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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 3 Statistics and Modelling, 2009

90646 Use probability distribution models to solve straightforward problems

Credits: Four
9.30 am Friday 20 November 2009

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 for ALL questions.

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.

For Assessor's use only	Achievement Criteria		
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Use probability distribution models to solve straightforward problems. ☐	Use probability distribution models to solve problems. ☐	Use and justify probability distribution models to solve complex problems. ☐
Overall Level of Performance ☐		

You are advised to spend 45 minutes answering the questions in this booklet.

Assessor's use only

TOM AND TANE'S HOLIDAY

Tom and Tane are having a holiday at a beachside hotel in an island resort.

QUESTION ONE

In the elevator at their hotel, Tom and Tane see a notice that says:

Maximum capacity: 14 persons or 980 kg.

Tane found a magazine article that stated the mean weight for adults is 73.7 kg with a standard deviation of 17.2 kg.

Assume the magazine article is correct and applies to the adults on the island. Also, assume the weights of adults are normally distributed.

(a) For 14 adults to have a total weight of 980 kg, the mean weight of the 14 adults would have to be 70 kg.

Suppose an adult is selected at random.

Calculate the probability that the adult would weigh more than 70 kg.

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(b) Once Tom and Tane shared the hotel elevator with 8 other adult guests and 5 suitcases.

The island resort is accessed by aeroplane. From the airline statistics for the island it is known that the weights of suitcases are normally distributed with a mean weight of 20.4 kg and a standard deviation of 2.1 kg.

(i) The airline servicing the island has a policy that suitcases heavier than a specified weight are classified as *heavy*. The airline finds that 1.8% of all suitcases are classified this way.

Find the minimum weight of a suitcase for it to be classified as *heavy*.

(ii) Calculate the probability that the total weight of 10 randomly selected adults and 5 randomly selected suitcases would exceed 980 kg.

QUESTION TWO

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The hotel that Tom and Tane are staying in is having a promotion at the beach. Each day the hotel staff bury prizes in random locations over an area of 100 m^2, and each hotel guest is allocated a 1 m^2 section of this area to dig in. The number of prizes buried varies each day, with the mean number of prizes buried per day being 60.

Suppose the number of prizes found on the beach each day can be modelled by a Poisson distribution, where the mean number of prizes per 100 m^2 is 60.

Tom and Tane decide to combine their search area so they have a total of 2 m^2 to search.

(a) Calculate the probability that they find no more than 2 prizes in their 2 m^2 area of beach.

(b) Calculate the probability that Tom and Tane find at least one prize on three out of the five days they are staying at that hotel.

(c) The hotel ran a similar promotion the previous year, but with fewer prizes. The probability of finding at least one prize in an area of 1 m^2 for this promotion was 0.27.

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Assume the number of prizes found on the beach each day for this promotion could also be modelled by a Poisson distribution.

Each prize was worth $12.

Calculate the mean of the total value of the prizes that were buried in areas of 100 m^2 over the 5-day period that this promotion was run.

Question Three is on the following page.

QUESTION THREE

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One day Tom and Tane go surfing at a local beach. Tom manages to ride a wave, on average, 7 out of every 10 times he tries. Tane manages to ride a wave, on average, 6 out of every 10 times he tries.

Calculate the probability that Tom and Tane each ride a total of 2 of the next 5 waves.

State what probability distribution model you use to solve this problem and justify your choice, including any assumptions you make.

Extra paper for continuation of answers if required.
Clearly number the question.

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Question number

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