

# UNIT 10 *Probability - Two Events*

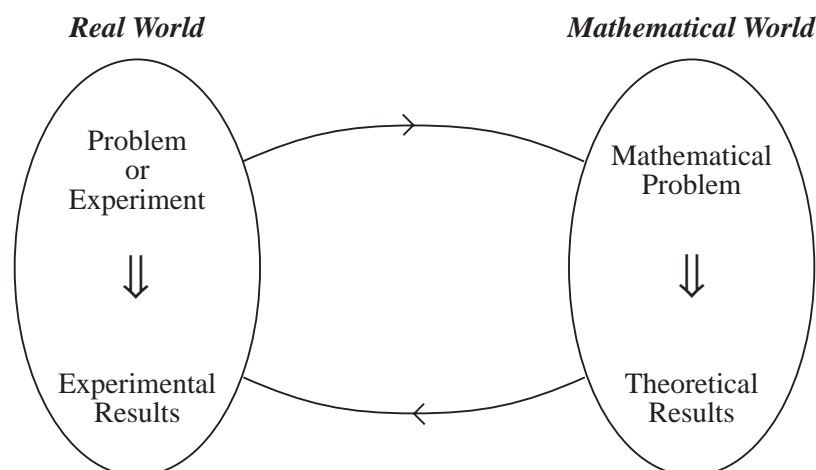
## Teaching Notes

### *Historical Background and Introduction*

Unit 21 of Y7B dealt with the background and introduction. We now extend the concept of the probability of one event to two (or more), which will enable us to solve a wide range of problems in probability theory, including the following three classical problems:

- compare the probability of a total of 9 with the probability of a total of 10 when three fair dice are tossed once (Galileo and Duke of Tuscany).*
- Compare the probability of at least one six in four tosses of a fair dice with the probability of at least one double-six in twenty-four tosses of two fair dice (Chevalier de Méré).*
- Compare the probability of at least one 6 when six dice are tossed with the probability of at least two sixes when 12 dice are tossed (Pepys to Newton).*

As well as expanding our theory to two events, the underlying theme is that of matching theoretical probabilities or frequencies with experimental values. Essentially, this is the concept of modelling, summarised below:



In the work which follows, the mathematical values are simplistic, e.g.  $p(H) = \frac{1}{2}$  for a fair coin, etc. but the idea of testing the theoretical results with experimental ones is fundamental to the way in which mathematics has been, and is still being, used to explain or predict phenomena in the real world.

### *Routes*

	Standard	Academic	Express
10.1 Recap: Basic Probability for One Event	✓	(✓)	✗
10.2 Outcomes with Two Events	✓	✓	✓
10.3 Probability Using Listings	✓	✓	✓
10.4 Multiplication Law for Independent Events	(✓)	✓	✓
10.5 Conditional Probability	✗	✗	✓

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### *Language*

	Standard	Academic	Express
Systematic listing	✓	✓	✓
Tree diagram	✓	✓	✓
Equally likely events	✓	✓	✓
Independent events	(✓)	✓	✓
Conditional probability	✗	✗	✓

### *Misconceptions*

- pupils must know that the probability of any event,  $p$ , must satisfy  $0 \leq p \leq 1$ , and that  $p$  can never be greater than 1 (or negative).
- pupils must know when probabilities must be *added* and when *multiplied*,  
e.g.  $p(\text{six}) = \frac{1}{6}$  so  $p(2 \text{ sixes}) = \frac{1}{6} + \frac{1}{6} = \frac{1}{3}$ , etc. is one error seen over and over again !

See also OS 10.8 for further misconceptions and also refer back to OS 2.10 in Y7 for other basic misconceptions.

### *Challenging Questions*

The following questions are more challenging than others in the same section:

	Section	Question No.	Page
<i>Practice Book Y8A</i>	10.2	10	174
" "	10.3	9, 10	177
" "	10.4	13, 14, 15	183
" "	10.5	10	188