



# Pathfinder Honour:

## Trainer's Notes

# Stars 1



### Instructions to Trainers / Instructors of this Honour

Thankyou for being involved with this Honour. These notes have been developed to assist in teaching / instructing this honour. We recognise that there is much more information available and we are grateful that you should share your expertise.

Please remember that Honours are designed to develop our Pathfinders in many ways; their interests, their knowledge and their relationship with their Saviour and Creator. Your enthusiasm and creativity will have a huge impact on those doing the honour.

To complete an Honour, the following (where applicable) must be completed satisfactorily:

- Physical and Practical Requirements.
- Honour Workbook.
- Honour Assessment Sheet. *(On SPD Honour Website but Leader's level access is required)*

### Additional Reference Material

Sky Map. See: <http://server1.sky-map.org/?locale=EN>

*Stars 1 Honour Trainer's Notes\_Extra Info* Edited by Dr B Hands, Queensland Wilderness Adventure Club. Also check out libraries of do a Google search on 'Astronomy'. There's heaps of information.

### Acknowledgements

[http://en.wikibooks.org/wiki/Adventist\\_Youth\\_Honors\\_Answer\\_Book/Nature/Stars\\_%28General\\_Conference%29](http://en.wikibooks.org/wiki/Adventist_Youth_Honors_Answer_Book/Nature/Stars_%28General_Conference%29)

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# Stars 1 Honour

## REQUIREMENT 1: Answer the following:

### a. Name the closest star beyond the solar system.

Beyond the solar system, our nearest star is Alpha Centauri. Alpha Centauri is the brighter of the two stars of the 'pointer' of the Southern Cross constellation.

### b. Compare the distance from earth of this star with the distance of the moon to earth.

The Moon has an average distance from the Earth of about 386,000 kilometres (240,000 miles). Alpha Centauri is about 4.2 light years away. Translated into kilometres (give and take a few!) this is about  $1 \times 10^{13}$  kilometres – 10 000 000 000 000 km. For the mathematically inclined, Alpha Centauri is about 165 million times the distance away from us than the moon. It is the closest star!

### c. What governs the tide?

The tides are governed by the Moon, and to a lesser extent, by the Sun. Spring tides are when the pull of the moon and sun is greatest and neap tides is when the pull is least.

### d. What causes an eclipse?

An eclipse is caused when the Sun, Earth and Moon are in a direct line with one another. When the Earth is between the Sun and the Moon, we see a lunar eclipse, which is the Earth's shadow falling on the moon. When the Moon is between the Sun and the Earth, we see a solar eclipse. The Moon's shadow falls on the Earth blocking the Sun.

### e. What is a shooting star?

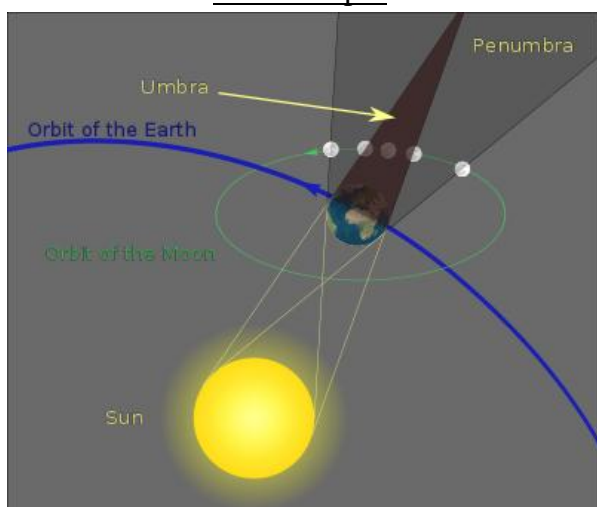
A shooting star is not a star at all, but rather a meteor. A meteor is any celestial body (usually quite small) that falls to the Earth. Most burn up in the atmosphere before reaching the surface, leaving a bright, short-lived streak in the sky.

### f. How fast does light travel?

Light travels about 300,000 km every second.

