



A Level Mathematics Year 2 Exam Questions by Topic
Chapter 15: Probability

These questions are taken from the Specimen Exam materials and the real 2018 papers for the new syllabus AS and A-level mathematics courses and arranged by chapter of the textbooks by Goldie et al (available here: <https://amzn.to/39umfr5> and <https://amzn.to/3hE8kBL>). There are a mixture of questions from OCR A, OCR B (MEI), Edexcel and AQA. Although the style of questions varies a little across the exam boards the content of the syllabus is almost identical so these are suitable for students preparing for any exam board.

Free problem sets for all other chapters, as well as video solutions, full past papers and other content for GCSE and A-level maths can be found at:

<https://mathsaurus.com/>

OCR B MEI Sample Paper 2 Question 7:

- 7 Two events A and B are such that $P(A)=0.6$, $P(B)=0.5$ and $P(A \cup B)=0.85$. Find $P(A|B)$. [4]
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AQA Sample Paper 3 Question 15:

- 15 A sample of 200 households was obtained from a small town.
Each household was asked to complete a questionnaire about their purchases of takeaway food.
 A is the event that a household regularly purchases Indian takeaway food.
 B is the event that a household regularly purchases Chinese takeaway food.
- It was observed that $P(B|A) = 0.25$ and $P(A|B) = 0.1$
- Of these households, 122 indicated that they did **not** regularly purchase Indian or Chinese takeaway food.
- A household is selected at random from those in the sample.
- Find the probability that the household regularly purchases **both** Indian and Chinese takeaway food.

[6 marks]

AQA 2018 Paper 3 Question 14:

14 A teacher in a college asks her mathematics students what other subjects they are studying.

She finds that, of her 24 students:

- 12 study physics
- 8 study geography
- 4 study geography and physics

14 (a) A student is chosen at random from the class.

Determine whether the event 'the student studies physics' and the event 'the student studies geography' are independent.

[2 marks]

14 (b) It is known that for the whole college:

the probability of a student studying mathematics is $\frac{1}{5}$

the probability of a student studying biology is $\frac{1}{6}$

the probability of a student studying biology given that they study mathematics is $\frac{3}{8}$

Calculate the probability that a student studies mathematics or biology or both.

[4 marks]

Edexcel Sample Paper 3 Question 4:

4. Given that

$$P(A) = 0.35 \quad P(B) = 0.45 \quad \text{and} \quad P(A \cap B) = 0.13$$

find

(a) $P(A' \mid B')$ (2)

(b) Explain why the events A and B are not independent. (1)

The event C has $P(C) = 0.20$

The events A and C are mutually exclusive and the events B and C are statistically independent.

(c) Draw a Venn diagram to illustrate the events A , B and C , giving the probabilities for each region. (5)

(d) Find $P([B \cup C]')$ (2)

OCR A 2018 Paper 2 Question 12:

- 12 The discrete random variable X takes values 1, 2, 3, 4 and 5, and its probability distribution is defined as follows.

$$P(X = x) = \begin{cases} a & x = 1, \\ \frac{1}{2}P(X = x-1) & x = 2, 3, 4, 5, \\ 0 & \text{otherwise,} \end{cases}$$

where a is a constant.

- (i) Show that $a = \frac{16}{31}$. [2]

The discrete probability distribution for X is given in the table.

x	1	2	3	4	5
$P(X = x)$	$\frac{16}{31}$	$\frac{8}{31}$	$\frac{4}{31}$	$\frac{2}{31}$	$\frac{1}{31}$

- (ii) Find the probability that X is odd. [1]

Two independent values of X are chosen, and their sum S is found.

- (iii) Find the probability that S is odd. [2]

- (iv) Find the probability that S is greater than 8, given that S is odd. [3]

Sheila sometimes needs several attempts to start her car in the morning. She models the number of attempts she needs by the discrete random variable Y defined as follows.

$$P(Y = y+1) = \frac{1}{2}P(Y = y) \quad \text{for all positive integers } y.$$

- (v) Find $P(Y = 1)$. [2]
- (vi) Give a reason why one of the variables, X or Y , might be more appropriate as a model for the number of attempts that Sheila needs to start her car. [1]
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OCR A Sample Paper 2 Question 11:

11 Each of the 30 students in a class plays at least one of squash, hockey and tennis.

- 18 students play squash
- 19 students play hockey
- 17 students play tennis
- 8 students play squash and hockey
- 9 students play hockey and tennis
- 11 students play squash and tennis

(i) Find the number of students who play all three sports. [3]

A student is picked at random from the class.

(ii) Given that this student plays squash, find the probability that this student does not play hockey. [1]

Two different students are picked at random from the class, one after the other, without replacement.

(iii) Given that the first student plays squash, find the probability that the second student plays hockey. [4]

OCR B MEI 2018 Paper 2 Question 12:

12 You must show detailed reasoning in this question.

In the summer of 2017 in England a large number of candidates sat GCSE examinations in **both** mathematics **and** English. 56% of these candidates achieved at least level 4 in mathematics and 80% of these candidates achieved at least level 4 in English. 14% of these candidates did not achieve at least level 4 in either mathematics or English.

Determine whether achieving level 4 or above in English and achieving level 4 or above in mathematics were independent events. [5]