**1. Probability**

**AS Recap – the theory for the A2 unit builds upon the following Y12 work**

**Venn Diagrams and Set Notation**

For two events A and B

* the event that A or B or both occur is called the UNION of A and B, which is written
* the event that A and B occur is called the INTERSECTION of A and B, which is written
* the event that A does not occur is called the COMPLEMENT of A, which is written
* the event that A is a SUBSET of B, for example A = {Hearts} B = {red cards} is written

Representing information on Venn diagrams can often help when solving some probability problems.

Eg1 Shade the following Venn diagrams to correctly represent the given events, A and B:



1. A



1. B’



1. A ∩ B
2. A ∪ B
3. A ∩ B = ∅



1. A ∩ B’



1. A’ ∩ B



1. A ∪ B’



1. A’ ∪ B



1. (A ∩ B)’



1. (A ∪ B)’



1. (A ⊃ B)



1. A’ ∪ B’



1. A’ ∩ B’

Using some of the Venn diagrams above, identify two set relationships which are equivalent:

**The Addition Law for Mutually Exclusive Events**

If events A and B are MUTUALLY EXCLUSIVE then event A can happen OR event B can happen but they cannot both happen. (Venn diagram (e) ABOVE).

In terms of probability this means

 **P(A ∪ B) = P(A) + P(B)**

**The Generalised Addition Law**

This links the probability of the intersection with the probability of the union of two events A and B

 **P(A ∪ B) = P(A) + P(B) – P(A ∩ B)**

Eg2 Consider the following GCSE PPQ





**Multiplication Law for Independent Events**

When an event has no impact on another event, they are said to be independent events. For such events A and B, the following applies:

 **P(A ∩ B) = P(A) × P(B)**

Eg3 Events A and B are such that P(A) = 0.3, P(B) = 0.2, P(A ∪ B) = 0.44

1. Show that A and B are independent
2. Calculate the probability of exactly one of the two events occurring.



Numerical Answers

(1a) 0.5 (b) 0.5 (2ai) 6/36 (ii) 15/36 (b) 1/3 (3a) 2/7 (b) 29/70 (5a) 0.12 (b) 0.58 (c) 0.42

(6a) 0.1 (7b) 0.44 (8a) 0.7 (b) 0.58 (9a) 0.5 (b) 0.44 (c) 0.3

**PPQs**

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