

Hands-on Lwr. 2nd'ry MATHS

PROBABILITY WORKSHOP



with blocks

You need 4 blocks : Red, Yellow, Green, Blue,

PERMUTATIONS :

1) Do Caleb Gattegno's train carriages :

No. of carriages	Different arrangements	Factorial ?
1	1	1!
2	2	2!
3		
4		
5		
6		

General Rule

n number of distinct things can be arranged in $n!$ ways

Q. 2 - 16 : If you have 4 blocks : Red, Yellow, Green, Blue, state the number of arrangements for :

2) Four blocks (order important) ? Ans :

3) Red always first ? Ans :



4) Red not first ? Ans :

5) Yellow first or last ? Ans :

6) Yellow neither first nor last ? Ans :

7) Red and Blue together ? Ans :

8) Red and Blue never together ? Ans :

9) Red and Blue together, but Red never next to Yellow ? (i.e. Blue next to Yellow is OK) Ans :

Name : No :

Class :

Date :



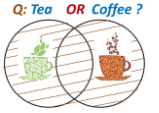
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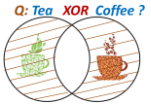
10) Red on one end AND Green on the other ?



11) Red on an end OR Green on an end ?



12) Red on an end XOR Green on an end ? (XOR means OR but not BOTH)



13) 4 blocks in a circle ?

14) 4 blocks in a circle : Red and Blue not next to each other ?

Using the formula for PERMUTATIONS

$${}^n P_k = n P_k = \frac{n!}{(n-k)!}$$

15) 2 selected from 4 blocks ? (order important)

16) 3 selected from 4 blocks ? (order important)

An easy way ? ${}^n P_k = n$ factorial to the first k number of factors

Using the formula for COMBINATIONS

$$\binom{n}{r} = {}_n C_r = C_{(n,r)} = \frac{n!}{r!(n-r)!}$$

17) How many pairs can be made from 4 blocks ?
(order is not important).

18) How many 3s from 4 blocks ? (order is not important)

19) How many 4s from 4 blocks ? (order is not important)

20) How many ways can you choose 0 blocks from 4 ?

21) How many ways can you choose 1 block from 4 ?

An easy way? Using Pascal's Triangle

Row 0					$\binom{0}{0}$
Row 1		$\binom{1}{0}$	$\binom{1}{1}$		
Row 2		$\binom{2}{0}$	$\binom{2}{1}$	$\binom{2}{2}$	
Row 3	$\binom{3}{0}$	$\binom{3}{1}$	$\binom{3}{2}$	$\binom{3}{3}$	
Row 4	$\binom{4}{0}$	$\binom{4}{1}$	$\binom{4}{2}$	$\binom{4}{3}$	$\binom{4}{4}$

Row 0					1
Row 1		1	1		
Row 2		1	2	1	
Row 3	1	3	3	1	
Row 4	1	4	6	4	1

Another handy trick with Combinations :

$${}^n C_r = {}^n C_{n-r} \text{ e.g. } {}^{20} C_{18} = {}^{20} C_2$$

RANDOM CHOICE w/out REPLACEMENT

Q. 22 - 24: Put the 4 blocks inside your hands :
What are the chances if taken at random ?

22. Red ? (taking 1)

23. Red or Blue ? (taking 1)

24. Red then Blue ? (taking 2)

Q. 25 - 29: Now imagine that you have 8 blocks
inside your hands (2 red, 2 blue, 2 yellow, 2 green) ...
What are the chances if taken at random :

25. Red ? (taking 1)

26. Blue or Green ? (taking 1)

27. Blue, Blue ? (taking 2)

28. Any 2 of the same colour ? (taking 2)

29. Any 2 different colours ? (taking 2)

30. Permutation question : How many ways can
you order 8 blocks if there are 2 red, 2 blue, 2
yellow, 2 green ?

31. Permutation question : How many ways can you
order 8 blocks in a circle if there are 2 red, 2 blue,
2 yellow, 2 green ?

32. Permutation question : How many ways can you take
2 (order is important) from 5 blocks (green, green,
blue, red, yellow) *note : $5P_2$ over $2!$ is not correct*

33. Some groups have 4 blocks, and some groups
have 4 triangular prisms. In how many ways can I
choose one block and one triangular prism ?

Hint : Fundamental Counting Principle

