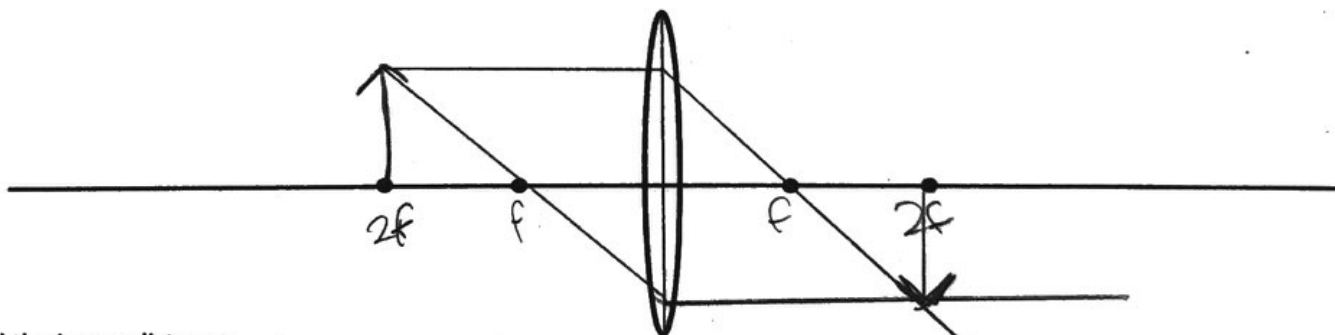$$\frac{hi}{15} = \frac{-22.2}{45}$$

$$\frac{hi}{15 \times 15} = -.493 \times 15$$

$$\boxed{hi = -7.4 cm}$$ ✓

Describe the image:
Smaller, inverted, real

2. A 15cm object is placed 30 cm from the convex lens. The lens has a focal length of 15 cm. Draw a ray diagram and solve for the image distance, image height, and describe the image.

2f   f   f   2f

Find the image distance:

$$\frac{1}{f} = \frac{1}{di} + \frac{1}{do}$$

$$\frac{1}{15} = \frac{1}{di} + \frac{1}{30}$$

Find the image height:

$$.067 = \frac{1}{di} + .033$$

$$\frac{-.033 \qquad\qquad}{.034 = \frac{1}{di}}$$

Describe the image:

$$di = \frac{1}{.034}$$

$$\boxed{di = 29.4 cm}$$

$$\frac{hi}{no} = \frac{-di}{do}$$
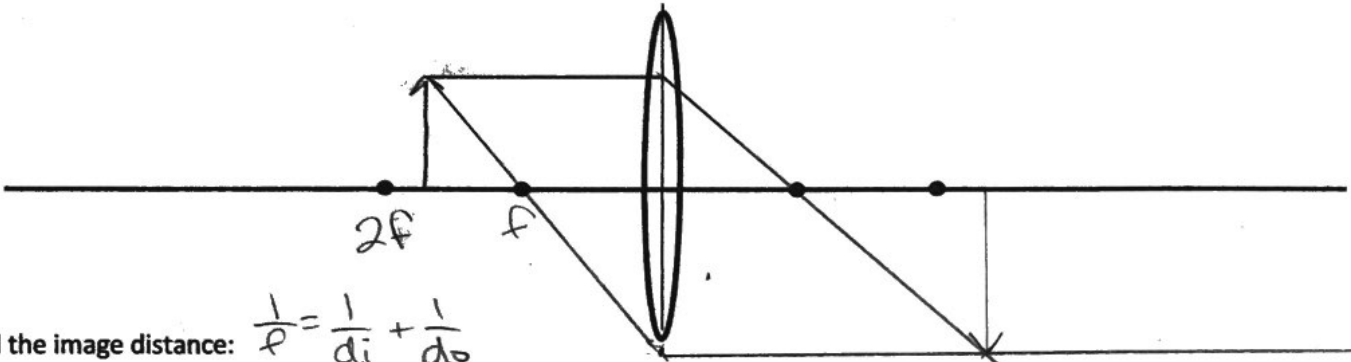
$$\frac{hi}{15} = \frac{-29.4}{30}$$

$$\frac{hi}{15} \overset{x}{\underset{15}{=}} -.98 \times 15$$

$$\boxed{hi = -14.7 cm}$$

same size
inverted
real.

