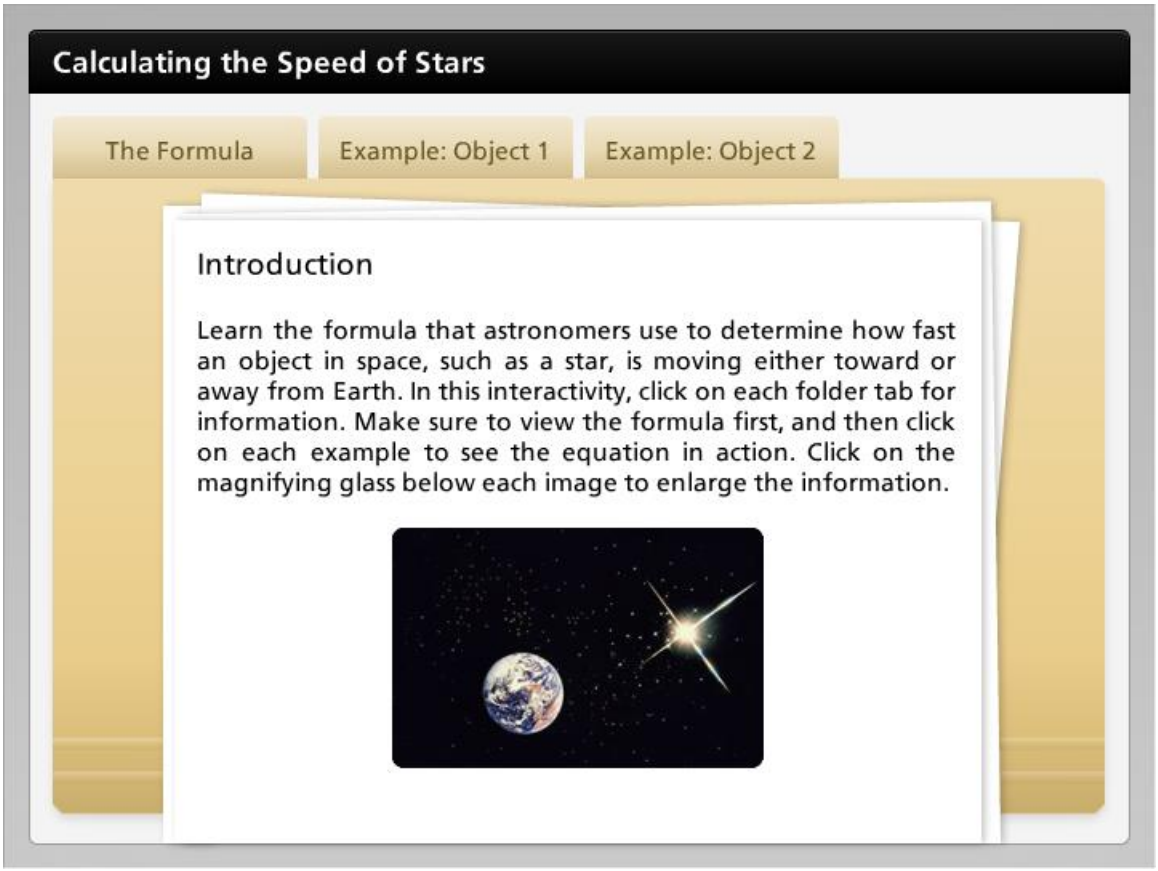
Module 4: Radiation and the Electromagnetic Spectrum
Topic 4 Content: Calculating the Speed of Stars Notes

Introduction



Learn the formula that astronomers use to determine how fast an object in space, such as a star, is moving either toward or away from Earth. In this interactivity, click on each folder tab for information. Make sure to view the formula first, and then click on each example to see the equation in action. Click on the magnifying glass below each image to enlarge the information.

