

# Teacher Worksheets

## Determining the Radiant of a Meteor Shower

**Grade:** 6

**Curriculum Outcome:** 302-13 Students should be able to identify constellations in the night's sky.

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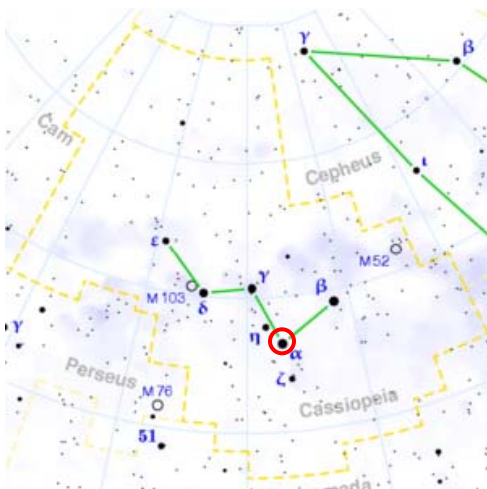
# Determining the Radiant of a Meteor Shower

Name \_\_\_\_\_

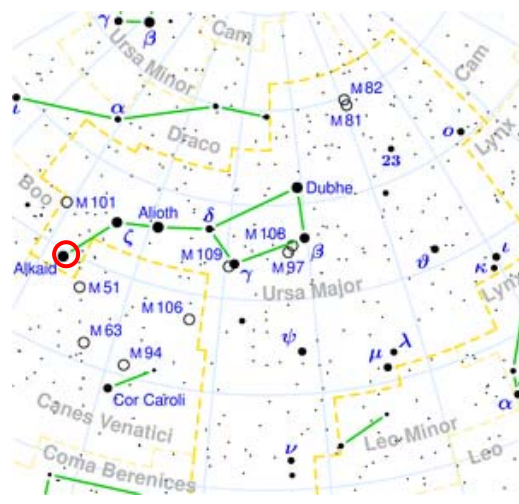
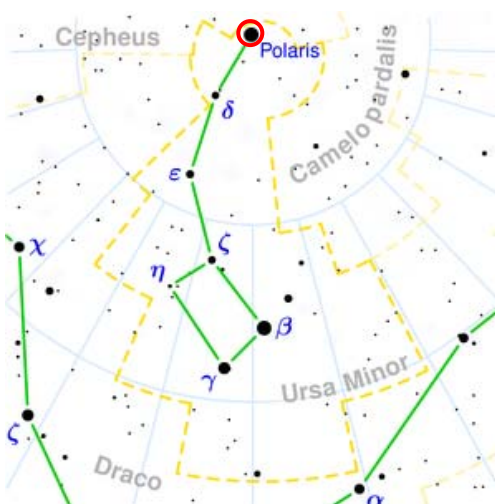
## Problem 1:

During the summer, there were a number of meteors observed passing through some identifiable constellations by some of your classmates. Plot these meteor paths on the August star map provided on page 6. Once all paths have been plotted, trace them back until they intersect. This point is called the radiant of this meteor shower. It's the point from which the meteors appear to radiate.

