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Ray Diagrams for **Lenses**

Student Worksheets

by Robert Prior





Ray Diagrams for **Lenses**

Drawing ray diagrams is a skill used in many branches of optics. As with any skill, practice makes perfect. This booklet contains many practice diagrams so you can become perfect.

Although there are an infinite number of light rays, you only need to draw three rays to locate the image.

For clarity, draw each ray in a different colour. This booklet uses **red** for rays through the optical centre, **green** for rays through the principal focus, and **blue** for rays through the secondary focus.

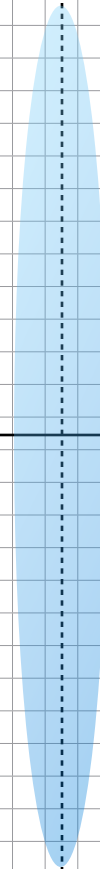
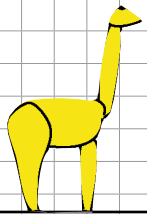
Real rays, which represent the path followed by a beam of light, should be drawn as solid lines: 

Virtual rays, which represent the path that a beam of light appears to follow, should be drawn as dashed lines: 

Always **use a ruler** and draw your lines carefully! A small mistake in a line can lead to a big mistake in an image.



Engraving on the title page of the **Thesaurus opticus**



Instructions

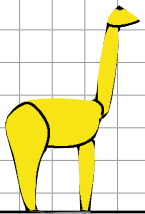
Label the following:

- lens
- object
- optical axis
- optical centre
- principal axis
- principal focus
- secondary focus



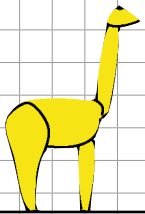
Instructions

Locate and **describe** the image



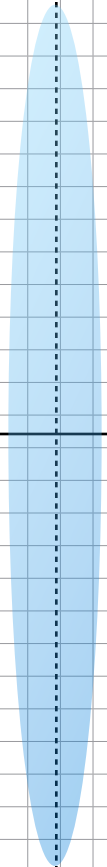
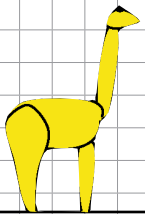
Instructions

Locate and **describe** the image



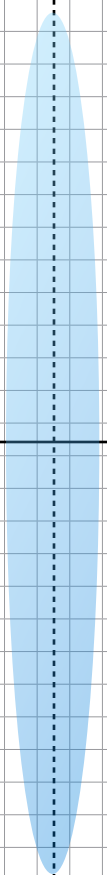
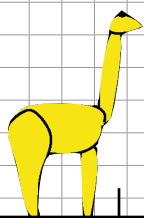
Instructions

Locate and **describe** the image



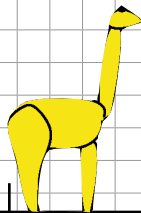
Instructions

Locate and **describe** the image



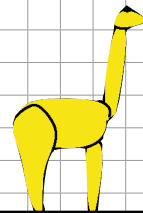
Instructions

Locate and **describe** the image



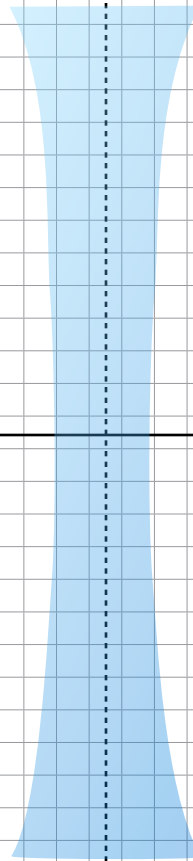
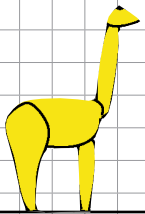
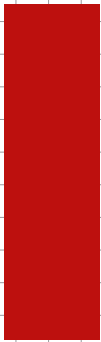
Instructions

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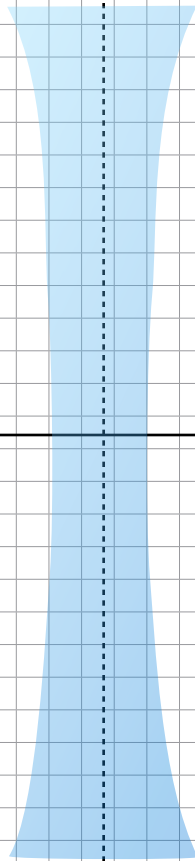
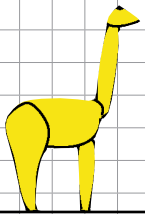
Instructions

Locate and **describe** the image



Instructions

Locate and **describe** the image





Music is the arithmetic of sounds
as optics is the geometry of light.

