NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 1, 2002

Mathematics: Calculate relative frequencies and theoretical probabilities (90194)

National Statistics

Assessment Report

Assessment Schedule

Mathematics: Calculate relative frequencies and theoretical probabilities (90194)

National Statistics

Number of Results	Percentage achieved			
	Not Achieved	Achieved	Merit	Excellence
38,512	49%	34%	13%	4%

General Comments

Many candidates made no attempt to answer this paper. Of those who did, only a small percentage attempted Question Four that addressed the simulation. It would appear from the candidates' performance that many had not known the specifications for the assessments. This was a disadvantage to them.

Probability needs a significantly greater allocation of study time than it has had in the past. The learning also needs to be to a greater depth, with greater thought being given by the candidates to what they are doing. This can come from experimental probability being explored in the junior secondary area. For example, a large number of candidates are giving probabilities greater than 1. From experimentation, and calculating the long-run relative frequencies, candidates can gain a greater understanding of this.

Writing of probabilities as ratios was also relatively common. 17/50 being written as a ratio of 17:50 was not acceptable.

Several candidates hashed their answers by incorrect conversions into percentages.

Candidates are required to carry out calculations in order to be able to calculate probabilities. Some candidates who answered Question One correctly did not answer Question Two, and vice versa.

Inclusion of conditional probability raised the standard and candidates were ill-prepared for this. This aspect needs to be learned by the candidate looking at their sample space and then looking at a specified subset of this. They should think about their sample space rather than formal treatment of conditional probability, although 'If' questions have always been acceptable without defining them as conditional probability (eg reading from a table – if the boy had blue shorts on, what is the probability that he had a green shirt).

In probability, attention needs to be given to language and the need for preciseness of terms such as 'between', 'at least', 'more than' so the candidates can adequately describe their own experiments.

Adding along branches of probability trees was common.

Candidates should look carefully at whether the question indicates it is an 'and' or an 'or' situation.

Candidates should be encouraged to attempt as much of the paper as possible to give the assessors sufficient evidence to make a judgement. Candidates need to be encouraged to show working and to set work out clearly, especially in the simulation – clearly defined steps may help here.

Candidates must not give multiple answers, eg 0.1 or 0.01.

Candidates should be reminded that the use of pencil rules out the option of reconsiderations – many used pencil.

Comments on Specific Questions

Question One

Candidates were expected to carry out calculations in order to then write their probabilities. Many candidates did not appear to know how to deal with the data missing from the table, which required them to find the number of losses. A good starting point is candidates being aware of the need for a balanced frequency table.

(a) Common error 9/17, 8/17, or just 17.
(b) Generally well done.
(c) 26/50 was a common answer, with candidates failing to find the complementary probability.

Question Two

Generally well done. Very few candidates listed the sample space. Some candidates appeared to use the sample space of three possible outcomes with equally likely probabilities (head/head, head/tail, and tail/tail), ie each 1 of 3. Common answers were 1/3 for part (a) and either 1/3 or 2/3 for part (b). Ratios 1:4 were also common in this question.

Question Three

(a) (i) Generally well done when attempted.
(ii) 0.45. Candidates appeared to have had trouble dealing with 'at least one'.
(b) 0.25 □ 0.6 □ 0.3 = 0.045 or 9/200 (ie failing to leave out the 0.25 having included the first hole) and 0.6 + 0.3 = 0.9

Very few candidates calculated 1 – 3(a), showing possible lack of understanding.

Candidates should gain more practice at drawing probability trees and performing calculations from these.
Calculations need to include examples where there is a reduced sample space, ie where the answer is restricted to part of the tree diagram.

Question Four

Many candidates did not attempt this question but candidates from some centres did very well. Candidates need to realise that all answers may provide evidence for achievement in any standard.

A simulation at this level involves matching a tool to a given probability. Theoretically, simulations are used where the probability of an event is unknown, but within the context of this achievement standard it involves matching a tool to a given probability. Defining simulations for unknown probabilities to predict outcomes is a much higher level.

The expectations of the description of the experiment are not clear from the achievement standard. This year, the assessors were looking for a description of the tool to be used for the experiment and a match of this to the situation, a description of a trial and the fact that this involves repetition of a process, a description or table showing what is recorded and a description of how the calculation is carried out. This year, the explanation was accepted with either the recording of the results or the calculation being defined. This may not be the case in future.

