Exercise walk-through

The Earth and the Solar System ▪ 6.1

eXercise

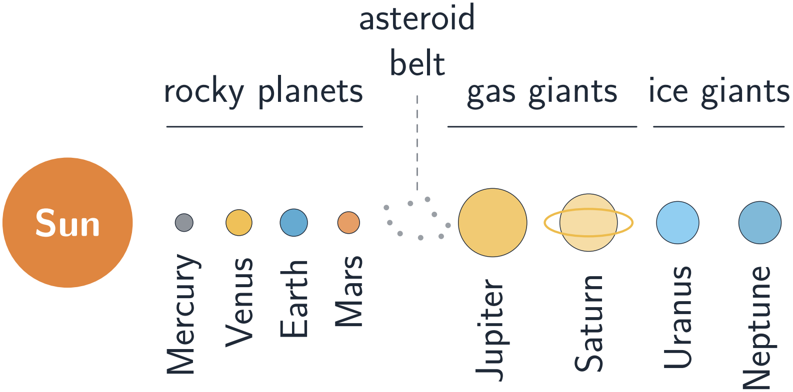
You must be able to

- explain day, year, seasons and Moon phases
- use $v = \dfrac{2\pi r}{T}$ for an orbit
- describe the Solar System and elliptical orbits

Method — Orbits and orbital speed

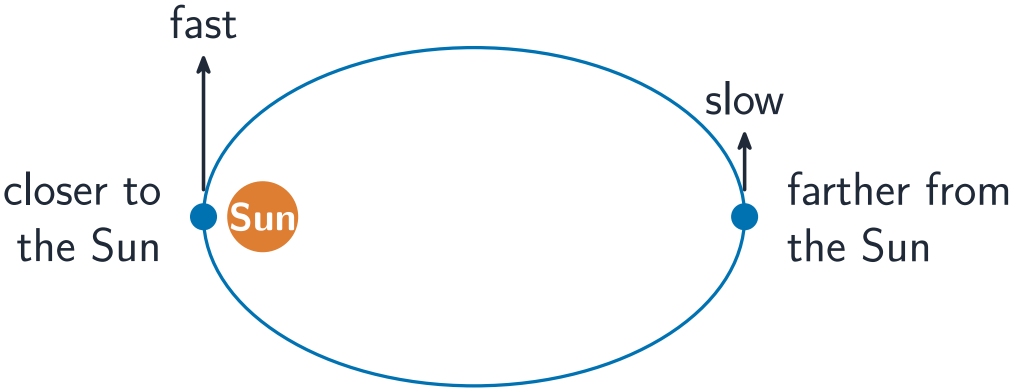
Space station, $r = 7.0 \times 10^6$ **m,** $T = 5800$ **s:** $v = \dfrac{2\pi r}{T} = \dfrac{2\pi(7.0 \times 10^6)}{5800} \approx 7600$ m/s.

Method — Orbits and orbital speed



The Sun and its eight planets: four rocky, then four gaseous

Method — Orbits and orbital speed



An elliptical orbit with the Sun at one focus

Practice 2.1 ▪ 1 mark

State what causes day and night.

Solution 2.1

Worked steps

the Earth spinning (rotating) on its axis **B1**.

Practice 2.2 ▪ 1 mark

Name the force that keeps a planet in orbit around the Sun.

Solution 2.2

Worked steps

gravity / the Sun's gravitational attraction **B1**.

Exam-style 3.1 ▪ 1 mark

Compared with the inner planets, the outer planets orbit the Sun:

A faster

B more slowly

C at the same speed

D in the opposite direction

Solution 3.1

Method: Orbits and orbital speed

A faster

B more slowly ✓

C at the same speed

D in the opposite direction

Worked steps

B. The Sun's gravity is weaker further out, so outer planets move more slowly.

Exam-style 3.2 ▪ 3 marks

A moon orbits a planet at a radius of 4.0×10^8 m with a period of 2.0×10^6 s.
(a) Find its orbital speed.
(b) State what happens to the gravitational field strength of the planet as you move further from it.

Solution 3.2

Method: Orbits and orbital speed

Worked steps

(a) $v = \dfrac{2\pi r}{T} = \dfrac{2\pi(4.0 \times 10^8)}{2.0 \times 10^6}$ **M1** **M1**; $= 1.3 \times 10^3$ m/s **A1**.

(b) it decreases (gets weaker) **B1**.

Exam-style 3.3 ▪ 2 marks

A comet moves in a very stretched elliptical orbit. Explain why it moves fastest when closest to the Sun.

Solution 3.3

Method: Orbits and orbital speed

Worked steps

as the comet comes closer, its gravitational potential energy falls **M1**; by conservation of energy this becomes kinetic energy, so it speeds up **A1**.