

SUN DIAL ACTIVITY BOX

INSTRUCTION SHEET

CONTENTS

Within this box you will find:

- 1 Globe
- 4 A4 Clipboards
- 4 Shadow Angle Conversion charts
- 4 Shadow Protractors
- 4 Pieces of string
- 4 Stakes
- 4 Dowling rods
- 1 Mallet
- 4 Compass
- Blue Tac and spent matches

Please return the box and its contents in the same condition you found it, such that the next group can have the same amount of enjoyment using it.

If there is anything missing please notify the Warden so the box can be replenished.

INSTRUCTIONS

1. Run through the "Explanation of how Sundials work" using the globe and match provided.
2. Follow the instructions on "How to build a Sundial"
3. Replace the stake with your own stave so you can return the box but keep your sundial for the rest of your stay.
4. Number the hours using roman numerals and/or decorate with stones.

EXPLANATION OF HOW SUNDIALS WORK

USING QUESTIONS ASK THE GROUP

1. How many days does it take for the Earth to orbit the Sun?
Get someone to be the Sun and walk around them using the globe - keeping the axis facing north. Answer: 365¼ days.
2. Which way is the axis of the Earth facing in the height of Summer?
Demonstrate that the northern hemisphere is facing the Sun in the summer and 1) it is closer to the sun and 2) there is more daylight from the sun in a 24 hour period.
3. Where are we on the surface of the globe?
*Find England and show using the globe's latitude markers that we are located at the 54th parallel which is 54° from the equator.
Show the equator at 0° and the north pole at 90°.*
4. How many hours does it take for the Earth rotate about its axis?
Spin the globe about its axis. Answer: 24 hours
5. How many degrees in one revolution? *Answer: 360°*
6. How many degrees do we rotate every hour?
*Spin the globe about its axis. Answer: 360° / 24 hours = 15°.
If they don't get the answer ask it a different way.*
 - 6a. How many degrees in a single revolution? *Answer: 360°.*
 - 6b. How many degrees in ½ a revolution or 12 hours? *Answer: 180°.*
 - 6c. How many degrees in ¼ of a revolution or 6 hours? *Answer: 90°.*
 - 6d. How many degrees in 3 hours? *Answer: 45°.*
 - 6e. How many degrees in a single hour? *Answer: 15°.*
7. *Explain that if we were at the north pole it would be very easy to make a sundial. We could divide the earth into 24 segments, 15° each and the shadow cast by the match would move 15° every hour.*
8. *Now demonstrate and explain where we are on the earth at 54° and that our match, perpendicular to the surface of the earth, sticks out at a odd angle. Explain how the shadow cast here is different from that of the North pole and hence why we need a Shadow Angle conversion chart.*

HOW TO BUILD A SUNDIAL

DEMONSTRATE HOW TO BUILD A SUNDIAL

1. Find a flat piece of ground with plenty of opportunity for sunlight and insert the stake perpendicular to the ground using the mallet. Insert the dowelling into stake. See figure 1 and 2.
2. Pop the Shadow Protractor over the stake. See figure 3.
3. Using the Compass, line the Shadow Protractor up facing magnetic North. See figure 4.
4. Loop one end of the string over the stake. See figure 6.
5. Explain the difference between Greenwich Mean Time (GMT) and British Summer Time (BST) and depending on the time of year, ensure you read the right hour from the chart. See figure 5.
6. For each hour:
 - a. Ensure the protractor is facing magnetic north - figure 4
 - b. Read the angle for the month you are in - figure 5
 - c. Use the string to measure the angle on the shadow protractor - figure 6
 - d. Mark the hour using a stone or peg - figure 7
7. Please note compasses are easily affected by large metal objects so it is worth verifying that the compass is not adversely affected. If you can, use the Sun to verify one of the hours, or alternatively verify that the compass points in the same direction when you move around.
8. Please also note that variations can occur because the stake is not straight or the ground is not flat.

NOW LET THE GROUP BUILD THEIR OWN SUNDIAL

ONCE COMPLETE LET THEM DECORATE THE NUMBERS USING PEGS OR STONES. See figure 8.

REPLACE THE STAKE WITH YOUR OWN STAVE TO KEEP YOUR SUNDIAL FOR THE DURATION OF YOUR STAY. See figure 9.



ROMAN NUMERALS FOR A CLOCK FACE

ROMAN NUMERAL CONVERSION

Using Roman Numerals may be easier to identify numbers using sticks on the ground rather than trying to write numbers.

1	2	3	4	5	6	7	8	9	10	11	12
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII



HALLOWTREE !
SCOUT ACTIVITY CENTRE
What did you do this weekend?



EXAMPLE



Figure 1 - Stake



Figure 2 - Dowelling



Figure 3 - Shadow Protractor



Figure 4 - Compass



Figure 5 - Shadow Angles

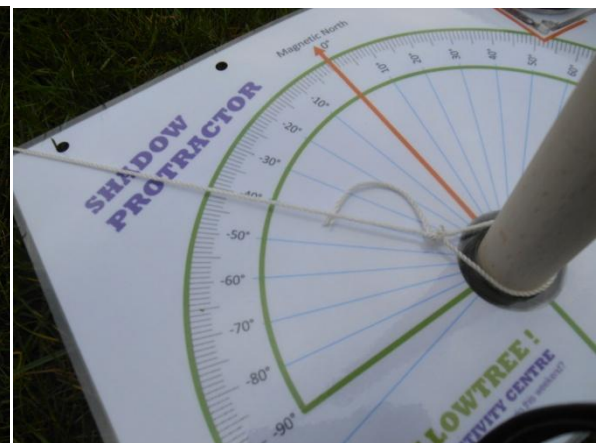


Figure 6 - String



Figure 7 - Peg out the numbers



Figure 8 - Roman numerals



Figure 9 - Swap stake for stave



Figure 10 - Completed Sundial