

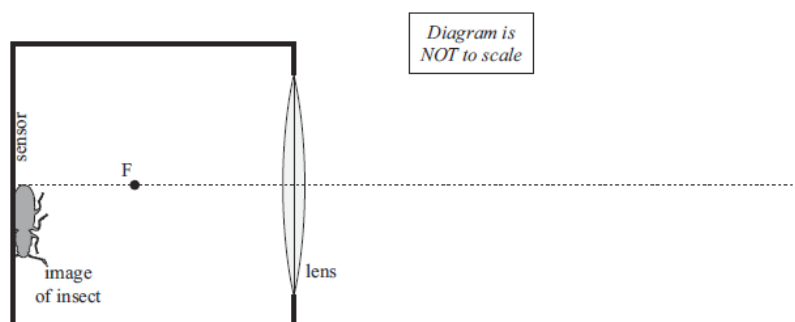
## WAVES: LENS QUESTIONS

### CURVED MIRRORS AND LENSES (2010;2)

Ashley places a pin in front of a concave lens. The focal length of the lens is 15 cm. The pin is 20 cm from the lens. Calculate the distance from the image of the pin to the lens.

### LENSES (2009;1)

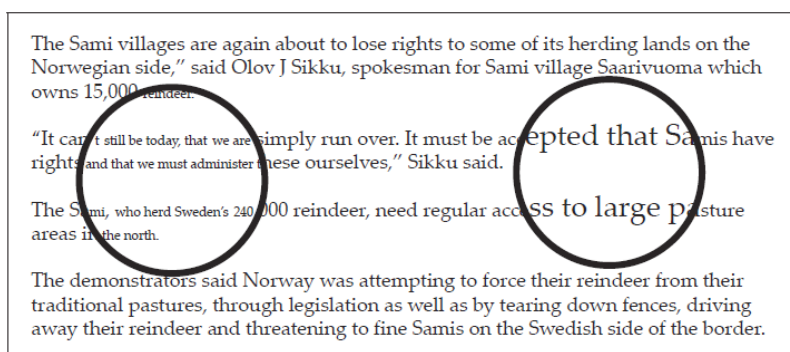
Bianca is trying out her new digital camera. She knows that the camera is basically a box with a lens at the front and a sensor at the back. The camera lens has a focal length of 100 mm. She takes a picture of an insect which is 12 mm from head to tail. The image of the insect is formed at the back of the camera, and is shown in the diagram below.



- On the diagram above, draw two rays to locate the position of the insect. Show the insect on your diagram.
- The magnification is 0.33. Calculate the size of the insect's image.
- Explain what change must be made to the distance from the sensor to the lens if the lens was made with glass with a higher refractive index.

### LENSES (2008;4)

Rufus was looking at the image of newsprint using a concave lens, and a convex lens, by holding the lenses close to the page of the newspaper. The illustration below shows what Rufus saw.

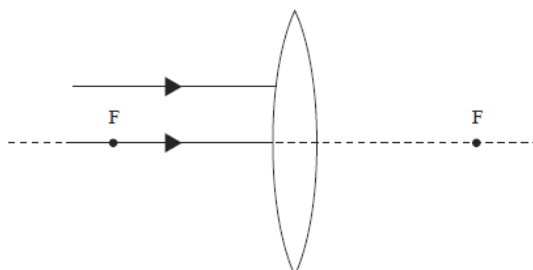


- Name the type of lens that produces a diminished (smaller) image.
- The actual height of a letter on the newspaper is 3.0 mm. The image produced is 1.0 mm high when the lens in part (a) is held 3.0 cm from the print on the newspaper. Calculate the focal length of the lens.

