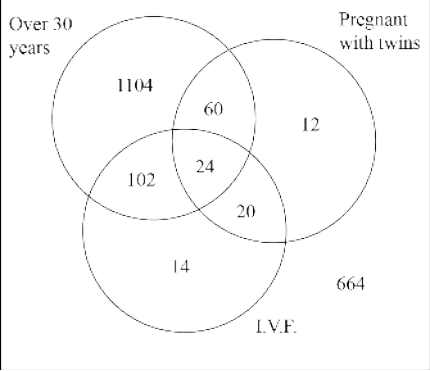


Assessment Schedule – 2014

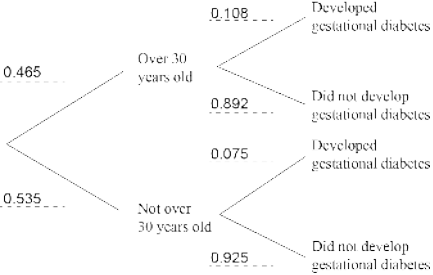
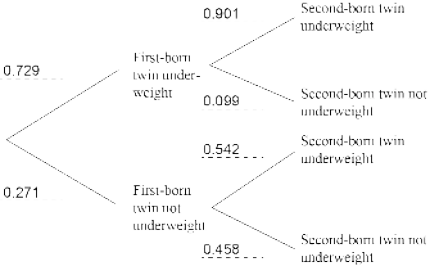
Mathematics and Statistics (Statistics): Apply probability concepts in solving problems (91585)

Evidence Statement

One	Expected Coverage	Achievement (u)	Merit (r)	Excellence (t)																
(a)	<table border="1" data-bbox="220 421 657 741"> <thead> <tr> <th></th> <th>Over 30 years old</th> <th>Not over 30 years old</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>Pregnant with twins</td> <td>84</td> <td>32</td> <td>116</td> </tr> <tr> <td>Not pregnant with twins</td> <td>1206</td> <td>678</td> <td>1884</td> </tr> <tr> <td>Total</td> <td>1290</td> <td>794</td> <td>2000</td> </tr> </tbody> </table> <p data-bbox="220 775 639 882"> P(not pregnant with twins and over 30) $= \frac{1206}{2000} = 0.603$ </p>		Over 30 years old	Not over 30 years old	Total	Pregnant with twins	84	32	116	Not pregnant with twins	1206	678	1884	Total	1290	794	2000	<p data-bbox="711 427 951 488">Proportion correctly calculated for part (a).</p> <p data-bbox="711 533 751 562">OR</p> <p data-bbox="711 611 963 734">Conditional probability for one woman correctly calculated for part (b).</p>	<p data-bbox="1000 427 1214 577">Conditional probability for both women correctly calculated for part (b).</p>	
	Over 30 years old	Not over 30 years old	Total																	
Pregnant with twins	84	32	116																	
Not pregnant with twins	1206	678	1884																	
Total	1290	794	2000																	
(b)	<p data-bbox="220 1151 639 1249"> P(one women over 30 if pregnant with twins) = $\frac{84}{116}$ (0.724) </p> <p data-bbox="220 1263 639 1361"> P(both women over 30 if both pregnant with twins) = $\frac{84}{116} \times \frac{83}{115} = 0.523$ </p>																			
(c)	<p data-bbox="220 1189 480 1256"> P(is with twins) = $\frac{116}{2000}$ </p> <p data-bbox="220 1272 448 1339"> P(is over 30) = $\frac{1290}{2000}$ </p> <p data-bbox="220 1352 624 1458"> P(is pregnant with twins and over 30) $= \frac{84}{2000} = 0.042$ </p> <p data-bbox="220 1471 555 1576"> P(is with twins) \times P(is over 30) $= \frac{116}{2000} \times \frac{1290}{2000} = 0.037$ </p> <p data-bbox="220 1590 660 1671"> Therefore the events are not independent as $P(A) \times P(B) \neq P(A \cap B)$ </p> <p data-bbox="220 1695 256 1724">OR</p> <p data-bbox="220 1753 491 1859"> P(is with twins over 30) $= \frac{84}{1290} = 0.065$ </p> <p data-bbox="220 1883 564 1944"> P(is with twins) = $\frac{116}{2000} = 0.058$ </p> <p data-bbox="220 1977 660 2080"> Therefore the events are not independent as $P(B / A) \neq P(B)$ <i>Accept other valid chains of reasoning.</i> </p>	<p data-bbox="711 1182 948 1332">Correct probabilities calculated as part of a reasonable attempt to use an independence rule.</p>	<p data-bbox="1000 1182 1203 1368">Independence rule used with correct probabilities to determine events are not independent.</p>																	

