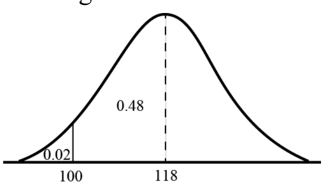
Assessment Schedule – 2025

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

Evidence

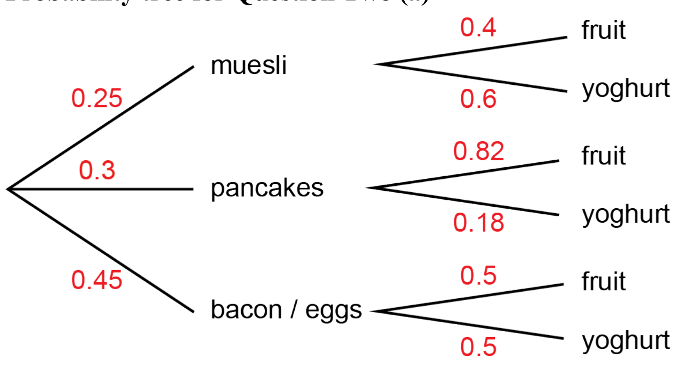
Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)(i)	$P(X > 100) = 0.8283$	• Probability correct.		
(ii)	$\mu = 118$, SD = 19 $P(100 < X < 120) = P(-0.95 < Z < 0.11)$ $= 0.370 = 37\%$	• Probability correct, expressed as a percentage.		
(iii)	$0.5 - 0.1 = 0.4 \quad z = -1.281$ $P(X < x) = 0.1$ OR Using $z = \frac{X - 118}{19}$ Then $-1.281 = \frac{X - 118}{19}$ $= 93.65$ g	• CAO OR ±z-value.	• Correct answer given. • Some evidence of working using formula **or** clearly labelled diagram must be shown.	
(b)	$P(x < 10) = 0.02$ $0.5 - 0.02 = 0.48$ $Z = -2.054$ Altering the Standard deviation:  $Z = -2.054$ $\frac{100 - 118}{\sigma} = -2.054$ $\frac{-18}{\sigma} = -2.054$ $\sigma = 8.76$	• Correct z-value. (negative. OR CAO.	• Correct standard deviation found, with valid working, using the correct negative z-score.	

(c)(i)	$\frac{80}{430} = 0.186 = 0.19$ $\frac{1}{4} = 0.25$ $0.19 < 0.25$, so claim is true.	• Probability calculated. AND Claim justified.		
(ii)	**Shape** Saturday wait times are asymmetrical and skewed to the right, with the bulk of the data between 8 and 15 minutes. Sunday wait times are approximately normal and almost symmetrical, with more people waiting about 22 minutes than a normal distribution would have. Has a bell-shaped curve. Both distributions are unimodal with a single peak. The most common wait time on a Saturday is between 11–12 minutes, whereas on a Sunday it is slightly longer between 13 – 14 minutes. **Centre** **Sunday wait times tend to be longer than Saturday wait times. (1)** On Saturday, the mean wait time would be slightly longer than 12 minutes (as skewed). On Sunday, the mean wait time is between 13 – 14 minutes (as normal distribution). The median wait time on a Saturday is between 12 – 13 minutes, whereas the median weight time on a Sunday is between 13 – 14 minutes. **Spread** There is more variation in Saturday wait times compared to Sunday. On Sunday, the standard deviation is 2.3 minutes ($\frac{14}{6}$), whereas Saturday standard deviation is not easily calculated, as it is not a normal distribution. Saturday wait time is skewed, so the standard deviation will be different. IQR (middle 50%) of Saturday (approx. 14.5 – 10.5 = 4) is wider than Sunday (approx. 15 – 12.5 = 2.5). i.e. More variation in the middle 50% of the Saturday waiting times.	• General statements about both graphs, discussing ONE of shape, centre, spread.	• Statements giving comparisons about both distributions on TWO, out of shape, centre, spread AND including some correct numerical evidence, in at least one of the two comments.	**T1**: Statements giving values and comparisons about both distributions on all THREE, out of shape, centre, spread, using correct terminology AND including a statement equivalent to (1). **T2**: Statements giving values and comparisons about both distributions on all THREE of shape, centre, spread, using correct terminology AND including a statement equivalent to (1). AND including a spread comment that include either interquartile range OR a standard deviation comment.