Claude Debussy

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Ray Diagrams for **Lenses**

Solutions for Student Workbook

by Robert Prior





Ray Diagrams for Lenses

Drawing ray diagrams is a skill used in many branches of optics. As with any skill, practice makes perfect. This booklet contains solutions to the student workbook.

Although there are an infinite number of light rays, you only need to draw three rays to locate the image.

For clarity, draw each ray in a different colour. This booklet uses **red** for rays through the optical centre, **green** for rays through the principal focus, and **blue** for rays through the secondary focus.

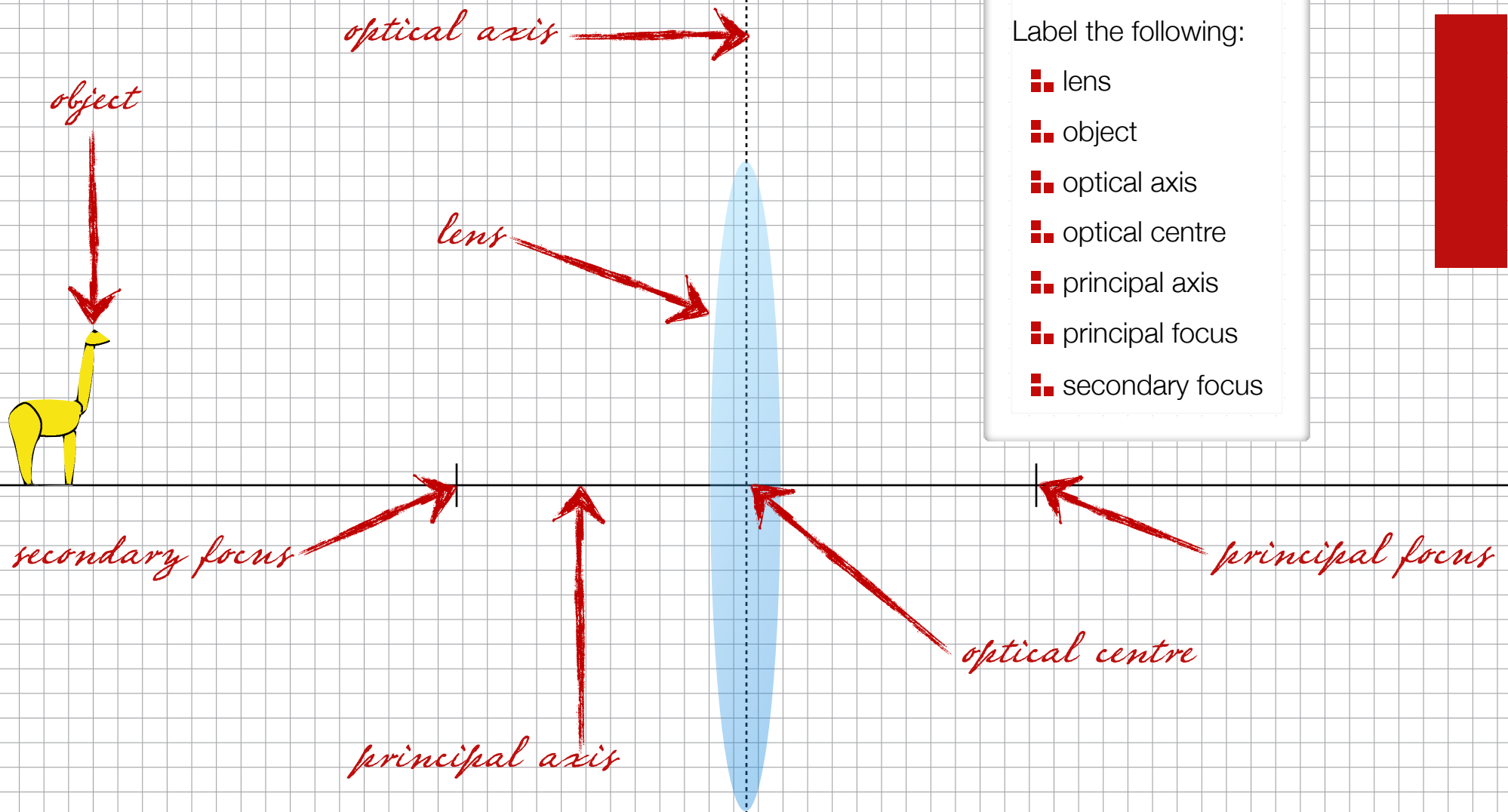
Real rays, which represent the path followed by a beam of light, should be drawn as solid lines: 

Virtual rays, which represent the path that a beam of light appears to follow, should be drawn as dashed lines: 

Always **use a ruler** and draw your lines carefully! A small mistake in a line can lead to a big mistake in an image.



