Science: Astronomy

Observational Astronomy

Objectives

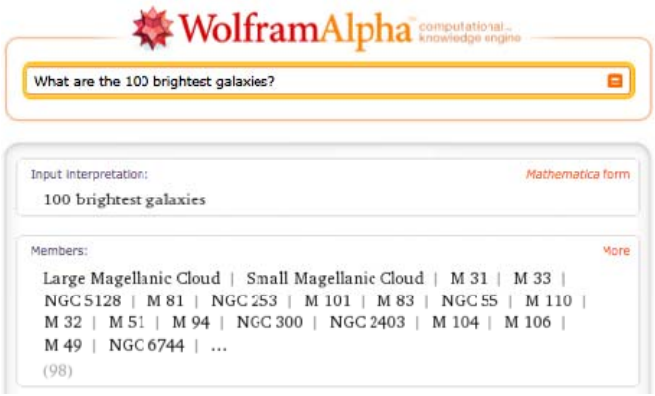
Students will be able to:
• Plan observation sessions by date, time, location, and target.
• Identify specific astronomical objects as examples of principles and information learned in class.
• Research the properties of astronomical objects.

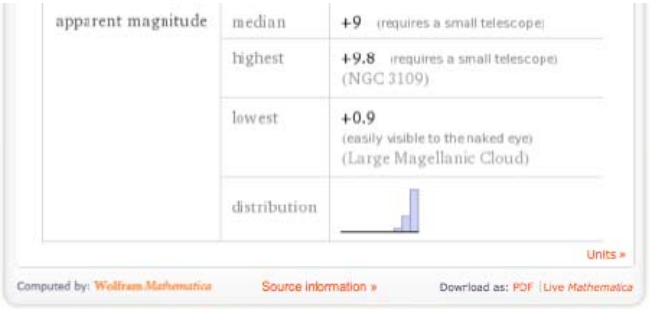
Warm-Up

What do you see? Ask students how many stars or constellations they can recognize when looking up at the night sky, and ask about the history of human efforts to study the heavens. What do students know about telescopes? Satellites? Orbiting telescopes? Manned spaceflight? Space probes?

Lesson

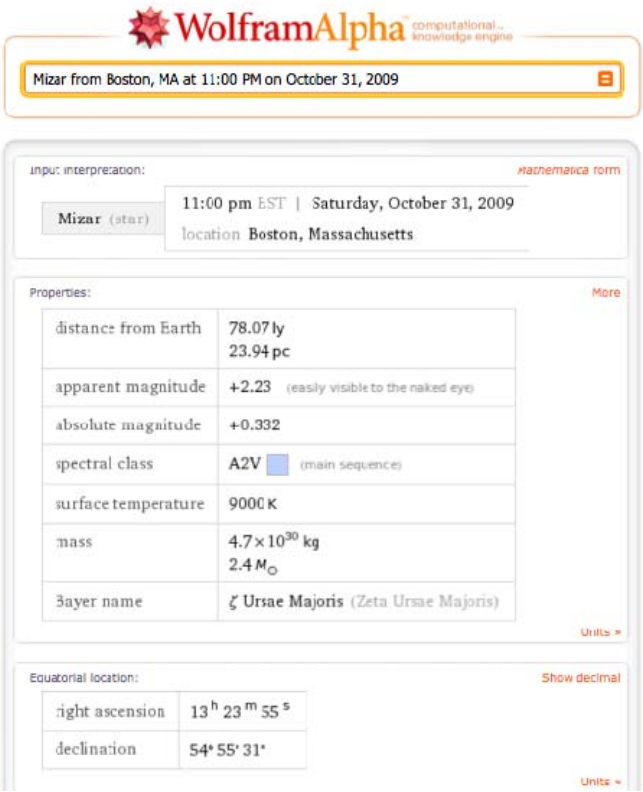
• Ask students what kinds of objects they might look for when doing observational astronomy. The Moon? Stars? Point out that a wide variety of objects are present in the sky, such as planets, galaxies, and binary stars. Have students research these objects using W|A and make determinations about their visibility.

