**Y12 AS Mathematics**

**16 Probability 0.5 weeks**

## Teaching objectives

**a Recap and extend ideas from GCSE Venn Diagrams**

**b Link them to different representations of related problems in Tree Diagrams and Two Way Tables**

**c Using the notation of probability and sets**

**d Creating probability distributions and starting to understand what they are.**

**e Applying probability models to real situations.**

**Resources for advance preparation:**

[**Venn Puzzles**](http://www.math.tamu.edu/~kahlig/venn/venn.html)

[**Venn regions dominoes**](https://www.teachitmaths.co.uk/resources/ks3/venn-diagrams/venn-diagram-dominoes/23166)

[**Titanic Task 1**](http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/025/original/public_task_949.pdf?1462394179)

**[Titanic Task 2](http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/026/original/public_task_950.pdf?1462394185)**

[**Titanic Task 3**](http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/027/original/public_task_951.pdf?1462394192)

[**Binomial activity (pages 3 and 4)**](http://mei.org.uk/files/sow/16-binomial-distribution-res.pdf)

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|  | **Starter** | **Main teaching**Including key questions, key teaching points, models and resources | **Notes**Including Support and Extension | **Consolidation/Plenary**Including key questions and homework |
| **1** | [Using Venn diagrams puzzles](http://www.math.tamu.edu/~kahlig/venn/venn.html)To remind them of the ideas of things overlapping and adding/subtracting to different sections. | Using one of the completed diagrams, start asking questions: What is the probability of… (If teaching with the A2 module, you could bring in conditionals here.). Checking that all the separate probabilities sum to 1 could be a useful step, and highlights the mutual exclusivity of the sections.Start using the notation $P(A∩B)$ &c. and the technical meanings of *and* and *or* and so on. You may want to quiz/challenge them on it this [dominoes resource](https://www.teachitmaths.co.uk/resources/ks3/venn-diagrams/venn-diagram-dominoes/23166) (free, but login needed).[Titanic Task 1](http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/025/original/public_task_949.pdf?1462394179) – reading and interpreting two way tables and calculating probabilities from them.[Titanic Task 2](https://www.illustrativemathematics.org/content-standards/tasks/950) – extending the previous with more complex data and questions to help students to understand what ‘independence’ really means in probability. (Best defined as $P\left(A∩B\right)=P(A)×P(B)$ at this stage, unless you are combining this with the A2 probability content) | The three Titanic Tasks do not assume much. If the class are happy with the related topics from GCSE, which should cover all the content in this lesson to some degree (although not necessarily the interpretation or problem solving aspects), skipping the first one would not affect much. | Use the Venn diagrams to derive (or reinforce) that $P\left(A∪B\right)=P\left(A\right)+P\left(B\right)-P(A∩B)$. [This tool](http://mei.org.uk/files/ict/stats/venn.xls) may help.[Titanic Task 3](http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/027/original/public_task_951.pdf?1462394192) – an open ended task in which the students have to apply what they have learned. Would make a good homework. |
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| **2** | How does probability link to shape?1) List the outcomes for rolling a fair die.2) List the outcomes for the sum of two rolled fair dice. What is the neatest way to do this? How could we represent graphically that some outcomes are more likely than others?3) Three dice? Why not roll some and make a graph. Or just work out the theoretical probabilities and draw them. | The graphs we have drawn are called Probability Distributions. For the first situation, we have a ‘Uniform Distribution’, as every event is equally likely, and each bar has the same area (like a histogram).More complex situations have more complex distributions. [Page 3 of this](http://mei.org.uk/files/sow/16-binomial-distribution-res.pdf). Combine and graph class results to (hopefully) find something binomial-y. The obvious extension to coins has a lovely simulation [here](http://www.math.uah.edu/stat/apps/BinomialCoinExperiment.html), and probably worth doing. You can change many different parameters. | [Page 4](http://mei.org.uk/files/sow/16-binomial-distribution-res.pdf) of the same gives a theoretical outline for the experiment.[Here](http://onlinestatbook.com/2/probability/binomial_demonstration.html) is an online tool for modelling Binomial Distributions, and [here](https://www.tes.com/teaching-resource/binomial-distribution-creator-four-dice-11706072) is one specifically for the dice problem (can be adapted to choose a different number as the success) – could be used to highlight that changing the number does not change the distribution due to equal probabilities. i.e. rolling a 6 is not more unlikely than rolling a 5.Extension: What happens as we add more and more dice? | Linking the three ways to represent probability calculations (Trees, Tables, and Venns). Challenge: go back to any of the questions you have looked at and try to answer it in three different ways. Which is the ‘best’ and why?Some generic bookwork on calculating different combined probabilities may be suitable for some pupils. |