

# KINEMATICS

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## SCOTT KELLEY'S YEAR IN SPACE



On Tuesday, [Scott J. Kelly](#) is scheduled to return from the International Space Station, completing the longest stay in space for a NASA astronaut.



The International Space Station in February 2010.

**INTRODUCTION:** The purpose of this application is to utilize data listed below to verify numbers and stats in the article.

**QUESTIONS:** (a) Confirm Kelly in the International Space Station (ISS) was moving at more than 17,000 mph?

(b) Find circumference of one orbit in miles?

(c) Find radius R of ISS orbit in miles ?

This radius R would be distance from center of earth.  $R = R_{\text{EARTH}} + h$

(d)  $R_{\text{EARTH}} = 3959$  miles, Confirm ISS was on average 250 miles = h Height above the earth.

(e) Knowing orbital circumference and time to orbit, confirm ISS was traveling at more than 17,000 mph?

**HINTS:**  $X = V t$  ,  $C = 2\pi R$  ,  $[C / \text{time of orbit}] = \text{speed of orbit}$

**ANSWERS:** (a)  $V = 17,647$  mph , (b)  $C = 26,442.4$  miles , (c)  $R = 4208.43$  miles , (d)  $h = \sim 249$  miles , close to article's 250 mi. (e)  $V = \sim 17,628.3$  mph , close to computed value in (a)

**((340 days))** NASA billed it as a year in space, but Mr. Kelly's trip will actually be a few weeks short of that. (An unexpected delay could extend his stay slightly.) But it is far short of the all-time record of almost 438 days. That was achieved by Valeri Polyakov on the old Russian Mir space station back in 1994 and 1995.

### 10,944 sunrises and sunsets

The International Space Station zips around Earth at more than **((17,000 miles per hour,))** or **((once every 90 minutes))** That means over the course of Mr. Kelly's stay, the space station will have made **((5,440 orbits))**, and the sun will have gone up and down 10,944 times from the perspective of the astronauts aboard. Of course, Mr. Kelly did not see all of them. He is not continuously looking out the window, and he sleeps, too.

**(( 143,846,525 miles ))**

That is the distance that Mr. Kelly will have traveled during this mission, or roughly the distance for a one-way trip to Mars. Of course, on the space station, **(( Mr. Kelly was never more than about 250 miles from Earth.))** **193 gallons** *That is the amount of recycled urine and sweat that Mr. Kelly will have drunk,* according to NASA. Water is heavy and expensive to transport from Earth, so for efficiency, [water is continually recycled.](#)