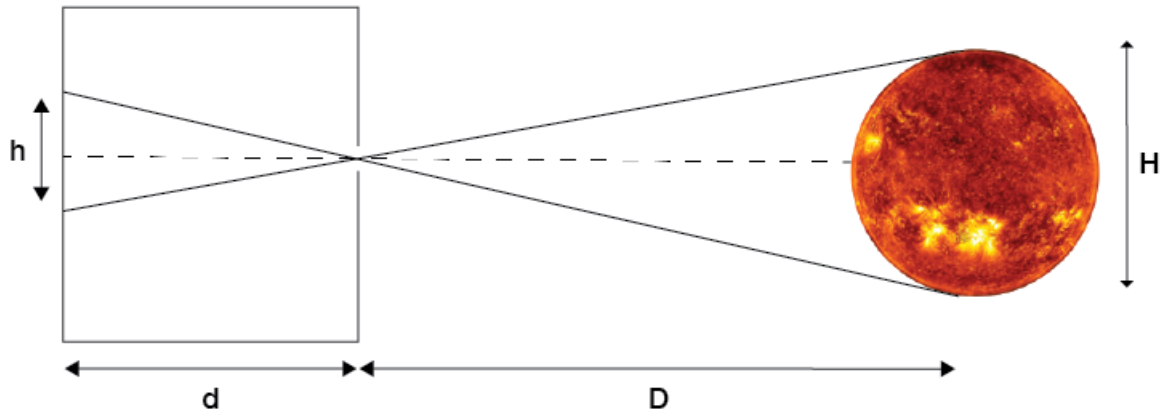
Name: _____ Date: _____ Class: _____

Title: Calculating the Diameter of the Sun with a Pinhole Projector
Student Sheet



Relationship between projection image height h, projection distance d, Sun distance D, and Sun height (diameter) H. *Credit: Lani Sasser/NASA HEAT*

Your back should be to the Sun when using a pinhole projector.

For a pinhole projector, the relationship between the Sun's height, the Sun's distance from Earth, the projection distance, and projection image height can be expressed as an equivalent ratio:

H = Height of the Sun
D = Distance to the Sun
h = Height of the projected image
d = Projection distance

$$\frac{H}{D} = \frac{h}{d}$$

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Step 1: Define (d): The pinhole projector is held 1 meter (m) above the ground, which is the projection distance **(d)**.

(d) = 1m

Step 2: Define (h): The hole in your pinhole projector has a diameter of 5 millimeters (mm), creating a projection of the Sun on the ground of about 9mm in diameter, when you hold the pinhole projector 1 meter above the ground. We will use 9mm as the height **(h)** value.

To convert millimeters (mm) to meters (m), divide the **(h)** value by 1000.

(h) = .009m

Step 3: Define (D): The average distance from you (on Earth) to the Sun **(D)** is about 150 million kilometers (km), or 1.5 x 10^{11} meters (m).

(D) = 1.5 x 10^{11} m

Step 4: Calculate (H): Using the values for **D, h, and d,** calculate the diameter of the Sun **(H)** using the equation above. *Make sure to use scientific notation. For example, to enter 1.5 x 10^{11} into a computer/smartdevice calculator, type “1.5 ” [the “EE” button] “11”. Or ask your instructor how to use the scientific notation feature on your specific calculator model.

$$\frac{H}{D} = \frac{h}{d}$$

Step 5: Try it! Go outside and use your pinhole projector to measure **(d)** and **(h)**. Do you get the same result for **(H)**? **Remember to always keep your back to the Sun when using a pinhole projector.**