Engraving on the title page of the **Thesaurus opticus**



Instructions

Label the following:

- lens
- object
- optical axis
- optical centre
- principal axis
- principal focus
- secondary focus

Rays parallel to the principal axis are refracted through the primary focus.

Instructions

Locate and **describe** the image

Rays passing through the optical centre are not refracted.

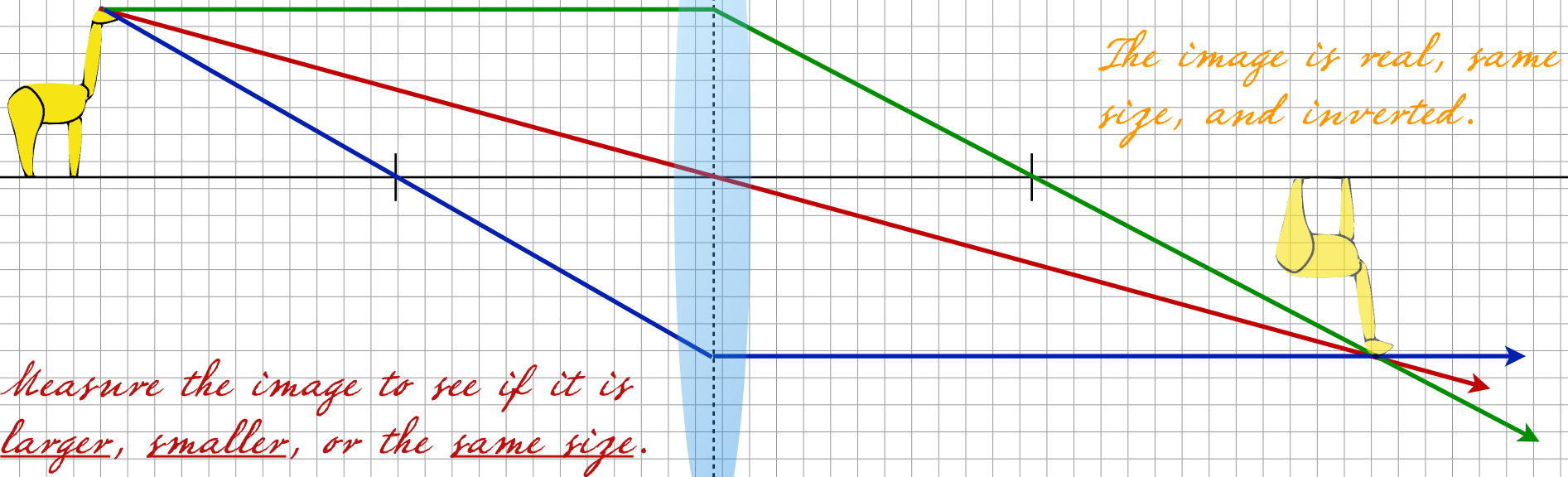
The image is real, smaller, and inverted.

Draw the image where all three rays cross.

Rays passing through the secondary focus are refracted parallel to the principal axis.

