

# Solar Observing Exercise Work Booklet

## Grade 9 Science

**Names**\_\_\_\_\_

**Due Date (Day Month Year)**

**Date Submitted**\_\_\_\_\_

## **Notes on Introduction**

On this page, you record the main ideas from the introduction and any insights you gained.

### **1<sup>st</sup> Reason for Studying the Sun**

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### **2<sup>nd</sup> Reason for Studying the Sun**

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### **3<sup>rd</sup> Reason for Studying the Sun**

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### **4<sup>th</sup> Reason for Studying the Sun**

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**The key to understanding flares and sunspots on the sun is ....**

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## Activity 1: Pin Hole Camera Observations and Calculations

A.

		Observations and Calculations
1	Distance from pinhole to screen in mm	
2	Estimate the error (+ or -) of distance measurement in mm	
3	Diameter of image on screen in mm	
4	Estimate the error (+ or -) of the diameter measurement in mm	
5	Calculate the diameter of the sun using your answers to 1 and 3 given that the distance from the Earth to the Sun is 149,600,000 km (this varies slightly during the year)	
6	Using the error estimates (lines 2 and 4), calculate what could be the maximum size of the sun	
7	Using the error estimates (lines 2 and 4), calculate what could be the minimum size of the sun	
8	Restate your answer in Line 5 to show the + or - values.	

B. What happened to the image of the sun on the screen as you increased and decreased the distance between the pinhole and the screen? Why?

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## Internet Research Homework

Research the following URLs and be prepared to discuss what you found or learned:

<http://curious.astro.cornell.edu/question.php?number=319>

- Discusses how the size of the sun and moon are measured using angles. It's short article and leads nicely into the next activity.

[www.google.ca](http://www.google.ca) for images of the sun, using those or other similar terms

[www.google.ca](http://www.google.ca) , select "images" from the top bar and run the search again.

- What difference did you find between the two google searches?

<http://sohowww.nascom.nasa.gov/gallery/Movies/sunspots.html>

- This site has some amazing video images of the sun through different filters.

<http://sohowww.nascom.nasa.gov/gallery/Movies/animations.html>

- View the animations on sunspot formation, and the CME affecting the earth's magnetosphere.

[http://sohodata.nascom.nasa.gov/cgi-bin/data\\_query](http://sohodata.nascom.nasa.gov/cgi-bin/data_query)

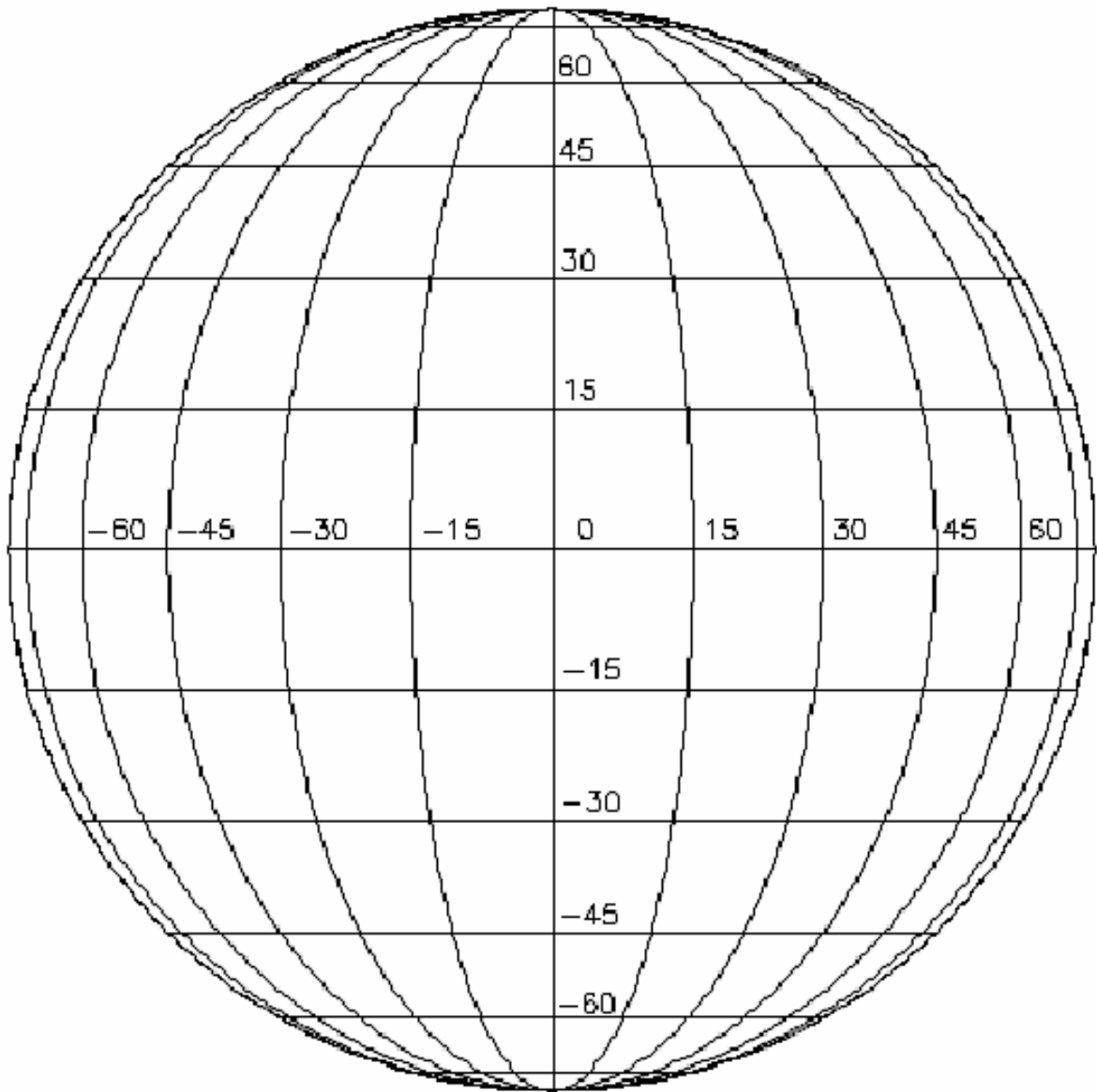
- This is the location where the images used in the sunspot activity were retrieved.
- View some images based on whatever selections you like.
- Look at the Sun Now section. Can we see images of the sun here at any time of the day? Why?

