



# Am I being Cheated in the Market Place ?



## Student Activities

### Scenario

The one or two-pan balance (scales) continues to be a crucial instrument in buying vegetables and other foodstuffs in the market which involve weighing. The suspicion that we are being cheated by people using faulty balances, or false weights often troubles us. But how do we find out whether a pair of scales is true or false? Does it suffice to check that the arms balance with empty pans, and if they don't, then does only a compensatory weight need to be added to obtain correct weighing? Even after this initial balancing, how many people realise that the scales may still be faulty?

To understand this we need to investigate the principles behind different types of balances and determine factors which can affect the weighing.



## Your Tasks

1. Describe the different types of balances in use in the marketplace and the reason for the use of different types.
2. Construct your own, hand-held, 2-pan balance using simple materials. Hold the balance using a short length of string which is tied to the middle of a length of wood 50-100cm in length. Attach pans at each end using string and make sure the length of wood is horizontal when the balance is held by the string. If it is not, then move the place where the string is tied to the wood until you find the balance point and the length of wood is horizontal. Weights can be made using marbles, stones, plastic, sand, etc. in polythene bags or small bottles or whatever. You are encouraged to explore and suggest better materials. Learn to operate the balance quickly and effectively. Record the weights of the objects you use.
3. Now construct a 1-pan balance, where weights are fixed in place of the other pan at different distances from the balance point (the fulcrum) where the hand-held string is attached). Again establish the balance point by moving the place where the string is tied to the length of wood.
4. Use this balance to carry out a series of experiments to see what happens if weights are placed in the pan (on the lefthand side) and then different weights are attached at different distances from the fulcrum (on the righthand side). Complete the following table:

Left Hand Side of Fulcrum

Right Hand Side of Fulcrum

Weight attached (g wt)	Distance of pan from the fulcrum (cm)	Weight x Distance (g wt x cm)	Weight needed to balance (g wt)	Distance from fulcrum (cm)	Weight x Distance (g wt x cm)

- The weight x distance is called the moment of a balance. Now express your conclusions from the table in terms of moments of the left hand side versus the moments of the right hand side.
- Use a spring balance and compare the value of a series of weights with the corresponding reading on the spring balance. Record your results and draw any conclusion between the reading on the spring balance (written in Newtons) and the value of the weight.
- Comparing the balances you have constructed, which type of balance do you consider easier to use and/or which is more accurate. Which type is more appropriate for use in the market?
- To check the weights used in the market it is necessary to use a standard. Find out about standard weights. Weight is the absolute standard kept?
- In groups discuss the potential for cheating using the different types of balances and decide whether you feel there is too great a potential for people to be cheated when shopping in marketplaces.

## Questions to answer

- What is the relationship between Newtons and the weights used on other balances?
- Are the weights used on 2-pan or 1-pan balances actually recording weight or mass? What is the difference?
- Comment on the readings obtained when weighing an object on the moon using a 1-pan balance and a spring balance.