3. A 15cm object is placed 20 cm from the convex lens. The lens has a focal length of 15 cm. Draw a ray diagram and solve for the image distance, image height, and describe the image.

Find the image distance:

$$\frac{1}{f} = \frac{1}{di} + \frac{1}{do}$$

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

$$.067 = \frac{1}{di} + .05$$

$$\underline{-.05 \qquad \qquad .05}$$

Find the image height:

$$.017 = \frac{1}{di}$$

$$di = \frac{1}{.017}$$

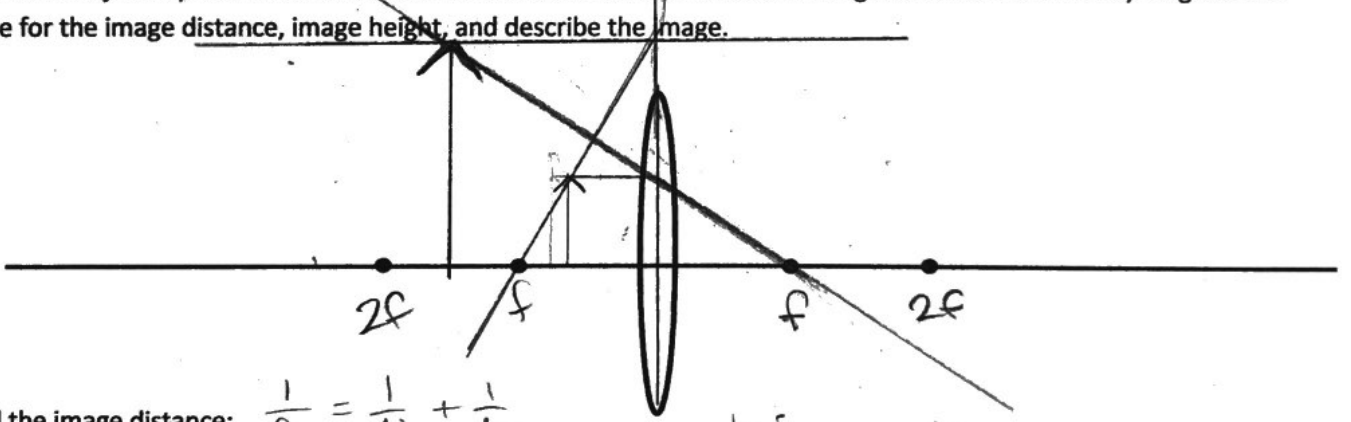$$\boxed{di = 58.8cm}$$

$$\frac{hi}{ho} = \frac{-di}{do}$$

$$\frac{hi}{15} = \frac{-58.8}{20}$$

$$\boxed{hi = -44.1\,cm}$$

Describe the image:

bigger, inverted, real

4. A 15cm object is placed 10 cm from the convex lens. The lens has a focal length of 15 cm. Draw a ray diagram and solve for the image distance, image height, and describe the image.

Find the image distance:

$$\frac{1}{f} = \frac{1}{di} + \frac{1}{do}$$

$$\frac{1}{15} = \frac{1}{di} + \frac{1}{10}$$

$$.067 = \frac{1}{di} + .1$$

$$\underline{-.1 \qquad \qquad -.1}$$

Find the image height:

$$-.033 = \frac{1}{di}$$

$$di = \frac{1}{-.033}$$

$$\boxed{di = -30}$$

$$\frac{hi}{ho} = \frac{-di}{do}$$

$$\frac{hi}{15} = \frac{+30}{10}$$

$$\frac{hi}{15} = 3 \times 15$$

$$15 \times$$

$$\boxed{hi = 45\,cm}$$

Describe the image:

bigger, upright, virtual