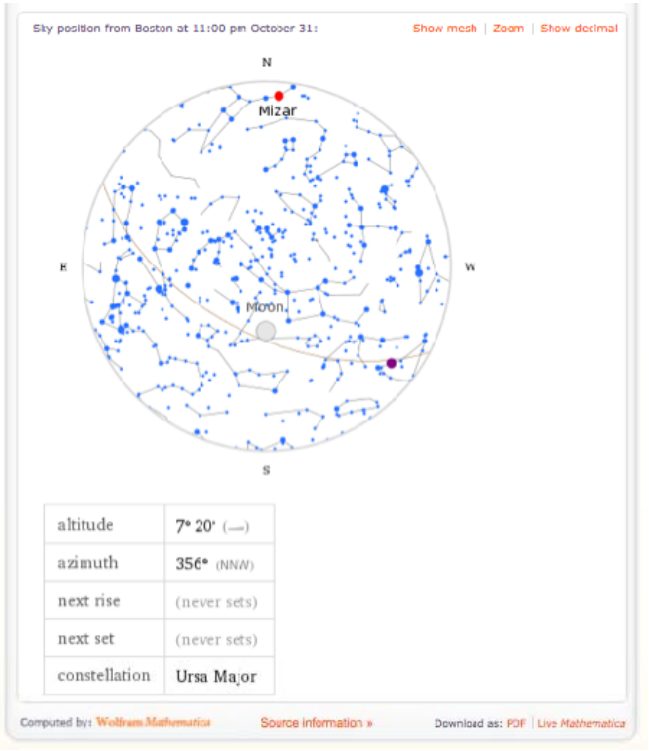


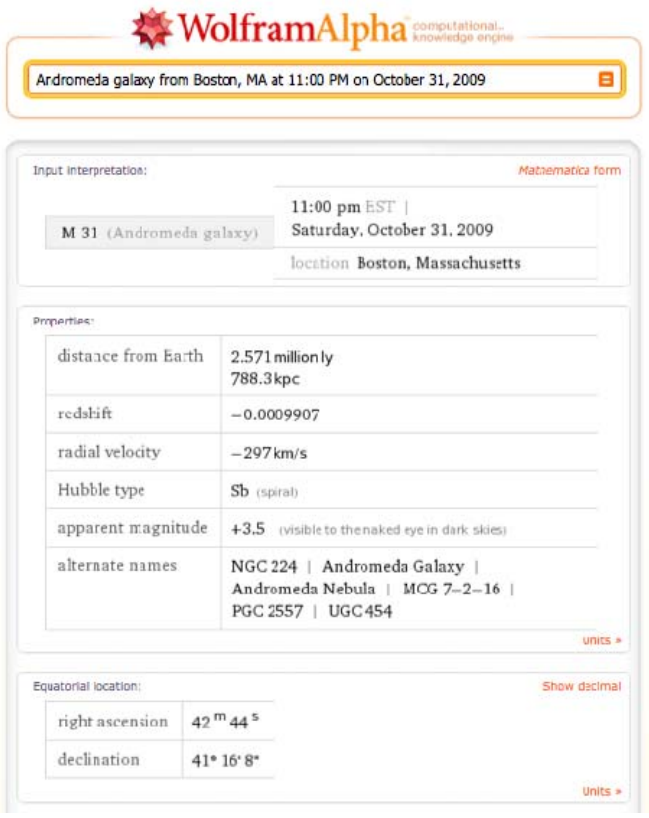


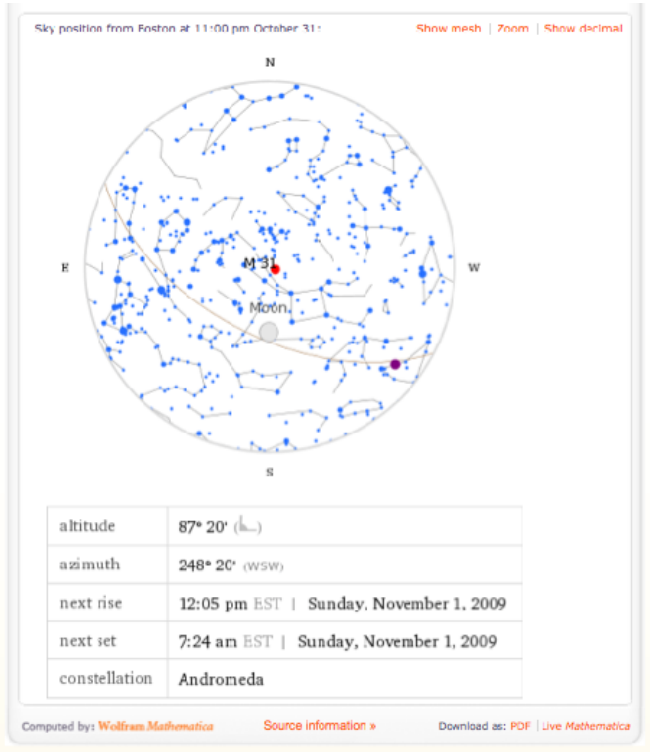
• Now ask students to plan an observing session. Split them into groups and ask each group to pick several targets (perhaps one planet, one galaxy, one constellation, and one binary star) as well as a specific night and time at which they may conduct observations.

• Have each group input the date, time, name of their hometown, and target object into W|A. Suggested targets include easily visible objects