



This is an image of a starfield in the constellation Centaurus taken by the Hubble Space Telescope in 1994. In addition to the bright stars, the streak of a single asteroid can also be seen. The Hubble has 'accidentally' detected over 100 asteroids as its cameras have been looking at other targets. Many of the asteroids are new discoveries. The curvature of the asteroid's trail as it moved across the sky was caused by parallax changes as the telescope orbited Earth during the 40-minute exposures. The field is 2.7 arcminutes on a side, and the distance to the asteroid was estimated to be 140 million kilometers from Earth. Based on the faintness of the asteroid at this distance, it was probably only 2 kilometers across!

Problem 1 - At the distance of the asteroid, this field would measure about 110,000 kilometers across. How many kilometers did the asteroid travel during the time of the exposure?

Problem 2 - What was the approximate speed of the asteroid in kilometers/hour from the beginning to the end of the trail?

Problem 1 - At the distance of the asteroid, this field would measure about 110,000 kilometers across. How many kilometers did the asteroid travel during the time of the exposure?

Answer: Students will have to convert the length of the streak into kilometers using the scale of the image. Use a millimeter ruler to determine the scale of the image by first measuring the width of the image to get 118 millimeters. This physical length is equal to 110,000 kilometers, so the image scale is just $110,000 \text{ km} / 118 \text{ millimeters} = 932 \text{ km/mm}$. The length of the asteroid streak is 20 millimeters, so its length is $20 \times (932 \text{ km/mm}) = 18,640 \text{ kilometers}$.

Problem 2 - What was the approximate speed of the asteroid in kilometers/hour from the beginning to the end of the trail?

Answer: The paragraph says that the exposure took 40 minutes, so during that time the asteroid moved the distance indicated in Problem 1. The speed is then $18,640 \text{ Kilometers} / 0.66 \text{ hours} = 28,200 \text{ km/hr}$.

The photograph below shows another asteroid streak across a picture taken of the Hickson Galaxy Group # 87 in the constellation Capricornus. The size of the field is 132,000 km at the distance of the asteroid, and the exposure was about 6.6 hours. During this time the asteroid traveled 166,000 kilometers for a speed of about 25,000 km/hr.

