

To our teachers:

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Name: * _____

Date: * ____ / ____ / ____ Class Hour: * ____



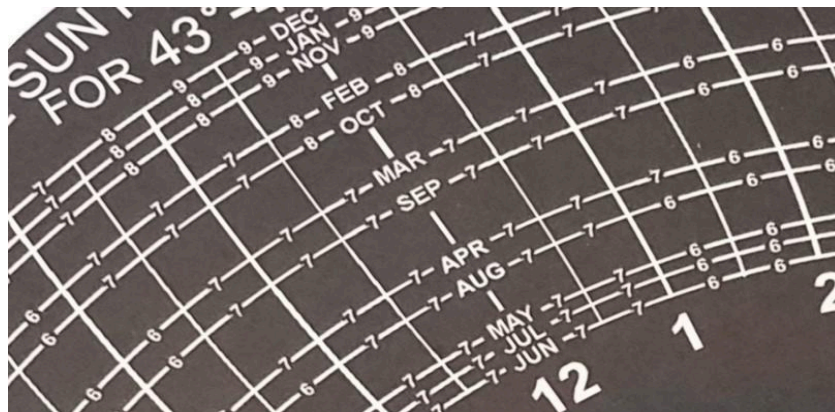
Center for Renewable Energy Advanced Technological Education

SOLAR SITE ANALYSIS: THE SOLAR PATHFINDER™

INTRODUCTION:

The good news is that the cost of installing a solar photovoltaic system continues to fall. However, it still represents a significant monetary investment for those who would like to install one. When that investment is weighed against other uses of the same money—saving energy through conservation, for example—it's easy to see that any solar PV system should be located in a place where it can produce as much energy as possible. That's the focus of this lesson. What makes a site a good location for a solar PV system?

In this lesson, you will be introduced to and then learn how to use a Solar Pathfinder™. The Pathfinder is an instrument developed to determine whether or not a given site is appropriate for locating a solar PV array. By the conclusion of the lesson you'll know how to use the Solar Pathfinder. You'll also understand critical vocabulary used by those who work in the solar industry. Finally, you'll learn important site-specific variables that must be considered when determining where to place, or not place, a solar photovoltaic system.



Part 1: Introduction to the Solar Pathfinder™ by the Manufacturer

Watch these short videos describing the Solar Pathfinder and how it's used. Write critical notes on the photos and illustrations on this page and in the space available on the next page.

- Solar Pathfinder, Pathfinder Overview (5:18):
<http://www.solarpathfinder.com/video/2>
- Solar Pathfinder, Fast Accurate Solar Site Analysis (4:34):
<http://www.solarpathfinder.com/video/6>