like the visual binary star Mizar (located in the Big Dipper), the relatively nearby Andromeda galaxy, and planets like Mars, Jupiter, or Saturn.

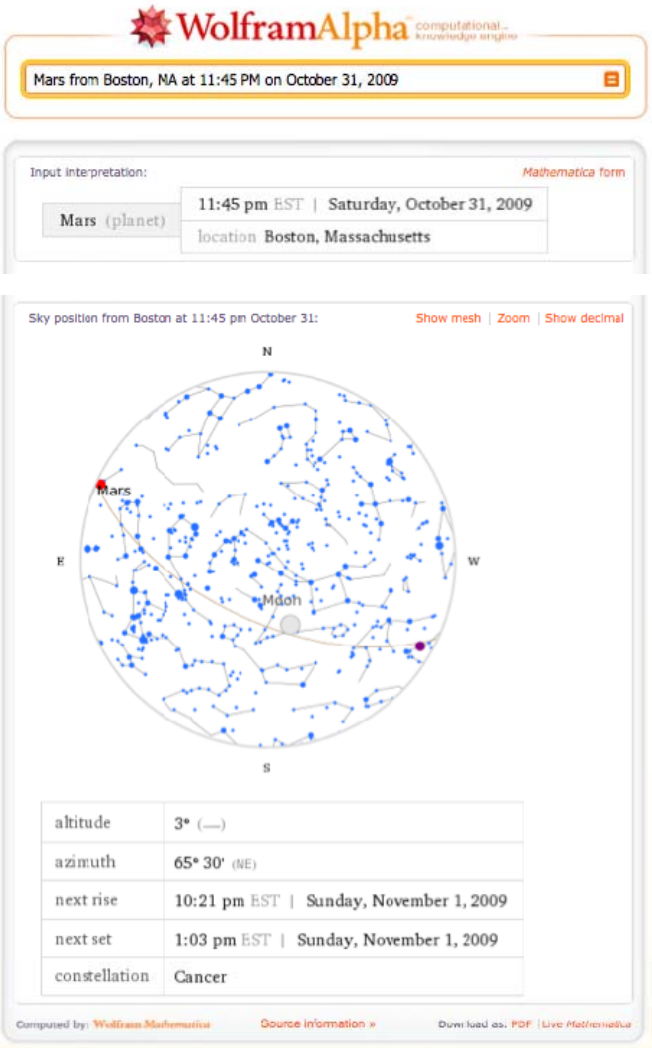


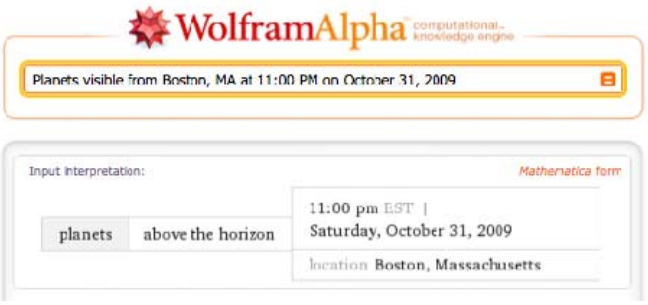

Sky position from Boston at 11:00 pm October 31:
Show mesh | Zoom | Show decimal
N
Mizar
E
W
Moon
S
altitude 7° 20' (—)
azimuth 356° (NNW)
next rise (never sets)
next set (never sets)
constellation Ursa Major
Computed by: Wolfram Mathematica
Source information »
Download as: PDF | Live Mathematica

