# A-level physics summer assignment

Below is a diagram of a pendulum. The image of the pendulum on the right shows it at the highest part of the swing in that direction. Here is some data about the pendulum:

The angle θ as shown in the diagram is 60° (it is the same in both cases)

The mass m of the pendulum bob is 5 kg

The weight of the pendulum bob is shown as mg on the diagram where m is the mass and g is the acceleration due to gravity given as 9.81 N/kg

The value of r is 0.5 m
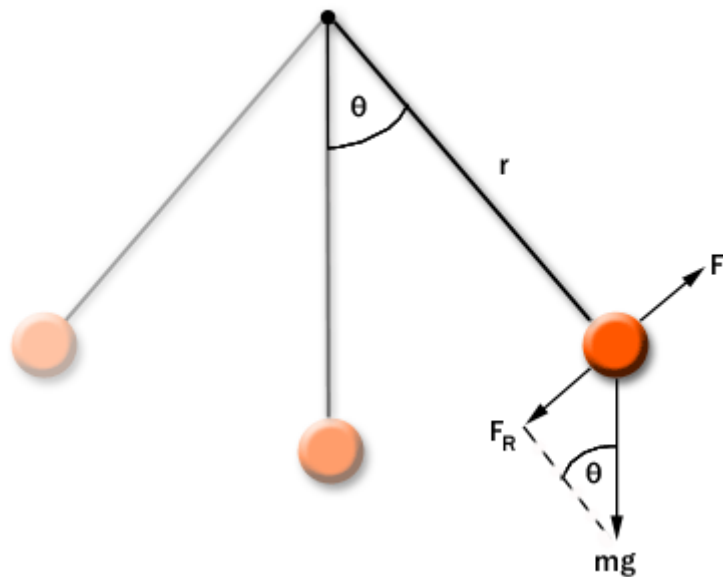
Answer the following questions bring your answers to the first Y12 physics lesson.

1. Calculate the weight of the pendulum bob

2. The pendulum bob is released from the position shown on the diagram the force F_i shows the force from the person's hand holding the bob before releasing it, describe what force F_R represents.

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3. Calculate the size of the force F_R before the pendulum is released (HINT – ignore F_i and use your maths skills!)

4. Calculate how long the pendulum takes to complete one full oscillation (if you missed the induction session you will need to google how to do this)

5. State how energy is stored in the pendulum bob before it is released. Explain how this will change as it swings through one full oscillation and back to its original starting position.

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6. The relationship between the maximum velocity of a pendulum and the amplitude of the pendulum is given by this formula:

$$V_{max} = 2\pi fA$$

V_{max} = Maximum velocity

f = frequency

A = Amplitude (highest position from rest that the pendulum reaches)

An experiment is conducted where the Amplitude is varied and the corresponding maximum velocity measured whilst keeping the frequency constant at all times.

The following data was obtained.

V_{max} (m/s)	A (cm)
0.05	1.5
0.23	6.5
0.37	12.0
0.51	15.6
0.62	21.2
0.83	26.8
0.94	30.0
1.02	33.4

Plot a graph of the maximum velocity against the amplitude <u>on graph paper</u> and use the graph to calculate the frequency of the pendulum.