4.1 Probability Distributions

Question Paper

Course	OCR A Level Maths: Statistics
Section	4. Statistical Distributions
Topic	4.1 Probability Distributions
Difficulty	Medium

Time allowed: **40**

Score: **/31**

Percentage: **/100**

Question 1

Three biased coins are tossed.

(a) Write down all the possible outcomes when the three coins are tossed.

[1 mark]

Question 1

A random variable, X, is defined as the number of heads when the three coins are tossed.

Given that for each coin the probability of getting heads is $\frac{2}{3}$,

(b) complete the following probability distribution table for X:

x	0	1	2	3
$\mathbf{P}(X = x)$				

[3 marks]

Question 1

(c) represent the probability distribution for X as a probability mass function.

[2 marks]

Question 2

The random variable X has the probability function

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

(i) Show that $k = 5$.

(ii) Write down the name of this probability distribution.

[3 marks]

Question 3

The random variable X has the probability function

$$\mathrm{P}(X = x) = \begin{cases} kx & x = 1, 3, 5, 7 \\ 0 & \text{otherwise} \end{cases}$$

(a) Find the value of k.

[2 marks]

Question 3

(b) Find $\mathrm{P}(X > 3)$.

[2 marks]

Question 3

(c) State, with a reason, whether or not X is a discrete random variable.

[1 mark]

Question 4

The random variable X has the probability function

$$\mathrm{P}(X = x) = \begin{cases} 0.23 & x = -1, 4 \\ k & x = 0, 2 \\ 0.13 & x = 1, 3 \\ 0 & \text{otherwise} \end{cases}$$

(a) Find the value of k.

[2 marks]

Question 4

(b) Construct a table giving the probability distribution of X.

[2 marks]

Question 4

(c) Find $P(0 \leq X < 3)$.

[1 mark]

Question 5

A discrete random variable X has the probability distribution shown in the following table:

$\boldsymbol{x}$	0	1	2	3	4
$\mathbf{P}(\boldsymbol{X}=\boldsymbol{x})$	$\frac{5}{24}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{12}$	$\frac{1}{8}$

Find:

(i) $\mathrm{P}(X < 4)$

(ii) $\mathrm{P}(X > 1)$

(iii) $\mathrm{P}(2 < X \leq 4)$

(iv) $\mathrm{P}(0 < X < 4)$

[4 marks]

Question 6

Leonardo has constructed a biased spinner with six sectors labelled 0, 1, 1, 2, 3 and 5. The probability of the spinner landing on each of the six sectors is shown in the following table:

number on sector	0	1	1	2	3	5
probability	$\frac{6}{20}$	p	$\frac{3}{20}$	$\frac{5}{20}$	$\frac{3}{20}$	$\frac{1}{20}$

(a) Find the value of p.

[1 mark]

Question 6

Leonardo is playing a game with his biased spinner. The score for the game, X, is the number which the spinner lands on after being spun.

(b) Leonardo plays the game twice and adds the two scores together. Find the probability that Leonardo has a *total* score of 5.

[3 marks]

Question 6

(c) Complete the following cumulative probability function table for X:

Score x	0	1	2	3	5
$\mathbf{P}(X \leq x)$	$\frac{6}{20}$				1

[2 marks]

Question 6

(d) Find the probability that X is

(i) no more than 1

(ii) at least 3.

[2 marks]