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Building a bowling ball pendulum AQ1

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Abstract

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AQ4 This article details a method for adapting a bowling ball to become a pendulum which can be used to demonstrate the independence of period on mass and conservation of energy.

Pendulums remain a common topic on school curriculums and examination board specifications. The ease and simplicity of experiments to determine the time period (while mass, length or release angle are varied) coupled with the opportunities to discuss methods to reduce timing uncertainty and manipulating data to produce a straight line graph means pendulums are applicable right across the 11–18 age range.

Seeing a pendulum where the bob is a bowling ball has a big impact upon students. They immediately understand that the mass is dramatically greater than a typical school pendulum with an approximately 2 cm diameter bob. By placing it alongside a typical school pendulum of the same length the time periods can be verified to be the same.

Perhaps more impressive is a demonstration of the law of conservation of energy. If a pendulum is released from a certain position to complete 1 swing, it will always return to a height slightly less than that of its release—indeed the best it could do if no energy was transferred would be to return to the same height. Provided some safety advice is followed—which more able students should be able to figure out for themselves before taking part—the bowling ball can be released from touching a student's nose. The student should then try to hold their head in the same position without reacting as the ball returns to a position just short of their nose. They must never push the pendulum on release or move their nose further forwards.

To build you own bowling ball pendulum, firstly a bowling ball must be acquired. Sometimes bowling alleys will replace balls with damaged surfaces and are happy to give these away. Alternatively they can be purchased online either new or second hand. It does save on postage costs if a local one can be found which can be collected.

The safest way to attach a string is to drill right though the ball. Figure 1 shows the hole drilled using a long 14 mm drill bit. The drilling task was shorted a little, buy extending one of the finger holes.

An 18 cm M12 bolt [1] can then be passed through the ball and attached to an M12 eye nut

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Figure 1. A 14 mm hole drilled through a bowling ball.

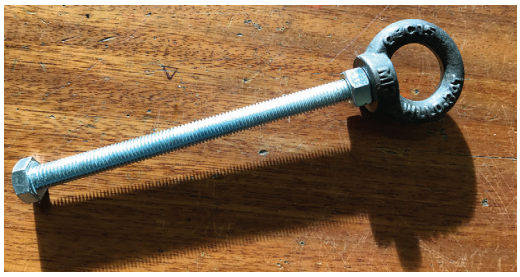

Figure 2. An 18 cm M12 nut and bolt and an M12 eye nut. Showed without the ball for clarity.

Figure 3. A bow shackle attached to the eye nut.

Figure 4. The bowling ball pendulum bob completed.

Figure 5. The bowling ball pendulum completed.

[2]. This is showed in figure 2. A bow shackle [3] can be used to attach a webbing lifting sling [4] to the eye nut. This is showed in figure 3. The completed ball is showed in figure 4.

The lifting sling can then be looped around a fixed structure such as a classroom celling beam or rugby/football goal post as showed in figure 5 and the pendulum tested. AQ5

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References

[1] Bolt (https://uk.rs-online.com/web/p/hex-bolts/9173227/)
[2] Eye nut (www.safetyliftingear.com/products/eyenuts-for-lifting-sizes-8mm-to-36mm--metric-course-thread-/enm)
[3] Shackle (www.safetyliftingear.com/products/3-25-ton-alloy-bow-shackle--safety-pin-by-liftingear-/abs3-25tsaf)
[4] Webbing lifting sling (www.safetyliftingear.com/products/lifting-webbing-sling--strops-1tonne/web1xlg)