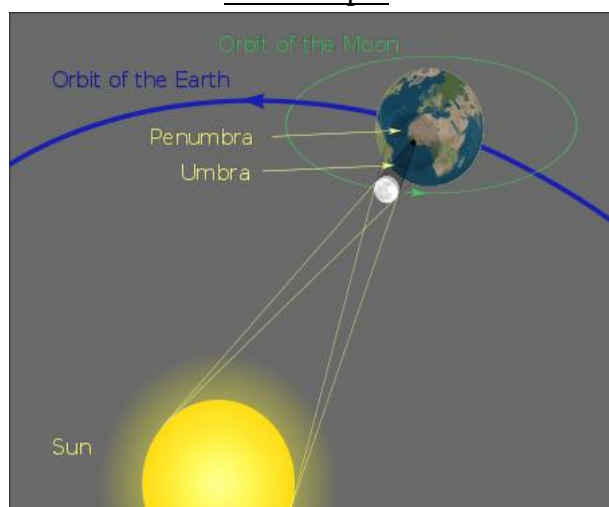
## REQUIREMENT 2: Make a diagram showing relative positions and movements of the earth, sun, and moon. Show positions and movements for eclipses of the sun and moon.

Lunar eclipse



[http://en.wikibooks.org/w/index.php?title=File:Geometry\\_of\\_a\\_Lunar\\_Eclipse.svg&filetimestamp=20080614044111](http://en.wikibooks.org/w/index.php?title=File:Geometry_of_a_Lunar_Eclipse.svg&filetimestamp=20080614044111)

Solar eclipse

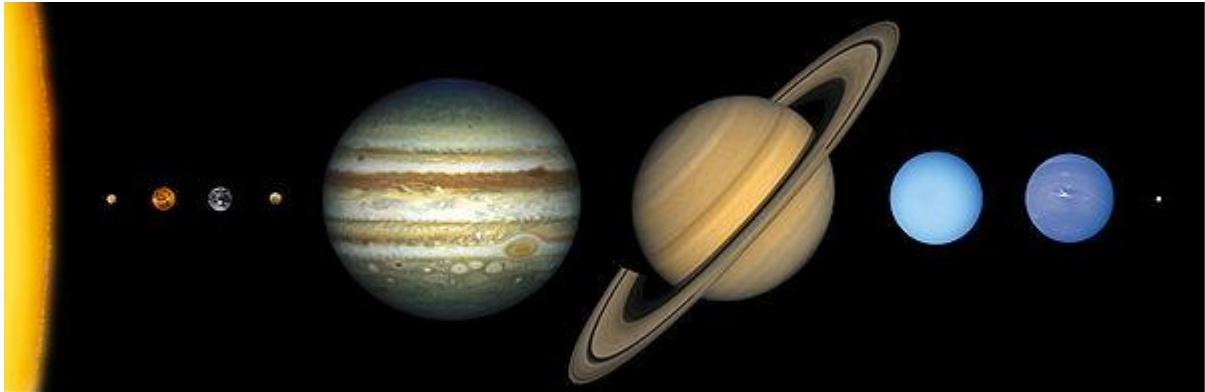


[http://en.wikibooks.org/w/index.php?title=File:Geometry\\_of\\_a\\_Total\\_Solar\\_Eclipse.svg&filetimestamp=20080614035051](http://en.wikibooks.org/w/index.php?title=File:Geometry_of_a_Total_Solar_Eclipse.svg&filetimestamp=20080614035051)

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**REQUIREMENT 3: Make a diagram of our solar system and be able to name the planets in order from the sun.**

Solar System diagram showing the relative sizes of the planets (plus Pluto, a dwarf 'planet')



[http://en.wikibooks.org/w/index.php?title=File:Solar\\_system\\_scale.jpg&filetimestamp=20050117195414](http://en.wikibooks.org/w/index.php?title=File:Solar_system_scale.jpg&filetimestamp=20050117195414)

The following text has been sourced from:

[http://en.wikibooks.org/wiki/Adventist\\_Youth\\_Honors\\_Answer\\_Book/Nature/Stars\\_\(General\\_Conference\)](http://en.wikibooks.org/wiki/Adventist_Youth_Honors_Answer_Book/Nature/Stars_(General_Conference))

The planets in our solar system, starting from the Sun, are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.

