



Physics. *You work it out.*

[Home](#)[Gameboard](#)[Physics](#)[Mechanics](#)[Circular Motion](#)[Essential Pre-Uni Physics F3.1](#)

# Essential Pre-Uni Physics F3.1

**A Level**

How big is 3 rad, when expressed in degrees to the nearest whole number?

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# Essential Pre-Uni Physics F3.8



A car travels 10 km. One of its wheels has a radius of 30 cm. Calculate the angle the wheel turns as the car travels this distance (answer in radians to 2 significant figures).

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# Essential Pre-Uni Physics F3.3



Complete the questions in the table by converting the units.

Time period / s	Frequency / Hz	Angular velocity / $\text{rad s}^{-1}$	Revolutions per minute (rpm)
0.50	(a)	(b)	(c)

**Part A   Frequency**

a) Frequency?

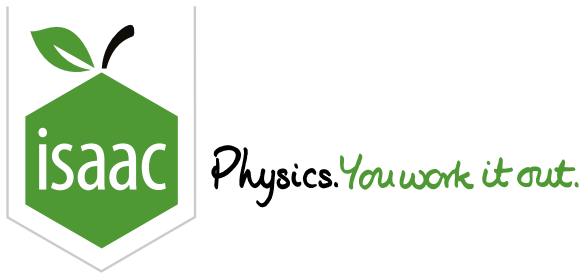
**Part B   Angular velocity**

b) Angular velocity?

**Part C   Revolutions per minute**

c) Revolutions per minute?

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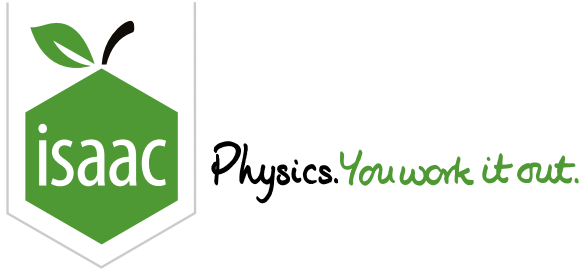
# Essential Pre-Uni Physics F3.10



My washing machine has a spin speed of 1200 rpm, and a drum radius of 20 cm. Calculate how fast clothes go when up against the side of the drum when the machine is spinning. Give your answer to 2 significant figures.

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Essential Pre-Uni Physics F4.1

A Level  
P P P

You must give the correct unit for each answer.

Complete the questions in the table.

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

Part A    Centripetal acceleration (a)

Speed / $\text{m s}^{-1}$	Radius / m	Angular velocity / $\text{rad s}^{-1}$	Centripetal acceleration / $\text{m s}^{-2}$
	0.32	5.2	(a)

a) What is the centripetal acceleration in  $\text{m s}^{-2}$ ?

Part B Centripetal acceleration (b)

Speed / $\text{m s}^{-1}$	Radius / $\text{m}$	Angular velocity / $\text{rad s}^{-1}$	Centripetal acceleration / $\text{m s}^{-2}$
2.1	0.070		(b)

b) What is the centripetal acceleration in  $\text{m s}^{-2}$ ?

Part C Speed (c)

Speed / $\text{m s}^{-1}$	Radius / $\text{m}$	Angular velocity / $\text{rad s}^{-1}$	Centripetal acceleration / $\text{m s}^{-2}$
(c)	30.0		9.8

c) What is the speed in  $\text{m s}^{-1}$ ?

Part D Radius (d)

Speed / $\text{m s}^{-1}$	Radius / $\text{m}$	Angular velocity / $\text{rad s}^{-1}$	Centripetal acceleration / $\text{m s}^{-2}$
	(d)	0.20	9.8

d) What is the radius in  $\text{m}$ ?

Part E Centripetal acceleration (e)

Speed / $\text{m s}^{-1}$	Radius / m	Angular velocity / $\text{rad s}^{-1}$	Centripetal acceleration / $\text{m s}^{-2}$
60	1200		(e)

e) What is the centripetal acceleration in  $\text{m s}^{-2}$ ? Give your answer to 2 significant figures.



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[Home](#)[Gameboard](#)[Physics](#)[Mechanics](#)[Circular Motion](#)[Essential Pre-Uni Physics F4.2](#)

# Essential Pre-Uni Physics F4.2

**A Level**

A car goes round a roundabout at  $30.0 \text{ mph}$  ( $13.4 \text{ m s}^{-1}$ ) on a circular path with a radius of  $8.0 \text{ m}$ . Calculate the centripetal acceleration.

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# Essential Pre-Uni Physics F4.5

A Level

c

c

c

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  $9.8 \text{ m s}^{-2}$ , calculate the speed at which the walls rotate (in  $\text{m s}^{-1}$ ).

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# Essential Pre-Uni Physics F4.6

A Level

C

C

C

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. Give your answer to 2 significant figures.

Gameboard:  
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# Cornering on a Smooth Surface

A Level

C

C

C

A car of mass  $m = 1000\text{ kg}$  is driven round a smooth circular track of radius  $r = 250\text{ m}$  and takes a time  $T = 30\text{ s}$  to complete one lap.

At what angle  $\theta$  must the track be banked to counteract the tendency of the car to slip sideways?

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[Home](#) [Gameboard](#) [Physics](#) [Mechanics](#) [Circular Motion](#) [Geostationary Orbit](#)

# Geostationary Orbit

A Level



A satellite is to be placed in a circular orbit around the Earth.

The gravitational force  $F_A$  between the satellite and the Earth is in the inward radial direction and its magnitude is given by the equation

$$F_A = \frac{GMm}{R^2}$$

where  $G = 6.67 \times 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$  is the gravitational constant;  $M = 5.97 \times 10^{24} \text{ kg}$  and  $m$  are the masses of the Earth and the satellite respectively; and  $R$  is the radius of the orbit.

Use the information and data above to calculate the required radius of the orbit if the satellite is in a geostationary orbit (remains above the same point on the equator).

Used with permission from UCLES, A Level Physical Science, June 1989, Paper 2, Question 3.

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