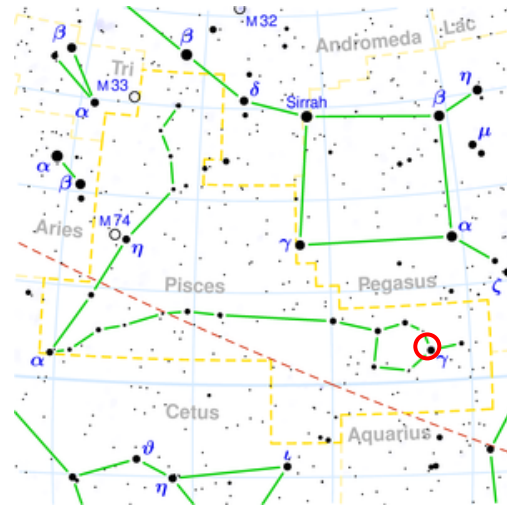
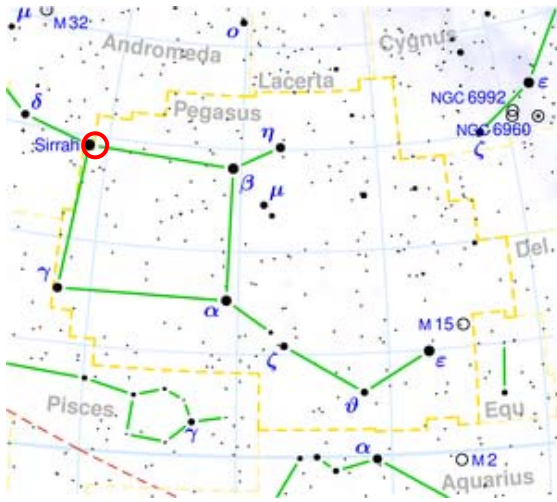
Step 1: John saw a meteor starting at  $\alpha$  CAS (star in the constellation Cassiopeia) and ending at Altair in the constellation Aquila (see below). Identify these locations on the August star map and plot the meteor sky track.



Step 2: Jane saw a meteor starting at Polaris (North Star) in Ursa Minor and ending at Alkaid in the constellation Ursa Major (see below). Identify these locations on the August star map and plot the meteor sky track.



Step 3: Jack saw a meteor starting at Sirrah in the constellation Pegasus and ending at  $\gamma$  PSC, the western most star circled in the constellation Pisces. Identify these on the August star map and plot the meteor sky track.



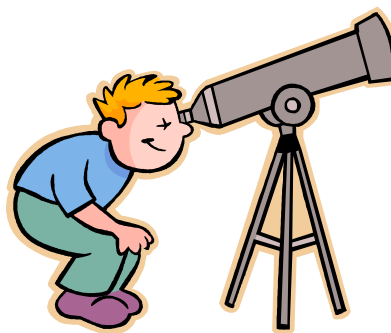
Once the radiant is found (the point from which the three meteors appear to radiate), find the constellation that is nearest the radiant. Knowing this constellation name, and the time of the year, try to define the name of the meteor shower on the Table on page 8, and the source of the meteor material. Once found, fill in the following 4 blanks.