<http://www.astrosociety.org/education/publications/tnl/05/05.html>

- Determine which stars are closest to the earth and how our sun compares to some of these stars.

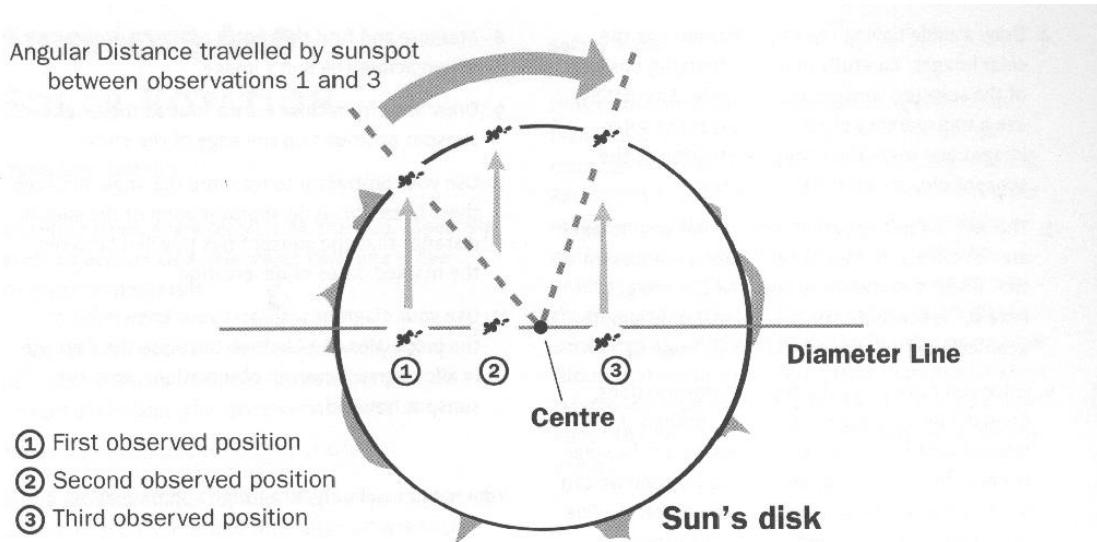
## Activity 2: Sunspot Movement

Record the movement of sunspots on the diagram below, and the details of the large sunspot in the middle and any other one on the left side of the image in the tables.



## How to Measure Angles on the Disc of the Sun

The diagram below is a summary of a method that can be used to measure the change in the longitude of sun spots.



**Figure 18**

*Translating observed sunspot locations from the centre of the Sun's disk to its edge to estimate their angular motion and the solar rotation period.*

Activity 2: Sunspot Movement Cont'd

Spot Group Id \_\_\_\_\_

Date/Time	Latitude	Longitude	Change in Angle	Angular speed ( $\Delta$ angle/ time)	Comments (size, shape, etc)

Longitude is measured **left or right** (west or east) in degrees of the line in the middle running up and down from top to bottom. Use whole degrees only.

Latitude is measured **up or down** (north or south) in degrees from the horizontal line located in the middle. Use whole degrees only.

$\Delta$  angle means change in angle.



Spot Group Id \_\_\_\_\_

Date/Time	Latitude	Longitude	Change in Angle	Angular speed ( $\Delta$ angle/ time)	Comments (size, shape, etc)

## Activity 2: Sunspot Movement Cont'd

1. In general terms, describe what you observed in the images.

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2. Write a scientific question relating sunspot movement to the rotation of the sun.

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3. Write a hypothesis regarding sunspot movement and the rotation of the sun.

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4. Describe the angular speed for the two sunspots you studied. How do they compare? What is the + or – error of your answer. Do your results make sense and why?

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5. Calculate the period of rotation of the sun.

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6. Did you notice any changes in sunspots? Why is this possible?

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7. Do the spots appear to move more slowly or quickly near the edges? Why?

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### Activity 3 Predicting Sunspot Activity

On a separate piece of graph paper, graph the table of values shown below and predict on the graph--by drawing a dotted line--what will happen in the next 11 years or so. Explain why you drew your line the way you did. How certain are you of this dotted line?

Year	Sunspots		Year	Sunspots
1950	84		1979	55
1951	69		1980	55
1952	32		1981	41
1953	14		1982	16
1954	4		1983	67
1955	38		1984	46
1956	42		1985	18
1957	90		1986	13
1958	85		1987	29
1959	59		1988	0
1960	12		1989	58
1961	54		1990	43
1962	38		1991	46
1963	28		1992	94
1964	10		1993	55
1965	15		1994	30
1966	47		1995	18
1967	94		1996	9
1968	6		1997	22
1969	6		1998	64
1970	5		1999	93
1971	67		2000	20
1972	69		2001	11
1973	38		2002	4
1974	35		2003	64
1975	16		2004	40
1976	13		2005	30
1977	28		2006	15
1978	93		2007	8