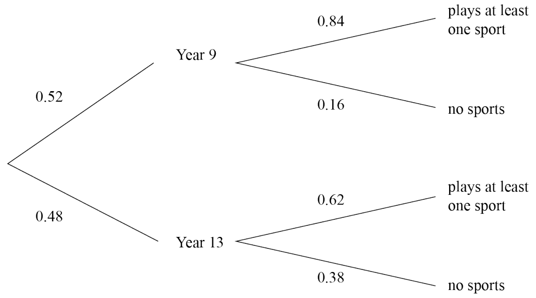
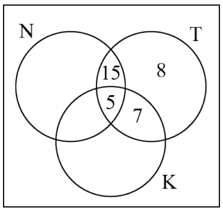
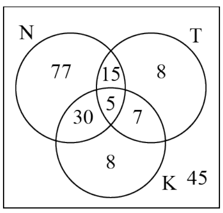
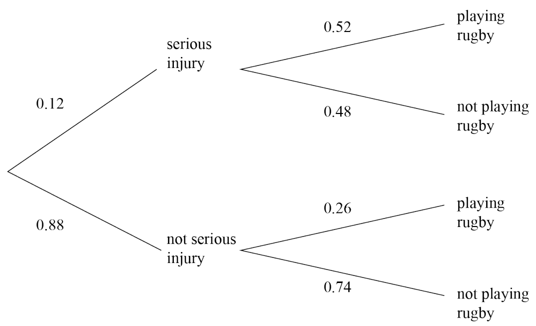
Assessment Schedule – 2013 Mathematics and Statistics (Statistics): 91585

Evidence Statement

One	Expected Coverage	Achievement (u)	Merit (r)	Excellence (t)
(a)(i)	 P(played at least one sport) $= 0.52 \times 0.84 + 0.48 \times 0.62 = 0.7344$ (73.4%)	Probability correctly calculated.		
(ii)	$\text{P(Year 9 play no sport)} = 0.52 \times 0.16 = 0.0832$ $\text{P(Year 13 play no sport)} = 0.48 \times 0.38 = 0.1824$ OR $\text{P(Year 13 \| play no sport)}$ $= \frac{0.48 \times 0.38}{1 - 0.7344} = 0.6867$ This is greater than 0.5, so the complementary event P(Y9 / play no sports) must be smaller. So the student is more likely to be a Year 13 if play no sports.	Calculation of two relevant probabilities.	Correct conclusion reached as to which is more likely, with sufficient reasoning.	
(b)(i)	 Percentage of students who play tennis = $\frac{35}{195}$ = 17.9%	Partially correct Venn diagram is drawn (at least three events correctly shown). OR Consistent probability from incorrect Venn Diagram.	Probability correctly calculated.	
(ii)	 Number of students who play netball = 127 P(both play netball) = $\frac{127}{195} \times \frac{126}{194}$ = 0.4230 (4 d.p.)	Probability that one student plays netball consistent from Venn Diagram.	Incorrect probability for sampling with replacement consistent from Venn Diagram eg: P(both play netball) $= \frac{27}{195} \times \frac{127}{195}$ $= 0.4242$	Probability correctly calculated.

Nϕ	N1	N2	A3	A4	M5	M6	E7	E8
No relevant evidence.	Making progress.	1 of u	2 of u	3 of u	1 of r	2 of r	1 of t with minor error	1 of t

Two	Expected Coverage	Achievement (u)	Merit (r)	Excellence (t)
(a)(i)	P(injury | netball) = $\frac{15\,143}{123\,994} = 0.1221$ P(injury | tennis) = $\frac{7354}{311\,662} = 0.0236$ A New Zealand adult is more likely to be injured while playing netball than while playing tennis.	Probabilities correctly calculated. AND Statement given as to who is more likely.		
(ii)	To calculate the P(A or B), either it is necessary to know that the events are mutually exclusive, so P(A and B) = 0, or it is necessary to know the value of P(A and B). In this case, we can't assume P(A and B) = 0 as there will be people who play tennis and netball, so we are unable to calculate P(injury from tennis or injury from netball).	Identification of relevant probability theory related to mutually exclusive events.	A description of how the events are not mutually exclusive is given AND is supported with reference to the context.	
(b)(i)	$P(A \cup B) = 0.35$, so $P(A' \cap B') = 0.65$ $P(A \cup B') = 0.9$, so $P(A' \cap B) = 0.1$ $P(A') = 0.75$ $P(A) = 0.25$ Proportion of students who were injured playing tennis = 0.25 *A two way table or a Venn Diagram could also be used to deduce P(A).*		One example of correct use of probability theory / method to deduce a relevant probability not provided.	The proportion is correctly calculated with a logical chain of reasoning.
(ii)	 P(playing rugby) = $0.12 \times 0.52 + 0.88 \times 0.26$ = 0.2912	Correct tree diagram drawn. OR Tree diagram drawn incorrectly, but used consistently to find required probability.	Probability correctly calculated.	

