AS Mathematics Exam Questions by Topic
Chapter 17: The binomial distribution

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) and Edexcel. 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 5:

5 In a particular country, 8% of the population has blue eyes. Find the probability that, in a random sample of 20 people, exactly two have blue eyes. **[2]**

Edexcel 2018 Paper 3 Question 3:

3. In an experiment a group of children each repeatedly throw a dart at a target.
For each child, the random variable H represents the number of times the dart hits the target in the first 10 throws.

Peta models H as B(10, 0.1)

(a) State two assumptions Peta needs to make to use her model.

(2)

(b) Using Peta's model, find $P(H \geqslant 4)$

(1)

For each child the random variable F represents the number of the throw on which the dart first hits the target.

Using Peta's assumptions about this experiment,

(c) find $P(F = 5)$

(2)

Thomas assumes that in this experiment no child will need more than 10 throws for the dart to hit the target for the first time. He models $P(F = n)$ as

$$P(F = n) = 0.01 + (n - 1) \times \alpha$$

where α is a constant.

(d) Find the value of α

(4)

(e) Using Thomas' model, find $P(F = 5)$

(1)

(f) Explain how Peta's and Thomas' models differ in describing the probability that a dart hits the target in this experiment.

(1)

OCR B MEI 2018 Paper 2 Question 8:

8 Every morning before breakfast Laura and Mike play a game of chess. The probability that Laura wins is 0.7. The outcome of any particular game is independent of the outcome of other games. Calculate the probability that, in the next 20 games,

(i) Laura wins exactly 14 games, **[2]**

(ii) Laura wins at least 14 games. **[2]**

Edexcel AS 2018 Paper 2 Question 5:

5. A biased spinner can only land on one of the numbers 1, 2, 3 or 4. The random variable X represents the number that the spinner lands on after a single spin and $\mathrm{P}(X = r) = \mathrm{P}(X = r + 2)$ for $r = 1, 2$

Given that $\mathrm{P}(X = 2) = 0.35$

(a) find the complete probability distribution of X.

(2)

Ambroh spins the spinner 60 times.

(b) Find the probability that more than half of the spins land on the number 4
Give your answer to 3 significant figures.

(3)

The random variable $Y = \dfrac{12}{X}$

(c) Find $\mathrm{P}(Y - X \leqslant 4)$

(3)

OCR A AS 2018 Paper 1 Question 11:

11 The probability that Janice sees a kingfisher on any particular day is 0.3. She notes the number, X, of days in a week on which she sees a kingfisher.

(i) State one necessary condition for X to have a binomial distribution. **[1]**

Assume now that X has a binomial distribution.

(ii) Find the probability that, in a week, Janice sees a kingfisher on exactly 2 days. **[1]**

Each week Janice notes the number of days on which she sees a kingfisher.

(iii) Find the probability that Janice sees a kingfisher on exactly 2 days in a week during at least 4 of 6 randomly chosen weeks. **[3]**

OCR A AS Sample Paper 1 Question 10:

10 **(i)** Write down and simplify the first four terms in the expansion of $(x + y)^7$, in ascending powers of x. **[2]**

(ii) Given that the terms in x^2y^5 and x^3y^4 in this expansion are equal, find the value of $\dfrac{x}{y}$. **[2]**

(iii) A hospital consultant has seven appointments every day. The number of these appointments which start late on a randomly chosen day is denoted by L. The variable L is modelled by the distribution $\mathrm{B}\left(7, \frac{3}{8}\right)$. Show that, in this model, the hospital consultant is equally likely to have two appointments start late or three appointments start late. **[3]**