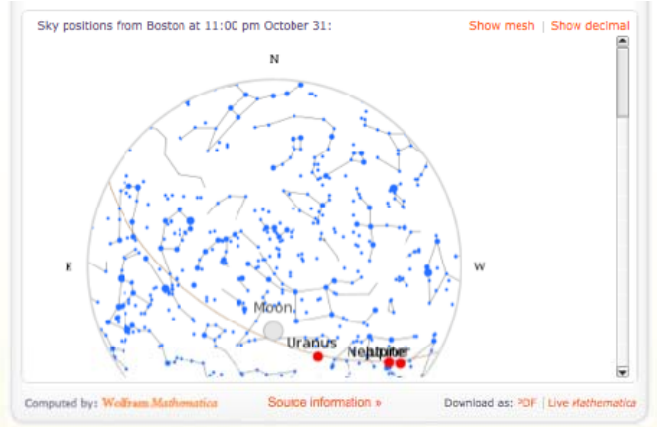

WolframAlpha computational knowledge engine
Andromeda galaxy from Boston, MA at 11:00 PM on October 31, 2009
Input interpretation:
Mathematica form
M 31 (Andromeda galaxy)
11:00 pm EST |
Saturday, October 31, 2009
location Boston, Massachusetts
Properties:
distance from Earth 2.571 million ly
788.3 kpc
redshift −0.0009907
radial velocity −297 km/s
Hubble type Sb (spiral)
apparent magnitude +3.5 (visible to the naked eye in dark skies)
alternate names NGC 224 | Andromeda Galaxy |
Andromeda Nebula | MCG 7−2−16 |
PGC 2557 | UGC 454
units »
Equatorial location:
Show decimal
right ascension 42m 44s
declination 41° 16' 8"
units »



• Clearly, in order to observe Mars from Boston, MA on this particular evening, it would be necessary to keep observing until at least 11:23 PM. If a group runs into this type of problem, instruct them to alter their observation plan accordingly, either by conducting observations at a different time or by looking for a different target. W|A allows users to do both.


WolframAlpha computational knowledge engine
Mars from Boston, MA at 11:45 PM on October 31, 2009
Input interpretation:
Mathematica form
Mars (planet)
11:45 pm EST | Saturday, October 31, 2009
location Boston, Massachusetts
Sky position from Boston at 11:45 pm October 31:
Show mesh | Zoom | Show decimal
N
E
W
S
Mars
Mdoh
altitude 3° (—)
azimuth 65° 30' (NE)
next rise 10:21 pm EST | Sunday, November 1, 2009
next set 1:03 pm EST | Sunday, November 1, 2009
constellation Cancer
Computed by: Wolfram Mathematica
Source information »
Download as: PDF | Live Mathematica


WolframAlpha computational knowledge engine
Planets visible from Boston, MA at 11:00 PM on October 31, 2009
Input interpretation:
Mathematica form
planets above the horizon
11:00 pm EST |
Saturday, October 31, 2009
location Boston, Massachusetts



• Searching for a variety of objects and studying their rise and set times will allow students to determine optimal times for observing the objects that interest them. Ask each group to confirm a date, time, and list of targets for its observing session, and ask students to collect such data as relative brightness, apparent color, apparent size, etc. Help students print out sky maps for their chosen objects and observing times and recommend binoculars as a tool for making more detailed observations of dim objects.

Closing

• Ask each group of students to research, write, and deliver a presentation about one of the objects they observed. Remind them to discuss the results of their own observations and to research data such as multiple names for the object, the object's discoverer (if applicable), and anything known about the object's composition, size, distance, etc. For up-to-date facts, use W|A and point students toward SIMBAD (an online catalog of data on astronomical objects) and ASTRO-PH (an online compendium of published and not-yet-published astrophysical research).

Demonstrations

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The Celestial Sphere

Advanced Celestial Sphere

Phases of Planets
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