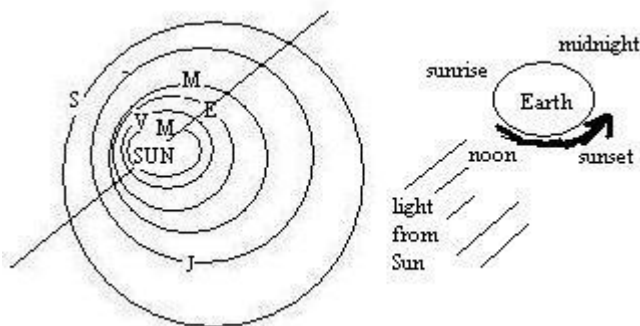


Ponder the Portage County Skies with Paul Sky events for November 2007

- 4 Daylight savings time ends @ 2 a.m.
- 5 Moon passes 3° south of Venus 14:00
- 5 Taurid meteor shower
- 6 Shuttle Discovery scheduled to return
- 8 Mercury at greatest elongation (19° W)
- 9 New Moon 17:03,
- 8 Moon @ apogee (252,694 miles from Earth)
- 12 Moon passes 5° south of Jupiter @ 17:00
- 15 Mars appears stationary
- 17 1st Q. Moon 16:00
- 18 Leonid meteor showers peaks
- 23 Moon at perigee (221,950 miles from Earth)
- 24 Full Moon @ 08:30
- 27 Moon passes 1.7° north of Mars @ 00:00
- 28 Venus passes 4° north of Spica

The Leonids on the 18th should range from 20 to 40 per hour between 2 am and 5:16 am (when astronomical twilight starts in Portage county.)
The 1st Q. moon will set at midnight, so the skies will be prime for the Leonid meteor shower.



Most of the action this month is after midnight. Note the diagrams. The inside M represents the location of Mercury. (V)enus, (E)arth, (M)ars, (J)upiter, and (S)aturn are also shown in the diagram where they are at the start of Nov. A line is drawn through the Earth and the Sun. These diagrams serve to explain two sky phenomena. First note that as the Earth spins counterclockwise (diagram on the right) that the left side of the Earth facing the sun represents noon and the right side of the Earth away from the sun represents midnight. Thus, all celestial objects under the line (diagram on the left) can be seen in the evening hours and the objects above the line can be viewed in the morning. Notice that Jupiter (below the line) is the only planet visible at sunset but as the world turns Mars appears about 11 pm, Saturn about 2:30 am, Venus about 4 pm, and Mercury on the 8th will be just above and between the moon and Spica at dawn.

Secondly note (left diagram) that as earth passes Mars on the inside track that Mars will appear to go backwards (retrograde motion) from Nov. 15th until Dec. 24th. As Earth approaches opposition with Mars (at which point Mars will be on the Sun-Earth line), on Dec. 24th, Mars will almost double in brightness (-0.6 to -1.3 magnitude). During the next three months Mars makes its best appearance in two years.

Whether it is chemistry's first element Hydrogen or Astronomy's first Messier Object (M1) everything starts with one. The number 1 is the oldest of all numbers and existed thousands of years before zero. Some of the obvious ways to arrive at 1 are: 1+0; 9-8; 1 times 1; 6/6; and 1 to the 1 power. In logarithms, any log of a number to the base of the same number is 1 (examples: log base 8 of 8 = 1). In trigonometry, $\sin^2 X + \cos^2 X = 1$ and the unit circle (a circle with radius 1), aids in determining trigonometric values. For exponential functions, anything to the zero power is 1 ($8^0 = 13^0 = 1$). In imaginary numbers, i to any power evenly divisible by 4 equals 1 (examples: $i^4 = i^8 = i^{12} = 1$). Whether it is the unit vector or the identity matrix, the number 1 plays a key role in every set of numbers in mathematics. The first derivative (slope of the tangent line) of $f(x) = e^x$ at $x = 0$ is 1. One of the coolest things ever discovered to equal 1 is $-e^{(\pi i)} = 1$ where i equals the square root of a negative one and e (approx. 2.71828...) is a transversal irrational number like π (approx. 3.14159...).

One of the greatest uses of 1 is for unit conversions. Since 12 eggs = 1 dozen. 12 eggs/1 dozen = 1 and so does 1dozen/12 eggs = 1. Also, since multiplying by 1 gives something equivalent back, taking (24 eggs) X (1 dozen/12 eggs) = 24/12 dozen = 2 dozen. Note the unit of eggs cancels above. To figure out how many years a billion minutes would be note the following unit conversions.

$(1,000,000,000 \text{ min.})(1 \text{ hr.}/60 \text{ min.})(1 \text{ day}/24 \text{ hr.})(1\text{-yr.}/365.24219 \text{ days}) = 1,109 \text{ years}$. Note how each time you are multiplying by a form of the number 1 and yet each time the unit you don't want cancels out and you approach the unit you desire. Imagine, if you went back 1 billion minutes from today you would end up in the year 106 AD. GNATS!