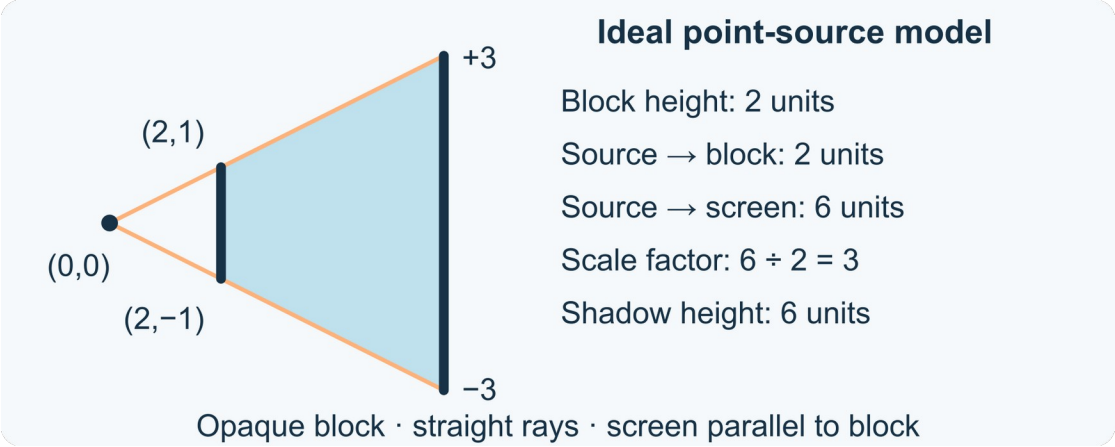
Explain a drawn shadow

How can a ray diagram show what a shadow model assumes?

Use a complete point-source drawing to locate a shadow region and explain what an ideal ray model leaves out.

Explore | 15–25 minutes, or two rays | Paper and a pencil or pen, The supplied coordinate model; no lamp, laser, sunlight viewing or experiment needed

Start here Use a drawn point source at (0, 0), an opaque vertical block at x = 2 from y = -1 to 1, and a parallel screen at x = 6. All coordinates use the same arbitrary unit.



Point-source shadow: an ideal drawing

1 Draw the boundary rays

Join the source to the block's top (2, 1) and bottom (2,-1). Continue each straight line to the screen. These construction lines just skim the edges; they do not pass through the block.

2 Find the shadow limits

The screen is three times as far from the source as the block: 6 ÷ 2 = 3. The upper boundary reaches y = 3 and the lower y = -3, so the ideal shadow height is 6 units.

3 Label the assumptions

State point source, opaque block, straight rays in one uniform medium, parallel screen and no other illumination. Mark the region between the boundaries on the screen as missing direct light.

4 Explain one limit

A large real light source, surrounding reflected light or different geometry can give a different or blurred boundary. Keep this a paper model; it is not a photograph or a test of an actual lamp.

Constructed ray model a threefold scale factor

The coordinates and diagram are original ideal geometry, not experimental observations. Source-to-block distance is 2 units; source-to-screen distance is 6.

• Upper boundary: y/x = 1/2, so at x = 6, y = 3. Lower boundary: y/x = -1/2, so y = -3.

• The block's height is 1 - (-1) = 2 units. The screen's ideal shadow height is 3 - (-3) = 6 units.

• The height ratio is 6 ÷ 2 = 3. The shadow is a region with direct light blocked, not a second object travelling from the block.

What this example can show A point source is an idealisation. This two-dimensional construction does not include an extended source, scattering, diffraction or ambient reflected light.

A different way

Trace the supplied rays with a finger, have the coordinates read aloud or discuss only the blocked region. Accurate ruler work is optional.

If you want to go further

Keep the source and block fixed but draw the screen at x = 4. The same model gives boundaries y = ±2 and a 4-unit shadow height. Compare the new ratio with the original without performing a light test.

Something to notice

Which features belong to this ideal drawing rather than every real shadow?

Read or explore more

Horizon topic Light Optics

https://launchhorizonhq.com/learn/light-optics/

Horizon topic Refraction Lenses

https://launchhorizonhq.com/learn/refraction-lenses/

Horizon topic Physics

https://launchhorizonhq.com/learn/physics/

Science Learning Hub, University of Waikato Light basics

https://www.sciencelearn.org.nz/resources/171-light-basics

Science Learning Hub, University of Waikato Light and shadows

https://www.sciencelearn.org.nz/resources/2771-light-and-shadows