

Earth, day, seasons and orbits

Grade 6 science (Year 7 · Class 6) · Worksheet answers

Check your answers once you have tried every problem. Pay attention to the method and to the units, because astronomy answers often use very large numbers that you must write clearly.

Level: Grade 6 science (Year 7 · Class 6) · **Curriculum:** MS-ESS1-2

Problem 1 Planet order

1. **Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune.**
2. **Earth.**

Problem 2 Rotate or revolve?

1. (a) Rotation. (b) Revolution around the Sun.
2. **Rotation: 24 hours. Revolution: about 365 days.**

Problem 3 True or false?

(a) True. (b) False: the Earth orbits the Sun, and the Sun only seems to move because the Earth spins. (c) True. **Only statement (b) is false.**

Problem 4 Gravity and orbits

1. **Gravity** from the Sun.
2. The planet would fly off in a **straight line** in space.

Problem 5 Reading the planet table

1. **Mars.**
2. **More:** Neptune takes 165 years and Saturn takes 29.5 years.

Problem 6 What causes seasons?

1. The **tilt of the axis, 23.5°.**
2. **Summer** in the north.

Problem 7 Time zones

1. $360^\circ \div 24 \text{ h} = 15^\circ \text{ per hour}$. $75^\circ \div 15^\circ \text{ per hour} = \mathbf{5 \text{ hours}}$.
2. The east is ahead: $10:00 + 5 \text{ h} = \mathbf{15:00}$.

Problem 8 Sunrise and sunset

1. A faces the Sun: **midday**. C is opposite: **midnight**.
2. The Earth spins counter-clockwise, so A moves toward D and enters darkness there: **D is sunset**. A place at C moves toward B and enters light: **B is sunrise**.

Problem 9 Light from the Sun

1. $150\,000\,000\text{ km} = 1.5 \times 10^8\text{ km}$.
2. $t = d \div v = 150\,000\,000 \div 300\,000 = 500\text{ s}$. $500 \div 60 = 8.33\text{ min}$. **500 s, about 8.3 minutes**.

Problem 10 Years on Venus

1. $900 \div 225 = 4$ **Venus years**.
2. $900 \div 365 = 2.5$ **Earth years** (2.47 to two decimal places).

Problem 11 Which season?

1. At **P**, the north leans toward the Sun, so sunlight is more direct and days are longer: summer in the north.
2. **Winter** in the south, because the south leans away from the Sun.

Problem 12 Spinning at the equator

$v = d \div t = 40\,000\text{ km} \div 24\text{ h} = 1666.7\text{ km/h}$. **About 1700 km/h**.

Problem 13 Weight on other worlds

Earth: $50 \times 9.8 = 490\text{ N}$. Mars: $50 \times 3.7 = 185\text{ N}$. Difference: $490 - 185 = 305\text{ N}$. Her mass stays 50 kg.

Problem 14 Distance myth

The Earth is closer in January (147 million km) than in July (152 million km), yet July is not warmer in the north. The difference is 5 million km. **The cause is the tilt, not the distance**.

Problem 15 Age in Mars years

$3650 \div 687 = 5.31$. **About 5.3 Mars years**.

Problem 16 Orbital speed of Earth

1. $2\pi \times 150\,000\,000\text{ km} = 942\,477\,796\text{ km}$, **about $9.42 \times 10^8\text{ km}$** .

2. $v = 942\,477\,796 \div 8760 = 107\,589$ km/h. Divide by 3600: 29.9 km/s. **About 1.08×10^5 km/h or 29.9 km/s.**

Problem 17 Slow Jupiter

1. $2\pi \times 778\,000\,000 = 4.888 \times 10^9$ km. Time: $4333 \times 24 = 103\,992$ h. Speed: $4.888 \times 10^9 \div 103\,992 = 47\,006$ km/h. **About 4.7×10^4 km/h.**
2. $47\,006 \div 107\,589 = 0.44$. **Jupiter moves at 44 % of Earth's speed, so planets farther out orbit more slowly.**

Problem 18 Straight line or curve?

1. The planet moves sideways fast, so as gravity pulls it inward, it keeps missing the Sun and bends into a curve: **the sideways motion balances the fall.**
2. A stronger pull would bend the path more, so the planet would spiral closer to the Sun: **its orbit would shrink.**

Problem 19 Equator and Leeds

In June the north leans toward the Sun, so a northern place such as Leeds spends more than half its daily circle in sunlight. The equator is always cut in half by the day-night line, giving about 12 h every day. **The tilt makes daylight vary with latitude, but at the equator it stays near 12 h.**

Problem 20 Daylight in Leeds

1. $16.7 - 7.6 = 9.1$ hours.
2. $16.7 \div 24 \times 100 = 69.6$ %.
3. **21 December** is at the start of northern winter; the north leans away from the Sun, so the Sun is low and the days are short.