SUVA SANGAM COLLEGE

YEAR 13

PHYSICS

WORKSHEET 4

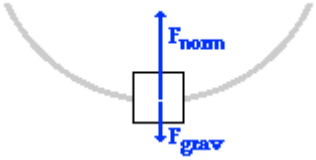
Strand 1 P13.1	Mechanics
Sub-Strand P13.1.4	Rotational Kinematics (Vertical Circles)
Content Learning Outcome P13.1.3.1	Apply the knowledge of Newton's Second Law and appreciate the concept of rotational kinematics.
Reference from Text	Pg 17 to 19

Questions

No.	**CONCEPT IN BRIEF**: Object feels lighter when descending and heavier when ascending in vertical circular motion
1.	Complete the following: a) A vertical circle is any circle that is _____ to the ground. b) The direction of Normal force at the top of the circle is _____. c) The direction of centripetal force at the bottom of the circle is _____. d) A child whirls a ball at the end of a rope in a vertical circle. Which of the following statements is true? I. The speed of the ball is constant. II. The velocity of the ball is constant. III. The magnitude of the balls acceleration is constant. IV. The acceleration of the ball is directed radially inwards, towards the centre of its path.
	CONCEPT IN BRIEF: Tension in vertical circle

Top	$T = \frac{mv^2}{r} - mg$
Middle	$T = \frac{mv^2}{r}$
Bottom	$T = \frac{mv^2}{r} + mg$

2.	a) A 5 kg mass is attached to one end of a rope 3 m long and the mass is swung in a

	vertical circle from the free end of the rope. Determine the tension in the rope when the mass is at its highest point if it is moving with a speed of 6 m/s.
	b) A ball of mass m is fastened to a string. The ball swings at constant speed in a vertical circle of radius R with the other end of the string held fixed. Neglecting air resistance, what is the difference between the string's tension at the bottom of the circle and at the top of the circle? I. mg II. 2mg III. 4 mg IV. 8 mg
	CONCEPT IN BRIEF: v_{top}(min) $F_c = F_g$ $\frac{mv^2}{r} = mg$ $v = \sqrt{rg}$ $v_{(bottom)}$ $v = \sqrt{5rg}$
3.	A 0.250 kg ball is being swung on a 1.3 m string in a vertical circle. Its tangential speed at the bottom of the path is 4.2 m/s. a) What is the tension in the string at that position?  b) Determine the minimum speed that the ball can have at the top and still move in a circle.