Instructions

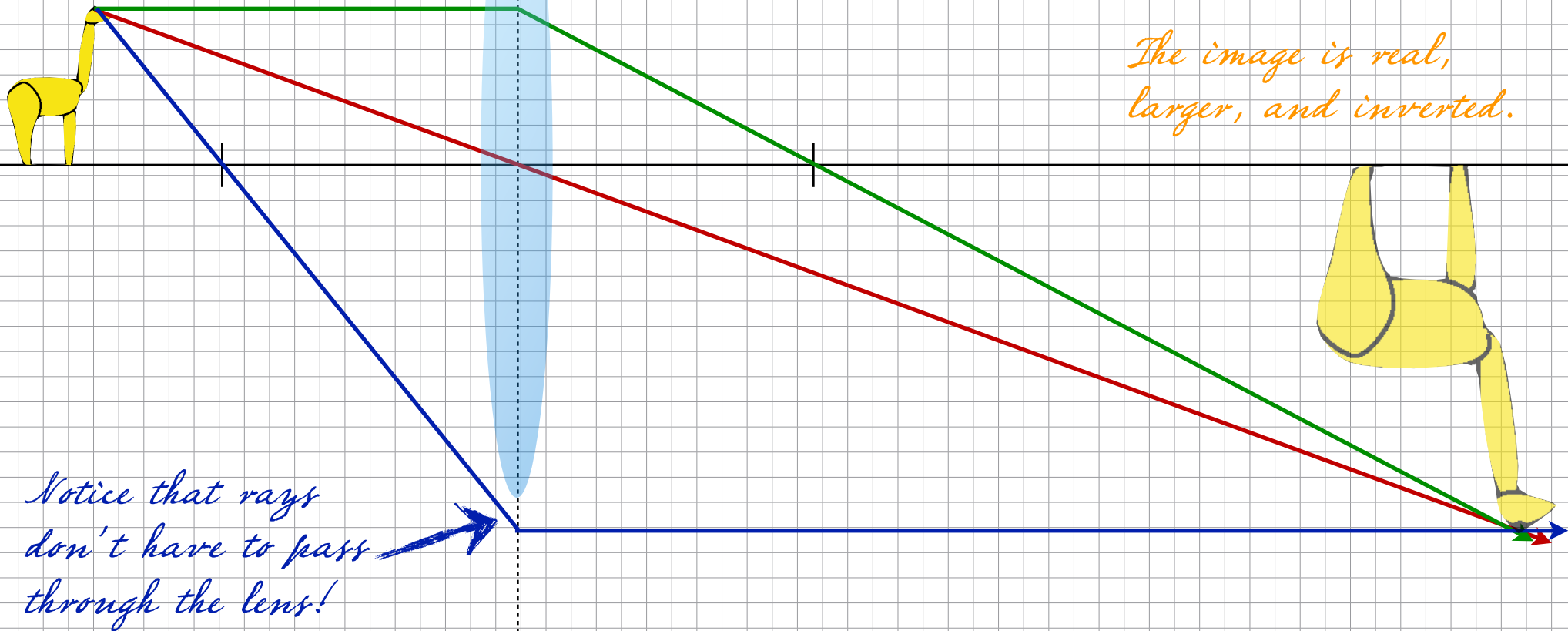
Locate and **describe** the image



The image is formed with real rays, so it is a real image.

