

Solutions

2.1 Gravity; towards the centre of the orbit – at right angles to the motion.

2.2 The Moon is the Earth's natural satellite; any artificial one, e.g. a GPS or communication satellite.

2.3 Velocity is a vector; its direction changes continuously around the circle; so the velocity changes even though the speed does not.

3.1 (a) Acceleration is a change in velocity; velocity is a vector, and its direction changes continuously in a circle; so the satellite accelerates even at constant speed. **3.1** (b) Towards the centre of the orbit – at right angles to the motion; the Earth's gravitational pull. **3.1** (c) A stable orbit at the higher speed needs a smaller radius; otherwise gravity would not bend the path enough and the satellite would spiral outward.

3.2 Similarity: both orbit a larger body and are kept in orbit by the same gravitational force. Distinction: the Moon is a natural satellite orbiting the Earth; a GPS satellite is artificial – made and launched by humans – also orbiting the Earth but in a chosen orbit.

3.3 (a) The gravitational force gets stronger (closer to the planet). **3.3** (b) Closer in, gravity is stronger; a stronger force at right angles changes the direction of motion faster, curving the path more sharply; so the satellite can maintain a circular path only at a higher speed – lower orbits are faster.