Illustration 1: The Sunpath Diagram Explained

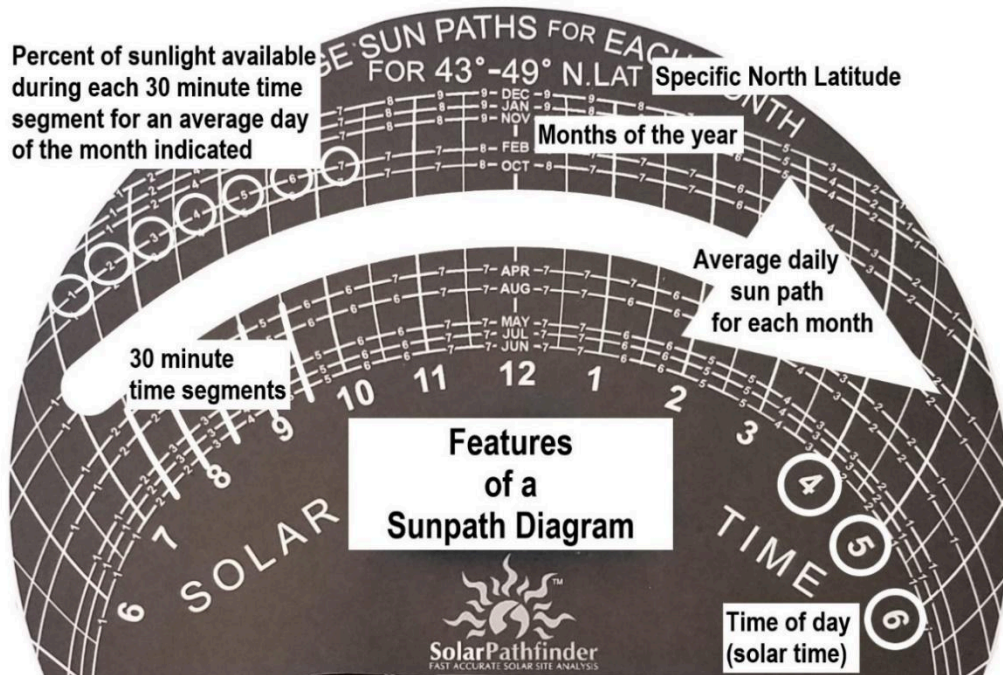
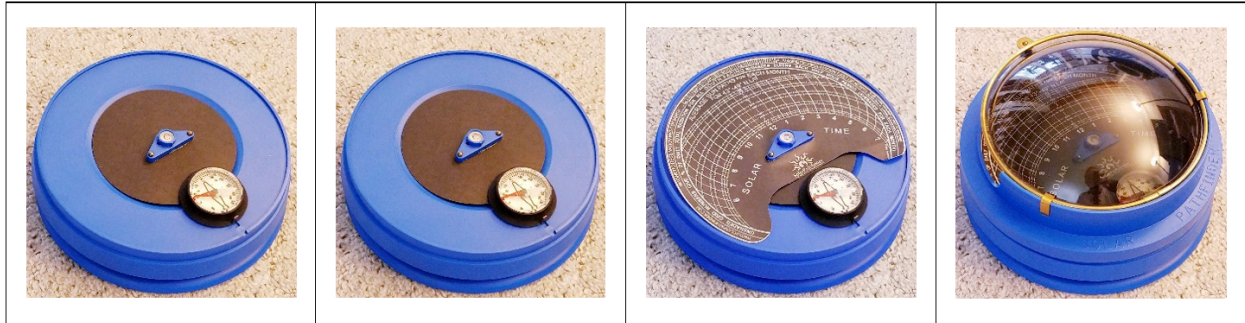


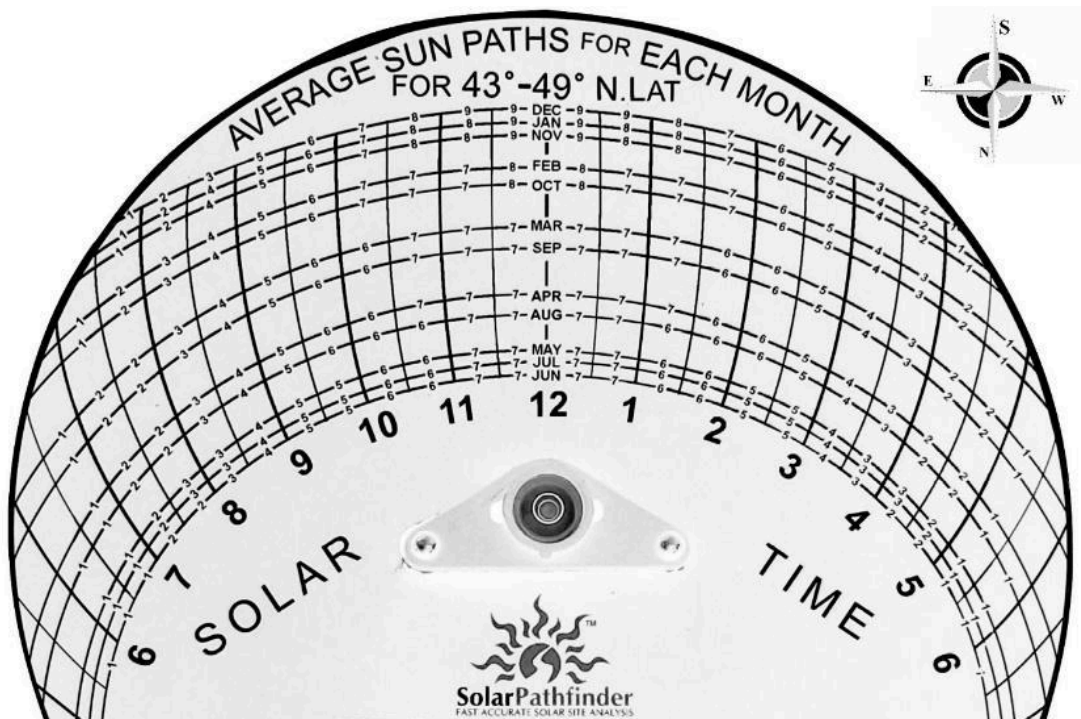
Illustration 2: Parts and Features of the Solar Pathfinder



Part 2: Introduction to the Solar Pathfinder™ by your Teacher

Your teacher will show you the Solar Pathfinder, in its parts and as a whole. You will also get casual practice using the Pathfinder. Finally, you will assess the available sunlight at several different locations outside, on slides in a visual presentation, or both. Add to your critical notes as needed on the photos and illustrations from the previous page and in the space available on this page.