Pluto was also considered a planet from 1930 until 2006 when the International Astronomer's Union (IAU) was prompted by the discovery Eris, a body larger than Pluto, to come up with a formal definition of the word "planet." For years leading up to this announcement there had been rumblings in the scientific community that classifying Pluto as a planet had been a mistake, much as the classification of Ceres, the largest asteroid had been a mistake in the 1800's. After the discovery of Ceres, more and more asteroids were discovered, and it became increasingly clear that it was not a planet. The same thing began to happen in the late 1900's when astronomers began to discover several Pluto-like objects in the Kuiper belt. The debate came to a head with the discovery of Eris, which has a diameter that exceeds Pluto's by 70 miles (110 km). The IAU would have to either recognize Eris as the tenth planet or "demote" Pluto. The demotion of Pluto, though not popular with the general public, makes the most scientific sense and demonstrates that science is capable of correcting its errors.

The new definition of a planet requires that an object:

- a. Orbit a star (such as the Sun),
- b. Not orbit another planet (such as a satellite), and
- c. Dominate the vicinity of its orbit.

Pluto did not make the cut because its orbit is dominated by Neptune, and there are many objects orbiting in its vicinity that Pluto has no effect upon.

There are a number of mnemonic phrases that are easily memorized for remembering the names of the planets, including "**M**y **V**ery **E**nergetic **M**other **J**ust **S**erved **U**s **N**oodles (or Nutmeat!).

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**REQUIREMENT 4: What is the difference between planets and fixed stars? Identify in the sky eight fixed stars.**

Differences between planets and fixed stars are as follows (Source: *Stars 1 Honour Trainer's Notes\_Extra Info*)

- \* The planets give off a more steady light and the stars give off a twinkling light. That is because the light from the stars travels a far greater distance and will be distorted and bent a little somewhere in its travels to earth.
- \* When viewed over several nights, a planet will be noticed to steadily migrate through the stars in the constellation where the planet is observed. The word 'planet' comes from a Greek word that means 'wanderer' because the Greeks observed that some 'stars' were not fixed in position with the rest of the stars but wandered along independently.
- \* Planets are found only in the band of sky where the sun and moon are seen.

The stars are named by use of the Greek alphabet – alpha, beta, gamma, delta and so on. The brightest star in each constellation is named alpha followed by the constellation name. Then the next brightest star is called beta followed by the constellation name. For example: Sirius is the common name for the brightest star in the constellation of Canis Major and the alternative name for the star Sirius is Alpha Canis Majoris.

To identify eight fixed stars please see '*Stars 1 Honour Trainer's Notes\_Extra Info*' page 11 for a list of stars. Stars are identified in the constellations shown from pages 12 to 35. Alternatively see internet sites such as <http://server1.sky-map.org/?locale=EN> or star charts which are readily available (viz Australian Geographic in Australia) or libraries.

**REQUIREMENT 5: What is a constellation? Name and point out six. Name two constellations visible throughout the year.**

The word 'constellation' means in Latin '*set with stars*'. A constellation is a grouping of stars that have been arbitrarily considered to be a group and usually named after some object, animal or mythological being. Source: *Stars 1 Honour Trainer's Notes\_Extra Info*)

To name and point out six constellations use the strategy outlined in Requirement 5. *Stars 1 Honour Trainer's Notes\_Extra Info* (Pages 12 to 35) contains fascinating background information on the constellations shown.

