Answer on Question#37803 – Physics – Mechanics

Question:

A 38.0 kg child is in a swing that is attached to ropes 1.50 m long. The acceleration of gravity is 9.81 m/s^2 . Find the gravitational potential energy associated with the child relative to the child's lowest position under the following conditions:

a) when the ropes are horizontal.

b) when the ropes make 34.0 degree angle with the vertical.

Answer:

a) Change of potential energy equals:

$$\Delta U = mg\Delta h$$

where Δh is change of height.

When the ropes are horizontal change of height equals length of the ropes:

$$\Delta h = l$$

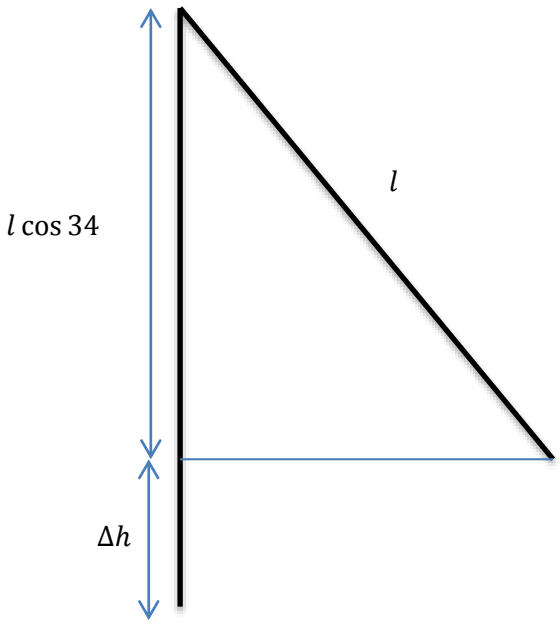
Therefore:

$$U = mgl = 559\,J$$

Answer: $559\,J$

b) Change of potential energy equals:

$$\Delta U = mg\Delta h$$



$$\Delta h = l - l\cos 34 = l(1 - \cos 34)$$

Therefore, gravitational potential energy of child equals:

$$W = mgl(1 - \cos 34) = 95.6\,J$$

Answer: $95.6\,J$