Constellation nearest the radiant: \_\_\_\_\_

Shower Name: \_\_\_\_\_

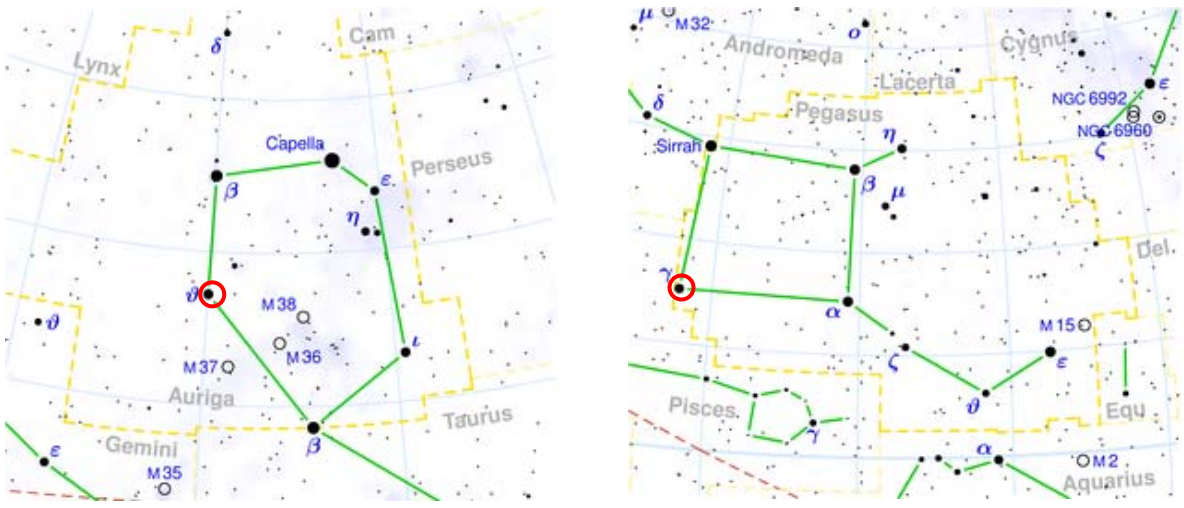
Activity Period: \_\_\_\_\_

Parent Comet/Asteroid: \_\_\_\_\_





Step 3: Bob saw a meteor starting at  $\theta$  Aur (in the constellation Auriga) and ending at  $\gamma$  Peg (in the constellation Pegasus). These locations are shown below.



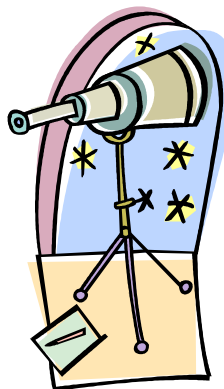
Once the radiant is found, use the constellation that is nearest the radiant along with the month the meteor shower was seen and try to locate the name of the meteor showers from the meteor shower table provided. Once found, fill in the following 4 blanks.

