MATHSAURUS

AS Mathematics Exam Questions by Topic
Chapter 16: 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 A Sample Paper 2 Question 14:

14 A random variable X has probability distribution given by

$$P(X=x)=\frac{1}{860}(1+x) \quad \text{for } x=1, 2, 3, \ldots, 40.$$

(i) Find $P(X>39)$. **[2]**

(ii) Given that x is even, determine $P(X<10)$. **[6]**

OCR B MEI 2018 Paper 2 Question 3:

3 The probability that Chipping FC win a league football match is $P(W) = 0.4$.

(i) Calculate the probability that Chipping FC fail to win each of their next two league football matches. **[1]**

The probability that Chipping FC lose a league football match is $P(L) = 0.3$.

(ii) Explain why $P(W) + P(L) \neq 1$. **[1]**

OCR B MEI 2018 Paper 2 Question 11:

11 The discrete random variable X takes the values 0, 1, 2, 3, 4 and 5 with probabilities given by the formula

$$P(X = x) = k(x + 1)(6 - x) .$$

(i) Find the value of k. **[2]**

In one half-term Ben attends school on 40 days. The probability distribution above is used to model X, the number of lessons per day in which Ben receives a gold star for excellent work.

(ii) Find the probability that Ben receives no gold stars on each of the first 3 days of the half-term and two gold stars on each of the next 2 days. **[2]**

(iii) Find the expected number of days in the half-term on which Ben receives no gold stars. **[2]**

OCR B MEI AS 2018 Paper 2 Question 4:

4 The probability distribution of the discrete random variable X is given in Fig. 4.

r	0	1	2	3	4
$P(X = r)$	0.2	0.15	0.3	k	0.25

Fig. 4

(i) Find the value of k. **[2]**

X_1 and X_2 are two independent values of X.

(ii) Find $P(X_1 + X_2 = 6)$. **[3]**

OCR B MEI AS Sample Paper 2 Question 4:

4 There are four human blood groups; these are called O, A, B and AB. Each person has one of these blood groups. The table below shows the distribution of blood groups in a large country.

Blood group	**Proportion of population**
O	49%
A	38%
B	10%
AB	3%

Two people are selected at random from this country.

(i) Find the probability that at least one of them has blood group O. **[2]**

(ii) Find the probability that they have different blood groups. **[3]**

AQA 2018 Paper 3 Question 11:

11 The table below shows the probability distribution for a discrete random variable X.

x	1	2	3	4	5
$\mathbf{P}(X = x)$	k	$2k$	$4k$	$2k$	k

Find the value of k.

Circle your answer.

[1 mark]

$\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{10}$ 1

AQA AS 2018 Paper 2 Question 13:

13 The table below shows the probability distribution for a discrete random variable X.

x	0	1	2	3	4 or more
$\mathbf{P}(X = x)$	0.35	0.25	k	0.14	0.1

Find the value of k.

Circle your answer.

[1 mark]

0.14 0.16 0.18 1

OCR A AS Sample Paper 1 Question 9:

9 The probability distribution of a random variable X is given in the table.

x	1	2	3
$\mathrm{P}(X = x)$	0.6	0.3	0.1

Two values of X are chosen at random. Find the probability that the second value is greater than the first.

[3]

AQA AS Sample Paper 2 Question 13:

13 The number of pots of yoghurt, X, consumed per week by adults in Milton is a discrete random variable with probability distribution given by

x	0	1	2	3	4	5	6	7 or more
$P(X = x)$	0.30	0.10	0.05	0.07	0.03	0.16	0.09	0.20

Find $P(3 \leq X < 6)$

Circle the correct answer.

[1 mark]

0.26 0.31 0.35 0.40

AQA AS Sample Paper 2 Question 15:

15 A school took 225 children on a trip to a theme park.

After the trip the children had to write about their favourite ride at the park from a choice of three.

The table shows the number of children who wrote about each ride.

