F4 Centripetal Acceleration

$^{9}/_{11}$

F4.1 Complete the questions in the table:

Speed /m s^{-1}	Radius /m	Angular velocity /rad s^{-1}	Centripetal acceleration /m s^{-2}
	0.32	5.2	(a)
2.1	0.070		(b)
(c)	30.0		9.8
	(d)	0.20	9.8
60	1200		(e)

F4.2 A car goes round a roundabout at 30 mph (13.4 m s^{-1}) on a circular path with a radius of 8.0 m. Calculate the centripetal acceleration.

F4.3 Calculate the force needed to hold a 55 kg teenager in place when in a horizontal fairground ride of radius 3.5 m going round once in 5.0 s.

F4.4 a) Calculate the force needed to keep a planet of mass 6.4×10^{24} kg in its orbit around the Sun (radius 1.5×10^{11} m). The planet takes $365\frac{1}{4}$ days to orbit the Sun once.

b) What is the name of the force which keeps the Moon in orbit round the Earth?

F4.5 A space station with an 8.0 m radius is spun to give the astronauts something which feels like gravity. If the centripetal acceleration is 9.8 m s^{-2}, calculate the speed at which the walls rotate (in m s^{-1}).

F4.6 Calculate the centripetal force experienced by a 500 g pair of wet trousers when in the spin cycle of a washing machine with a 20 cm drum radius if it rotates at 1200 rpm.