<p>(d)</p>	<p>A Venn diagram or other suitable diagram or method is used.</p>  <p>P(not over 30 and not pregnant with twins and did not use I.V.F.)</p> $= \frac{664}{2000} = 0.332$ <p><i>Accept other valid chains of reasoning.</i></p>		<p>A reasonable attempt is made to organise information (eg. calculates at least four values correctly) and arrives at a consistent incorrect probability.</p>	<p>Probability correctly calculated.</p>
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NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Reasonable start / attempt at one part of the question.	Almost complete correct answer.	1 of u	2 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>$P(\text{gestational diabetes OR over 30}) = 0.505$ $400 \times 0.505 = 202$ 202 women in this study developed gestational diabetes or were over 30 years old.</p>	<p>The number of women is correctly determined in part (i).</p>	<p>The correct probabilities are calculated for all branches in part (ii).</p>	
(ii)	<p>Tree is completed with probabilities rounded to 3 decimal places where needed.</p> 	<p>OR</p> <p>The correct probabilities are calculated for the first set of branches in part (ii).</p>		
(iii)	<p>$P(\text{gestational diabetes / over 30}) = 0.108$ $P(\text{gestational diabetes / not over 30}) = 0.075$ Relative risk = $\frac{0.108}{0.075} = 1.44$ The risk for a woman over 30 years of age developing gestational diabetes is 1.44 [times] greater than the risk for a woman no more than 30 years old.</p>	<p>The correct conditional probabilities are identified for the comparison, eg through the use of probability statements.</p>	<p>A statement is made that compares the risk using numerical values.</p>	
(b)	<p>Probability statements, a tree diagram or another method (two-way table) is used to find required probabilities of combined events.</p>  <p>$P(\text{first-born twin underweight and second-born twin not underweight})$ $= 0.729 \times 0.099 = 0.0722$ $P(\text{second-born twin normal weight or overweight})$ $= 0.124 + 0.729 \times 0.099 = 0.1962$ $P(\text{first-born twin underweight / second-born twin not underweight})$ $= \frac{0.0722}{0.1962} = 0.368$</p>	<p>At least one correct probability relevant to the problem is calculated.</p>	<p>A reasonable attempt to model the situation using appropriate methods and / or diagrams is demonstrated, including at least one correct probability relevant to the problem being calculated.</p>	<p>The correct conditional probability is calculated, supported by a clear communication of strategy used to obtain this probability, including use of correct probability statements.</p>

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Reasonable start / attempt at one part of the question.	Almost complete correct answer	1 of u	2 of u	1 of r	2 of r	1 of t (with minor error)	1 of t

Three	Expected Coverage	Achievement (u)	Merit (r)	Excellence (t)
(a)	<p>The proportion of days where the sum of the ages of the three children was 8 is $\frac{12}{30}$ (or $\frac{12}{33}$). This is different to the theoretical probability of 0.3.</p> <p>However, we would expect a difference between the observed proportion and the theoretical probability, [due to chance variation.]</p> <p>[So the parent is incorrect to reason that just because the two probabilities are different, this is evidence the selection process was not random.]</p>	<p>A vague explanation about how the observed proportion is unlikely to be the same as the theoretical probability for part (a).</p> <p>OR</p> <p>Some discussion how a simulation would allow the parent to see that there is variability present in part (b).</p>	<p>A clear explanation about how the observed proportion is unlikely to be the same as the theoretical probability for part (a).</p> <p>OR</p> <p>Discusses how a simulation would allow the parent to see that there is variability present in part (b).</p>	<p>A clear explanation about how the observed proportion is unlikely to be the same as the theoretical probability for part (a).</p> <p>AND</p> <p>Discusses how a simulation would allow the parent to see that there is variability present in part (b).</p>
(b)	<p>A simulation would allow the parent to see that there is variation for the experimental probability for sets of 30 days.</p> <p>[They could then determine the likelihood of obtaining a result at least as large as 40% if the children were randomly selected.]</p>			
(c)	<p>Table is completed with correct probabilities:</p> <p>P(sum of the ages of the three children is 6)</p> $= \frac{6}{10} \times \frac{5}{9} \times \frac{4}{8} = \frac{1}{6}$ <p>P(sum of the ages of the three children is 7)</p> $= 1 - \frac{1}{6} - \frac{1}{30} - \frac{3}{10} = \frac{1}{2}$ <p>P(sum of the ages of the three children is 9)</p> $= \frac{4}{10} \times \frac{3}{9} \times \frac{2}{8} = \frac{1}{30}$	<p>One probability not given in the table is correctly calculated.</p>	<p>All missing probabilities are correctly calculated.</p>	

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Reasonable start / attempt at one part of the question.	Almost complete correct answer	1 of u	2 of u	1 of r	2 of r	1 of t (with minor error)	1 of t

Cut Scores

	Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
Score range	0 – 6	7 – 12	13 – 19	20 – 24