

How Much Do You Know About the Transit of Venus?

Grade levels: 5–12

Time: 45 minutes

Key concepts: History of astronomy, history of Venus transit observations, eclipses, planetary orbits, extrasolar planets, current research, observation of phenomena

Activity

These questions will help you make the most of the materials on our Web site and other transit of Venus sites. Each question has a (very) short answer, and links that lead to more information. These questions may look simple at first, but the answers might surprise you!

Questions:

1. What is the transit of a planet?
2. How old were you when the last transit of Venus occurred?
3. Why won't the 2004 transit of Venus be visible on the West Coast of North America?
4. When is the next transit of Venus? Where will it be visible?
5. Why do all transits of Venus come in pairs? Why is it so long between paired transits?
6. How is the transit of Venus similar to a solar eclipse? How is it different?
7. What have astronomers learned from transits of Venus?
8. Is any research planned for this transit of Venus?
9. If you want to watch the transit live on the Internet, when should you visit our Web site?

Getting Started

The Web links listed below are all available online:
<http://www.exploratorium.edu/venus/questions.html>

1. What is the transit of a planet?

A transit is what we see when a planet passes between the Earth and Sun in such a way that we can see the planet as a dark disk moving across the Sun.

Learn more about what a transit is:
<http://www.exploratorium.edu/venus/question1.html>

Mercury has transits across the Sun as well. Learn more about the transit of Mercury:
<http://www.exploratorium.edu/transit/>

2. How old were you when the last transit of Venus occurred?

Unless you're more than 122 years old, you weren't alive during the last transit of Venus. In fact, the transit is such a rare event that no one alive on Earth today has seen it.

Our timeline (see link below) will show you when the last six transits happened. How often do the transits happen? Do you see a pattern in the frequency of their occurrence?

Timeline: <http://www.exploratorium.edu/venus/index.html>

Mercury also transits the Sun, more frequently than Venus. You'll find more information about the most recent transit of Mercury on astronomer Juergen Giessen's Mercury Transit Web site (see link below). How old were you during the last transit of Mercury?

Link: <http://www.mercury-transit.de/mercury.html>

3. Why won't the 2004 transit of Venus be visible on the West Coast of North America?

For you to see a transit, the Sun must be visible—in other words, it must be daytime. Anyone in a place where it's nighttime during the six hours of the transit won't be able to see it.

Check out our map of transit visibility (see link below) to see whether you'll be able to watch any of the event, and learn why some people won't be able to watch the transit.

Map of transit visibility:

<http://www.exploratorium.edu/venus/teacher-map.html>

You can see whether it's day or night, or what time it is right now on any point of the globe, using the Web site www.worldtime.com.

Our timeline (see link below) describes how in the past, some people traveled a very long way to be in a part of the world where they could see the transit of Venus. Would you do the same?

Timeline: <http://www.exploratorium.edu/venus/index.html>

4. When is the next transit of Venus? Where will it be visible?

You'll find a map of visibility for the next transit on NASA's Sun-Earth Connection Web site (see link below). How does this compare with the map for 2004 (see link below)?

Map of Visibility for Next transit:

<http://sunearth.gsfc.nasa.gov/eclipse/transit/venus/Map2012-1.GIF%20>

Map for 2004:

<http://www.exploratorium.edu/venus/teacher-map.html>

Why would these maps look different? Why would one transit be visible in some parts of the world in 2004 and in other parts during the next transit?

Will the next transit cross the Sun in the same place? Why or why not? Our article "What Is a Transit of Venus?" (see link below) will help you answer these questions.

Article: <http://www.exploratorium.edu/venus/question1.html>

5. Why do all transits of Venus come in pairs? Why is it so long between paired transits?

Our article "What Is a Transit of Venus?" (see link below) explains that one factor in the transit's rarity is that the orbits of Earth and Venus are on planes that lie at an angle to each other.

Article: <http://www.exploratorium.edu/venus/question1.html>

You can see the geometry for yourself with this easy but elegant paper plate activity about transit frequency from DePaul University:

http://analyzer.depaul.edu/paperplate/Transit%20of%20Venus/transit_frequency.htm

6. How is the transit of Venus similar to a solar eclipse? How is it different?

Both events are caused by one body in space (Venus or the Moon), passing between Earth and the Sun, but from Earth, they look quite different. During the transit of Venus, Venus appears as a small spot on the Sun, while during a solar eclipse, the entire disk of the Sun may be blocked out. Even though the Moon is smaller than Venus, it is closer to Earth, so the shadow it casts falls on parts of the Earth causing darkness. Venus doesn't cast a noticeable shadow, but it can be observed as dark spot on the Sun, because the light from a small portion of the Sun is blocked from Earth.

You can compare how the two phenomena happen: "What Is a Transit of Venus?" (see link below) explains why we see what we see during the transit, and "Why Eclipses Happen" (see link below) explains how a solar eclipse occurs and why the Sun is blocked out.

What is a Transit of Venus?:

<http://www.exploratorium.edu/venus/question1.html>

Why Eclipses Happen:

<http://www.exploratorium.edu/eclipse/why.html>

7. What have astronomers learned from transits of Venus?

The most important information gleaned from the transit is the distance from the Sun to the Earth, known as the Astronomical Unit, or AU. How is the motion of Venus related to calculating that distance? Find out here: <http://www.exploratorium.edu/venus/question4b.html>

You can calculate the AU yourself using the upcoming transit and this activity from NASA's Sun-Earth Connection:

http://sunearth.gsfc.nasa.gov/sunearthday/2004/vt_edu2004_venus_912.htm

Transits can also be used to help astronomers find planets outside our solar system. You can read about how scientists will use transits in this way for NASA's upcoming Kepler mission, launching in 2007:
<http://www.kepler.arc.nasa.gov/>

8. Is any research planned for this transit of Venus?

Scientists can use this transit to learn about better ways to observe transits in general. Transits can help astronomers find planets outside our solar system. An excellent article from space.com describes how transits lead to new discoveries in space:
http://www.space.com/searchforlife/seti_transits_030904.html

9. If you want to watch the transit live on the Internet, when should you visit our Web site?

Well, that all depends on where you are!

Our Webcast of the transit begins at:
10:00 p.m. Pacific Daylight Time, June 7
5:00 Universal Time, June 8
8:00 a.m Athens time, June 8

To find out how those times translate into the time where you live, visit this page on the Fixed Time World Clock:
<http://www.timeanddate.com/worldclock/fixeditime.html?day=8&month=6&year=2004&hour=5&min=0&sec=0&p1=0>

We'll be doing live Webcasts as the disk of Venus passes into and out of the face of the Sun. Between Webcasts, we'll bring you updated photos of the transit every 15 minutes.

For a schedule of when Venus will be making contact with the edge of the Sun, see our Webcast schedule:
<http://www.exploratorium.edu/venus/webcast.html>