

# The Stars : Notes/W.S.-180

## Stellar Magnitudes

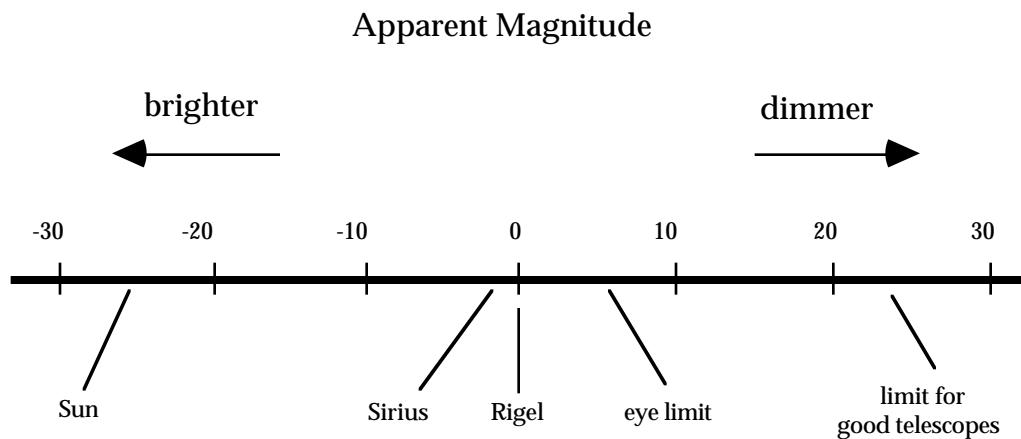
Stars vary in brightness. The astronomers assign a number to each star depending on how bright the star is. This number is called the **magnitude** of the star.

The **apparent magnitude** of a star is its brightness as it appears to us on the Earth.

The apparent magnitude of a star depends on how far away it is, plus how bright it really is.

The Greek astronomer Hipparchus devised the first classification system. There were six categories, ranging from first magnitude for the brightest stars, to sixth magnitude for the stars which were very faint. In modern times the scale was extended as shown below.

Brighter stars have a smaller magnitude.



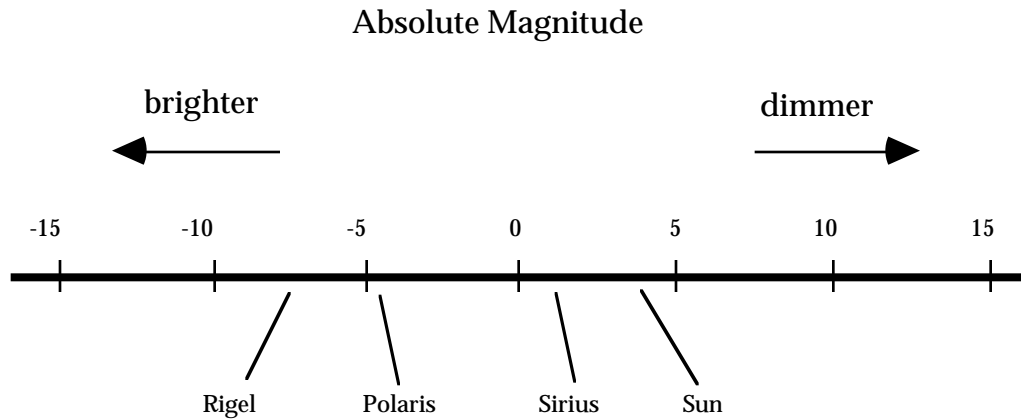
The apparent magnitudes of some objects are shown below.

<b>Object</b>	<b>Apparent Magnitude</b>
Sun	-26.5
Full Moon	-12.5
Venus	-4.4
Sirius	-1.4

Vega	0.0
Polaris	2.0
Uranus	5.5
Pluto	15

The naked eye can detect objects with a magnitude of about 6. The best telescopes can detect objects with magnitudes greater than 24.

The **absolute magnitude** is the true brightness of the object. The absolute magnitude is calculated by determining how bright the object would be at a distance of 10 parsecs from The Earth. A parsec is equal to 3.3 light-years. It turns out that the Sun is an ordinary star.



The absolute magnitudes of some stars are shown below.

Object	Absolute Magnitude
Rigel	-7.1
Polaris	-4.6
Sirius	1.4
Sun	4.8

In both scales, a decrease of one magnitude equals an increase in brightness by a factor of 2.5.

Questions:

- 1) What is the magnitude of a star?
- 2) What is the apparent magnitude of a star?

- 3) What two things determine the apparent magnitude?
- 4) Which star appears to be brighter; Sirius or Polaris?
- 5) Can Uranus be seen with the naked eye?
- 6) What is the absolute magnitude of a star?
- 7) What distance is 1.0 parsecs?
- 8) Which star is really brighter; Sirius or Polaris?
- 9)a) How much brighter is a magnitude 3 star than a magnitude 4 star?
- b) How much brighter is a magnitude -2 star than a magnitude +5 star?
- 10) Several stars have the apparent and absolute magnitudes given below. Answer the following questions.

<b>Star</b>	<b>Apparent Magnitude</b>	<b>Absolute Magnitude</b>
W	6	3
X	1	8
Y	-2	-2
Z	10	-7

- a) Which star appears to be the brightest?
- b) Which star is really the brightest?
- c) Which star is ten parsecs from the Earth?
- d) Which star is closest to the Earth?
- e) Which star cannot be seen with the naked eye?

Answers: 1) The magnitude is a number which tells how bright a star is., 2) The apparent magnitude is the brightness as it appears from the Earth., 3) The apparent magnitude depends on the distance from the

Earth and the true magnitude., 4) Sirius, 5) Yes, 6) The absolute magnitude is the true brightness of a star., 7) 3.3 light years, 8) Polaris, 9)a) 2.5, b) 610, 10)a) Y, b) Z, c) Y, d) X, e) Z.