2. Rowan and Alex are both check-in assistants for the same airline.
The number of passengers, R, checked in by Rowan during a 30-minute period can be modelled by a Poisson distribution with mean 28

(a) Calculate $\mathrm{P}(R \geqslant 23)$

(1)

The number of passengers, A, checked in by Alex during a 30-minute period can be modelled by a Poisson distribution with mean 16, where R and A are independent.
A randomly selected 30-minute period is chosen.

(b) Calculate the probability that exactly 42 passengers in total are checked in by Rowan and Alex.

(2)

The company manager is investigating the rate at which passengers are checked in.
He randomly selects 150 non-overlapping 60-minute periods and records the total number of passengers checked in by Rowan and Alex, in each of these 60-minute periods.

(c) Using a Poisson approximation, find the probability that for at least 25 of these 60-minute periods Rowan and Alex check in a total of fewer than 80 passengers.

(4)

On a particular day, Alex complains to the manager that the check-in system is working slower than normal. To see if the complaint is valid the manager takes a random 90-minute period and finds that the total number of people **Rowan** checks in is 67

(d) Test, at the 5% level of significance, whether or not there is evidence that the system is working slower than normal. You should state your hypotheses and conclusion clearly and show your working.

(4)

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Question 2 continued

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Question 2 continued

(Total for Question 2 is 11 marks)

3. The discrete random variable X has probability distribution

x	-3	-2	-1	0	2	5
$\mathrm{P}(X = x)$	0.3	0.15	0.1	0.15	0.1	0.2

(a) Find $\mathrm{E}(X)$

(1)

Given that $\mathrm{Var}(X) = 8.79$

(b) find $\mathrm{E}(X^2)$

(2)

The discrete random variable Y has probability distribution

y	-2	-1	0	1	2
$\mathrm{P}(Y = y)$	$3a$	a	b	a	c

where a, b and c are constants.

For the random variable Y

$$\mathrm{P}(Y \leqslant 0) = 0.75 \qquad \text{and} \qquad \mathrm{E}(Y^2 + 3) = 5$$

(c) Find the value of a, the value of b and the value of c

(5)

The random variable $W = Y - X$ where Y and X are independent.

The random variable $T = 3W - 8$

(d) Calculate $\mathrm{P}(W > T)$

(4)

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Question 3 continued

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Question 3 continued

(Total for Question 3 is 12 marks)

4. Charlie carried out a survey on the main type of investment people have.
The contingency table below shows the results of a survey of a random sample of people.

		Main type of investment		
		Bonds	Cash	Stocks
Age	25 – 44	a	$b - e$	e
	45 – 75	c	$d - 59$	59

(a) Find an expression, in terms of a, b, c and d, for the difference between the observed and the expected value $(O - E)$ for the group whose main type of investment is Bonds and are aged 45 – 75
Express your answer as a single fraction in its simplest form.

(4)

Given that $\sum \frac{(O-E)^2}{E} = 9.62$ for this information,

(b) test, at the 5% level of significance, whether or not there is evidence of an association between the age of a person and the main type of investment they have.
You should state your hypotheses, critical value and conclusion clearly.
You may assume that no cells need to be combined.

(3)

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Question 4 continued

Question 4 continued

(Total for Question 4 is 7 marks)

TOTAL FOR FURTHER STATISTICS 1 IS 40 MARKS

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