

ISS Activity #1

Understanding brightness of objects:

- Graph paper.
- Activity #1 Worksheet and information sheet.

Topic: How is brightness of astronomical objects measured?

Activity:

Read **Astronomical Objects – Brightness/Distance from Earth** on the other side of this sheet.

Worksheet:

What surprised you about the brightness scale or the brightness of individual objects?

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The ISS is often VERY bright. At the right time of day (dawn or dusk) if it is passing overhead, it will be the brightest object in the sky (unless the Moon is up).

Copy the brightness scale and extend it to -13 on the left. Try and make it as wide as possible inside the box. Now write in all the objects in the table on your graph (you can leave the Sun out).

Astronomical Objects – Brightness/Distance from Earth

How is brightness measured?

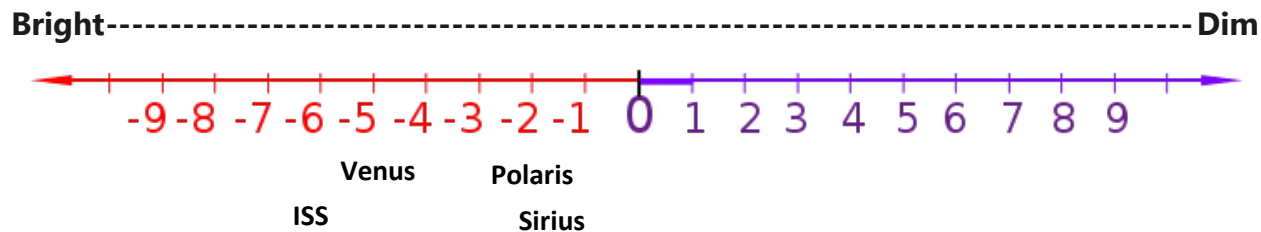
Major objects in the sky are given a brightness number. For example, the Sun is -26.74 – that's its magnitude, Venus is -4.89. The Pole Star (Polaris) is 1.47.

Does that seem strange to you? The Sun is the brightest object in the sky but has the lowest number.

The scale appears to work 'in reverse' - objects with a negative magnitude (on the left of the scale) are brighter than those with a positive magnitude (on the right of the scale). The 'larger' the negative value, the brighter the object is.

It's even weirder than that. Let's take two objects that are about 1 number apart – Venus at -4.89 and the ISS at -5.90. Which is brighter? The ISS. And how much brighter is it? 2.5 times brighter. Each point on the scale is 2.5 time brighter than the one to the right.

The brightness scale is not LINEAR (not a straight line on a graph). It's LOGARITHMIC and grows steeply (just like exponents do – 10^1 , 10^2 , 10^3 – each is bigger than the number before by a factor of 10). On the brightness scale, the factor is 2.5 (not 10).



Have you ever seen Venus in the sky (look near the horizon close to the Sun at sunrise or sunset)? At its brightest, it's bright. The International Space Station at its brightest is even brighter.

Astronomical Objects and Their Brightness

Below are some objects in the sky and their brightness numbers.

Object	Magnitude (brightness)	Distance at its closest (from Earth)
Sun	-26.74 (about 400,000 times brighter than the full Moon)	93 million miles
Full Moon	-12.90 (when at its closest)	238,900 miles
An Iridium flare (see Activity 2)	-9.50 maximum. Iridium flares are satellites in Earth orbit. When their solar panels reflect sunlight, they "flare" up for a few seconds and then fade away again – very dramatic. These satellites are being replaced with new ones that are less reflective by 2018. Now's the time to see one. (See Activity #2).	483 miles
International Space Station (ISS)	-5.90 when closest to Earth and illuminated by the Sun. Can be seen at dawn and dusk only	254 miles
Venus	-4.89 maximum brightness as a crescent	24 million miles
Jupiter	-2.94	365 million miles
Mercury	-2.45 when on the far side of the Sun	48 million miles
Sirius	-1.47 Sirius is the brightest star (other than the Sun of course)	50.62 trillion miles or 8.61 light years
Vega	0.3	147.3 trillion miles or 25.05 light years
Polaris	1.98 (the Pole Star)	2,550 trillion miles 533.8 light years