Probability Assignment, Semester 2, 2000

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Question 1

A = points scored by team A
B = points scored by team B

Period 1

(i) $A + B = 1$ or 2
Possible combinations:

A	B
2	0
1	1
0	2
0	1
1	0

(ii) $A \neq B$
Possible combinations:

A	B
2	0
0	2
0	1
1	0

(iii) $A - B \leq 2$, $B - A \leq 2$
Possible combinations:

A	B
2	0
0	2
0	1
1	0

(iv) $A > B$

Possible combinations:

A	B
2	0
1	0

Possible combinations for scoring in period one are:

A	B
2	0
1	0

Period 2

When A = 2, B = 0 in period 1

(I) A + B = 1 or 2
Possible combinations:

A	B
4	0
3	1
2	2
2	1
3	0

(ii) $A \neq B$
Possible combinations:

A	B
4	0
3	1
2	1
3	0

(iii) $A - B \leq 2$, $B - A \leq 2$
Possible combinations:

A	B
3	1
2	1

When A = 1, B = 0 in period 1

(I) A + B = 1 or 2
Possible combinations:

A	B
3	0
2	1

1	2
1	1
2	0

(ii) $A \neq B$
Possible combinations:

A	B
3	0
2	1
1	1
2	0

(iv) $A - B \leq 2$, $B - A \leq 2$

Possible combinations:

A	B
2	1
1	2
2	0

Possible combinations for scoring in period 2 are:

When A = 2, B = 0 in period 1

A	B
3	1
2	1

When A = 1, B = 0 in period 1

A	B
2	1
1	2
2	0

Period 3

	A	B	A	B	A	B
In P1	**2**	**0**	**2**	**0**	**1**	**0**
In P2	**3**	**1**	**2**	**1**	**2**	**1**
(I)	5	0	4	0	4	0
	4	2	3	2	3	2
	3	3	2	3	2	3
	3	2	2	2	2	2

	4	1	3	1	3	1
(ii)	5	0	4	0	4	0
	4	2	3	2	3	2
	3	2	2	3	2	3
	4	1	3	1	3	1
(iii)	4	2	3	2	3	2
	3	2	2	3	2	3
			3	1	3	1

	A	**B**	**A**	**B**
In P1	**1**	**0**	**1**	**0**
In P2	**1**	**2**	**2**	**0**
(I)	3	2	4	0
	2	3	3	1
	1	4	2	2
	1	3	2	1
	2	2	3	0
(ii)	3	2	4	0
	2	3	3	1
	1	4	2	1
	1	3	3	0
(iii)	3	2	3	1
	2	3	2	1
	1	3		

All possible ways scoring can occur under these conditions:

Period	**Total points at the end of each period, for each possible combination.**				
1	2, 0	2, 0	2, 0	2, 0	2, 0
2	3, 1	3, 1	2, 1	2, 1	2, 1
3	4, 2	3, 2	3, 2	2, 3	3, 1
1	1, 0	1, 0	1, 0	1, 0	1, 0
2	2, 1	2, 1	2, 1	1, 2	1, 2
3	3, 2	2, 3	3, 1	3, 2	2, 3
1	1, 0	1, 0	1, 0		
2	1, 2	2, 0	2, 0		
3	1, 3	3, 1	2, 1		

There are 13 possible arrangements of scoring.

Team B will win in four of these ways.

Question 2a

The total number of combinations of 10 people randomly siting at two tables is given by:

The number of different combinations of five out of ten people for the first table - ${}^{10}C_5$ times by $\frac{5!}{5}$ Because it is a circular table and has to have a certain person for the starting point. Times by The number of different combinations of five out of five people for the second table - ${}^{5}C_5$ times by $\frac{5!}{5}$ Because it is a circular table and has to have a certain person for the starting point.

So, total number of combos is

${}^{10}C_5 * \frac{5!}{5} * {}^{5}C_5 * \frac{5!}{5}$ = 145152 different combinations.

With the two friends on the same table, to find the combinations of the other people on that table – ${}^{8}C_3$, times by $\frac{5!}{5}$ because they're on a circular table.

The number of combinations of the people on the other table - $\frac{5!}{5}$

Times by two, because the two people can be seated on either table.

