A Journey through the Galaxy

When you look into space, you are really looking back in time.
Light travels at about 300,000,000 m/s or about 300,000 km/s.
This means that when we look at the moon, we see it as it was around 1.5 seconds ago.
When we look at Jupiter, which is farther away, we see it as it was 45 minutes ago.

Our Solar System: The Sun and Inner Solar System

At the center of the solar system is the Sun which is a star.

Stars

A star is a hot ball of plasma, an electrically charged gas, which shines because nuclear fusion is taking place at its core.
Nuclear fusion is the process in which the nuclei of atoms fuse together.
During nuclear fusion, an enormous amount of energy is released.

Travelling outward from the sun we pass the four rocky planets.
Distances in the Inner Solar System, though vast, can still be measured in kilometers. However, it is often useful to use scientific notation. (See "Space Math")

Our Solar System: The Outer Solar System

Travelling outward from Mars we reach the asteroid belt as well as the four gas giants.
As we enter the *outer* solar system, distances become so vast that even scientific notation won't do! At this point, we turn to astronomical units.

Astronomical Units

An astronomical unit is the average distance from the Earth to Sun.
This distance is about 149,600,000 km. For more details, see "Space Math"

The Asteroid Belt

Located between mars and jupiter, the asteroid belt is a region of rocky debris that forms a ring around the Sun at a distance of about 3 AU.
The asteroid belt contains billions of pieces of rock. These pieces range in size from that of a grain of sand to more than 1000 km across.

Beyond Our Solar System

As we leave our solar system we find ourselves among the stars. The first one we come to (Proxima Centauri) is about 272,000 AU away. Interestingly, it is not the brightest!
You can imagine that at this point, even Astronomical Units won't do! So we use light years

Light Years

A light year is the distance that light travels in one year.
One light year is equal to 63,000 AU or 9.5×10^{12} km.
For more details, see "Space Math"

As we continue to travel deeper into space, we would come across more and more stars and we would notice that over half of the star systems we come across are binary systems, meaning they are systems with two stars.
If the stars of a system are close enough together, it might be possible for planets to orbit around both of them.

On our journey, we may even be lucky enough to see a star explode! This is called a supernova. Though a star may exist for millions or even billions of years, they can suddenly come to an end in just a few minutes. The gradual buildup of heavy elements in the star's core causes the core to explode.
This causes the outer layers of the star to be pulled into the star by gravity.
As the star rips apart, debris from the explosion provides the matter for a nebula.

A nebula is a large cloud of dust and gas. They are often called star nurseries because it is from their dust and gas that stars form.

The Milky Way

And so we finish our journey at the edge of the galaxy. We look back at the Milky Way, an astonishing 100,000 light years across, swirling around a common center.