		Ride written about			
		The Drop	The Beanstalk	The Giant	**Total**
Year group	Year 7	24	45	23	**92**
	Year 8	36	17	22	**75**
	Year 9	20	13	25	**58**
	Total	**80**	**75**	**70**	**225**

Three children were randomly selected from those who went on the trip.

Calculate the probability that one wrote about 'The Drop', one wrote about 'The Beanstalk' and one wrote about The Giant'.

[2 marks]

AQA Sample Paper 3 Question 11:

11 Terence owns a local shop. His shop has three checkouts, at least one of which is always staffed.

A regular customer observed that the probability distribution for N, the number of checkouts that are staffed at any given time during the spring, is

$$P(N = n) = \begin{cases} \frac{3}{4}\left(\frac{1}{4}\right)^{n-1} & \text{for } n = 1, 2 \\ k & \text{for } n = 3 \end{cases}$$

11 (a) Find the value of k.

[1 mark]

11 (b) Find the probability that a customer, visiting Terence's shop during the spring, will find at least 2 checkouts staffed.

[2 marks]

Edexcel 2018 Paper 3 Question 1:

1. Helen believes that the random variable C, representing cloud cover from the large data set, can be modelled by a discrete uniform distribution.

(a) Write down the probability distribution for C.

(2)

(b) Using this model, find the probability that cloud cover is less than 50%

(1)

Helen used all the data from the large data set for Hurn in 2015 and found that the proportion of days with cloud cover of less than 50% was 0.315

(c) Comment on the suitability of Helen's model in the light of this information.

(1)

(d) Suggest an appropriate refinement to Helen's model.

(1)

Edexcel AS 2018 Paper 2 Question 2:

2. A factory buys 10% of its components from supplier A, 30% from supplier B and the rest from supplier C. It is known that 6% of the components it buys are faulty.

Of the components bought from supplier A, 9% are faulty and of the components bought from supplier B, 3% are faulty.

(a) Find the percentage of components bought from supplier C that are faulty.

(3)

A component is selected at random.

(b) Explain why the event "the component was bought from supplier B" is not statistically independent from the event "the component is faulty".

(1)

Edexcel AS Sample Paper 2 Question 3:

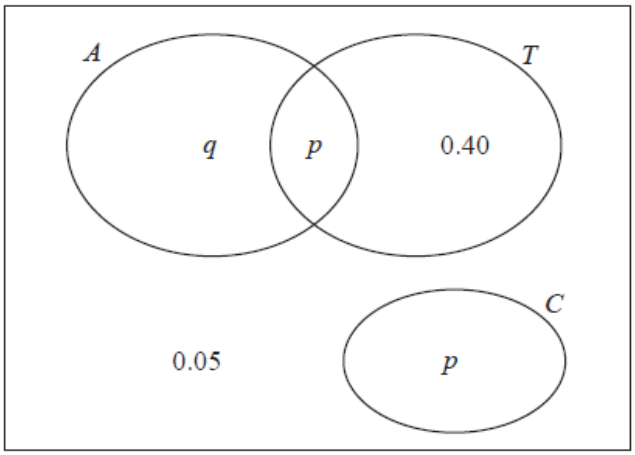
3. The Venn diagram shows the probabilities for students at a college taking part in various sports

A represents the event that a student takes part in Athletics.

T represents the event that a student takes part in Tennis.

C represents the event that a student takes part in Cricket.

p and q are probabilities.



The probability that a student selected at random takes part in Athletics or Tennis is 0.75

(a) Find the value of p.

(1)

(b) State, giving a reason, whether or not the events A and T are statistically independent. Show your working clearly.

(3)

(c) Find the probability that a student selected at random does not take part in Athletics or Cricket.

(1)

OCR A AS 2018 Paper 1 Question 10:

10 The probability distribution of a random variable X is given in the table.

x	0	2	4	6
$P(X = x)$	$\frac{3}{8}$	$\frac{5}{16}$	$4p$	p

(i) Find the value of p. **[2]**

(ii) Two values of X are chosen at random. Find the probability that the product of these values is 0. **[3]**