



D&D Resources Ltd
Mathematics Exam Preparation Made Easy

Probability Methods - 91267

Practice External Assessments 2

PROBABILITY METHODS

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NCEA 2 Maths

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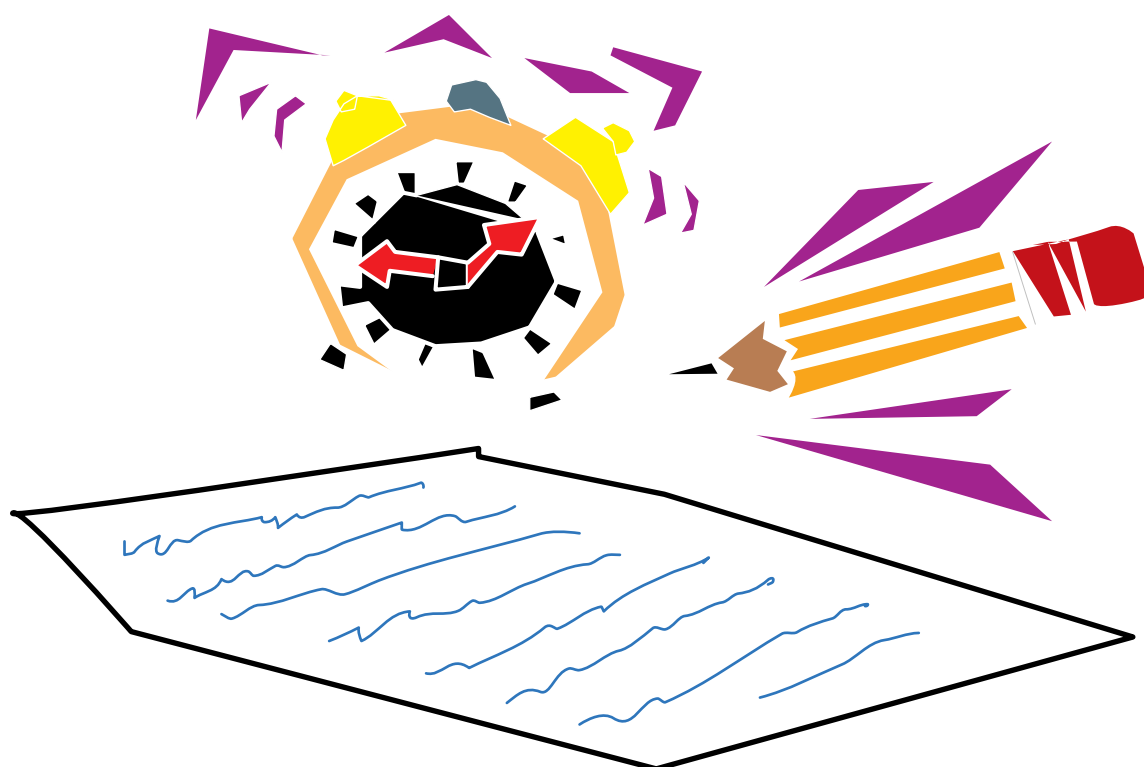
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The questions in the practice assessments are NOT in order of difficulty. Attempt all questions or you may not provide enough evidence to achieve the required standard.

Achievement Standard

91267

Apply probability methods in solving problems

Achievement	Achievement with Merit	Achievement with Excellence
Apply probability methods in solving problems.	Apply probability methods using relational thinking in solving problems.	Apply probability methods using extended abstract thinking in solving problems.