Illustration 3: A Blank Sunpath Diagram (color inverted)



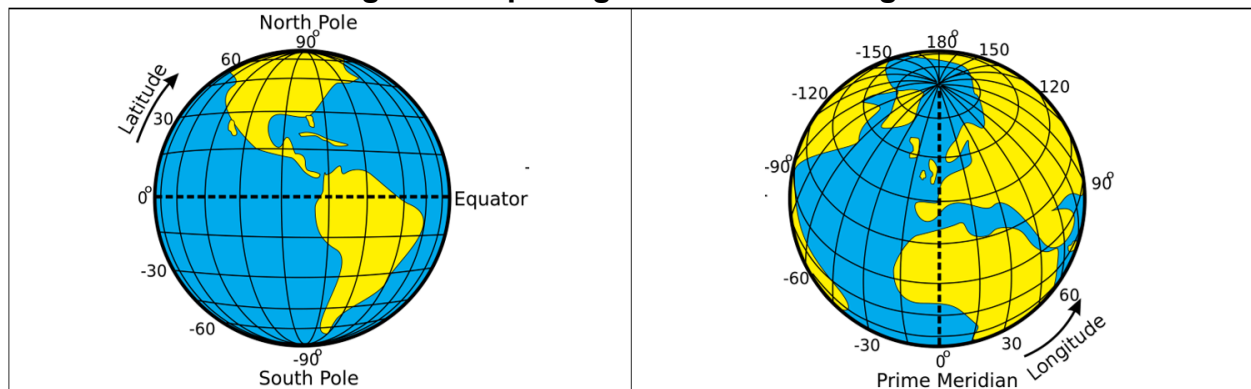
Notes:

* Write here:

Part 3: Critical Solar Vocabulary

Develop definitions for the following terms according to your teacher's directions.

Illustration 4: Earth Diagrams Depicting Latitude and Longitude



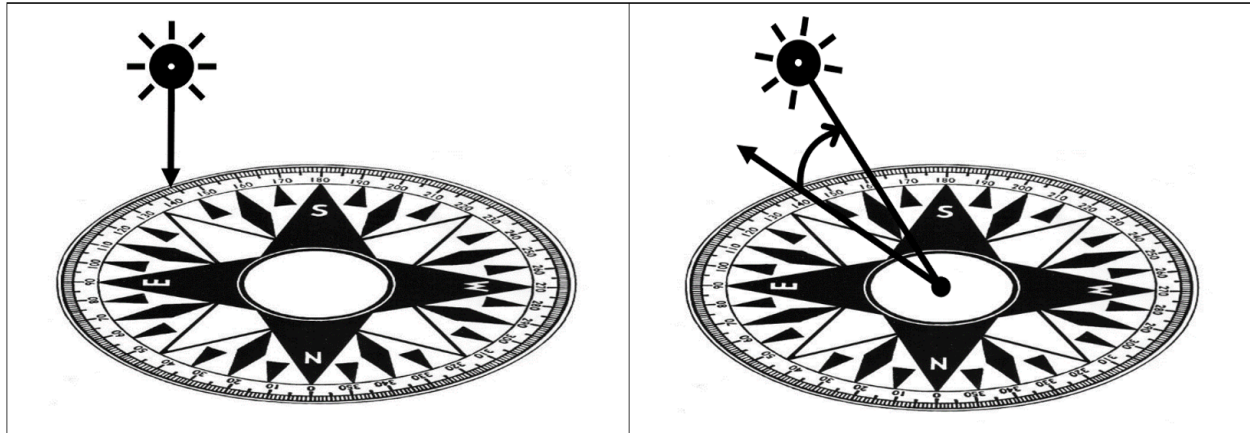
Latitude definition:

*** Write here:**

Longitude definition:

*** Write here:**

Illustration 5: Compass Diagrams Depicting Azimuth and Altitude



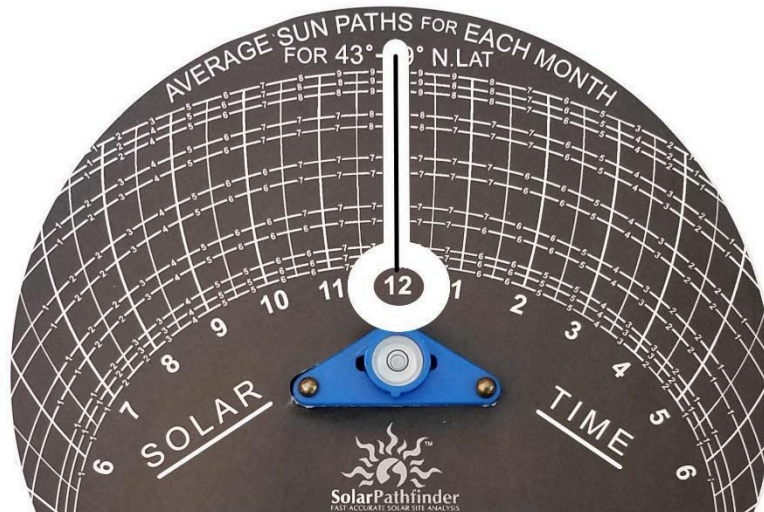
Solar azimuth definition:

* **Write here:**

Solar altitude or elevation definition:

* **Write here:**

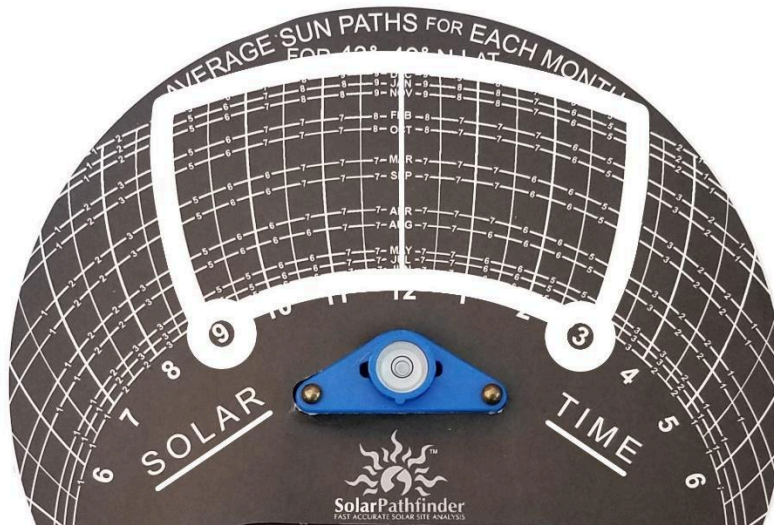
Illustration 6: Sunpath Diagram Depicting Solar Noon



Solar noon definition:

* **Write here:**

Illustration 7: Sunpath Diagram Depicting the Solar Window



Solar window (the definition used most commonly in the solar PV industry):

*** Write here:**

Part 4: Extending What You've Learned

Answer the questions in the tables that follow according to your teacher's directions. You will need to consult two things to complete them.

- 4-1. Your teacher will provide you with a hard copy of a Sunpath Diagram appropriate for your latitude.
- 4-2. Your teacher will have you view the sun's azimuth, altitude, day length, and solar noon information online for your city or one close to where you are located.
 - Go to: <https://www.timeanddate.com/sun/>
 - Type your state in the search box
 - Select your city, or the city closest to your location
 - Use the navigation tools to obtain the information needed

Table 1: Sunpath Diagram Questions:

Answer:	Question:
*	1. On average, what time do we receive our first usable sun in December?

*	2. On average, what time do we receive our last usable sun in February?
*	3. On average, how many hours of usable sun do we receive in August?
*	4. On average, how many hours of usable sun do we receive in January?
*	5. On average, what % of the day's usable sun do we receive from 8:30-9:00 am in March?
*	6. On average, what % of the day's usable sun do we receive from 12:00-12:30 pm in July?

Table 2: timeanddate Questions

Answer:	Question:
*	7. What is the sun's azimuth at sunrise on October 5th?
*	8. What is the sun's altitude at solar noon on May 30th?
*	9. What is the sun's azimuth at sunset on April 15th?
*	10. What is the day length on November 30th?

Table 3: Sunpath Diagram / timeanddate Questions for December

Question Number:	Answer:	Question:
11a.	*	Use timeanddate to determine the sun's azimuth at sunrise on the 15 th of December.
11b.	*	Use a Sunpath Diagram to determine the time of first usable sun for an average day in December.