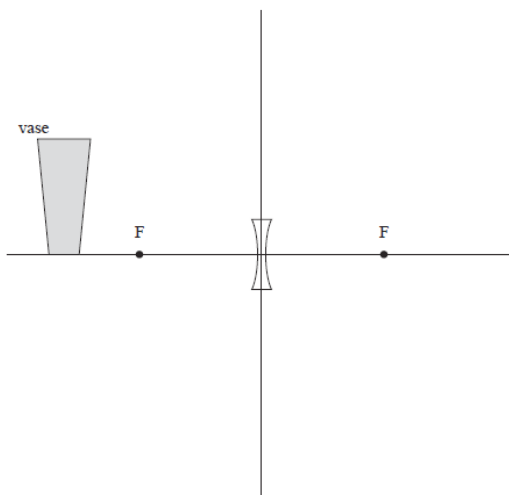
### THE OPTICIAN (2007;1)

Pita is visiting the medical centre to get a new pair of glasses. He finds out that lenses can be made of either plastic or glass. Plastic has a refractive index of 1.60. Glass has a refractive index of 1.50.

- (a) The lenses in Pita's glasses are convex. Two parallel rays are shone into a convex lens as shown in the diagram below. Complete the paths of the rays to show how they continue through the plastic and into the air (Show refraction at both boundaries).



- (b) A second lens has an identical shape, but is made from the glass with a refractive index of 1.50. Use the diagram above to explain how the focal lengths of the two lenses compare.
- (c) Pita looks at a vase through a concave lens. On the diagram below, draw appropriate rays to show how the image of the vase is formed.

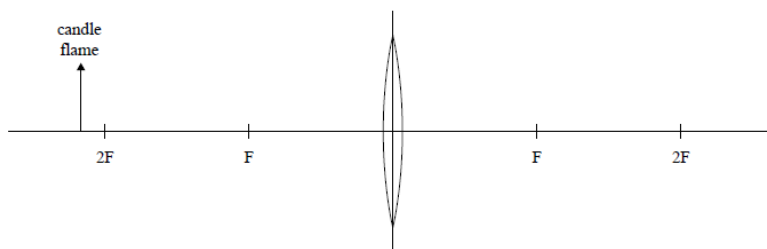


- (d) Describe the nature of the image of the vase.
- (e) Use the diagram above to calculate the magnification.
- (f) The vase is now placed 1.0 m from the lens. The vase is 35 cm high. The focal length of the lens is 30 cm. Calculate the height of the image.

### LIGHT (2006;2)

Sally uses a convex lens to project the image of a candle flame onto a screen.

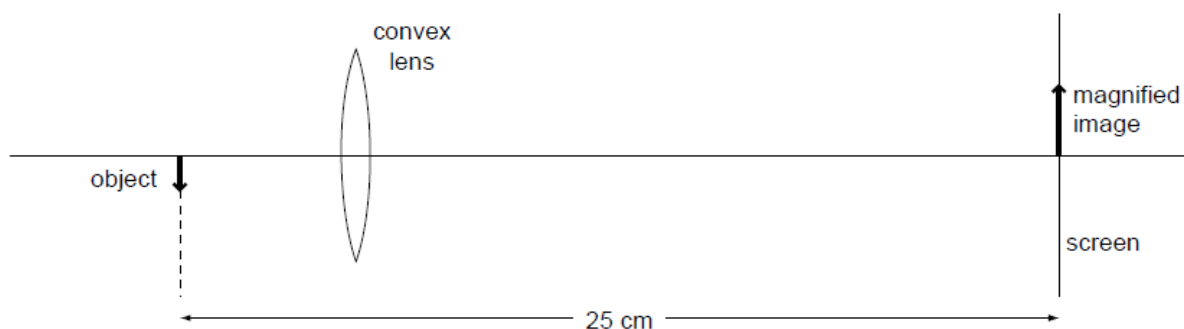
- (a) Draw TWO appropriate rays on the diagram below to show where the clear image of the candle flame would be formed. Draw the image in the correct position.



- (b) The candle flame is 2.0 cm high and 13.0 cm away from the lens. The focal length of the lens is 6.0 cm. Calculate the height of the candle flame's image.

### MIRRORS AND LENSES (2004;1)

Mere can use a convex lens to produce a magnified image of an object on a screen. A possible set-up is shown in the following diagram, which is not drawn to scale.



The convex lens has a focal length of 4.0 cm. A sharp magnified image is formed on the screen when the distance between the object and the screen is 25 cm. Calculate the distance between the screen and the lens.