

**AQA – Circular motion – A2 Further Mathematics Mechanics**

1. June/2020/Paper\_3/No.6

A particle moves with constant speed on a circular path of radius 2 metres.

The centre of the circle has position vector  $2\mathbf{j}$  metres.

At time  $t = 0$ , the particle is at the origin and is moving in the positive  $i$  direction.

The particle returns to the origin every 4 seconds.

The unit vectors  $i$  and  $j$  are perpendicular.

(a) Calculate the angular speed of the particle.

[2 marks]

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(b) Write down an expression for the position vector of the particle at time  $t$  seconds.

[2 marks]

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(c) Find an expression for the acceleration of the particle at time  $t$  seconds.

[3 marks]

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(d) State the magnitude of the acceleration of the particle.

[1 mark]

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(e) State the time when the acceleration is first directed towards the origin.

[1 mark]

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2. June/2019/Paper\_3/No.2

A particle has an angular speed of 72 revolutions per minute.

Find the angular speed in radians per second.

Circle your answer.

[1 mark]

$$\frac{6\pi}{5}$$

$$\frac{12\pi}{5}$$

$$12\pi$$

$$24\pi$$

## 3. June/2019/Paper\_3/No.7

A particle of mass 2.5 kilograms is attached to one end of a light, inextensible string of length 75 cm. The other end of this string is attached to a point  $A$ .

The particle is also attached to one end of an elastic string of natural length 30 cm and modulus of elasticity  $\lambda$  N. The other end of this string is attached to a point  $B$ , which is 60 cm vertically below  $A$ .

The particle is set in motion so that it describes a horizontal circle with centre  $B$ . The angular speed of the particle is  $8 \text{ rad s}^{-1}$

Find  $\lambda$ , giving your answer in terms of  $g$ .

[9 marks]

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