Assessment Schedule – 2015

Mathematics and Statistics: Apply probability methods in solving problems (91267)

Evidence Statement

One	Expected Coverage	Achievement (u)	Merit (r)	Excellence (t)
(a)(i)	$P(0 < Z < 0.75) = 0.2734$	Probability found.		
(ii)	$P(0 < Z < z) = 0.4 \Rightarrow z = 1.2815$ $\frac{x-34}{8} = 1.2815$ $x = 44.25$	$z = 1.2815$ found.	$x = 44.25$ found.	
(iii)	$P(0 < Z < z) = 0.45 \Rightarrow z = 1.645$ $\frac{40-34}{\sigma} = 1.645$ $\sigma = 3.647$ $\frac{8-3.647}{0.4} = 10.88$	$z = 1.645$ found.	$\sigma = 3.647$ found.	10.88 or 11 extra doctors.
(b)(i)	$P(0 < X < 90)$ $P(-3 < Z < 1.5) = 0.932$	0.932 found.		
(ii)	$p = 1 - \frac{20}{80} = 0.75$	Proportion found.		
(iii)	Possible valid comparative statements that may relate to the points listed below. **Shape:** Graph 1: Not symmetrical; skewed to the left; two peaks; bunching of values to the right. Graph 2: As above but one peak. **Centre:** Graph 1: Mode at 75 – 90 seconds; Median at 60 – 75 seconds; mean to the right of centre. Graph 2: As above. **Spread:** Graph 1: Range of about105 seconds Graph 2: Range of 2 minutes (120 seconds) **Proportions:** Proportions are similar except for 30 – 60 seconds.	One valid comment about each of two aspects of shape, centre, and spread.	Two valid comments, at least one comparative covering each of two aspects of shape, centre, and spread. There must be numerical support for at least one comment.	As for Merit except at least two comparative comments covering each of two aspects of shape, centre, and spread. There must also be some comparisons of the class proportions, specifically noting the 30-60 second intervals in the first graph.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	A valid attempt at one question	1 of u	2 of u	3 of u	1 of r	2 of r	1 of t	2 of t

Two	Expected Coverage	Achievement(u)	Merit(r)	Excellence(t)
(a)(i)	$\frac{1200}{1500} = 0.8$	Proportion found.		
(ii)	$\frac{33}{300} = 0.11$	Proportion found.		
(iii)	$\frac{853}{1500} = 0.5687$ Expected No. $= 52500 \times 0.5687$ $= 29855$	Expected no. found.		
(iv)	Risk of Year 12 failing $= \frac{33}{380} = 0.087$ Risk of Year 13 failing $= \frac{267}{1120} = 0.238$ Relative risk $= \frac{0.238}{0.087} = 2.74$ This is not very close to 4, and hence the claim is not justified.	One risk found.	Relative risk found.	Comparison with 4 and correct conclusion.
(b)(i)	<table><tr><td></td><td>5 subjects</td><td>6 subjects</td><td>Total</td></tr><tr><td>Passed</td><td>626</td><td>574</td><td>1200</td></tr><tr><td>Failed</td><td>192</td><td>108</td><td>300</td></tr><tr><td>Total</td><td>818</td><td>682</td><td>1500</td></tr></table> $\frac{574}{1500} = 0.3827$		Proportion found.	
(ii)	P(passed with 6 subjects) $= \frac{574}{682} = 0.8416$ P(passed with 5 subjects) $= \frac{626}{818} = 0.7653$ $\frac{0.8416}{0.7653} = 1.0997$ Hence 10% more likely to pass if taking 6 subjects BUT this is deceptive, as candidates with more ability are likely to be taking 6 subjects. There could also be comment on the representativeness of the sample.	Both risks found.	Relative risk found.	Interpretation of risks and a realistic argument presented to support or not support taking 6 subjects.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	A valid attempt at one question	1 of u	2 of u	3 of u	1 of r	2 of r	1 of t	2 of t

Three	Expected Coverage	Achievement (u)	Merit (r)	Excellence (t)
(a)(i)	$p = 0.55 \times 0.7 = 0.385$	Probability found.		
(ii)	P(Female) = 0.45 $p = 0.45 \times 0.8 \times 0.35 = 0.126$	Probability found.		
(iii)	$p = (0.55 \times 0.3 \times 0.2) + (0.45 \times 0.8 \times 0.65)$ $= 0.033 + 0.234$ $= 0.267$ or 26.7%	Either 0.033 or 0.234 calculated.	Probability found.	
(iv)	$N = 550 \times (0.55 \times 0.3 \times 0.2)$ $= 18.15$	18.15. Expected numbers do not need to be integer values, but accept 18.		
(v)	P(Male and retained) must be $0.033 \times 10 = 0.33$ Hence P(Female and sold) = $0.45 - 0.33 = 0.12$ $0.45 \times p = 0.12$ $p = \frac{0.12}{0.45} = 0.267$		0.12 found.	Probability found.
(b)(i)	$p = 0.3 + 0.4 + 0.15 = 0.85$	Probability found.		
(ii)	Proportion of black pairs and three eggs $= (0.05 \times 0.15)$ $= 0.0075$ Proportion of nests with three eggs $= (0.75 \times 0.4) + (0.2 \times 0.35) + (0.05 \times 0.15)$ $= 0.3775$ $p = \frac{0.0075}{0.3775} = 0.0198$ which is very close to $\frac{1}{50}$ or 0.02, so the researcher's claim is justified.	0.0075 found.	0.3775 found.	Proportions found and compared.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	A valid attempt at one question	1 of u	2 of u	3 of u	1 of r	2 of r	1 of t	2 of t

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 8	9 – 14	15 – 19	20 – 24