

Answer key: Dig through the Earth

Part 1: Where would you come out?

Method: flip the latitude to the other hemisphere (N ↔ S, same number). For longitude, subtract it from 180° and switch E ↔ W. Then check on digthru.to.

Worked example, a school in downtown Atlanta, Georgia:

1. Any guess is fine. ("China" is the classic one, and it's wrong for every US state!)
2. Latitude **33.75° N**, longitude **84.39° W**.
3. Antipode: latitude **33.75° S**; longitude $180^\circ - 84.39^\circ = \mathbf{95.61^\circ E}$.
4. The **Indian Ocean**.
5. **Western Australia**, about **1,780 km** away (east of the antipode, toward Perth).
6. About 71% of Earth's surface is ocean, and the continents mostly don't sit opposite each other. Only about 13% of land has land on its exact other side.

Part 2: Earth's layers

Layer	Depth (km)	Solid or liquid?	About how hot?	One cool fact (any true fact is fine)
Crust	Surface to about 35 km (5–10 km under oceans, 30–50 km under continents)	Solid	Up to ~500 °C at the bottom	The deepest hole ever drilled (Kola, Russia) is about 12 km deep: not even through the crust.
Upper mantle	35 to 660 km	Solid (flows very slowly)	~500–1,600 °C	Most diamonds form here, about 150–200 km down.
Lower mantle	660 to 2,890 km	Solid	~1,600–3,800 °C	The mantle is about 84% of Earth's volume, the biggest layer by far.
Outer core	2,890 to 5,150 km	Liquid	~3,800–5,400 °C	Churning liquid iron here makes Earth's magnetic field.
Inner core	5,150 to 6,371 km (the center)	Solid	~5,400–5,600 °C	About as hot as the Sun's surface, but squeezed so hard it stays solid.

Temperatures deep inside the Earth are estimates and different sources give different numbers. Accept anything in the right ballpark.

Part 3: Think about it

7. About **12,743 km** (between about 12,710 and 12,760 km depending on latitude, because Earth is slightly squashed). The tunnel goes straight through the middle, while walking follows the curved surface halfway around (about 20,015 km). A straight line is the shortest path: the diameter is only about $2/\pi$, or 64%, of the half-way-around distance.
8. Any one of: **earthquake waves** (they speed up, bend, bounce or stop as they pass through different layers); **meteorites** (iron meteorites are like the core's metal); **lab experiments** that squeeze and heat rock and iron; Earth's **weight and density** (the planet is much denser than surface rock, so the inside must be heavier); **Earth's magnetic field**.
9. **Liquid**. One kind of earthquake wave, the S-wave (shear wave), can't travel through liquids. S-waves never make it through the outer core, so they leave a "shadow zone" on the far side of the planet from an earthquake.