

QQQ – Statistics Year 1 – Chapter 6 – DRVs & Binomial Distribution (Version 1)

Total Marks: 24

(24 = Platinum, 22 = Gold, 19 = Silver, 16 = Bronze)

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

x	0	1	2	3	4 or more
$P(X = x)$	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

(Total 1 marks)

AQA June 2018 Paper 2 Q13

2. The random variable $X \sim B(20, 0.37)$

(a) Find $P(X = 8)$ **(1)**

(b) Find $P(X \leq 5)$ **(1)**

(c) Find $P(X \leq 5.7)$ **(1)**

(Total 3 marks)

Edexcel June 2025 Statistics Q1

3. A probability distribution is given by

$$P(X = x) = c(4 - x), \quad \text{for } x = 0, 1, 2, 3$$

where c is a constant.

(a) Show that $c = \frac{1}{10}$ [2 marks]

(b) Calculate $P(X \geq 1)$ [2 marks]

(Total 4 marks)

AQA June 2019 Paper 2 Q14

4. A mathematical puzzle is published every day in a newspaper.

Over a long period of time Paula is able to solve the puzzle correctly 60% of the time.

(a) For a randomly chosen 14-day period find the probability that:

(i) Paula correctly solves exactly 8 puzzles [1 mark]

(ii) Paula correctly solves at least 7 but not more than 11 puzzles. [2 marks]

(b) State one assumption that is necessary for the distribution used in part (a) to be valid.

[1 mark]

(Total 4 marks)

AQA June 2020 Paper 2 Q16

5. A spinner has sides numbered 1, 2, 3, 4. When the spinner is spun the score is given by the number of the side on which it lands. The spinner is biased, as shown in the table.

Score	1	2	3	4
Probability	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{1}{6}$	$\frac{1}{3}$

In a fairground game, each player has two spins. They win a prize if the total of the scores on the two spins is greater than 5.

Zayn says, "If I play, it's more likely that I'll win a prize than I won't win a prize."

Determine whether Zayn is correct.

[4]

(Total 4 marks)

OCR A June 2025 Paper 1 Q11

6. Julia selects 3 letters at random, one at a time without replacement, from the word

V A R I A N C E

The discrete random variable X represents the number of times she selects a letter A.

(a) Find the complete probability distribution of X . (5)

Yuki selects 10 letters at random, one at a time **with** replacement, from the word

D E V I A T I O N

(b) Find the probability that he selects the letter E at least 4 times. (3)

(Total 8 marks)

Solutions

1.

Scheme	Marks	AO
Circles correct answer	B1	1.1b
	(1 mark)	

Typical solution

0.16

2.

Mark scheme (a)

Scheme	Marks	AO
awrt 0.173	B1	1.1b
	(1)	

Notes

B1: calc gives 0.172968...

Mark scheme (b)

Scheme	Marks	AO
awrt 0.191	B1	1.1b
	(1)	

Notes

B1: calc gives 0.191004... do not isw if e.g. $1 - 0.191 = 0.809$ is then found

Mark scheme (c)

Scheme	Marks	AO
awrt 0.191	B1ft	2.2a
	(1)	

	(3 marks)	
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Notes

B1ft: ft their answer to (b) to 3sf or better only ft $0 < \text{“their (b)”} < 1$

SC: For all correct answers given to 2sf i.e. (a) 0.17 (b) 0.19 (c) 0.19 score B0B0B1ft

3.

Mark scheme (a)

Scheme	Marks	AO
Substitutes x values into formula at least 3 terms correct in terms of c ACF NB No need for addition of terms to be seen or Uses $c = \frac{1}{10}$ and shows the addition of the correct four probabilities summing to 1 Max mark M1R0	M1	3.1a
Equates sum to 1 and shows convincingly that $c = \frac{1}{10}$	R1	2.1
	(2)	

Typical solution

$$4c + 3c + 2c + c = 1$$

$$10c = 1$$

$$c = \frac{1}{10}$$

Mark scheme (b)

Scheme	Marks	AO
Adds probabilities for $x = 1, 2$ and 3 NB Can be in terms of c or States $P(X = 0) = 4c$ OE and subtracts this from 1	M1	1.1a

Obtains correct value for probability CAO ACF	A1	1.1b
	(2)	
	(4 marks)	

Typical solution

$$3c + 2c + c = 6c$$

$$P(X \geq 1) = 0.6$$

4.

Mark scheme (a)

Scheme	Marks	AO
(i) Finds $P(X = 8)$ correctly AWRT 0.207	B1	3.4
	(1)	
(ii) Finds $P(X \leq 11) - P(X \leq 6)$. Must be two terms subtracted with at least one term correct Or Terms for $P(X = 7, 8, 9, 10, 11)$ added, at most one error	M1	1.1a
Obtains correct probability (AWRT 0.81)	A1	1.1b
	(2)	

Typical solution

(i)

0.207

(ii)

$$\begin{aligned}
 &P(X \leq 11) - P(X \leq 6) \\
 &= 0.96020841 - 0.1501401 \\
 &= 0.810
 \end{aligned}$$

Mark scheme (b)

Scheme	Marks	AO
States one clear assumption in context linked to independence or the constant probability of success.	E1	3.5b
Do not accept a fixed number of trials or she either fails or does not fail or the probability is 0.6.		
	(1)	
	(4 marks)	

Typical solution

Being able to solve one puzzle is independent of being able to solve any other puzzle

5.