11c.	*	Use timeanddate to determine the sun's altitude at solar noon on the 15 th of December.
11d.	*	Use a Sunpath Diagram to determine the time of last usable sun for an average day in December.
11e.	*	Use timeanddate to determine the sun's azimuth at sunset on the 15 th of December.
11f.	*	Use a Sunpath Diagram to determine the total hours of usable sun for an average day in December.
11g.	*	Use timeanddate to determine the total hours of usable sun on the 15 th of December.

Table 4: Sunpath Diagram / timeanddate Questions for March

Question Number:	Answer:	Question:
12a.	*	Use timeanddate to determine the sun's azimuth at sunrise on the 15 th of March.
12b.	*	Use a Sunpath Diagram to determine the time of first usable sun for an average day in March.
12c.	*	Use timeanddate to determine the sun's altitude at solar noon on the 15 th of March.
12d.	*	Use a Sunpath Diagram to determine the time of last usable sun for an average day in March.
12e.	*	Use timeanddate to determine the sun's azimuth at sunset on the 15 th of March.
12f.	*	Use a Sunpath Diagram to determine the total hours of usable sun for an average day in March.
12g.	*	Use timeanddate to determine the total hours of usable sun on the 15 th of March.

Table 5: Sunpath Diagram / timeanddate Questions for June

Question Number:	Answer:	Question:
13a.	*	Use timeanddate to determine the sun's azimuth at sunrise on the 15 th of June.
13b.	*	Use a Sunpath Diagram to determine the time of first usable sun for an average day in June.
13c.	*	Use timeanddate to determine the sun's altitude at solar noon on the 15 th of June.
13d.	*	Use a Sunpath Diagram to determine the time of last usable sun for an average day in June.
13e.	*	Use timeanddate to determine the sun's azimuth at sunset on the 15 th of June.
13f.	*	Use a Sunpath Diagram to determine the total hours of usable sun for an average day in June.
13g.	*	Use timeanddate to determine the total hours of usable sun on the 15 th of June.

Table 6: Sunpath Diagram / timeanddate Questions for September

Question Number:	Answer:	Question:
14a.	*	Use timeanddate to determine the sun's azimuth at sunrise on the 15 th of September.
14b.	*	Use a Sunpath Diagram to determine the time of first usable sun for an average day in September.
14c.	*	Use timeanddate to determine the sun's altitude at solar noon on the 15 th of September.
14d.	*	Use a Sunpath Diagram to determine the time of last usable sun for an average day in September.

14e.	*	Use timeanddate to determine the sun's azimuth at sunset on the 15 th of September.
14f.	*	Use a Sunpath Diagram to determine the total hours of usable sun for an average day in September.
14g.	*	Use timeanddate to determine the total hours of usable sun on the 15 th of September.

Part 5: Shade and Sun Evaluation for a Specific Site

Your teacher will provide you and your classmates with Sunpath Diagram tracings made on the south-facing roof of a residential site. Determine the percentage of sunlight available for the year at your site using the following chart. Be prepared to review the sun and shade dynamics at your site with your classmates.

Chart 1: Shade and Sun Evaluation

Sunpath Diagram for _____ Street

Percentage of sunlight available number from Sunpath diagram		Number of these numbers located in shade from the Sunpath diagram			
1	X		=		Calculate the percentage of sunlight available for the year at this location in the space below. Show your math work in detail..
2	X		=		
3	X		=		
4	X		=		
5	X		=		
6	X		=		
7	X		=		
8	X		=		
9	X		=		
Sum total of Sunpath dia- gram shaded numbers					Percentage of sunlight available for the year at this location.

5-1. The people who own the residence where your tracing was made need a loan to cover most of the purchase and installation costs for the solar PV system they want to install. Imagine you are a bank loan officer. Do you believe the percentage of sunlight available for the year at this location is enough for you to approve the loan? Answer yes or no, then provide your reasoning.

*

Part 6: Show What You Know

6-1. Demonstrate what you've learned in this lesson in answering the following question. How does the Solar Pathfinder enable most people (buyers, installers, bankers) to make good, site-specific decisions about where to locate a solar PV system?

*

6-2. The Solar Pathfinder provides data on the percentage of sunlight available for the year at a given site. Develop a paragraph that describes at least three additional factors that often make a difference in determining whether or not a solar PV system makes sense for most people to install.

*

6-3. Describe the most important idea, concept, principle, or fact you learned while completing this this part of the lesson. Explain why it is important for you (and probably other people) to know and understand.

*