Constellation nearest the radiant: \_\_\_\_\_

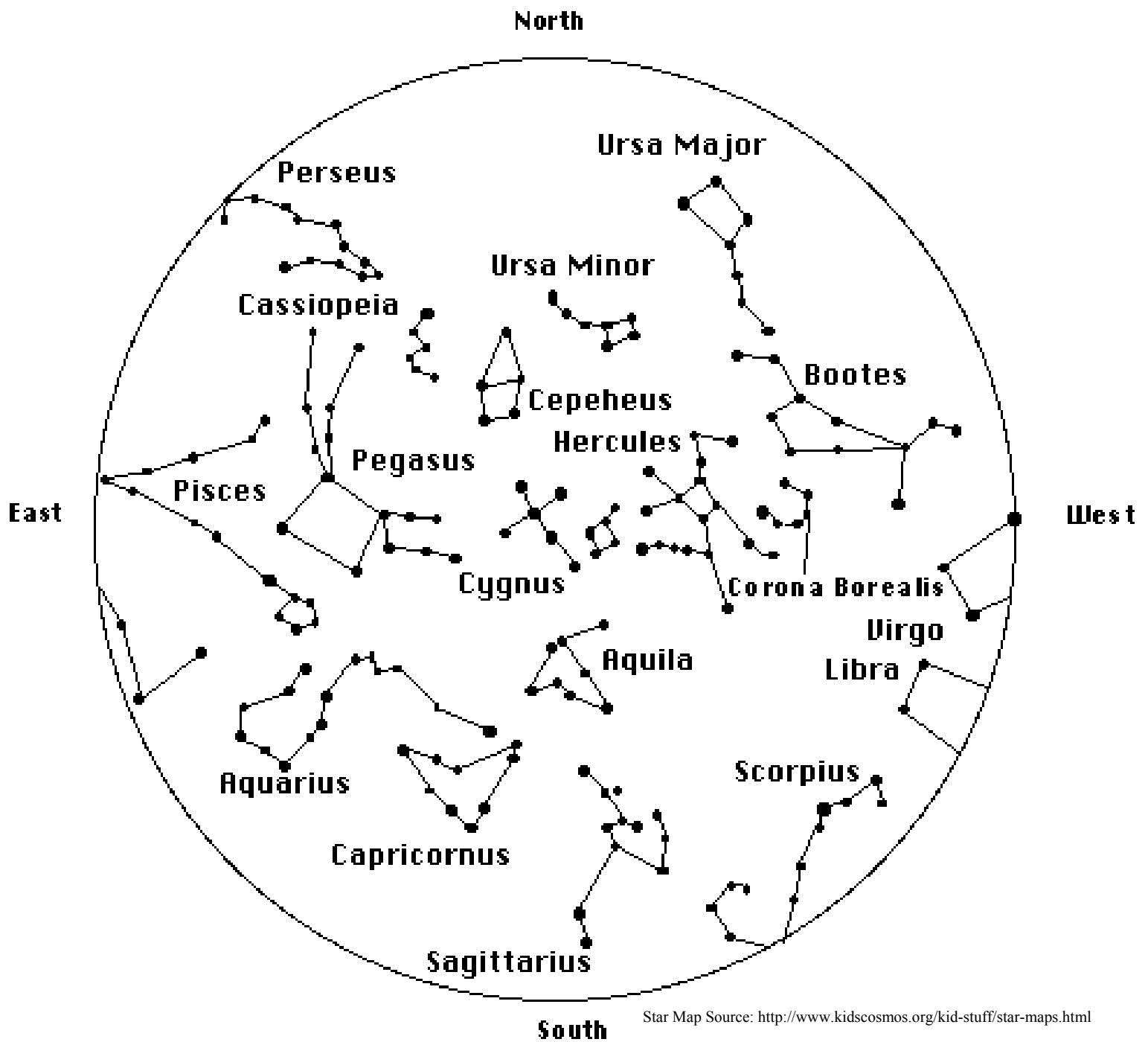
Shower Name: \_\_\_\_\_

Activity Period: \_\_\_\_\_

Parent Comet/Asteroid: \_\_\_\_\_

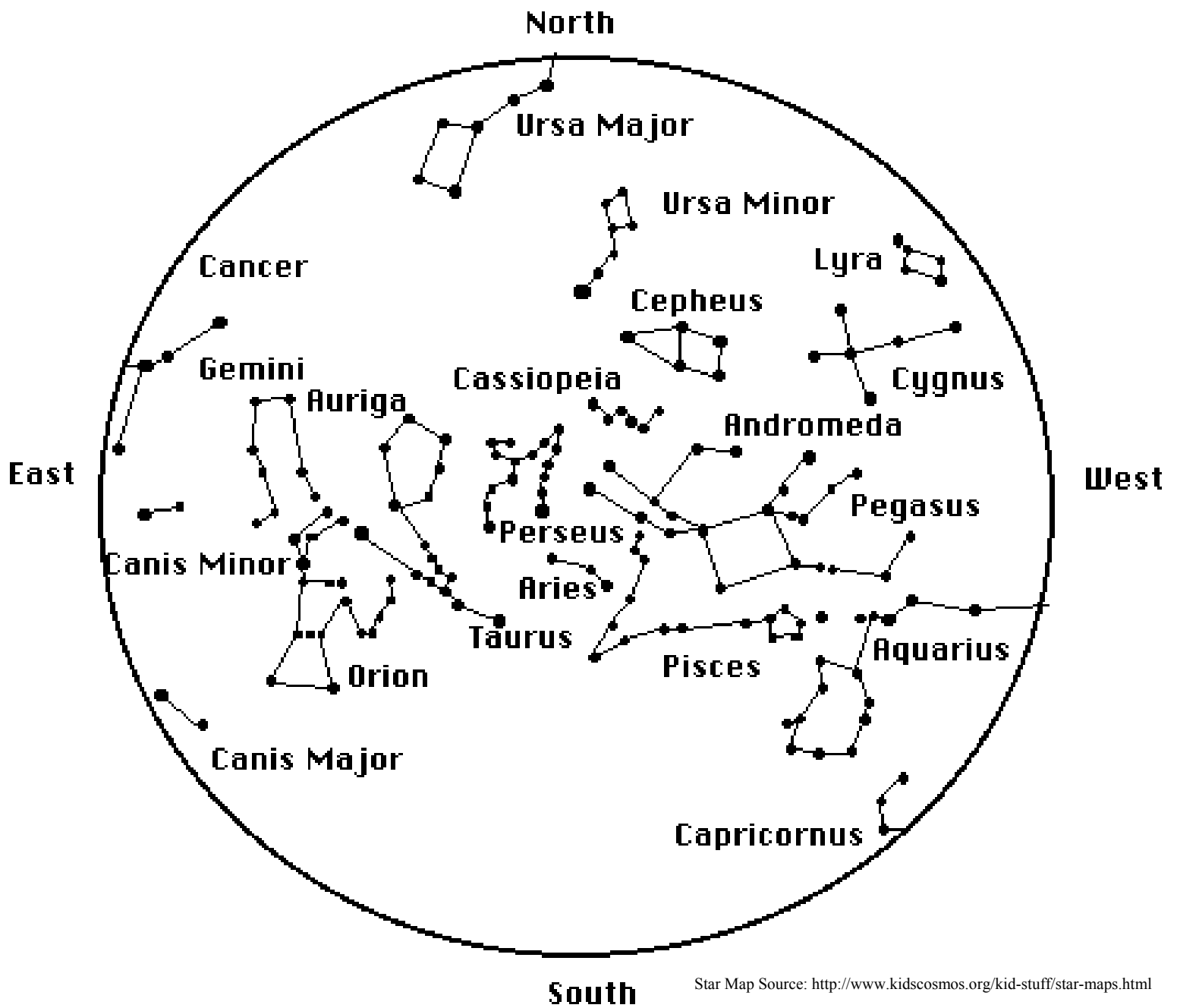


# August Star Map



Star Map Source: <http://www.kidscosmos.org/kid-stuff/star-maps.html>

# December Star Map



# Meteor Shower Calendar (2007)

Meteor Shower Name	Radiant Location	Activity Period	Maximum Date	Zenith Hourly Rate	Source of meteor material
Antihelion Source	various	Jan 01-Dec 31	n/a	3	
Quadrantids	Bootes	Jan 01-Jan 05	Jan 04	120	2003 EH1 (asteroid)
alpha-Centaurids	Centaurus	Jan 28-Feb 21	Feb 08	5	
delta-Leonids	Leo	Feb 15-Mar 10	Feb 25	2	
gamma-Normids	Scorpius	Feb 25-Mar 22	Mar 14	4	
Lyrids	Lyra	Apr 16-Apr 25	Apr 22	18	Thatcher (comet)
pi-Puppids	Puppis	Apr 15-Apr 28	Apr 24	var.	
eta-Aquarids	Aquarius	Apr 19-May 28	May 06	60	Halley's Comet
eta-Lyrids	Lyra	May 03-May 12	May 09	3	C\1861 G1 (comet)
June Bootids	Near Bootes	Jun 26-Jul 02	Jun 27	var.	7P/Pons-Winnecke (comet)
Pisces Austrinids	Piscis Austrinus	Jul 15-Aug 10	Jul 28	5	
Southern delta-Aquarids	Aquarius	Jul 12-Aug 19	Jul 28	20	
