

3c) B_b, B_y, B_n, B_d, B_a

B_y sits on B_b right hand side

$$\# \text{ ways} = 1 \times 1 \times 3!$$

d) B_d sits between B_b and B_n

$$\# \text{ ways} = 2 \times 1 \times 2!$$

e) B_a, B_y can't sit together.

$$\# \text{ ways} = 4! - 2 \times 1 \times 3!$$

5/ A E I P Q R

arrange vowels

place in circle

$$a) P(\text{vowels together}) = \frac{3! \times 1 \times 3!}{5!}$$

$$b) P(A \text{ opposite } R) = \frac{1}{5}$$

$$c) P(\text{Vowels and consonants alternate}) = \frac{2! 3!}{5!}$$

$$d) P(\geq 2 \text{ vowels next to each other})$$

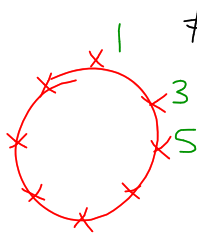
$$= 1 - P(\text{vowels and consonants alternate})$$

$$= 1 - \frac{1}{10}$$

$$= \frac{9}{10}$$

b) 1 2 3 4 5 6 7 8

ways 1, 7 are next to each other



= $2! \times 1 \times 6!$

c) # ways ≥ 3 odd together.

$$= {}^4P_3 \times 1 \times 3 \times 4! + 4! \times 1 \times 4!$$

7b) 3w, 7m

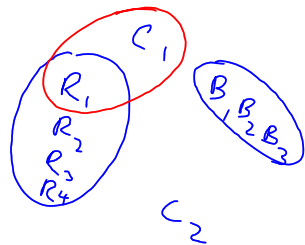
$$P(P, VP \text{ opposite}) = \underline{\frac{1}{9}}$$

9b)

8 R, 3 B, 1 G

$$\text{Ways} = \frac{11!}{8! \cdot 3!}$$

11b) 4R, 3B, 2C

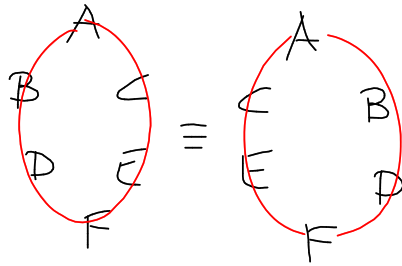


$$\begin{aligned} \text{a) Ways} &= 4! \cdot 3! \cdot 1 \cdot 1 \cdot 2 \\ &= \underline{\underline{288}}. \end{aligned}$$

$$\text{b) } P(R_{11} | C_{1, \text{next}}) = \frac{3! \cdot 2 \cdot 1 \cdot 3!}{288}$$

13/

A B C D E F



a) ways = $\frac{5!}{2}$

b) ways = $\frac{9!}{2}$

13/

Y RR GGGG
R R Y
(4G) 2 G G

(3G) (G) 3
RR G
G Y
G G

Y
R G
G R
G G

Y
R R G
G G

Y R G
G R
G G

$(2G)$ $(2G)$ 2.

R Y
X G
X G
R

R R
X G
X G
Y

$(2G)$ (G) (G) 2

X X
R G Y
G R G
X X
R R
G G
Y

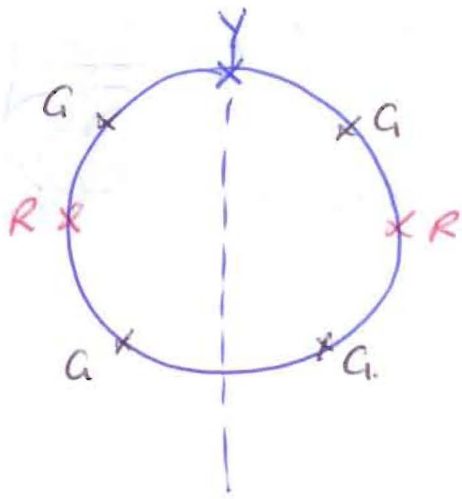
		<u>turn over</u>
✓ Y <u>RR</u> G	$\frac{3!}{2!} = 3$	2
✓ Y <u>RR</u> <u>GG</u>	$\frac{4!}{2!2!} = 6$	4
✓ Y <u>RR</u> <u>GGG</u>	$\frac{5!}{2!3!} = 10$	7
✓ Y <u>RGG</u>	$\frac{3!}{2!} = 3$	2
✓ Y <u>RGGG</u>	$\frac{4!}{3!} = 4$	2
✓ Y <u>RGGGG</u>	$\frac{5!}{4!} = 5$	3
Y <u>RGGGGG</u>	$\frac{6!}{5!} = 6$	3
✓ Y <u>RR</u> <u>GGG</u> <u>G</u>	$\frac{6!}{2!4!} = 15$	<u>9</u>

even normal T - # single color doubles!

odd

- leftover

B/



$$\frac{\# \text{ways}}{2} + \frac{\# \text{ways symmetric}}{2}$$

to be symmetric each half has
G G R

$$\begin{aligned} \# \text{ways symmetric} &= \frac{3!}{2!} \\ &= 3 \end{aligned}$$

$$\begin{aligned} \text{Total ways} &= \frac{6!}{4! \cdot 2!} + 3 \\ &= \frac{15 + 3}{2} \\ &= \underline{\underline{9}} \end{aligned}$$