

Problem of the Month

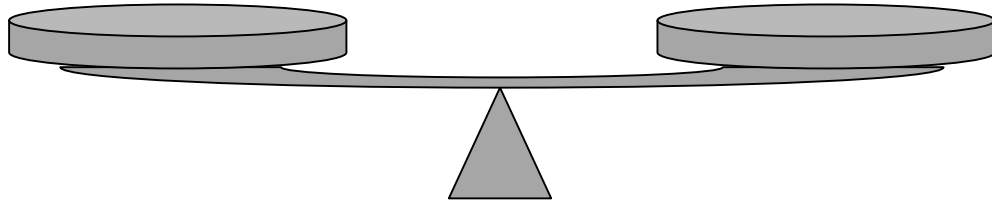
# On Balance

## Level A

Debbie works at an apple orchard. She knows every so often there is a bad or rotten apple in the baskets of apples she picks. She knows that bad apples weigh less than good ones. There are a lot of apples in her basket so she wants to spend as little time as possible for checking apples. She thinks she knows a fast way to check.



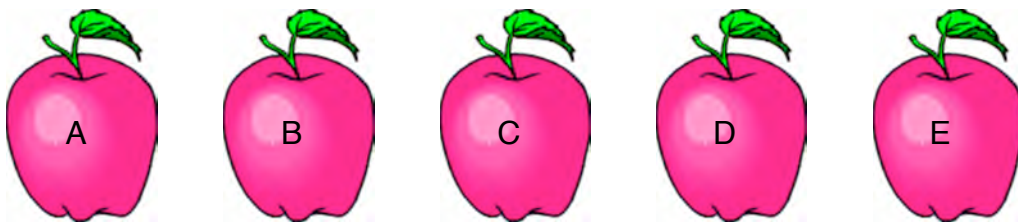
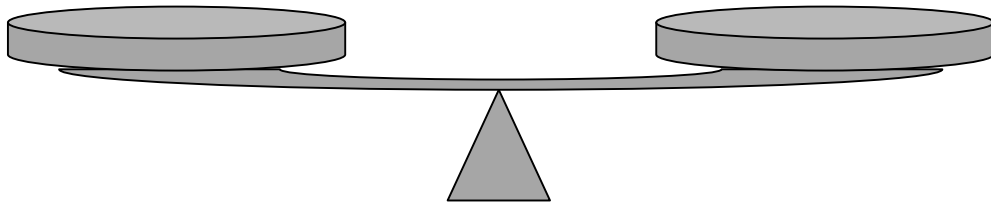
She has three apples and one is bad. How can she weigh apples just one time and still find out which one is bad.



Making only one weighing, can you determine a way to know for sure which apple is bad? Explain.

## Level B

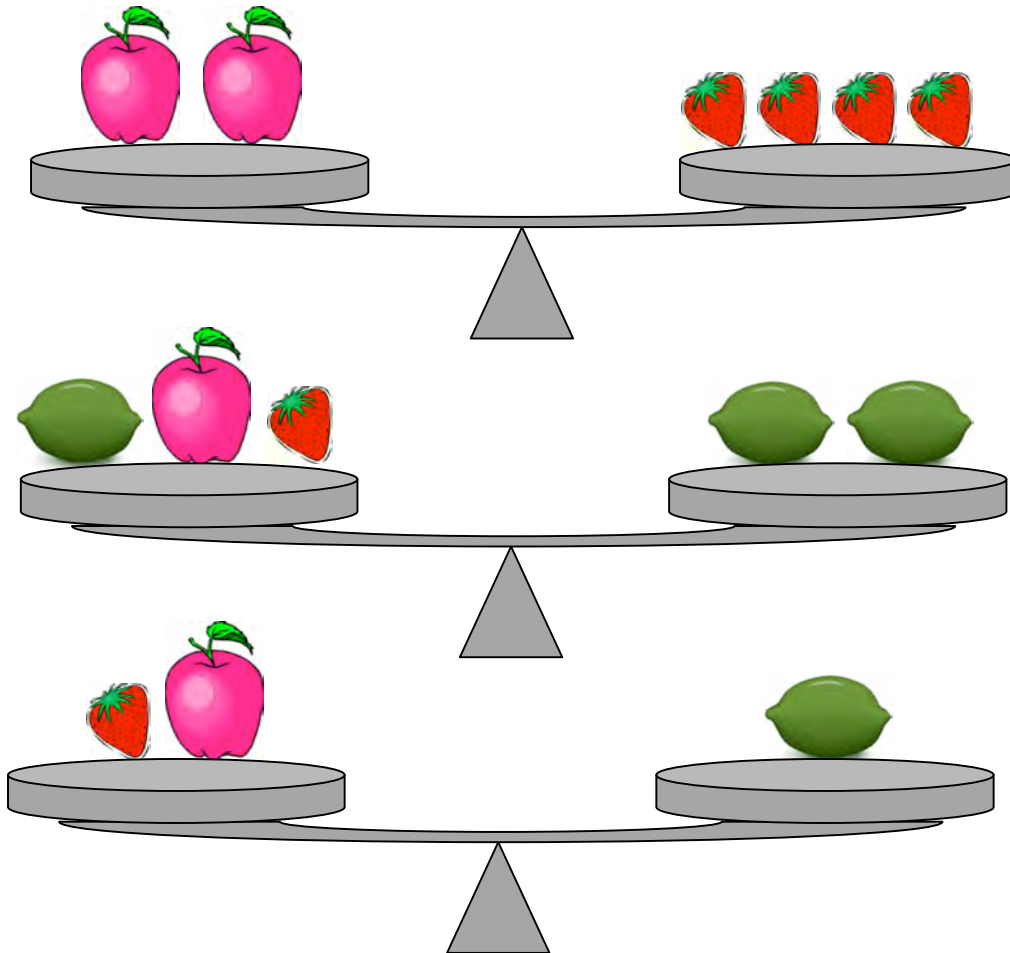
Debbie has a lot more apples to check. Now she has five apples. Four apples are good, all weighing the same. But the bad one either weighs more or weighs less than the others. List the process steps and decision you need to make in order to determine which apple is bad, and whether it is heavier or lighter than the good ones.