alpha-Capricornids	Capricornus	Jul 03-Aug 15	Jul 30	4	
Perseids	Near Perseus	Jul 17-Aug 24	Aug 13	100	Swift-Tuttle (comet)
kappa-Cygnids	Cygnus	Aug 03-Aug 25	Aug 18	3	
alpha-Aurigids	Auriga	Aug 25-Sep 08	Sep 01	7	
September Perseids	Perseus	Sep 05-Sep 17	Sep 09	5	
Draconids	Near Hercules	Oct 06-Oct 10	Oct 09	var.	Giacobini-Zinner (comet)
epsilon-Geminids	Gemini	Oct 14-Oct 27	Oct 18	2	
Orionids	Orion	Oct 02-Nov 07	Oct 21	23	Halley's Comet
Leo Minorids	Leo Minor	Oct 19-Oct 27	Oct 24	2	
Southern Taurids	Taurus	Oct 01-Nov 25	Nov 05	5	Encke (comet)
Northern Taurids	Taurus	Oct 01-Nov 25	Nov 12	5	
Leonids	Leo	Nov 10-Nov 23	Nov 18	15+	Tempel-Tuttle (comet)
alpha-Monocerotids	Canis Minor	Nov 15-Nov 25	Nov 22	var.	
Dec. Phoenicids	Phoenix	Nov 28-Dec 09	Dec 06	var.	
Puppids-Velids	Between Puppis and Vela	Dec 01-Dec 15	Dec 07	10	
Monocerotids	Near Gemini	Nov 27-Dec 17	Dec 09	2	
sigma-Hydrids	Near Head	Dec 03-Dec 15	Dec 12	3	
Geminids	Gemini	Dec 07-Dec 17	Dec 14	120	3200 Phaethon (asteroid)
Coma Berenicids	Near Coma Berenices	Dec 12-Jan 23	Dec 20	5	
Ursids	Ursa Minor	Dec 17-Dec 26	Dec 23	10	8P/Tuttle (comet)