Nϕ	N1	N2	A3	A4	M5	M6	E7	E8
No relevant evidence.	Making progress.	1 of u	2 of u	3 of u	1 of r	2 of r	1 of t with minor error	1 of t

<table>
<tr><th>Three</th><th>Expected Coverage</th><th>Achievement (u)</th><th>Merit (r)</th><th>Excellence (t)</th></tr>
<tr><td>(a)</td><td>
<table>
<tr><th></th><th>Warm up</th><th>Did not warm up</th><th>Total</th></tr>
<tr><td>Injured</td><td>1</td><td>4</td><td>5</td></tr>
<tr><td>Not injured</td><td>13</td><td>2</td><td>15</td></tr>
<tr><td>Total</td><td>14</td><td>6</td><td>20</td></tr>
</table>
P(injury | did not warm up) = $\frac{4}{6} = \frac{2}{3}$
</td><td>Tree, table or Venn
Conditional probability found from incorrect tree, table or Venn Diagram.</td><td>Conditional probability is correctly calculated.</td><td></td></tr>
<tr><td>(b)(i)</td><td>From graph: 24 + 23 + 21 + 16 + 12 = 96
P(game finished in 5 or less rolls) $= \frac{96}{150} = 0.64$</td><td>Probability is correctly calculated.</td><td></td><td></td></tr>
<tr><td>(ii)</td><td>To finish the game in two rolls, the numbers on each of the two rolls need to be either (1, 4), (2, 3), (3, 2), (4, 1) or (6, 5).
This is 5 outcomes out of a total of 36 possible outcomes. Therefore the theoretical probability is $\frac{5}{36}$.</td><td>Shows the answer is 5 / 36 with a vague explanation.</td><td>Correct explanation is given for the theoretical probability.</td><td></td></tr>
<tr><td>(iii)</td><td>Finishing with one roll is the same as P(rolling a 5) = 1/6, which is what the formula gives $\left(\frac{5}{6}\right)^0 \times \left(\frac{1}{6}\right)^1 = \frac{1}{6}$.
There are five possible outcomes out of 36 for finishing the game in two rolls: (6, 5), (1, 4) (2, 3) (3, 2) & (4, 1) when means P(two rolls) = 5/36, which is what the formula gives $\left(\frac{5}{6}\right)^1 \times \left(\frac{1}{6}\right)^1 = \frac{5}{36}$.
This is the same as not getting a five on the first roll (p = 5 / 6) and then getting either the one number that sums with the first number to make 5 on the second roll or getting a 5 (p = 1 / 6).
This will continue for finishing in three rolls – you would want to not get a five for two rolls (so 5/6 × 5/6) and then get either the one number that sums with the last rolled number to make 5 or get a 5 (p = 1 / 6), which is what the formulae gives $\left(\frac{5}{6}\right)^2 \times \left(\frac{1}{6}\right)^1 = \frac{25}{216}$.
This will continue for finishing in r rolls – you would want to not get a five for r - 1 rolls (so $(5/6)^{r-1}$) and then get either the one number that sums with the last rolled number to make 5 or get a 5 (p = 1 / 6), which is what the formulae gives $\left(\frac{5}{6}\right)^{r-1} \left(\frac{1}{6}\right)$.
Yes, the student is correct in her thinking.</td><td>The probability formula is shown to work for at least one other probability

OR

the sample space is used to correctly calculate the probability of finishing the game in two rolls.</td><td>A reasonable attempt is made to link the sample space to the probability obtained using the formulae given.</td><td>The method to calculate the probability of finishing the game in r rolls is generalised to the formula given.</td></tr>
</table>

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Achievement	**Achievement with Merit**	**Achievement with Excellence**
Apply probability concepts in solving problems involves: • selecting and using methods • demonstrating knowledge of concepts and terms • communicating using appropriate representations.	*Apply probability concepts, using relational thinking, in solving problems* involves: • 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.	*Apply probability concepts, using extended abstract thinking, in solving problems* involves: • 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.

Judgement Statement

	Not Achieved	**Achievement**	**Achievement with Merit**	**Achievement with Excellence**
Score range	0 – 7	8 – 12	13 – 18	19 – 24