

University of Technology Sydney
School of Mathematical and Physical Sciences

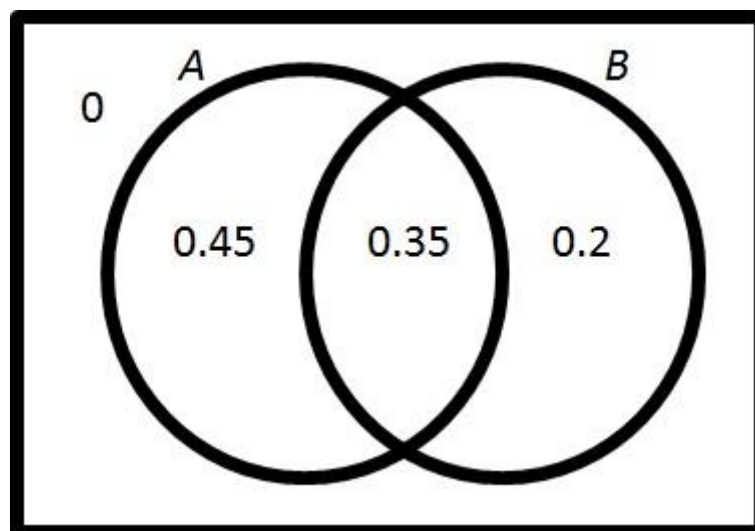
Probability and Random Variables (37161) –
 Class 1 Preparation Work

1. Two fair regular six-sided dice are rolled. The sample space, Ω , therefore contains 36 equally likely possible outcomes $\Omega = \{1,1,2,1,3,1,4,1,5,1,6,2,1,2,2,\dots,6,4,6,5,6,6\}$
 - i) The probability that the second die shows a larger number than the first is

$$\frac{|\{12,13,14,15,16,23,24,25,26,34,35,36,45,46,56\}|}{|\Omega|} = \frac{15}{36} = \frac{5}{12}.$$
 - ii) The probability that the sum of the values is 8 is

$$\frac{|\{2,6,3,5,4,4,5,3,6,2\}|}{|\Omega|} = \frac{5}{36}.$$
 - iii) The probability that the product of the two values is a multiple of 10 is

$$\frac{|\{2,5,4,5,6,5,2,5,4,5,6\}|}{|\Omega|} = \frac{6}{36} = \frac{1}{6}.$$
2. If 80% have passed A, including 35% who have passed A and B, then 45% must have passed only A.
 100% of students have passed A or B. If 80% have passed A, then the remaining 20% must have passed B but not A.
 Together, these give a total of 55% who have passed B.



3. A random experiment consists of selecting one person at random. The sample space for this experiment is the set of all living people.

Consider the following events:

- X_1 : The set of all people living in Australia
- X_2 : The set of all people enrolled at UTS
- X_3 : The set of all people enrolled in a university course
- X_4 : The set of all adults
- X_5 : The set of all people living in Australia or New Zealand
- X_6 : The set of all children living in New Zealand
- X_7 : The set of all adults living in Australia
- X_8 : The set of all children living in Australia

- i) The following pairs are mutually exclusive:

- X_1 & X_6 (a child living in New Zealand cannot also be living in Australia)
- X_4 & X_6 (an adult cannot also be a child living in New Zealand)
- X_4 & X_8 (an adult cannot also be a child living in Australia)
- X_6 & X_7 (an child living in New Zealand cannot also be an adult living in Australia)
- X_6 & X_8 (an child living in New Zealand cannot also be a child living in Australia)

(Arguably also others, depending on if you believe all people enrolled at university are adults and/or if you believe all UTS students are living in Australia.)

- ii)
- | | | |
|-----------------------|---------------------|---------------------|
| $X_7 \subseteq X_1$ | $X_8 \subseteq X_1$ | $X_1 \subseteq X_5$ |
| $X_6 \subseteq X_5$ | $X_7 \subseteq X_5$ | $X_8 \subseteq X_5$ |
| $X_2 \subseteq X_3$. | | |

(Arguably also others, depending on if you believe all people enrolled at university are adults and/or if you believe all UTS students are living in Australia.)

- iii) $X_1 = X_7 \cup X_8$
- iv) $X_7 = X_1 \cap X_4$
- v) $X_6 = X_1^c \cap X_4^c \cap X_5$.