- ◆ This achievement standard is derived from Level 7 of The New Zealand Curriculum and is related to the achievement objectives
 - ❖ evaluate statistically based reports
 - interpreting risk and relative risk
 - ❖ investigate situations that involve elements of chance
 - comparing theoretical continuous distributions, such as the normal distribution, with experimental distributions
 - calculating probabilities, using tools such as two-way tables, tree diagrams;

in the Statistics strand of the Mathematics and Statistics Learning Area.
- ◆ Apply probability methods in solving problems involves:
 - ❖ selecting and using methods
 - ❖ demonstrating knowledge of probability concepts and terms
 - ❖ communicating using appropriate representations.
- ◆ Relational thinking involves one or more of:
 - ❖ selecting and carrying out a logical sequence of steps
 - ❖ connecting different concepts or representations
 - ❖ demonstrating understanding of concepts;

and also relating findings to a context or communicating thinking using appropriate statements.
- ◆ Extended abstract thinking involves one or more of:
 - ❖ devising a strategy to investigate or solve a problem
 - ❖ identifying relevant concepts in context
 - ❖ developing a chain of logical reasoning
 - ❖ making a statistical generalisation;

and also where appropriate, using contextual knowledge to reflect on the answer.
- ◆ Problems are situations which provide opportunities to apply knowledge or understanding of mathematical and statistical concepts. Situations will be set in real-life or statistical contexts.
- ◆ Methods include a selection from those related to:
 - ❖ risk and relative risk
 - ❖ the normal distribution
 - ❖ experimental distributions
 - ❖ relative frequencies
 - ❖ two-way tables
 - ❖ probability trees.

You are advised to spend 60 minutes answering this assessment.

You should show ALL working and answer ALL parts of ALL questions.

QUESTION ONE

Rawiri is interested in investigating the time it takes New Zealand students to get to school. He obtains a random sample of 1000 New Zealand students and their travel time to school, rounded to the nearest minute. The results of his random sample are graphed and tabulated below.

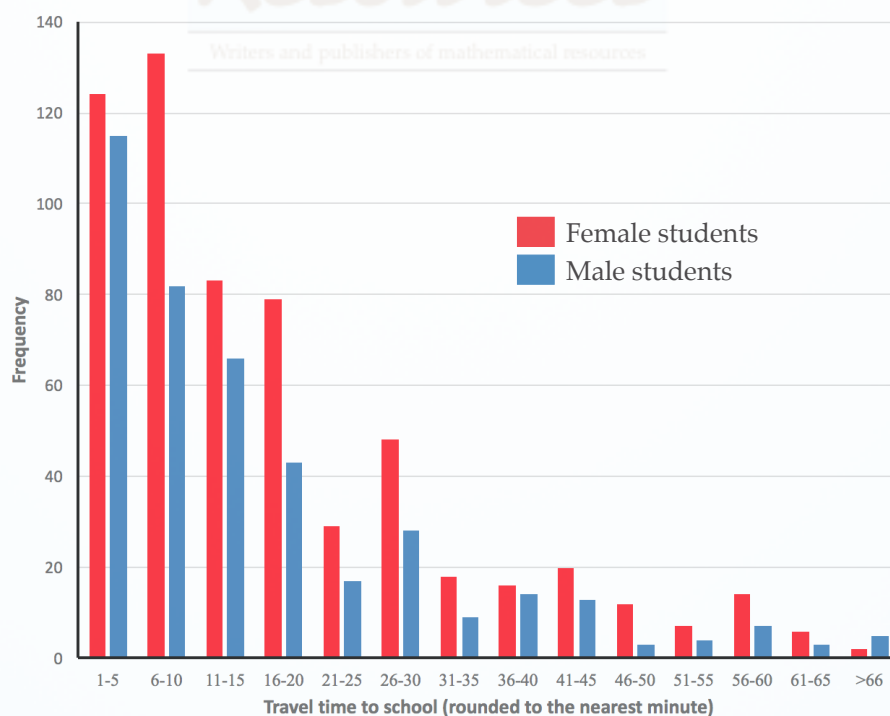
Table 1

Time (mins.)	Female students	Male students
1 – 5	124	115
6 – 10	133	82
11 – 15	83	66
16 – 20	79	43
21 – 25	29	17
26 – 30	48	28
31 – 35	18	9
36 – 40	16	14
41 – 45	20	13
46 – 50	12	3
51 – 55	7	4
56 – 60	14	7
61 – 65	6	3
≥ 66	2	5
TOTAL	591	409

Table 2

Statistics for time to travel to school (mins.)	Female students	Male students
Mean	18.6	17.0
Median	15.0	12.0

Figure 1
Travel time to school of some NZ students



imined that in the urban areas, there is a 20% increase in traffic volume during the weekend compared to during the week for a

you agree with this headline, stating full

Resources

Writers and publishers of mathematical resources

- (i) What proportion of alcohol offenders were caught on the open road?

