

STEP III, 1999, Q9

- 9 The gravitational force between two point particles of masses m and m' is mutually attractive and has magnitude

$$\frac{Gmm'}{r^2},$$

where G is a constant and r is the distance between them.

A particle of unit mass lies on the axis of a thin uniform circular ring of radius r and mass m , at a distance x from its centre. Explain why the net force on the particle is directed towards the centre of the ring and show that its magnitude is

$$\frac{Gmx}{(x^2 + r^2)^{3/2}}.$$

The particle now lies inside a thin hollow spherical shell of uniform density, mass M and radius a , at a distance b from its centre. Show that the particle experiences no gravitational force due to the shell.



NextStepMaths.com

To view mark schemes, fully worked solutions and examiner's comments, and for more details about tutoring and other services offered, go to [NextStepMaths.com](https://www.NextStepMaths.com)