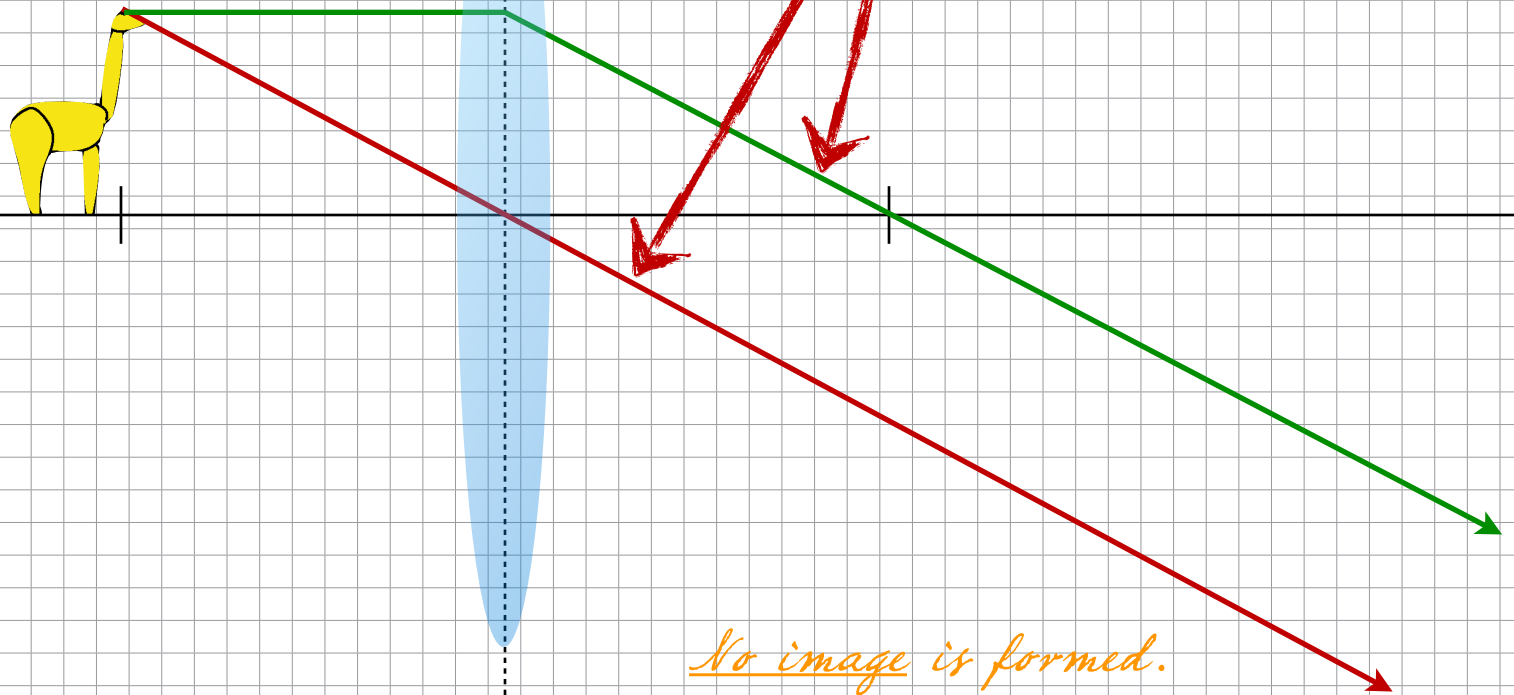
Instructions

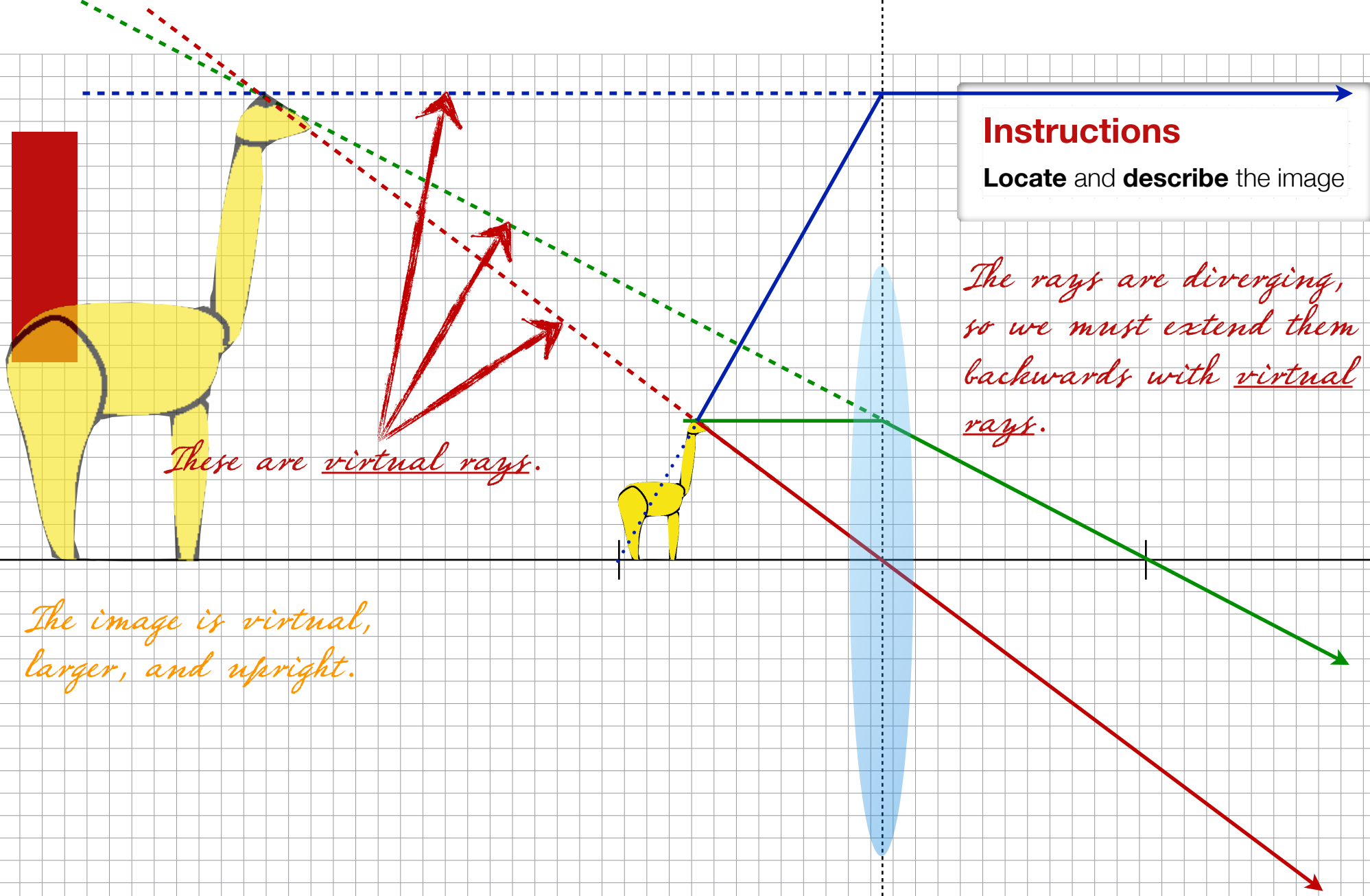
Locate and **describe** the image



Instructions

Locate and **describe** the image





Instructions

Locate and **describe** the image

The rays are diverging, so we must extend them backwards with virtual rays.

These are virtual rays.

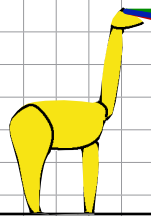
