Circular Motion Tutorial Self Review Suggested solutions

Self Review Questions		
S1	(a) (b) (c)	towards, centripetal, straight, first acceleration, velocity, radius frequency, hertz, period
S2		Since both points are on the same disc, they must have the same angular velocity, $\omega = \frac{v_P}{r_P} = \frac{v_Q}{r_Q}$ $\frac{v_P}{v_Q} = \frac{r_P}{r_Q} = 2$ Answer: **B**
S3		Linear velocity *v* - speed is constant but direction is varying, hence it is varying. Angular velocity ω is constant. Centripetal acceleration *a* – magnitude is constant but direction is varying, hence it is varying. Answer: **D**
S4		The particle has constant speed hence its kinetic energy is constant. However, the direction of its linear velocity is changing and its linear momentum varies. Answer: **B**
S5		Angular velocity, $\omega = \frac{2\pi}{T} = \frac{2\pi\ rad}{60\times 60s} = 1.75 \times 10^{-3}$ rad s^{-1} Answer: **B**
S6		$F = m\omega^2 r = m\frac{4\pi^2}{T^2}r = 2(\frac{4\pi^2}{3^2})5 = \frac{40\pi^2}{9}\ N$ Answer: **C**
S7		The actual forces acting on the ball are the tension exerted by the thread pulling on the ball and the gravitational pull of the earth on the ball (or its own weight). The **centripetal force** required to enable the ball to move in a horizontal circle is the **resultant of the two forces** acting on the ball. There should not be a third force acting on the ball. Answer: **B**
S8		The resultant force acting on the mass is the centripetal force. Answer: **D** *[<u>Extension:</u> Draw the forces acting on the mass. (FBD)*]
S9		At the top of the bridge, $mg - R = \frac{mv^2}{r}$, (where *R* is the net force exerted by the road on the car $R = mg - \frac{mv^2}{r}$ By Newton's 3rd Law, the net force exerted by the car on the road $R' = mg - \frac{mv^2}{r}$ Answer: **C**
S10		The linear velocity of the satellite is tangential to its orbit. When the rocket engine is fired and the net force acting on satellite is zero, the satellite will continue to move in a straight line based on Newton's first law. Answer: **B**