(ii) What was the percentage of offences that occurred during the weekend which were town related?

- (iii) A newspaper article claimed that in the urban areas, there is a 20% greater chance of being caught during the weekend compared to during the week for a driving offence involving alcohol.

Comment on whether you agree with this headline, stating full reasons and giving calculations.

- (iii) A claim is made that taking aspirin daily halves the risk of having a heart attack for people in this blind study.

Can this claim be justified statistically? Support your answer with appropriate calculations.

- (b) Studies into the effects of taking aspirin and whether it lowers blood pressure have also been undertaken. These studies have shown that aspirin's effectiveness in lowering blood pressure may be dependent on when in the day the dose is taken.

A study of 550 people with high blood pressure showed that 180 experienced a drop in blood pressure when taking the required aspirin dosage at night. 331 people in the study in total received no effective change in blood pressure and 221 people taking the aspirin dose during the day gained no lowering of blood pressure.

Aspirin / Blood pressure Study			
Time	Lowered blood pressure	No change in blood pressure	TOTAL
Night	180		
Day		221	
TOTAL		331	550

- (i) What is the probability that a person in the study taking aspirin at night has lower blood pressure?

- (ii) The following headline appeared in a recent internet article "*New Research: Taking aspirin at night helps lower blood pressure.*"

Comment on this headline and give statistics to support your conclusion.

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PEA 4

THREE				
	Tree Diagram: <pre> graph LR Root(()) --- M((M)) Root --- F((F)) M --- M1[0.25 ≥ 75] M --- M2[0.30 55 ≤ x < 65] M --- M3[0.45 65 ≤ x < 75] F --- F1[0.20 ≥ 75] F --- F2[0.45 55 ≤ x < 65] F --- F3[0.35 65 ≤ x < 75] </pre>			
(a) (i)	$P(65 \leq x < 75)$ $= 0.68 \times 0.45 + 0.32 \times 0.35$ $= 0.418$	probability calculated.		
(a) (ii)	Total fined $= 252 \div (0.32 \times 0.45)$ $= 1750$ Males drivers fined $= 1750 \times 0.68 \times 0.3$ $= 357$		total number of drivers found.	number of male drivers fined.
(a) (iii)	$P(\text{Female and not paid})$ $= 0.32 \times 0.3$ $= 0.096$		probability calculated.	
(a) (iv)	$P(\text{speed of 75 km/h or more})$ $= 0.68 \times 0.25 + 0.32 \times 0.2$ $= 0.234$ Expected number of fines $= 9402 \times 0.234$ $= 2200$ Revenue = 2200 × 230 $= \$506\,000$	probability calculated.	expected number found and revenue calculated.	
(b)	<pre> graph LR Root(()) --- OR((Open Rd)) Root --- UR((Urban Rd)) OR --- OR1[0.27 Speed] OR --- OR2[0.73 Not Speed] UR --- UR1[0.35 Speed] UR --- UR2[0.65 Not Speed] </pre> $P(\text{Fatality due to other causes}) = 0.74 \times 0.73 + 0.26 \times 0.65 = 0.7092$ $P(\text{Fatality occurs on open road}) = 0.74 \times 0.73 = 0.5402$ $\text{Probability} = \frac{0.5402}{0.7092} = 0.76$	calculates one part, numerator or denominator correctly.	minor error in calculation.	correct answer.

Marking Schedule for Questions 1, 2 and 3

N1	N2	A3	A4	M5	M6	E7	E8
One partial solution	1 of A	2 of A	3 of A	1 of M	2 of M	1 of E with minor error(s)	2 of E