The image is virtual, larger, and upright.

Locate and describe the image



Instructions

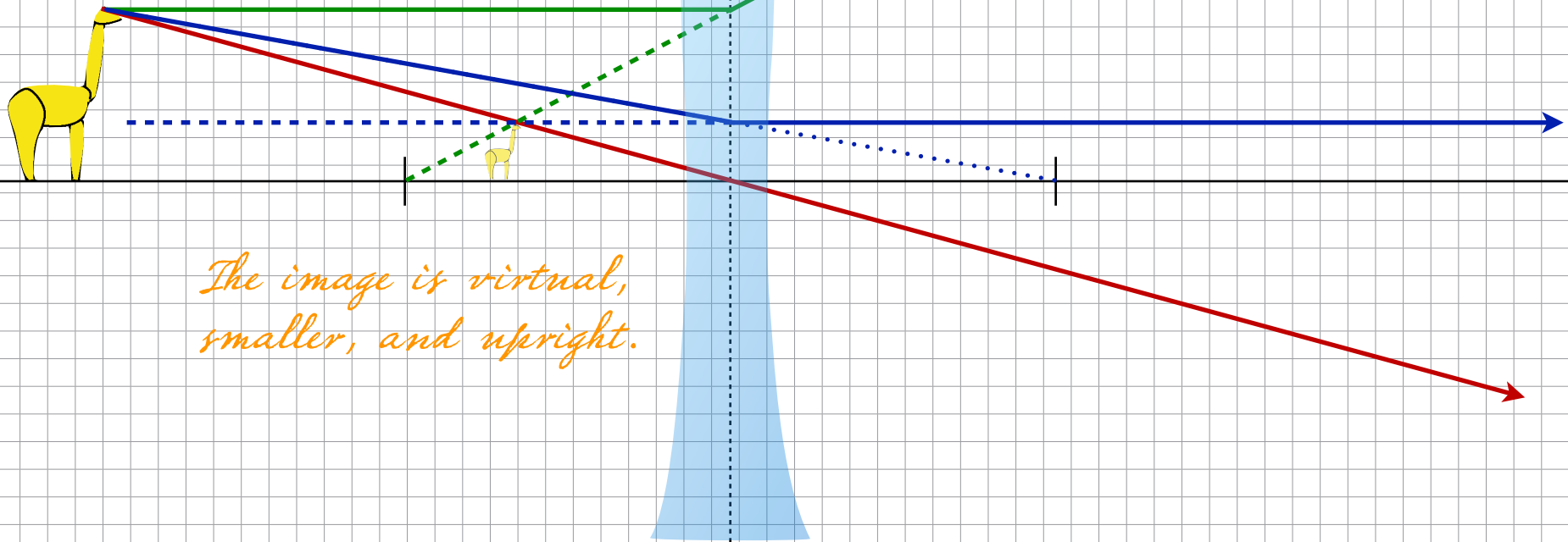
Locate and **describe** the image



*The image is virtual,
smaller, and upright.*

Instructions

Locate and **describe** the image



*The image is virtual,
smaller, and upright.*



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