

Systematic Listing Strategies

The PowerPoint contains the slides shown below and these give an animated presentation explaining how to use a tree type diagram to systematically list the permutations.


Systematically Listing Permutations

Objective: Use a tree type diagram to systematically list the permutations

1

Sometimes, we want to find the total number of ways it is possible to put things into order.

How many different ways, for example, can these three beads be arranged in a straight line?




This is called the number of different permutations.

2

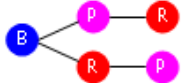
Sometimes, we want to find the total number of ways it is possible to put things into order.

How many different ways, for example, can these three beads be arranged in a straight line?



We can use the following systematic method to work out the possible arrangements...

3



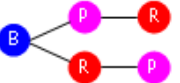
Suppose the first bead is blue (B)

Then the next bead could be purple (P) or red (R)

If the second bead is purple (P), the last bead must be red (R)

If the second bead is red (R), the last bead must be purple (P)

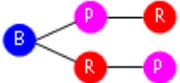
4



B, P, R
B, R, P

We can use the diagram to write down the orders

5

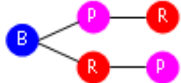


B, P, R
B, R, P
P, B, R
P, R, B

Now, repeat with this method and purple (P) as the first bead

We can use this diagram to write down the orders

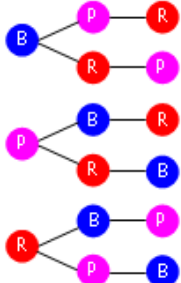
6



B, P, R
B, R, P
P, B, R
P, R, B
R, B, P
R, P, B

Finally, repeat this method with red (R) as the first bead

7




B, P, R
B, R, P
P, B, R
P, R, B
R, B, P
R, P, B

There are 6 possible ways the three beads can be arranged

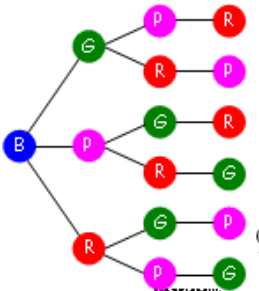
8

We can extend the method to more complicated arrangements:



How many different ways can these four beads be arranged in a straight line?

9

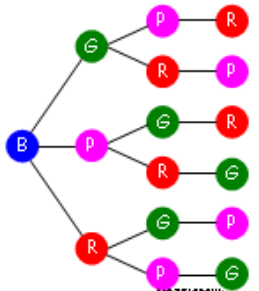


Starting with blue (B)

The next bead must be green (G), purple (P) or red (R)

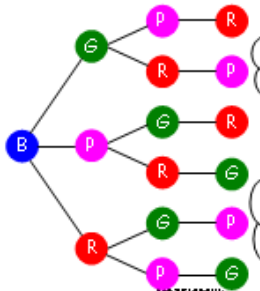
We can complete the diagram like this...

10



B, G, P, R
B, G, R, P
B, P, G, R
B, P, R, G
B, R, G, P
B, R, P, G

11



There are 6 ways that the beads can be arranged starting with blue

So there will be 6 ways starting green, 6 ways starting purple and 6 ways starting with red. This gives 24 ways in total

12