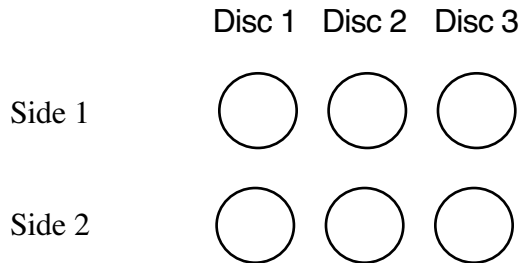


Solution to Discs

There are three circular discs. A number is written on each side of each disc. If I place the discs so that the number on only one face of each disc is visible, it is possible to get each of the following totals: 15, 16, 17, 18, 19, 20, 21, 22.

What are the numbers on each disc?



First, a hint: On side 1 write the lower of the two numbers on the discs. These must add up to 15. Then, on side 2 write the higher number. These must add up to 22. With this method of attack, it should be easy to find a solution (or several solutions) by trial and error.

To find a solution without trial and error, look at the solution that you found and note the following: On one disc, the numbers are consecutive; on another disc, the numbers differ by 2; on the third disc, the numbers differ by 4. This problem illustrates base 2 numeration with which you can represent any number from 0 to 7 (eight consecutive numbers) using three places. In base 2 numeration, the place values (from right to left) are 1, 2, and 4. and the consecutive numbers are represented by adding 1 or not adding 1, adding 2 or not adding 2, adding 4 or not adding 4.

To illustrate how this problem works and that there are many solutions, take the hint given above and write any three numbers that add up to 15. They may be the same or different numbers. Then add 1, 2 and 4 to them in any order. Three examples are:

$$\begin{array}{r} \text{Ex 1: } 5 \quad 5 \quad 5 \\ +1 \quad +2 \quad +4 \\ \hline 6 \quad 7 \quad 9 \end{array}$$

$$\begin{array}{r} \text{Ex 2: } 3 \quad 5 \quad 7 \\ +1 \quad +2 \quad +4 \\ \hline 4 \quad 7 \quad 11 \end{array}$$

$$\begin{array}{r} \text{Ex 3: } 1 \quad 2 \quad 12 \\ +1 \quad +2 \quad +4 \\ \hline 2 \quad 4 \quad 16 \end{array}$$

$$\begin{array}{r} \text{Ex 2: } 3 \quad 5 \quad 7 \\ \quad 5 \quad 9 \quad 8 \end{array}$$

$$\begin{array}{r} \text{Ex 3: } 1 \quad 2 \quad 12 \\ \quad 3 \quad 6 \quad 13 \end{array}$$

$$\begin{array}{r} \text{Ex 2: } 3 \quad 5 \quad 7 \\ \quad 7 \quad 6 \quad 9 \end{array}$$

$$\begin{array}{r} \text{Ex 3: } 1 \quad 2 \quad 12 \\ \quad 5 \quad 3 \quad 14 \end{array}$$