Scheme	Marks	AO
$P(\text{win}) = \frac{3}{8} \cdot \frac{1}{3} + \frac{3}{8} \cdot \frac{1}{3} + \left(\frac{1}{6}\right)^2 + \frac{1}{6} \cdot \frac{1}{3} + \frac{1}{6} \cdot \frac{1}{3} + \left(\frac{1}{3}\right)^2$	M1 A1	3.1a 3.4
$[P(\text{score} > 5) =] [P(\text{score} \leq 5) =] \frac{1}{2}$	A1	1.1
Zayn is incorrect. Winning and not winning are equally likely oe	A1FT	3.2a
	[4]	

Notes

M1 for ≥ 3 correct product terms soi

A1: For all 6 product terms (and no others)

Alternative for M1A1

Scheme	Marks
$P(\text{lose}) = \left(\frac{1}{8}\right)^2 + 2 \cdot \frac{1}{8} \cdot \frac{3}{8} + 2 \cdot \frac{1}{8} \cdot \frac{1}{6} + 2 \cdot \frac{1}{8} \cdot \frac{1}{3} + \left(\frac{3}{8}\right)^2 + 2 \cdot \frac{3}{8} \cdot \frac{1}{6}$	M1 A1

M1 for ≥ 3 correct product terms soi

A1: For all 10 product terms (and no others)

A1FT: Must conclude whether Zayn is correct/incorrect.

FT their probability (any value in $[0,1]$) e.g.:

- If $P(\text{score} > 5) > \frac{1}{2} \Rightarrow$ Zayn is correct
- If $P(\text{score} > 5) < \frac{1}{2} \Rightarrow$ Zayn is incorrect

Allow this mark even if $P(\text{win}) + P(\text{lose}) \neq 1$ for:

- $P(\text{win}) > P(\text{lose}) \Rightarrow$ Zayn is correct
- $P(\text{win}) < P(\text{lose}) \Rightarrow$ Zayn is incorrect

6.

Mark scheme (a)

Scheme	Marks	AO								
$X = 0, 1, 2$ only	B1	3.1b								
$[P(X = 0) =] \frac{6}{8} \times \frac{5}{7} \times \frac{4}{6}$	M1	1.1b								
$[P(X = 1) =] 3 \times \frac{2}{8} \times \frac{6}{7} \times \frac{5}{6}$ or $[P(X = 2) =] 3 \times \frac{2}{8} \times \frac{1}{7} \times \frac{6}{6}$	M1	2.1								
<table><tr><td>x</td><td>0</td><td>1</td><td>2</td></tr><tr><td>$P(X = x)$</td><td>$\frac{5}{14}$</td><td>$\frac{15}{28}$</td><td>$\frac{3}{28}$</td></tr></table>	x	0	1	2	$P(X = x)$	$\frac{5}{14}$	$\frac{15}{28}$	$\frac{3}{28}$	A1 A1	1.1b 1.1b
x	0	1	2							
$P(X = x)$	$\frac{5}{14}$	$\frac{15}{28}$	$\frac{3}{28}$							
	(5)									

Notes

B1: identifying that X can only take on the values 0, 1 and 2 (may be seen at end of tree diagram). If other values stated, they must be associated with a probability of 0.

M1: correct expression for $P(X = 0)$

M1: correct expression for either $P(X = 1)$ or $P(X = 2)$

A1: one correct probability

Watch out for $\frac{6}{8} \times \frac{5}{7} = \frac{15}{28}$ which is an incorrect attempt at $P(X = 0)$ and scores MOA0

A1: complete probability distribution, need not be in a table, but each value of x must be associated with its probability.

Allow awrt 0.357, awrt 0.536, awrt 0.107

Mark scheme (b)

Scheme	Marks	AO
$J \sim B\left(10, \frac{1}{9}\right)$	M1	3.1b
$P(J \geq 4) = 1 - P(J \leq 3)$ or $P(J \geq 4) = P(J = 4) + P(J = 5) + \dots + P(J = 10)$ or $1 - 0.981(57\dots)$	M1	3.4
= awrt 0.0184	A1	1.1b
	(3)	
	(8 marks)	

Notes

M1: identifying that the B(inomial) distribution with $n = 10$ is appropriate here.

If distribution not stated, may be implied by use of $(10Cr)p^r(1-p)^{10-r}$ or 0.981(57...)

M1: writing or using a correct probability statement

A1: awrt 0.0184

Correct answer scores 3 out of 3