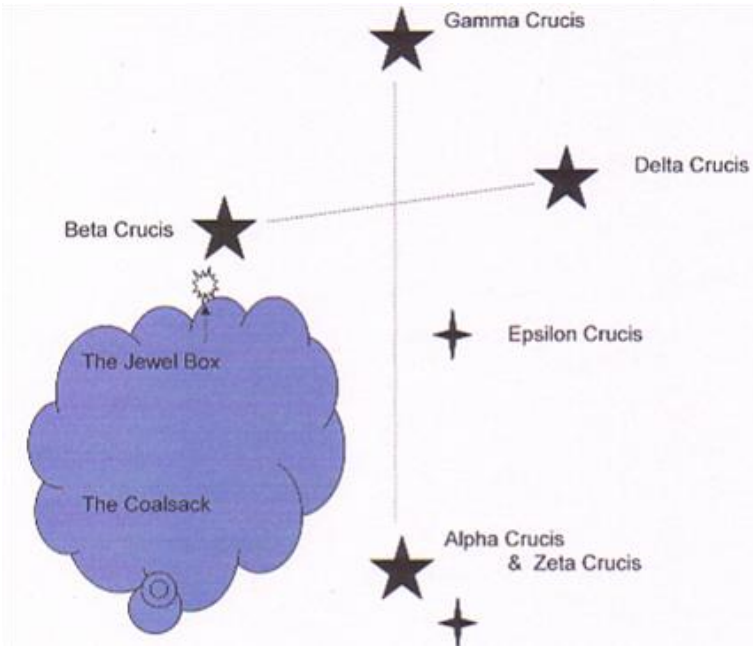
**Two constellations visible throughout the year.**

In the Southern Hemisphere the following are visible throughout the year: Southern Cross (ie Crux), Triangulum Australe, Centaurus, Musca and Apus. Apus is comprised of 4<sup>th</sup> magnitude stars and is thus very faint.

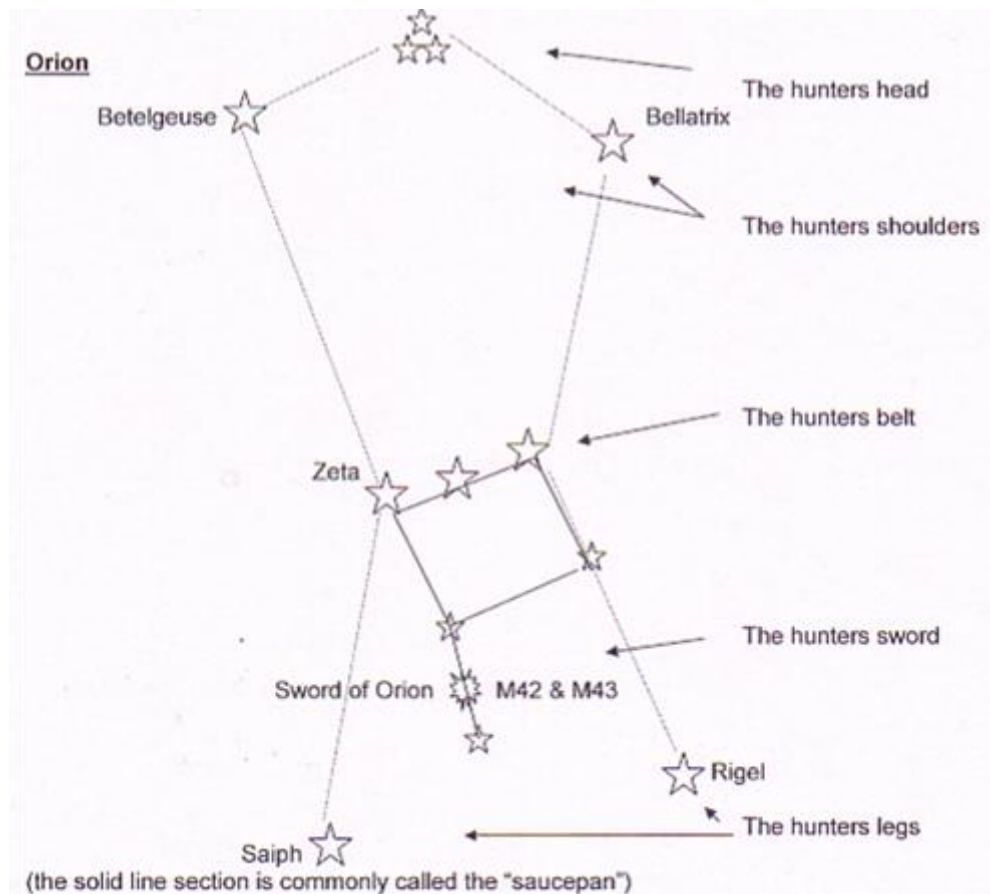
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**REQUIREMENT 6: For the Northern Hemisphere: draw a chart of the Big Dipper, Cassiopeia, and the North Star. For the Southern Hemisphere: draw a chart of the Southern Cross, Orion and Scorpio.**