**Shower Name:** named for the constellation or closest star within a constellation where the radiant is located at maximum activity.

**Radiant Location:** The constellation nearest the radiant.

**Activity Period:** the dates when the Zenith Hourly Rates are equal to or greater than one per hour.

**Maximum Date:** the date on which the maximum meteor activity is expected to occur.

**Zenith Hourly Rate:** the average maximum number of shower meteors visible per hour if the radiant is located exactly overhead.

**Source:** The source of the meteor shower. This is usually debris from the tail of a comet or, more rarely, an asteroid.

# Determining the Radiant of a Meteor Shower

## (Teacher's Guide)

**Grade:** 6

**Curriculum Outcome:** 302-13 Students should be able to identify constellations in the night's sky.

### Definitions:

**Meteoroid:** Dust and debris left behind from a comet or asteroid, floating in space (before it enters the atmosphere). These are small particles (no bigger than a boulder) anything bigger is called an **asteroid**.

**Meteors:** Pieces of this dust or debris that enter the atmosphere and burns up. These are also known as 'shooting stars' or 'falling stars'. Most burn up and never land at the surface.

**Fireball:** Is simply a very bright meteor, generated by a larger chunk or rock. Fireballs can make it to the ground, where the rocks are called meteorites.

**Meteorites:** Pieces that do not burn up and have landed on Earth. Larger rocks can sometimes generate an impact crater, though most are too small to do so.

**Radiant:** The location in the sky from which a group of meteors appear to be originating. A meteor that is unable to be traced back to a radiant is called a Sporadic and is not part of a meteor shower. These occur most nights of the year.

**Comet:** A comet is a body that orbits around the sun. The nucleus of the comet is composed of rock, dust and ice. The tail of the comet is caused by solar radiation vapourising the nucleus as it comes into the inner parts of the solar system. As the comet travels around the sun, particles break away, leaving a trail of debris. Most of the meteor showers occur when the Earth intersects one of these trails of debris. The meteors appear to radiate outwards from the centre of this trail as the earth passes through it on its orbit around the sun – this point is called the radiant.

