

- 1 (a) Define *gravitational potential* at a point.

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.....
..... [2]

- (b) TESS is a satellite of mass 360 kg in a circular orbit about the Earth as shown in Fig. 1.1.

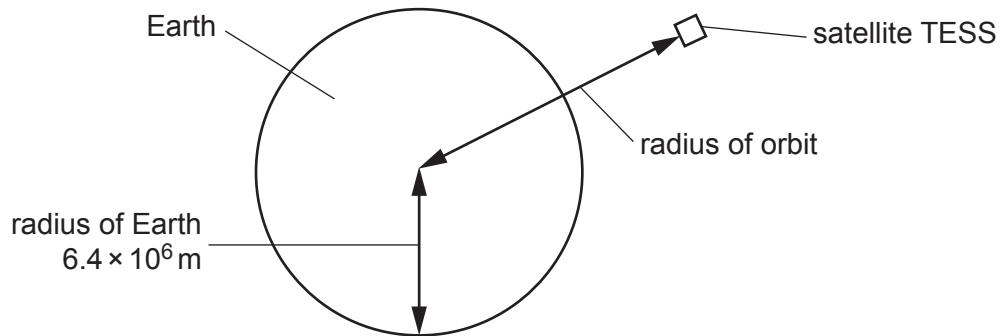


Fig. 1.1 (not to scale)

The radius of the Earth is $6.4 \times 10^6 \text{ m}$ and the mass of the Earth, considered to be a point mass at its centre, is $6.0 \times 10^{24} \text{ kg}$.

- (i) It takes TESS 13.7 days to orbit the Earth.

Show that the radius of orbit of TESS is $2.4 \times 10^8 \text{ m}$.

[3]

- (ii) Calculate the change in gravitational potential energy between TESS in orbit and TESS on a launch pad on the surface of the Earth.

change in gravitational potential energy = J [3]

- (iii) Use the information in (b)(i) to calculate the ratio:

$$\frac{\text{gravitational field strength on surface of Earth}}{\text{gravitational field strength at location of TESS in orbit}} .$$

ratio = [2]