The following charts are from *Stars 1 Honour Trainer's Notes\_Extra Info*

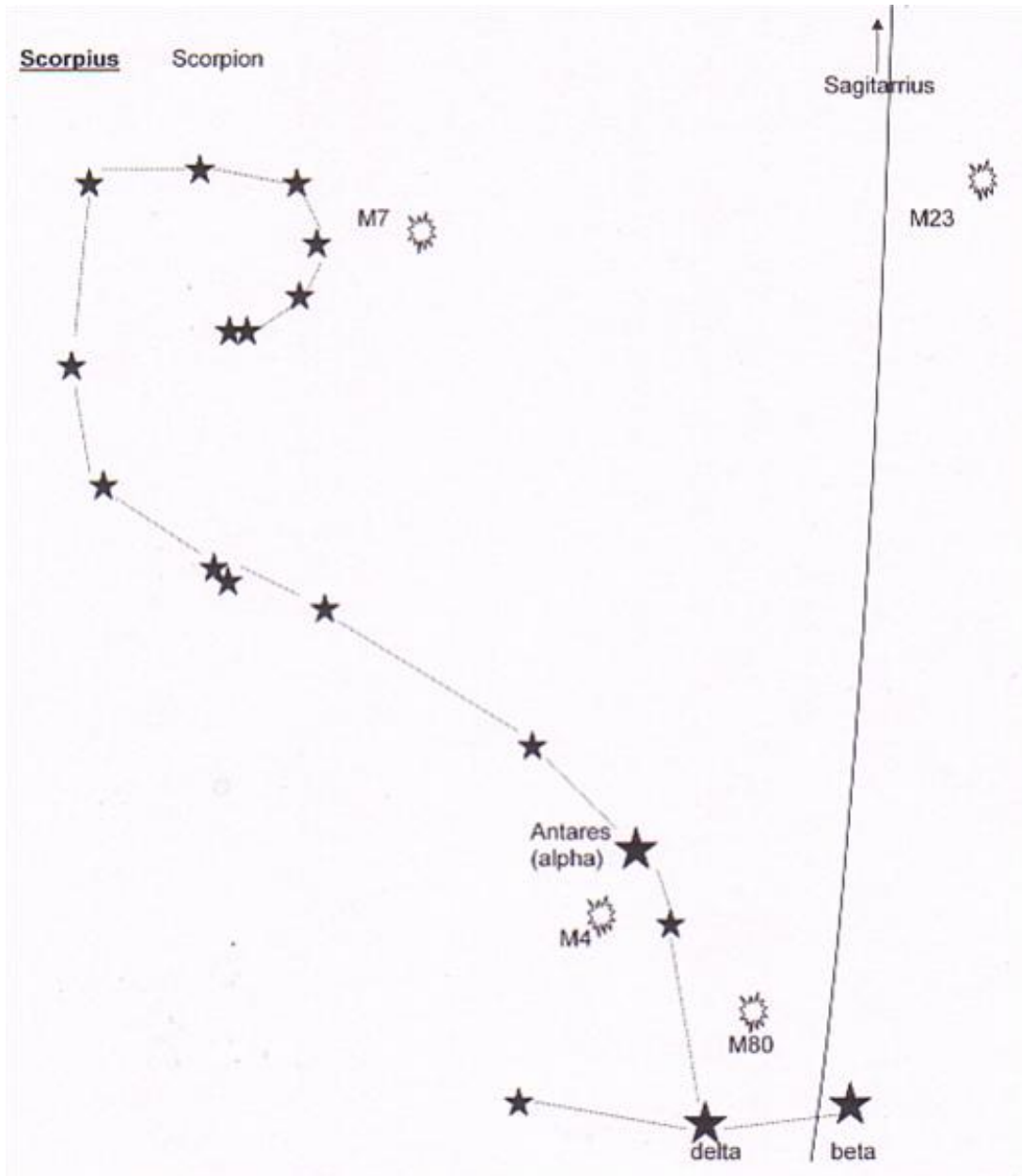


**Southern Cross (ie Crux)**



**Orion**

# Stars 1 Honour



## Scorpio

### **REQUIREMENT 7: What is the Milky Way? Observe the Milky Way in the night sky**

There are countless galaxies in the universe. The Milky Way is the galaxy in which our solar system exists. It is a barred spiral galaxy about 100 000 light years across and about 3 000 light years thick at the centre. We are about 25 000 light years from the centre. The portion visible in the night sky of Earth is only a single dimensional or flat view of the galaxy. When we look towards Sagittarius, we are looking towards the centre.

For more interesting information, see page 36 of *Stars 1 Honour Trainer's Notes\_Extra Info*

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## REQUIREMENT 8: What is the morning and evening star? Why does it carry both names?

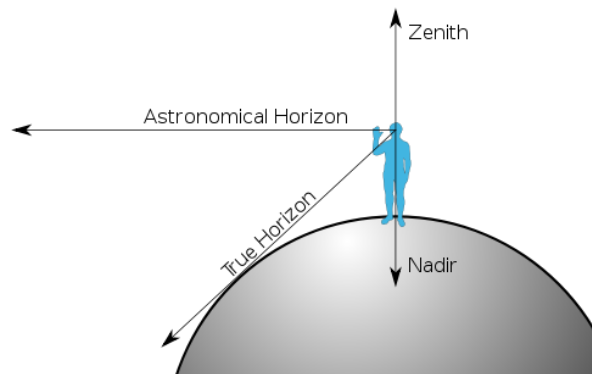
Based on *Stars 1 Honour Trainer's Notes\_Extra Info* page 37

The planet Venus is called both the morning and the evening star. Venus is cloud covered and therefore reflects a lot of the sun's radiation. That makes Venus shine very brightly. When Venus is near the western horizon, it is called the evening star. At sunset it is commonly the first "star" to be seen in the semi darkened sky as it is commonly the brightest object in that part of the twilight sky. Likewise at sunrise, when Venus is in the eastern sky it is the last "star" to disappear into the brightening sky as it is commonly the brightest object in the predawn sky.

## REQUIREMENT 9: Explain zenith and nadir.

Zenith is the point in space directly overhead. If you extend a line from the zenith to the point on Earth upon which you are standing, and continue that line through the Earth and out the other side, it would point to the nadir.

In other words, the line connecting the zenith and nadir passes through the point on Earth where you're standing and also passes through the centre of the Earth and out the other side.



Zenith is the vertical direction pointing away from the direction of the force of gravity. Nadir is the direction pointing in the same direction as gravity. Exact site for this picture <http://upload.wikimedia.org/wikipedia/commons/thumb/4/47/Zenith-Nadir-Horizon.svg/500px-Zenith-Nadir-Horizon.svg.png>

## REQUIREMENT 10: What is the Aurora Australis? What causes it?

An Aurora is a beautiful natural phenomenon that often occurs in the polar regions of Earth.

The immediate causes of aurora are precipitating energetic particles. These particles are electrons and protons that are energized in the near geospace environment. This energization process draws its energy from the interaction of the Earth's magnetosphere with the solar wind



Pictured: Aurora Australis 1994 from Bluff, New Zealand

<http://en.wikipedia.org/wiki/File:AuroraAustralisPaulMoss.JPG>