

# HW1 Mathematics 502

By Nasser Abbasi

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## Problem 2, page 27

### ■ Question

### ■ Answer

a) This is a list of the sample space. Simply toss one die, then make a toss of the second die. The result is as shown:

```
s = {1, 2, 3, 4, 5, 6};  
Table[{s[[i]], s[[j]]}, {i, 6}, {j, 6}];  
space = Flatten[%, 1]  
  
{1, 1}, {1, 2}, {1, 3}, {1, 4}, {1, 5}, {1, 6}, {2, 1}, {2, 2}, {2, 3}, {2, 4}, {2, 5}, {2, 6},  
{3, 1}, {3, 2}, {3, 3}, {3, 4}, {3, 5}, {3, 6}, {4, 1}, {4, 2}, {4, 3}, {4, 4}, {4, 5}, {4, 6},  
{5, 1}, {5, 2}, {5, 3}, {5, 4}, {5, 5}, {5, 6}, {6, 1}, {6, 2}, {6, 3}, {6, 4}, {6, 5}, {6, 6}
```

part b)

(1) This is event A. Look through each outcome in space and see if first+second die is less than or equal to 5

```
setA = Select[space, First[#] + Last[#] ≤ 5 & ]  
  
{1, 1}, {1, 2}, {1, 3}, {1, 4}, {2, 1}, {2, 2}, {2, 3}, {3, 1}, {3, 2}, {4, 1}
```

(2) This is event B, Look through each outcome in space and see if first die larger than second die

```
setB = Select[space, First[#] > Last[#] & ]  
  
{2, 1}, {3, 1}, {3, 2}, {4, 1}, {4, 2}, {4, 3}, {5, 1},  
{5, 2}, {5, 3}, {5, 4}, {6, 1}, {6, 2}, {6, 3}, {6, 4}, {6, 5}
```

(3) This is event C, Look through each outcome in space and see if first die is 4

```
setC = Select[space, First[#1] == 4 & ]  
  
{4, 1}, {4, 2}, {4, 3}, {4, 4}, {4, 5}, {4, 6}
```

Part c)

(1) This is  $A \cap C$ , which means event is in A and in C

```
setA ∩ setC  
  
{4, 1}
```

(2) This is  $B \cup C$ , which means event in B or in C or in both

```
setB ∪ setC  
  
{2, 1}, {3, 1}, {3, 2}, {4, 1}, {4, 2}, {4, 3}, {4, 4}, {4, 5},  
{4, 6}, {5, 1}, {5, 2}, {5, 3}, {5, 4}, {6, 1}, {6, 2}, {6, 3}, {6, 4}, {6, 5}
```

(3) This is  $A \cap (B \cup C)$  which is A intersect B union C, i.e. event in A and also in B union C. First find  $B \cup C$ , which is event in B or C or both

**setB  $\cup$  setC**

$\{\{2, 1\}, \{3, 1\}, \{3, 2\}, \{4, 1\}, \{4, 2\}, \{4, 3\}, \{4, 4\}, \{4, 5\},$   
 $\{4, 6\}, \{5, 1\}, \{5, 2\}, \{5, 3\}, \{5, 4\}, \{6, 1\}, \{6, 2\}, \{6, 3\}, \{6, 4\}, \{6, 5\}\}$

now find event in A or in the above or in both

**setA  $\cap$  (setB  $\cup$  setC)**

$\{\{2, 1\}, \{3, 1\}, \{3, 2\}, \{4, 1\}\}$