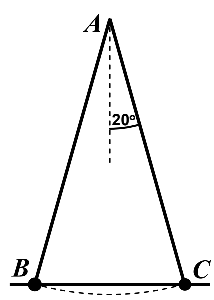
If we take a = 3 and $\theta < 5^{o}$ say, then $s = 3\cos x$.Let's check that this is the case: When the weight or bob starts its swing it is at position a = 3 on the displacement axis. It then moves to its vertical position a = 0 (left figure) which corresponds to 90^{o} (right figure). If you follow the rest of its path to B and then back to C you will notice that this is graphically represented by cosine curve in figure 2. The complete swing is technically called a cycle and is logically shown as 360^{o} in the second figure. Since one cycle is completed within 360^{o} we say that the period is 360^{o}. In practical problems it is sometimes necessary to calculate the period in terms of the time taken for one cycle. We will do this now in the following investigation.

Investigation:

Gravity is something very practical and useful which affects everyone and everything single thing. Therefore to know a little more about this universal property wouldn't be a bad thing. The gravity which attracts objects towards the centre of the earth is measured as *acceleration* and its intensity is slightly greater at the poles compared to the equator. (Why?) The letter 'g' is used to denote its value. Acceleration is the rate of change of velocity (directional speed) with respect to time and is measured in ms^{-2} (meters per second per second). In this activity we shall find the approximate measure of this acceleration (g) by means of a simple pendulum experiment.

Method: Tie a small object to the end of a piece of cotton. (A small snooker ball works well though you will need tape to prevent the cotton from slipping). Suspend the end of the cotton to a fixed point A, 1m above the centre of the ball or object.



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Once this is set up carefully pull the object to position C, keeping the cotton taut at an angle of approximately 20^{o} to the vertical, then release the weight and time 20 swings of the pendulum. (A swing is from C to B and then back to C). By taking the time of each swing to be the same (which you could easily verify) and then dividing the time by 20, you will determine the time of one swing. It is this time which we call the **period of the pendulum**. (Of cause you could count 30 swings and divide by 30 if you wish).Now, to approximate g, we make use of the formula: $T = 2\pi\sqrt{\frac{l}{g}}$

where T is the period measured in seconds, and l is the length of the pendulum (1m). In order to calculate g, we must change the subject of the formula. We make use of inverse operations. The **highest order operation** is the square root, so we must take the square of both sides.

i.e. $T = 2\pi\sqrt{\frac{l}{g}}$ becomes: $T^2 = 4\pi^2\frac{l}{g}$

Write the last step of the equation with g on the left hand side.

____

Next you must evaluate g by substituting the value of T and l that you found earlier. (Use π = 3.14159). Show you working below:

____

____

____

Check your answer by comparing the answers found by others to see how close you were. Is this value the same for all places on earth? ________
What is the internationally accepted value for g? _______

As a follow up to this investigation, you might get involved in a project which looks at gravity in the broader context, viz.: the Solar System and then the universe at large. Make a brief study of Newton, Einstein as well as the effects of Einstein's theory of relativity as applied to the formation of Black Holes.

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