

90646



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 3 Statistics and Modelling, 2008

90646 Use probability distribution models to solve straightforward problems

Credits: Four

9.30 am Monday 24 November 2008

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

Make sure you have a copy of the Formulae and Tables Booklet L3–STATF.

You should answer ALL the questions in this booklet.

Show ALL working.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–7 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

<i>For Assessor's use only</i>		Achievement Criteria	
Achievement	<input type="checkbox"/>	Achievement with Merit	Achievement with Excellence
Use probability distribution models to solve straightforward problems.	<input type="checkbox"/>	Use probability distribution models to solve problems.	<input type="checkbox"/>
		Use and justify probability distribution models to solve complex problems.	<input type="checkbox"/>
Overall Level of Performance		<input type="checkbox"/>	

You are advised to spend 40 minutes answering the questions in this booklet.

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ALL ABOUT EGGS



QUESTION ONE

The weights of chicken eggs produced at Clare's farm are normally distributed, with a mean weight of 59.6 g and a standard deviation of 0.87 g. If an egg weighs more than 60.5 g it is classified as a "Size 7" egg.

Calculate the probability that a randomly selected chicken egg will be classified as a "Size 7" egg.

QUESTION TWO

Clare sells her chicken eggs to a supermarket. She sends the eggs in boxes each containing 10 cartons. The probability that any carton contains an egg with a cracked shell is found to be 0.05. If more than two cartons contain cracked shells then the whole box of 10 cartons is rejected. Assume that eggs with cracked shells occur independently.

Calculate the probability that a randomly selected **box** is rejected.

QUESTION THREE

Clare's ducks are free-range, and she has to collect their eggs from all around the farm. On average she finds two duck eggs in a 10 m^2 area.

Assume that a Poisson distribution can model the probability of Clare finding duck eggs.

Calculate the probability that Clare finds at least twelve duck eggs in a randomly selected **30 m^2** area of her farm.

QUESTION FOUR

Louise raises ostriches on the farm next door to Clare. Louise sells ostrich eggs in packets of two. The weights of ostrich eggs are normally distributed, with a mean weight of 1527.5 g and a standard deviation of 31.8 g .

Assuming the weights of the ostrich eggs to be independent, calculate the probability that the combined weight of the two eggs is less than 3 kg .

QUESTION FIVE

Jack makes omelettes from emu eggs at the Farmer's Market. Each omelette uses one emu egg. The weights of emu eggs are normally distributed. It is known that 90% of the time the weight of the final omelette is more than 752 g.

Assume that the weight of all other ingredients is negligible.

Given that the weights of emu eggs have a standard deviation of 21.3 g, calculate the mean weight of emu eggs.

QUESTION SIX

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Image source: <http://witchdoctor.files.wordpress.com/2007/11/ferret1.jpg> (19 August 2008).

On Clare's farm, a ferret attacks the chickens on average three times every six months.

Calculate the probability that in each of **two consecutive months** a ferret attacks the chickens at least once. Assume that the occurrence of ferret attacks in any given month is independent of the occurrence of ferret attacks in any other month.

QUESTION SEVEN

Hemi has a farm next to Clare. He claims that his security system is better than Clare's, because the probability that his chickens have at least one ferret attack in any given month is only 0.17.

Assuming that the ferret attacks are independent, calculate the mean number of ferret attacks **per month** on Hemi's farm.

QUESTION EIGHT

As well as chicken eggs, Clare sells duck and goose eggs. She packages these in a carton containing four duck eggs and two goose eggs.

The weights of duck eggs are normally distributed, with a mean weight of 82.8 g and a standard deviation of 6.98 g. The weights of goose eggs are normally distributed with a mean weight of 146.3 g and a standard deviation of 1.96 g.

Assuming that the eggs are selected independently, calculate the probability that the total weight of eggs in a carton is between 600 g and 650 g.

QUESTION NINEAssessor's
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Double-yolk eggs occur independently at a rate of approximately three per 1 000 eggs. Ten eggs are chosen randomly. Let the random variable X represent the number of eggs in the ten that have double yolks.

Name the probability distribution model for X and give the parameter(s) of this distribution. Justify your answer.