Recording of results was not explicit enough. Definition of a successful trial was required.

Candidates were expected to choose their tool. This must be one that matches the situation. A candidate choosing a coin ruled themselves out of this question as the coin couldn't be used to match a 3/5 probability. Candidates need to be given the choice of equipment in their classroom experiences and to consider the appropriateness of these.

Many candidates selected the coin as their tool. Those who attempted the question and did not choose a coin generally did well at this question.

The numbers between 1 and 3 should have been used, rather than the numbers 1 to 3. These provided shaky evidence for the description of the tool but often this was rectified in the description of the recording of the results.

A few candidates multiplied Hari and Marianne's probabilities together to find the probability that they both got the serve in.

For part (b), 24% was a common answer.
Some candidates gave only one probability.

Many candidates looked only at the first serve.

Reasons why Hari was more successful, although ignored by assessors, were often waffly. The answer was ignored because it was obvious – the percentage was higher and good candidates were looking for more obscure reasons. Candidates need to look at justifiable answers, rather than produce reasons why 'they' think they were better.

Candidates who failed to do part (a) of this question often did part (b), which provided further evidence on which the assessor could base a judgement.

Assessment Schedule

Mathematics: Calculate relative frequencies and theoretical probabilities (90194)

	Achievement Criteria	No.	Evidence	Code	Judgement	Sufficiency
Evidence contributing to Achievement	Determine probabilities	One (a)	$\frac{17}{50}$	A	0.34, 34% or equivalent.	**Achievement** Three of Code **A**
		One (b)	$\frac{24}{50}$ or $\frac{12}{25}$	A	0.48, 48% or equivalent.	
		Two (a)	$\frac{1}{4}$	A	0.25, 25% or equivalent.	
		Two (b)	$\frac{3}{4}$	A	0.75, 75% or equivalent.	
Evidence contributing to Achievement with Merit	Solve theoretical probability problems.	Three (a) (i)	0.1	M A	1/10 or equivalent.	**Achievement with Merit** Three of Code **A** **plus** Two of Code **M** **OR** **Three of Code** M
		Three (a) (ii)	0.9	M A	9/10 or equivalent.	
		Three (b)	0.18	M A	18/100 or equivalent.	

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<td rowspan="2">Evidence contributing to Achievement with Excellenc</td>
<td rowspan="2">Devise strategies to explore probablility situations.</td>
<td>Four (a)</td>
<td>Example:

Probability tool:
Read the first digit of 5 Ran# or use of dice excluding 5, cards spinners or other appropriate tool

For first attempt use 0, 1 or 2 as in, and for the second attempt use 0 and 1 as in

A trial:
A trial consists of selecting a random number for the first serve. If the ball is in stop, otherwise select a second random number for the second serve.

A successful trial consists of getting the ball in on either serve.
Results:
Record whether or not each trial is successful.
For example:
<table>
<tr><th>Trial</th><th>Outcome</th><th>Result</th></tr>
<tr><td>1</td><td>1</td><td>3</td></tr>
<tr><td>2</td><td>2 1</td><td>3</td></tr>
<tr><td>3</td><td>4 3</td><td>X</td></tr>
</table>
Repeat several times.

Calculation:
P(serve in)
= <u>No. positive results</u>
No. of trials</td>
<td>To
(can be implied)

Tr

R

C</td>
<td>The key aspects of the simulation details must be sufficient for the experiment to be able to be carried out.

Could be implied in results or calculation.</td>
<td rowspan="2">Achievement with Excellence

Merit
plus
To Tr
R OR C
E</td>
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<tr>
<td>Four (b)</td>
<td>P(Hari)
= 0.3 + 0.7 × 0.8
= 0.3 + 0.56
= 0.86 (or 43/50)

P(Mariana)

= 0.6 + 0.4 × 0.4
= 0.6 + 0.16
= 0.76 (or 38/50)

Hari</td>
<td>A

A M

H</td>
<td>(Both correct for M)
Both probabilities calculated and correct decision stated for H.

This question may provide evidence for 2A or 1M as well as H</td>
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