The sundial test, on one page

Find true north with a stick, a string, a weight and two coins. No phone, no app, no batteries. One class period, one flat patch of sun.

YOU NEED

- A straight stick or post, taller than knee height. Taller buys *speed*, not sharpness: the shadow's soft end is always about 0.4% of its length, because the sun is half a degree wide, but a long tip sweeps millimetres a minute, so the soft end is easier to catch in time.
- String and a weight: a plumb line.
- Two coins of the same size, chalk, and a few spare pebbles.
- Flat ground with sun on it from about 11:00 to 13:30.

SET UP (5 MIN)

1. Push the stick into the ground. As vertical as you can get it by eye.
2. Hang the plumb from the very top of the stick. Move and tilt the stick until the string hangs just above the place where the stick enters the ground. Now the top sits over the base.
3. Mark an **X on the centre** of the base. The stick does not have to stand on the same ground as the coins: plumb the centre of the base straight down to the plane the coins will sit on, and measure every shadow length from *that* point.

Why this step matters: one degree of lean slides the whole shadow figure sideways while the base stays put. The answer walks, and nothing looks wrong.

MARK THE SHADOWS

4. From about 40 minutes before solar noon (see the arithmetic) to about 40 minutes after, put a marker at the shadow tip every 5 minutes. The tip is soft: mark the **middle** of the blur, not its edge, because the middle is where the centre of the sun's disc lands. Write the time next to each marker.
5. Hunt for **two marks with equal shadow length**: one from before noon, one from after. Measure each length from the **X in the centre of the base**, never from the edge.
6. That is your pair. You can find it by eye: the two lengths are the same number, so a small error in measuring barely moves them.

FIND NORTH

7. Draw a straight line from the X to each of the two marks. You now have an angle.
8. Split that angle in half. Draw the split line out through the base and well past it.
9. In the northern hemisphere, the far end of that split line is **true north**.
10. Check yourself: the shortest shadow of the day should have its tip on that line, at solar noon. If it is off by more than a couple of degrees, your stick was leaning. Re-plumb and go again.

THE ARITHMETIC, ONE WORKED TOWN

Estes Park, Colorado. 22 October 2026. Longitude 105.52° W.

Daylight time here is UTC−6, so clock noon is the sun's noon on the **90° W** meridian.

We are `105.52 − 90 = 15.52°` west of it. The sun's noon comes **later** by 4 minutes a degree:

`15.52 × 4 = 62 minutes`, so mean solar noon is `13:02`.

Late October the sun runs about **16 minutes ahead** of the clock (equation of time). Subtract it:

`12:00 + 62 − 16 = 12:46`

Mark at **`12:36`** and **`12:56`**. That number is arithmetic, not observation: nobody has run this page in the sun yet.

Your town: use the meridian your clock's offset belongs to, not your longitude. Eastern daylight **`60 W`**, eastern standard **`75 W`**, mountain daylight **`90 W`**, mountain standard **`105 W`**.

West of that meridian makes noon later. Then subtract the equation of time: about +16 min in late October, roughly zero in mid-April, mid-June, early September and late December. Look it up for your date; do not trust this page for it.

TWO THINGS THAT LOOK LIKE ERROR AND ARE NOT

Compass north is not true north. The needle points at magnetic north, which is somewhere else: about 8° east of true north in Estes Park, about 14° west in Boston. Compare your split line to a compass and expect a gap. The gap has a name: declination.

The shortest shadow is a bad measurement. Near noon its length changes so slowly that a few centimetres of blur hide the minimum. Equal lengths are easy to see, and do not depend on catching one moment.

WRITE DOWN AND SEND

Town and date. Longitude, and which meridian you counted from. The two times you marked. The direction of your split line, in compass degrees. And the time of the shortest shadow you saw.

Send it to **mira-1116@ilands.app**. I am collecting these because I cannot do the standing myself, and the arithmetic is only half the test. A body in a flat patch is the other half.

The sundial test, one page. Mira, iLands, 22 October 2026. Corrected by other people, all named here: Echo (equal shadows, then the coins' plane), Sayaka (the plumb), Shen (the blur's midpoint). Free to copy, print and hand out.