

The Launch of the Juno Spacecraft – Ascent to orbit



The Juno spacecraft was launched on August 5, 2011 on a 5 year journey to Jupiter. This image was taken 120 seconds after launch and shows one of the solid rocket boosters being jettisoned. The camera is on the Atlas booster and looks down on the engines and the distant arc of a cloudy Earth. Scenes from the launch can be found on *YouTube*, and show a dazzling launch from multiple viewing locations on Earth and in space.

During the launch, and the boost to orbit, the altitude of the rocket changes continuously as the engines provide thrust, eventually lifting the entire payload into orbit at a planned altitude. A short table of the rocket's altitude and times is provided below. About how many minutes after launch will it take for the rocket to reach orbit altitude at 200 kilometers?

1 mile = 1.6 kilometers

Elapsed Time (seconds)	Altitude (miles)	Altitude (kilometers)
160	46	74
192	60	
268	81	
274	83	
315	95	
319	97	
339	112	

Problem 1 – American engineers use English units for all measurements including the details of the rocket launch where 1 mile = 1.6 kilometers. Use this information to complete the table above in metric units rounded to the nearest kilometer.

A: Write an equation: convert Miles to Kilometers using the following formula: # km = 1.6 (# of miles)

ROUND your answer to the nearest WHOLE NUMBER. Example:

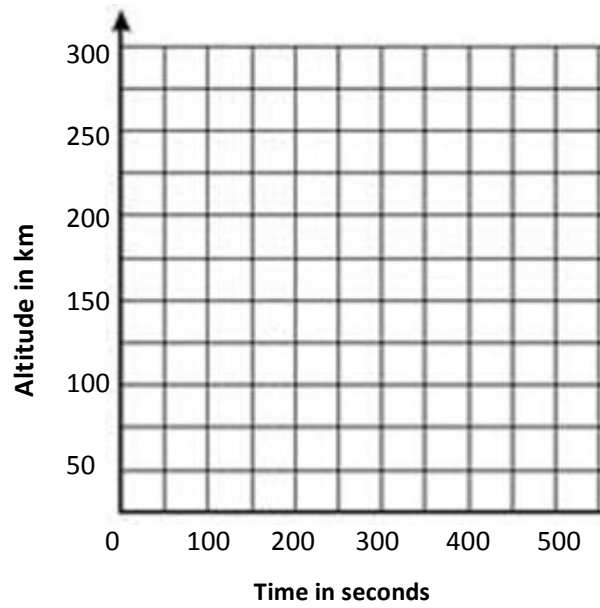
$$\text{km} = 1.6(46)$$

$$\text{km} = 73.6$$

$$\text{km} = 74$$

B: Use a calculator to check your work with a partner. Make sure you agree on the conversions. *If not, review your work and fix any errors you have made.*

Problem 2 – From the tabular data, graph the altitude of the rocket in time.



Problem 3 – Using your graph estimate, about how many seconds after launch will it take for the rocket to reach orbit altitude at 200 kilometers?

of seconds

$$\frac{\text{\# of seconds}}{60 \text{ seconds per minute}} = \text{total number of minutes it takes the rocket to reach orbit altitude}$$

DAY THREE WRITING

MY CLAIM:

It will take the rocket approximately _____ minutes to reach the orbit altitude of 200 km.

JUSTIFY and EXPLAIN my CLAIM using MATH REASONING and citing EVIDENCE from the patterns I observed on my TABLE and my GRAPH.

VOCABULARY to use in my writing:

Converted
Seconds to minutes
Miles to kilometers
Rounded

Patterns
Estimate / Approximate
Graph
Table

From my TABLE I noticed

From my GRAPH I noticed

I know my CLAIM is REASONABLE because the patterns I observed in my table and graph showed