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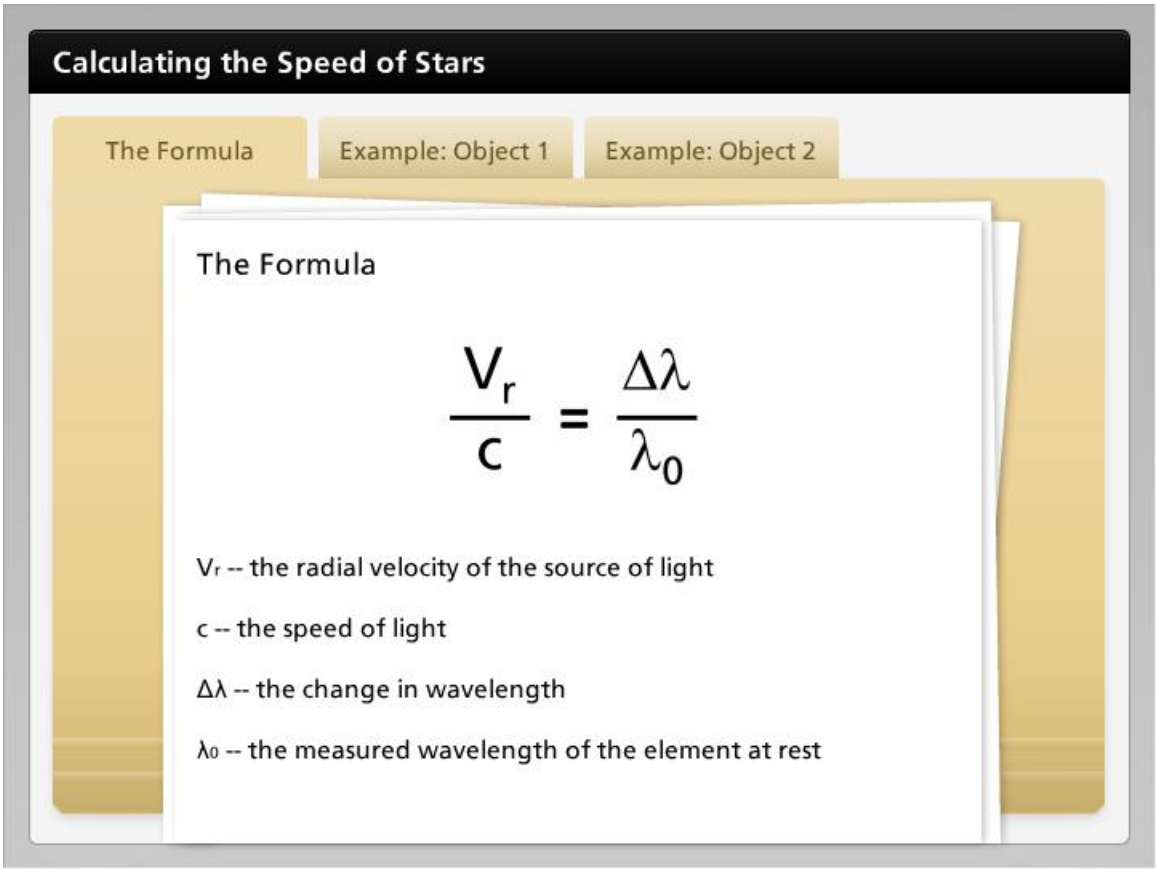
The Formula



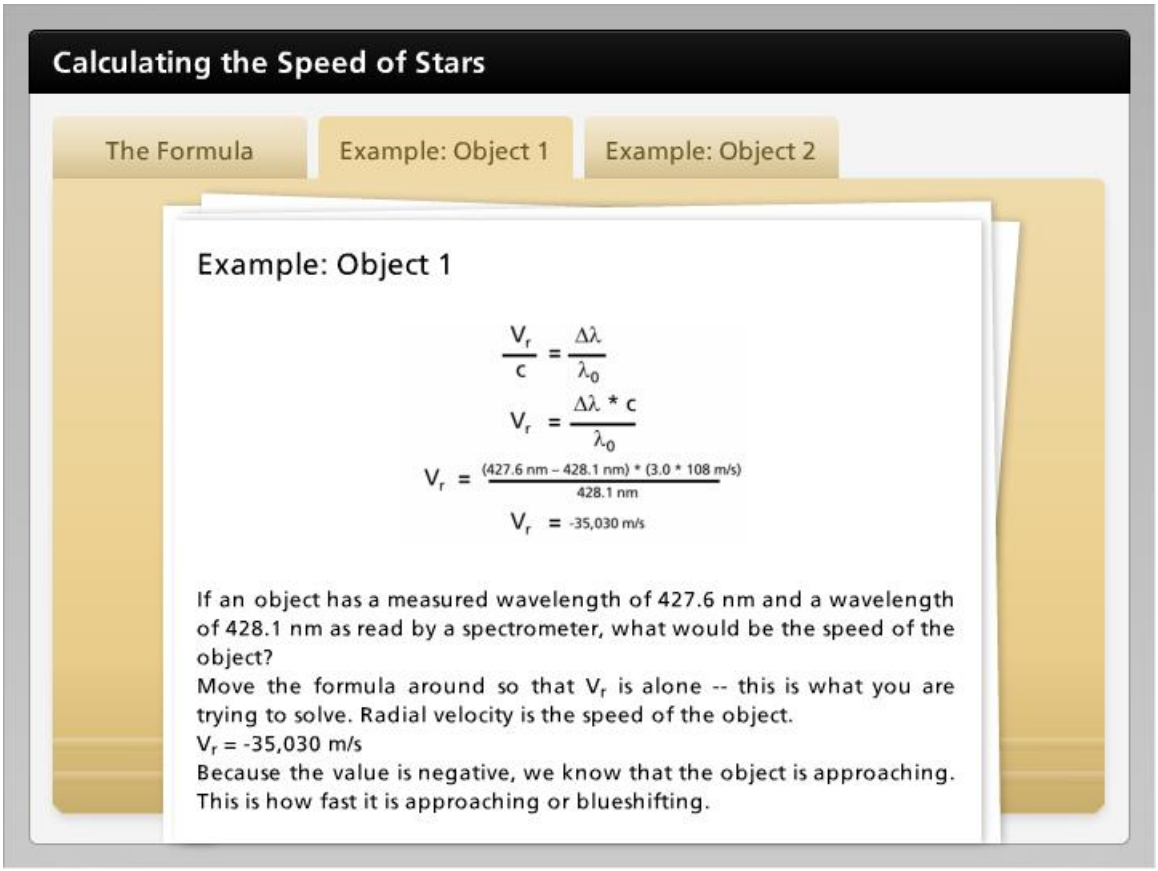
V_r -- the radial velocity of the source of light

