

Visual Magnitude

Magnitude in astronomy is defined as the degree of brightness of a celestial body designated on a numerical scale. Also known as Visual Magnitude, the brightness being measured is in the visible spectrum, the range of light which you can see with your eye.

Historically the magnitude system started with Hipparchus and Ptolemy when they divided the stars into six magnitudes. About 20 of the brightest stars that they could observe from their location were assigned to the first magnitude. The next set of bright stars was assigned to second magnitude and so forth. Sixth magnitude stars were assigned to stars that were barely visible to the unaided eye under favorable conditions. This method of describing the brightness of a star survives today.

As more accurate instruments came into play, astronomers found that the ratio of first magnitude to sixth magnitude was about 100 to 1 and a logarithmic scale of 2.512 between magnitude levels was implemented. The more accurate measurements also allowed the astronomers to assign stars decimal magnitude values, like 2.75, rather than rounding off to magnitude 2 or 3.

So each magnitude is about 2.5 times brighter than the next greater magnitude. For example, a first magnitude star is 2.5 times brighter than a star of second magnitude and a fifth magnitude star is 2.5 times brighter than a sixth magnitude star.

Today, there are stars known to be brighter than magnitude 1. For instance Vega (alpha Lyrae) has a visual magnitude of 0.03. Stars brighter than Vega will have a negative value for magnitude, such as Sirius (alpha Canis Majoris) that has an apparent magnitude of -1.44.

Usually, when an astronomer talks about magnitude, they mean "apparent visual magnitude," referring to the way we perceive stars, viewing them from Earth. However, a star's intrinsic brightness is not just a matter of how brightly it shines, but also how far away it is. So, astronomers came up with another way to measure brightness and called this "absolute magnitude." Absolute magnitude is defined as how bright a star would appear if it were exactly 10 parsecs (about 33 light years) away from Earth. For example, the Sun has an apparent magnitude of -26.7 (because it's very, very close) and an absolute magnitude of +4.8.

Star	Absolute Magnitude	Apparent Magnitude	Distance from Earth (light-years)
The Sun	+4.8	-26.72	.
Sirius	+1.4	-1.46	8.6
Arcturus	+0.2	-0.04	34
Vega	+0.6	0.03	25
Altair	+2.3	+0.77	16
Deneb	-7.2	+1.25	1,500
Capella	+0.4	+0.08	41
Rigel	-8.1	+0.12	900

Magnitudes of celestial bodies are expressed in terms of integrated light – the light of the object is compacted to a point source like a star, and then measured. Thus a very extended object like M33, a galaxy in Triangulum, has a fairly bright magnitude of 5.7 but looks quite faint in a telescope.

The larger the apparent magnitude, the fainter the object.