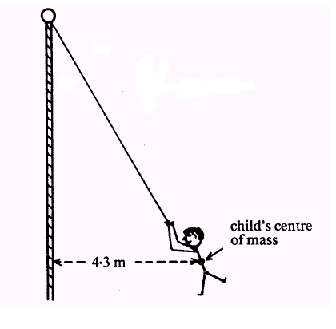
**Unit 3 PHYSICS SKILLS TEST 3 *(Circular Motion and Gravity)* NAME: SOLUTIONS**

*(26 Marks, 26 Minutes)*



1. A child is swinging on a maypole in a playground as shown in the diagram. The child (of mass 30 kg) is moving at a constant speed of 6.0 ms –1. The centre of mass of the child moves in a horizontal circle of radius 3.8m.

(a) What is the magnitude of the net force acting on the child?

3.8m

*(2 Marks)*

(b) What is the angle that the rope makes with the pole?

284 N

Arc of swing

*(3 Marks)*

2a. (WACE 2012) A person is sitting on a swing that is moving through the arc of a circle. It has reached the lowest point and is moving at maximum speed. Explain with reference to a vector diagram how the person’s apparent weight is different compared to being at rest on the swing.

*Weight effectively increased as now has centrifugal and gravitational components are both pressing down on the seat:*

*Fc*

*Fg*

*(3 Marks)*

b. If the person has a mass of 60kg, the swing cables are 2.5m long and the person’s velocity is 5ms-1, what is their apparent weight?

*Apparent Weight =*

*= 1188 N (*

*(4 Marks)*

c. What is the tension in each rope of the swing?

594 N

*(1 Mark)*

3. Prove that is a constant for all satellites of a particular planet.

*for stable orbit*

*which is a constant for a particular planet.*

*(4 Marks)*

b. A satellite of Earth has a period of 2 hours and an orbital radius of *r*. In terms of r, what will be the orbital radius of an earth satellite with period 16 hours?

*(2 hour satellite)*

*(ratio is constant)*

*64*

*(3 Marks)*

4a) In an experiment to measure the force of gravity, a physicist suspends two 100kg lead spheres from thin cables so that their centres are 622mm apart. Calculate the force of attraction between the spheres.

=

*(2 Marks)*

b. What deflection from vertical in the cable suspending one of the spheres is expected?

=

*mg=100(9.8)=980N*

*1.72x10-6N*

*(4 Marks)*