c -- the speed of light

$\Delta\lambda$ -- the change in wavelength

λ_0 -- the measured wavelength of the element at rest

Example: Object 1



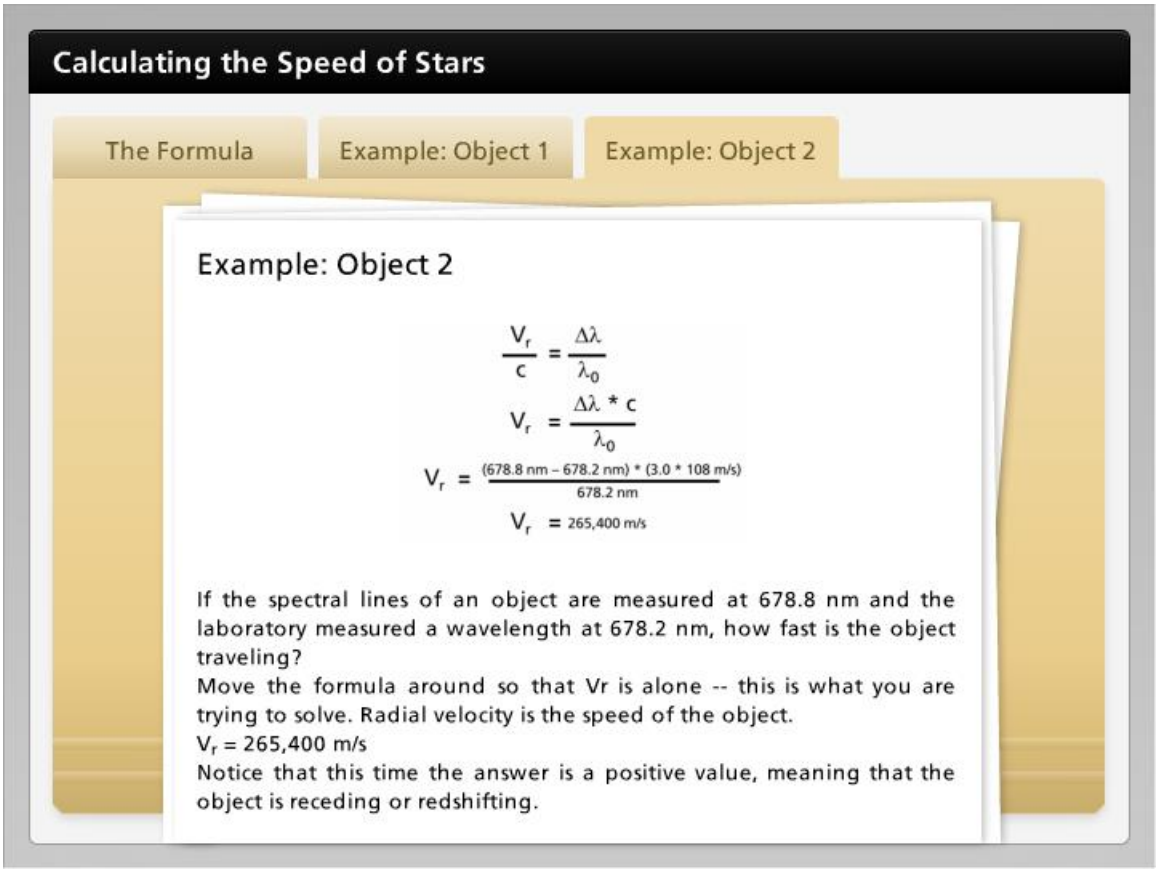
If an object has a measured wavelength of 427.6 nm and a wavelength of 428.1 nm as read by a spectrometer, what would be the speed of the object?

Move the formula around so that V_r is alone -- this is what you are trying to solve. Radial velocity is the speed of the object.

V_r = -35,030 m/s

Because the value is negative, we know that the object is approaching. This is how fast it is approaching or blueshifting.

Example: Object 2



If the spectral lines of an object are measured at 678.8 nm and the laboratory measured a wavelength at 678.2 nm, how fast is the object traveling?

Move the formula around so that V_r is alone -- this is what you are trying to solve. Radial velocity is the speed of the object.

V_r = 265,400 m/s

Notice that this time the answer is a positive value, meaning that the object is receding or redshifting.