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90643

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Level 3 Statistics and Modelling, 2004

90643 Solve straightforward problems involving probability

Credits: Four
9.30 am Monday 15 November 2004

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.

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

Check that this booklet has pages 2–8 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.

Achievement Criteria	*For Assessor's use only*	
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Solve straightforward problems involving probability. ☐	Solve probability problems. ☐	Apply probability theory. ☐
Overall Level of Performance ☐		

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

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Show **ALL** working.

QUESTION ONE

Coloured Ball Problem

- There are two bags of balls.
- The balls are identical in all aspects except colour.
- One bag contains 4 white balls and 1 black ball; the other bag contains 1 white ball and 5 black balls.
- One ball is drawn at random from each bag.

Let the random variable W be the number of white balls drawn in total.

Complete the table below for the probability distribution of W.

You may wish to draw a probability tree in the following space.

w	0	1	2
$P(W = w)$	$\frac{1}{6}$		

QUESTION TWO

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For two events A and B, the following information is known.

$\mathrm{P}(A \cup B) = \frac{5}{6},\ \mathrm{P}(A \cap B) = \frac{1}{3},\ \mathrm{P}(A') = \frac{7}{12}$

Find P(B).

QUESTION THREE

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Each day, Puna catches a bus and then a train from her home to Bernoulli College. The probability that the bus is late is 0.17. The probability that the train is late is 0.25. The probability that both the bus and the train are late on the same day is 0.045.

(a) Are the events 'the bus is late' and 'the train is late' independent?
Justify your answer.

(b) Find the probability that neither the bus nor the train is late.
You may wish to draw a diagram in the following space.

(c) Find the probability that given Puna's bus has been late, her train is also late.

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QUESTION FOUR

Joe is playing a game of chance at the school gala, costing $1 for each game. In the game two fair dice are rolled and the sum of the numbers that turn up is found. If the sum is seven, then Joe wins $5. Otherwise Joe loses his money.

Joe plays the game 15 times. Find his expected profit or loss.

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QUESTION FIVE

Bernoulli College has analysed the Level Three Mathematics courses taken by its Year 13 students in 2004. The school has 200 students in Year 13. One hundred and eight students take Statistics and Modelling and 73 students take Mathematics with Calculus. Forty-seven students take neither Mathematics course.

Find the probability that the only Level Three Mathematics course a randomly chosen Year 13 student takes is Mathematics with Calculus.

QUESTION SIX

Bernoulli College has been allocated four places at Outward Bound. Ten girls and seven boys apply to go to Outward Bound. The group of four students to go to Outward Bound is to be selected at random.

Find the probability that the group of four students selected to go to Outward Bound contains **more** girls than boys.

QUESTION SEVEN

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A competition is held at the school in which two teams compete. Team One contains y girls and z boys. Team Two contains w girls and x boys. A player is chosen at random from Team One and transferred to Team Two. A player is then chosen at random from Team Two.

Show that the probability that the player chosen from Team Two is a girl, is

$$\frac{yw+zw+y}{(y+z)(w+x+1)}.$$

Explain your reasoning carefully.

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

Assessor's use only

Question number