Therefor the number of combinations of the two friends at the same table are gotten by:

${}^{8}C_3 * \frac{5!}{5} * \frac{5!}{5} * 2 = 64512$

Therefor the probability that the two friends are sitting at the same table is, $\frac{64512}{145152} = \frac{4}{9}$

Question 2b

The number of combinations of the family of five seated at the same table with the parents sitting together is given by:

2! * 3! * 4! * 2 = 576

The combos of the parents sitting together is given by the 2! The combos of the rest of the family sitting at the same table is given by 3! The 4! Is the combinations of the

people sitting at the other table. And the times 2 is because the family could be sitting at either table.

Total number of combos is ${}^{10}C_5 * \frac{5!}{5} * {}^{5}C_5 * \frac{5!}{5} = 145152$

Probability of the family of five seated at one table with the parents seated together is:

$$\frac{576}{145152} = \frac{1}{252}$$

Question 3

Green die = 1, 2, 3, 9, 10, 11
Yellow = 0, 1, 7, 8, 8, 9
Red = 5, 5, 6, 6, 7, 7,
Blue = 3, 4, 4, 5, 11, 12

Green Vs Yellow

Green \ Yellow	**0**	**1**	**7**	**8**	**8**	**9**
1	1, 0	1, 1	1, 7	1, 8	1, 8	1, 9
2	2, 0	2, 1	2, 7	2, 8	2, 8	2, 9
3	3, 0	3, 1	3, 7	3, 9	3, 9	3, 9
9	9, 0	9, 1	9, 7	9, 8	9, 8	9, 9
10	10, 0	10, 1	10, 7	10, 8	10, 8	10, 9
11	11, 0	11, 1	11, 7	11, 8	11, 8	11, 9

Green win	**Yellow win**
22	12

Draw
2

Red Vs Blue

Red \ Blue	**3**	**4**	**4**	**5**	**11**	**12**
5	5, 3	5, 4	5, 4	5, 5	5, 11	5, 12
5	5, 3	5, 4	5, 4	5, 5	5, 11	5, 12
6	6, 3	6, 4	6, 4	6, 5	6, 11	6, 12
6	6, 3	6, 4	6, 4	6, 5	6, 11	6, 12
7	7, 3	7, 4	7, 4	7, 5	7, 11	7, 12
7	7, 3	7, 4	7, 4	7, 5	7, 11	7, 12

Red win	Blue win
22	12

Draw
2

Green Vs Blue

Green \ Blue	3	4	4	5	11	12
1	1, 3	1, 4	1, 4	1, 5	1, 11	1, 12
2	2, 3	2, 4	2, 4	2, 5	2, 11	2, 12
3	3, 3	3, 4	3, 4	3, 5	3, 11	3, 12
9	9, 3	9, 4	9, 4	9, 5	9, 11	9, 12
10	10, 3	10, 4	10, 4	10, 5	10, 11	10, 12
11	11, 3	11, 4	11, 4	11, 5	11, 11	11, 12

Green win	Blue win
12	22

Draw
2

Yellow Vs Blue

Yellow \ Blue	3	4	4	5	11	12
0	0, 3	0, 4	0, 4	0, 5	0, 11	0, 12
1	1, 3	1, 4	1, 4	1, 5	1, 11	1, 12
7	7, 3	7, 4	7, 4	7, 5	7, 11	7, 12
8	8, 3	8, 4	8, 4	8, 5	8, 11	8, 12
8	8, 3	8, 4	8, 4	8, 5	8, 11	8, 12
9	9, 3	9, 4	9, 4	9, 5	9, 11	9, 12

Yellow win	Blue win
16	20

Draw
0

Red Vs Yellow

Yellow

Red	0	1	7	8	8	9
5	5, 0	5, 1	5, 7	5, 8	5, 8	5, 9
5	5, 0	5, 1	5, 7	5, 8	5, 8	5, 9
6	6, 0	6, 1	6, 7	6, 8	6, 8	6, 9
6	6, 0	6, 1	6, 7	6, 8	6, 8	6, 9
7	7, 0	7, 1	7, 7	7, 8	7, 8	7, 9
7	7, 0	7, 1	7, 7	7, 8	7, 8	7, 9

Red win	Yellow win
12	22

Draw
2

Table of what to choose if the opponent has already chosen.

Opponent	Colour to choose
Green	Blue
Yellow	Green
Red	Yellow
Blue	Red

Joseph Curtis| The End