

Rocketry for Kids



Science Level 4

Guide to Solar System Math



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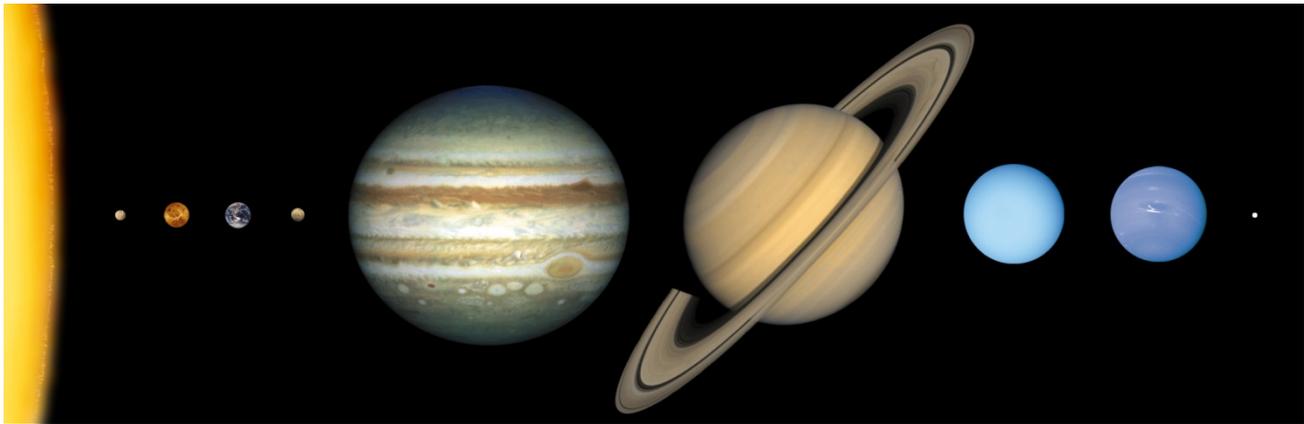
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NASA – National Aeronautics and Space Administration, Office of Human Resources and Education, Education Division.

<http://exploration.grc.nasa.gov/education/rocket/>

NASA Solar System Math

NASA has a series of lessons designed explicitly for the American Elementary School curriculum which can be used easily in Australian primary schools with only a little modification. **Each of these NASA “lessons” is in fact 8 to 10 individual sessions of 40-50 minutes each.** These are part of the NASA Explorer Schools Pre-Algebra lessons. The first two of these lessons are included on the CD with all the software necessary. The complete set of lessons is found at www.quest.nasa.gov/vft/. Other resources including the Virtual Field trip and Moon Math can also be found here.



Teachers may choose to combine parts of sessions to create a more compact and focused unit. The sessions combine ideas about the solar system with mathematics and practical activities.

They address many of the common misconceptions; something every teacher knows can be a stumbling block to real understanding.

Victorian teachers will adapt these lessons to suit the VELs and in particular will be relieved to omit much of the material on units of measurement. These lessons point up the ease of use of the metric system!

Of the four “Lessons” in this series the first two are the most relevant to the Victorian primary school curriculum, (VELs level 4).

These lessons use the NASA software *What’s the Difference?* which is included on the CD. WTD can also be downloaded from the web at <http://learn.arc.nasa.gov/wtd/index.html>. While you are there, take a peak at Moon Trax, NASA SVS, Virtual Lab and World Wind. These are more great programs from NASA.

Solar System Math Lesson 1

Comparing Size and Distance.

Students use WTD to compare a wide variety of measurements of the planets. Students gain an understanding of the true relationship between the sizes and separations of the Sun and planets. They analyse the data by creating scale models, tables and graphs. The scale model, using common objects such as a bowling ball, nuts and seeds spread over one kilometre, is very effective at illustrating the idea of “space”.

Students use ratios, decimals, proper fractions and percentages. They collect data and present it in a range of formats. They use a range of units including common ones such as metres and kilometres as well as new ones such as Astronomical Units.

The *Explain* part of these sessions includes higher order thinking skills with an emphasis on synthesis of the data.

Solar System Math Lesson 2

Comparing Mass, Gravity, Composition & Density.

This unit introduces students to the difference between weight and mass. This is a fundamental concept in science and often misunderstood. Students are introduced to the force of gravity as the connection between mass and weight.

Students use WTD to gather information on the planets and moons in our solar system. They use the data to create a scale model for the Solar System in terms of mass and volume.

Students use the density of Earth materials to determine a suitable range of values for the densities of planets and moons for humans to visit. Students will use the scale model and their numerical analysis of it to further refine their ideas as to where in our solar system humans should be sent to explore.

Students investigate the relationship between the circumference and diameter of a planet leading to an appreciation of the origin of π .

Students compare the gravity and density of the planets and moons using fractions, decimals, percentages, and number lines. They investigate the relationship between the volumes of a sphere, cone and cylinder. (This will be extension work to VELS level 5.)

Students compare the physical composition of the planets and learn how this is related to their density and surface gravity.

Solar System Math Lesson 3

Comparing Planetary Travel Distances.

The concepts and mathematical techniques in this Lesson are significantly more advanced than in the first two lessons.

In this lesson, students use the geometry of circles to calculate the distance a crew vehicle would travel to reach another planet or moon in our solar system. Using the speed at which a crew vehicle would be traveling, students calculate how long each mission would take. Based on this information, students decide which planets or moons are too far away for humans to visit.

Solar System Math Lesson 4

Analysing Payload Size and Cost

The concepts and mathematical techniques in this Lesson are significantly more advanced than in the first two lessons.

In this lesson, students calculate the total mass that is needed to support a mission to a possible destination in the solar system. Students calculate the mass needed to keep a crew of three astronauts alive for the duration of a mission, the amount of science material that can be transported on each mission, and the total cost of a mission. Students compare the costs relative to the amount of scientific materials that can be transported to determine which planets or moons would be the best place(s) to send humans in our solar system.