## **Materials:**

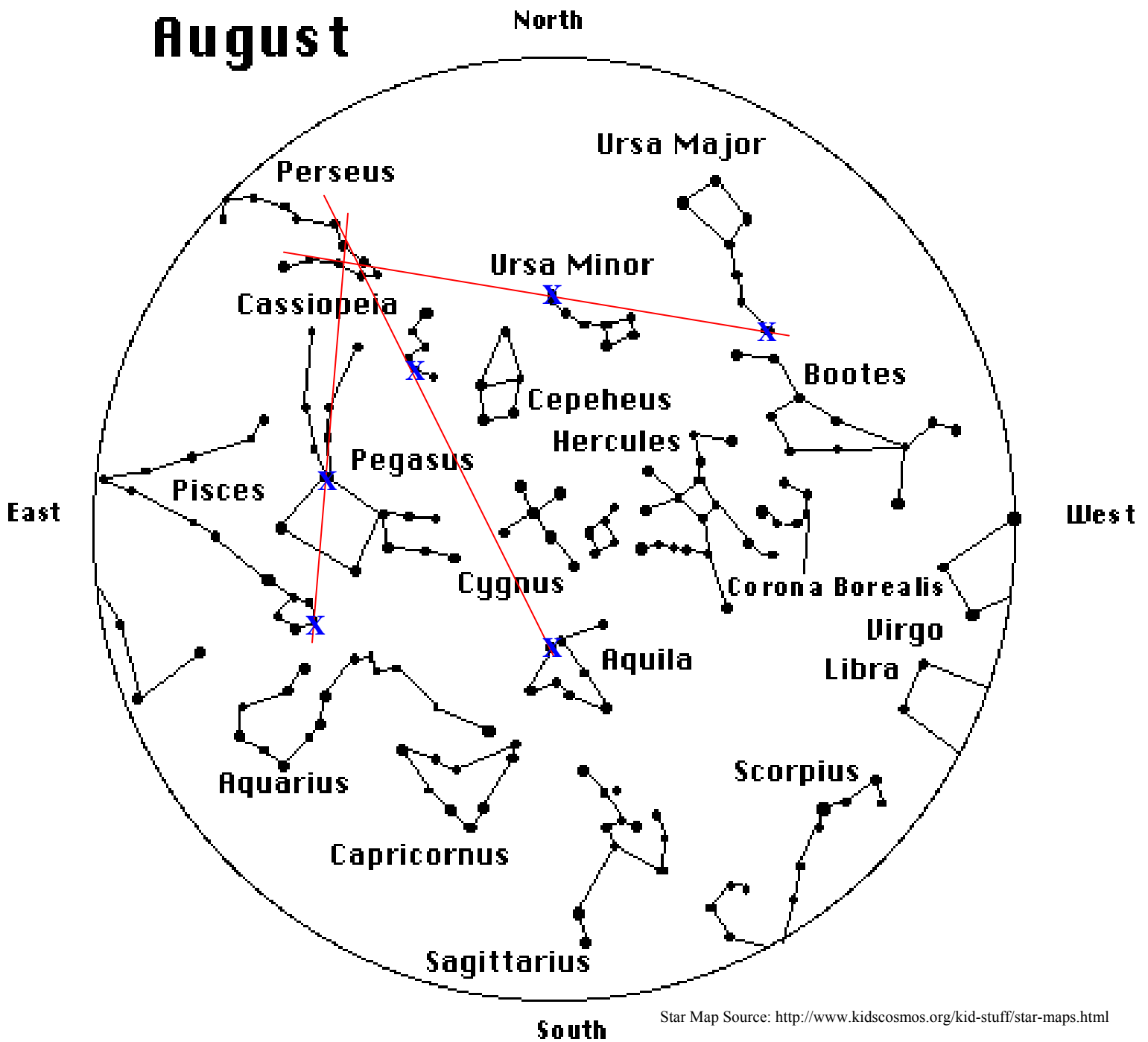
- ★ Worksheet Star Maps
- ★ List of Meteor Showers for 2007 (page 8)
- ★ Ruler and pencil

## **Description:**

For each question, students will plot the trajectories of three different meteors. They should be able to determine the path of the meteor based on the constellations in which it was first and last seen. They will then trace these paths back to a common area and determine that this is the radiant of the meteor shower. Once they have determined the radiant, the students need to determine the name of the constellation nearest this point. Using the constellation name and the month that the meteor shower was observed, they should be able to use the table of meteor shower information to determine the shower name and the source of the debris responsible for the meteor shower.

