EPro8 Challenge

Engineer Problem Solve Innovate

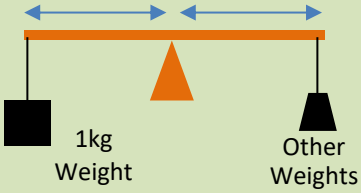
Air Freight

The EPro8 Challenge is going global. We have orders for equipment to be air freighted to Mongolia.

- A bag of nuts and bolts.
- A large gear.
- A bundle of aluminium.

You need to find the weight of each bag, so you can determine how much the air freight will cost.

Scale Construction	
Criteria	An axle is attached to a 700mm tall frame. The middle of a 700mm long arm is attached to the axle. The arm can pivot up and down. Blue joiners are attached to either end of the arm with the bolt pointing upwards.

Calibrate	
Criteria	The 1kg weight is attached to one side of the arm. The equivalent weights are attached to the other side of the arm so that the arm is balanced.
Hint	The distance from the axle to the 1kg weight must be EXACTLY THE SAME as the distance from the axle to the other weights. The weights must all be connected to a fixed point (and not spread out). 

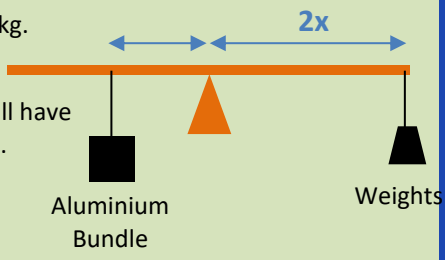
Weight - Nuts and Bolts

Criteria	Place all the unused nuts and bolts in a plastic bag. Use the scales to determine the weight of the nuts and bolts. Your answer must be accurate to within 100g of the actual weight.

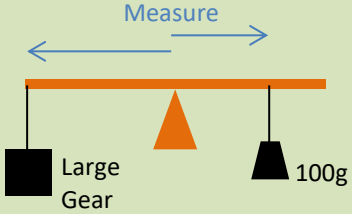
Air Freight Cost

Criteria	It costs $0.90 to air freight 100g to Mongolia. Calculate the cost to send the nuts and bolts to Mongolia.

Weight – Aluminium

Criteria	Move where the weights connect so that one is half the distance. Tie the unused long and medium length aluminium into a bundle. The unused aluminium weighs between 2 and 4kg. Determine the weight accurate to 200g.
Hint	This challenge requires you to weigh an object between 2 and 4 kg. But you only have 2kg of weights in your set. If the connection point on one side is further than the other it will have more leverage so not require as much weight to achieve balance. If the distance to the weights is twice the distance to the aluminium bundle then you would only require half the weight to achieve balance. Remember to double the weight to get the answer. 

Weight – Large Gear

Criteria	Place a large gear on the scales. The gear weighs less than 100g. Determine the weight accurate to 10g.
Hint	The problem here is that you must be accurate to the nearest 10g – and the smallest weight you have is a 100g weight. Instead of varying one of the weights to achieve balance, try varying the distance from the pivot point to the weight. The weight of the small gears will be: 100g x Distance to 100g Weight ÷ Distance to Large Gear. 

After you have attempted this challenge, watch the tutorial to see our solution at www.EPro8Challenge.co.nz/Tutorial and enter the Challenge Code **ARFR**.