> This resource is part of a suite of materials created to inspire entrants, and support parents, teachers and those out-of-school to make deeper connections with their surroundings. The *maths inside* is waiting to be discovered!

Below, you can find an example documenting the submission journey for an **Second Level** entry to the *maths inside* photo competition (credits).

We welcome entries, both individually and in groups, from all ages of children and young people, as well as parents, guardians, carers and teachers and anyone qualifying for the out-of-school category! See mathsinside.com for full details.

## The Sundial

Whilst having a walk outside, we came across a fascinating device, it turned out to be a device that told the time called a sundial.

We then came up with the title

> A Sundial

and commentary

> A sundial is a device that can tell time by using the sun and shadows.

This is an interesting example, but we could find out more about the sundial and include this information in our commentary. We could wonder — what is the *maths inside* a sundial? How could we find this out? Let us explore with some questions!

*How does a sundial tell the time?* What parts are there to a sundial? How does it work when it is cloudy? Or at night? Who uses sundials? Where can they be found? How can I make one? A sundial is made up of a flat surface and a vertical object that points straight up from the flat surface. As the sun's position moves across the sky, the shadow cast by the vertical object moves across the flat surface. If we record and mark the positions of the shadow at suitable intervals, for example, every hour, we can use this to tell time.

We thought a bit more and now have the title

> A Time Telling Device

and the following commentary

> A sundial is a device that can tell time. It does so by recording the position of a casted shadow of a vertical object onto a flat surface in suitable intervals, for example, every hour.

This is a better, but we could do more! One way is to get more creative and see if we can make a sundial ourselves.

*What is needed for our homemade sundial to work?*. We know we need a flat surface and a vertical object, but we also need sunlight. We chose to make our sundial with a small table and a stack of pencils tied together with some string. We put this near a window and recorded the positions of the casted shadow by placing a pebble where the shadow was cast, every hour.

We now have this improved commentary

> A sundial is a device that tells time. It does so by recording the position of a casted shadow of a vertical object onto a flat surface in suitable intervals, for example, every hour. We made our own sundial by placing a stack of pencil tied together with string and placed it upright onto a table. We marked the position of the shadow every hour with a pebble.

Let's keep digging with questions to discover a deeper connection between the *maths inside* our objects.

*When does the sundial not tell the time?* We cannot record the times when the sun is not out and so out sundial does not work during the night and during cloudy days.

*What other devices are similar to a sundial? What are the sundial's advantages? What are its disadvantages?* A sundial is similar to a clock, but a clock is more accurate. A clock can tell you small interval times like seconds, but our sundial can only tell you bigger interval times like hours, maybe minutes. However, our sundial is easier to make.

*Where is a clock used?* What happens if I use a sundial instead of a clock? We can use our sundial to estimate how long a journey could take? What is the connection between time, speed and distance?


This leads us to our final title

> Settling For Hours, Maybe Minutes

and our final commentary

> A sundial is a device that tells time. It does so by recording the position of a casted shadow of a vertical object onto a flat surface in suitable intervals, for example, every hour. We made our own sundial by placing a stack of pencil tied together with string and placed it upright onto a table. We marked the position of the shadow every hour with a pebble. This helped us estimate the time of day. Unlike a clock, these estimations were good for bigger intervals of time such as hours, maybe minutes, but not good for seconds. So, with our homemade time device, we are able to give good estimates on how long a journey to my local supermarket takes, but we are not able to give a good estimate on how long it takes to brush our teeth. We do this by using the link between time, speed and distance.

What questions could you ask? Where would you take your picture? What *maths inside* would you investigate?

*Remember that submissions need to be original to be eligible for the maths inside photo competition. Judges can only accept original photos, commentaries and titles that are not featured, shared or displayed elsewhere (this includes social media and other competitions). See the T&C for more information, and please do get in touch if you have any additional questions.*

## credits

This suite of resources are the fruit of a collaborative project between undergraduate and postgraduate students from the University of Glasgow — School of Mathematics & Statistics, and Dr Andrew Wilson (*maths inside* Founder and Director).

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The photos above are credited to David Nkansah.