# Answer Key

## August



Star Map Source: <http://www.kidscosmos.org/kid-stuff/star-maps.html>

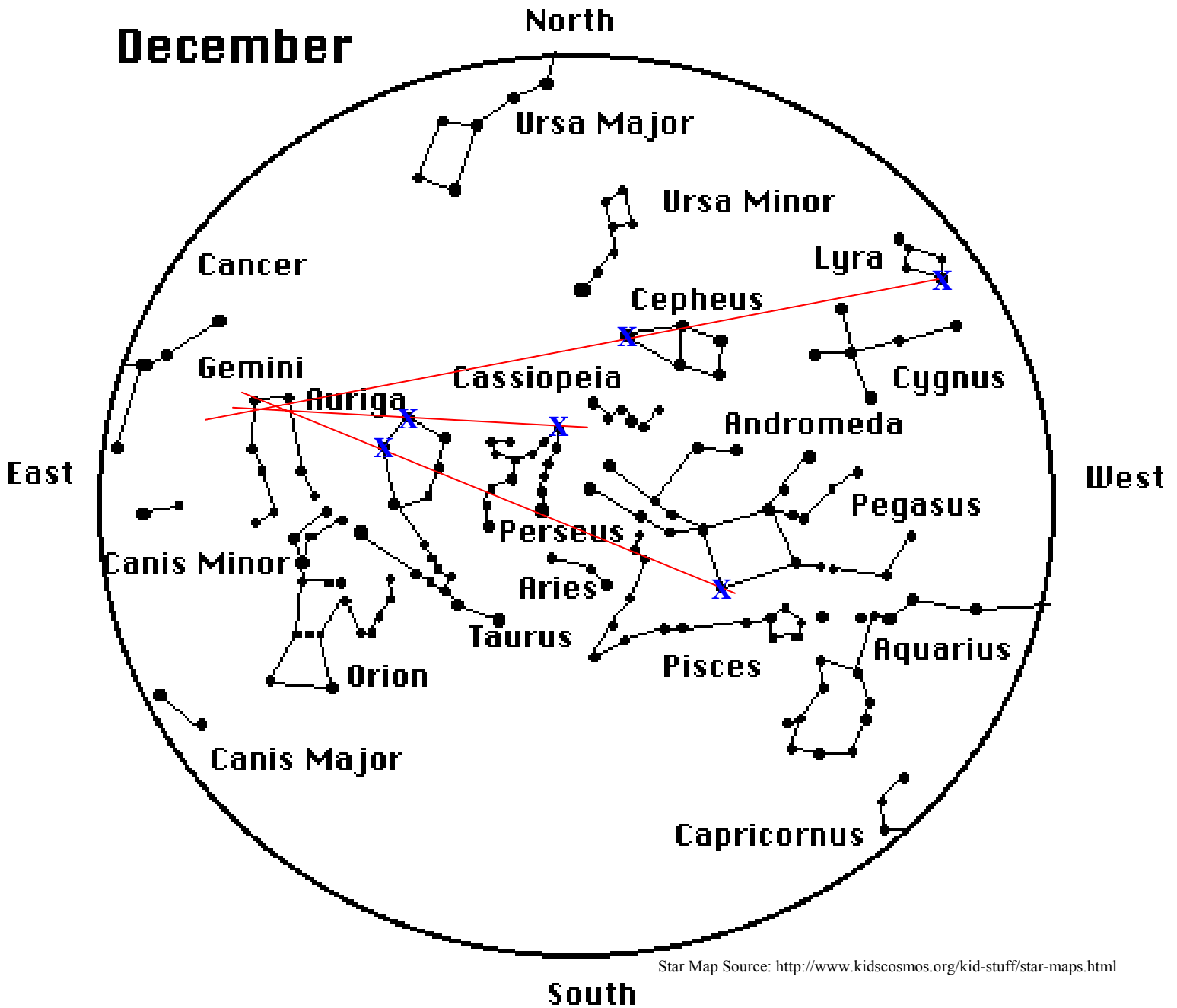
Constellation nearest the radiant: **Perseus**

Shower Name: **Perseids**

Activity Period: **Jul 17-Aug 24**

Parent Comet/Asteroid: **Swift-Tuttle (comet)**

# December



Constellation nearest the radiant: **Gemini**

Shower Name: **Geminids**

Activity Period: **Dec 07-Dec 17**

Parent Comet/Asteroid: **3200 Phaethon (asteroid)**