4. A communications satellite orbits the Earth at a height of $36 \cdot 0 \times 10^6$ m above the surface of the Earth.
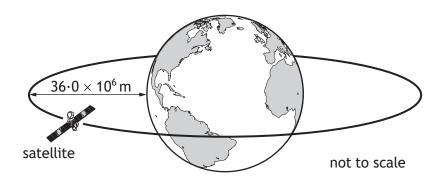

satellite   not to scale

The mass of the Earth is $6 \cdot 0 \times 10^{24}$ kg and the radius of the Earth is $6 \cdot 4 \times 10^6$ m.

(a) Determine the distance between the centre of the Earth and the satellite.   **1**

Space for working and answer

(b) The gravitational force of attraction between the Earth and the satellite is 57 N.

Calculate the mass of the satellite.   **3**

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4. (continued)

(c) Determine the value of the Earth's gravitational field strength g at the satellite.

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3

(d) A second satellite has a **quarter** of the mass of the first satellite.

The distance from the centre of the Earth to the second satellite is **half** the distance from the centre of the Earth to the first satellite.

State how the gravitational force of attraction between the second satellite and the Earth compares to the gravitational force of attraction between the first satellite and the Earth.

Justify your answer.

3