You know one of the apples is either heavier or lighter than all the others, what are the minimum weighs needed to determine which apple is bad, and whether it is heavier or lighter than the others. Show and justify your solution.

## Level C

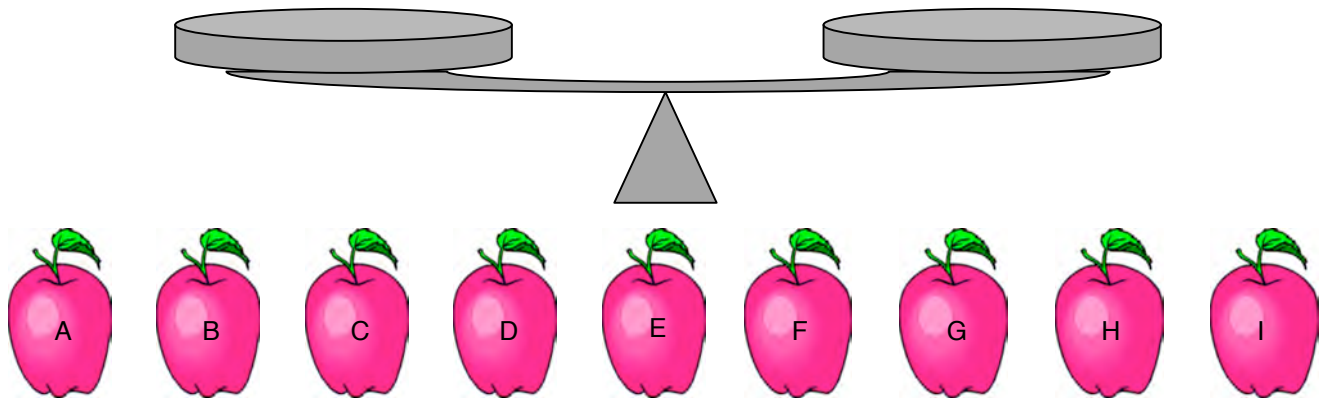
Each type of fruit has a unique weight that is consistent between scales. Use the scales to determine the relationship between the different types of fruit.



How do the weights of strawberries compare with limes?

## Level D

Suppose you were presented with nine apples (A-I). Eight apples are the same weight and the ninth, either weighs more or weighs less than the others. List the process steps and decision you need to make in order to determine which apple is different, and whether it is heavier or lighter than the others.



You are given any number of apples between 3 and 15 and you know that one of the apples is either heavier or lighter than the others, which weigh the same. For each set of apples, what are the minimum number times you need to weigh the items to insure that you find the one that weighs different than the others? Show the relationship between the number of apples and the minimum weighing needed.

## Level E

Each type of fruit has a unique weight that is consistent between scales. Use the five scales to determine the relationship between the different types of fruits. How do the weights of each fruit compare with each other? Which weighs the most? Which weighs the least? Suppose a strawberry weighs 3 oz., how many of one kind of fruit equal to another kind of fruit? Explain.

