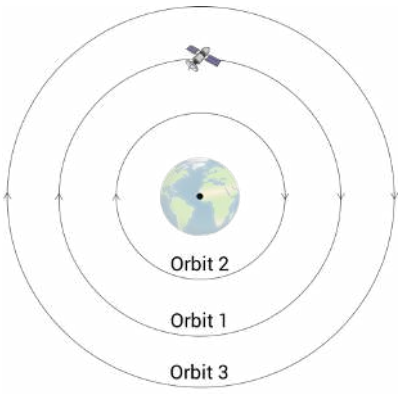
0 1

A communications satellite is in orbit around the Earth, as shown below.



0 1 . 1

Draw an arrow onto the diagram to indicate the direction in which the centripetal force on the satellite is acting. Label this arrow **F**.

[1 mark]

0 1 . 2

Write down the origin of this centripetal force.

[1 mark]

0 1 . 3

Draw a second arrow onto the diagram to indicate the direction of the velocity of the satellite at the point shown. Label this arrow **v**.

[1 mark]

0 1 . 4

Although the speed of the satellite in its current orbit (orbit 1) is constant, its velocity is constantly changing. Explain why.

[1 mark]

0 1 . 5

The speed of the satellite is **reduced** and it moves to a new orbit.
Which of the above orbits will it move to: orbit 2 or orbit 3?

[1 mark]

0 1 . 6

Explain your previous answer.

[2 marks]

0 2

Some information on the orbit of the eight planets about the Sun is shown in the below table.

Planet	**Average distance from Sun** (million km)	**Time taken to orbit Sun** (years)
Mercury	58	0.24
Venus	108	0.62
Earth	150	1
Mars	228	1.88
Jupiter	780	12
Saturn	1430	29
Uranus	2880	84
Neptune	4500	165

0 2 . 1

Show that the orbital speed of the Earth around the Sun is approximately equal to 30 km/s.

[4 marks]

0 2 . 2

The asteroid belt is located between Mars and Jupiter.

A particular asteroid takes 5.2 years to orbit the Sun, and travels at a speed of 17.2 km/s. Calculate its distance from the Sun.

Distance = _____ km

[4 marks]