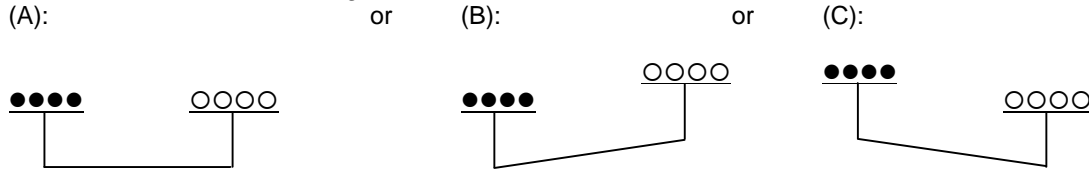


12 Coin Problem

There are 12 identical coins. One of them is fake. It may weigh more or less than a real one. How can you find out which one is fake using only 3 weighings on a balance?

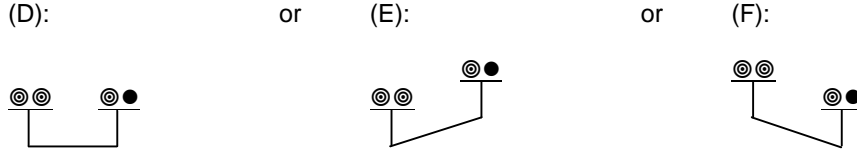
Divide the coins into 3 groups: ●●●●, ○○○○, ◎◎◎◎.
Step 1: Weigh ●●●● against ○○○○.

Then either one of the following situations will occur:



If (A) occurs, then one of the ◎◎◎◎ must be fake.

Step 2: Weigh any ◎◎ against any ◎●.
(Alternatively, weigh any ◎◎◎ against any ●●●.)
Then either one of the following situations will occur:



If (D) occurs, then the remaining ◎ must be fake.

Step 3: Weigh this ◎ against any other coin.

If (E) occurs, then one of the ◎◎ on the left is too heavy or the ◎ on the right is too light.

Step 3: Weigh the two ◎◎ on the left against each other.

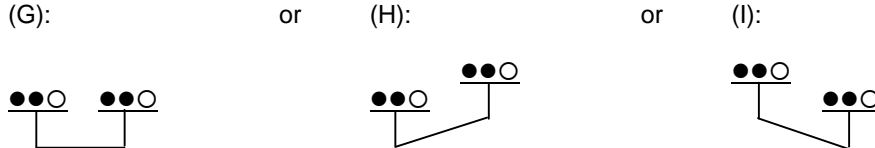
If (F) occurs, then one of the ◎◎ on the left is too light or the ◎ on the right is too heavy.

Step 3: Weigh the two ◎◎ on the left against each other.

If (B) occurs, then either one of the ●●●● must be too heavy or one of the ○○○○ must be too light.

Step 2: Weigh three of the ●●○ against another three ●●○.
(Alternatively, weigh ●●○ against ●●◎,
or weigh ●●○ against ●○◎,
or weigh ●●●○ against ●◎◎◎,
or weigh ●●○◎ against ●○◎◎,
or weigh ●●●○◎ against ●◎◎◎◎.)

Then either one of the following situations will occur:



If (G) occurs, then one the remaining ○○ must be too light.

Step 3: Weigh these two remaining ○○ against each other.

If (H) occurs, then either one of the ●● on the left is too heavy or the ○ on the right is too light.

Step 3: Weigh the two ●● on the left against each other.

If (I) occurs, then either the ○ on the left is too light or one of the ●● on the right is too heavy.

Step 3: Weigh the two ●● on the right against each other.

If (C) occurs, then either one of the ●●●● must be too light or one of the ○○○○ must be too heavy. Continue as in (B).