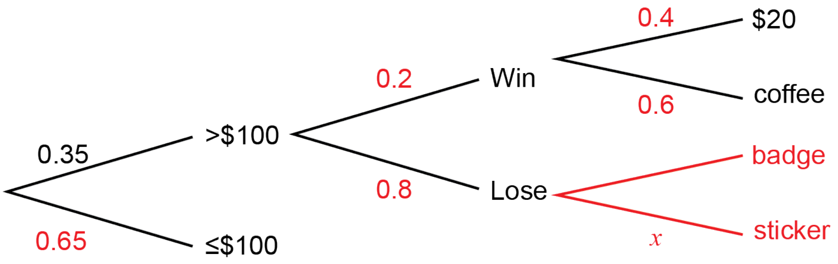
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	A valid attempt at one question.	1 u	2 u	3 u	1r	2r	T1	T2 or 2T1

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
TWO (a)(i)	$0.3 \times 0.82 = 0.246$	• Correct probability.		
(ii)	$(0.25 \times 0.6) + (0.3 \times 0.18) + (0.45 \times 0.5)$ $= 0.15 + 0.054 + 0.225 = 0.429$ Then $0.429 \times 250 = 107.25$ i.e. 107 (or 108) customers	• Correct probability of choosing yoghurt (0.429).	• Correct expected number. Must be a whole number.	
(b)(i)	$0.35 \times 0.8 = 0.28$ $0.28 + 0.65 = 0.93$	• Correct probability (0.93).		
(ii)	Probability that a customer who spent over \$100 wins a prize: $= \frac{1}{5} = 0.2$ Probability that a prize winner receives a free coffee: $= 1 - 0.4 = 0.6$ Probability that a randomly selected customer who spent over \$100 has won a free coffee: Using conditional probability: $= 0.6 \times 0.2 = 0.12$	CAO OR Finds probability that a customer receives a free coffee $(0.35 \times 0.2 \times 0.6$ $= 0.042)$	• Correct conditional probability, • with evidence of valid working.	
(iii)	P(winning sticker) $= 0.35 \times 0.8 - 0.21$ $= 0.28 - 0.21 = 0.07.$ (1) P(sticker / consolation) = $0.8 \times 0.35 \times x = 0.07$ $x = 0.25$ OR P (winning badge) $= 0.35 \times \frac{4}{5} \times y$ i.e. $0.21 = 0.28y$ $y = 0.75$ P(sticker / consolation) $= 1 - 0.75 = 0.25$	• CAO.	• Correct probability of winning a sticker. (1) with evidence of working.	**T1:** Correct algebraic equation set up to calculate x or y. OR Using clear working to find prob $= 0.75$ but then calculates $0.35 \times 0.8 \times 0.25$ $= 0.07$ **T2**: Correct probability of winning a sticker, given a consolation prize, with working.

Probability tree for Question Two (a)



Probability tree for Question Two (b)



NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	A valid attempt at one question.	1 u	2 u	3 u	1r	2r	T1	T2

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
THREE (a)(i)	$\frac{125}{650} = 0.192 \times 100 = 19.2\%$	• Probability correct, expressed as a percentage.		
(ii)	$\frac{184}{280} = \frac{23}{35} = 0.6571$	• CAO.		
(iii)	$\frac{370}{650} + \frac{125}{650} - \frac{105}{650} = \frac{390}{650} = \frac{3}{5} = 0.6$	• Probability of $\frac{495}{650} = 0.7615$.	• Correct probability.	
(b)(i)	According to the table: Teenagers = 76 Adults = 150 76 × 2 = 152 This is slightly more than 2 times.	• Correct reasoning explained.		
(ii)	$\text{P(adult ordering mocha)} = \frac{150}{370} = \frac{15}{37} = 0.4054$ $\text{P(teen ordering mocha)} = \frac{76}{280} = \frac{19}{70} = 0.2714$ But 2 × 0.2714 does not equal 0.4054 so the owner is wrong, it is not double. OR $\text{Relative Risk} = \frac{adults}{teenagers}$ $= \frac{150/370}{76/280} = \frac{0.4054}{0.2714} = 1.4936$ It is 1.5 times as likely for an adult than a teenager to order a mocha.	• At least ONE correct probability calculated.	• Both probabilities given. AND Correct conclusion. OR Relative Risk calculated AND interpreted.	
(c)	$\text{Anxiety/teenager} = \frac{267}{290} = 0.685$ $\text{Anxiety/adult} = \frac{80}{210} = 0.381$ $\text{RR} = \frac{0.685}{0.381} = 1.797 = 1.8$ Teenagers are 1.8 times as likely to experience coffee-induced anxiety compared to adults. OR Teenagers are 80% more likely to experience coffee induced anxiety compared to adults. The researcher's claim is correct.		• Relative risk calculated. OR Use of multiplicative inverse.	• T1 – Correct relative risk. AND Correct interpretation. • T2 – Correct relative risk. AND Correct interpretation. AND Claim evaluated.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	A valid attempt at one question.	1 u	2 u	3 u	1r	2r	T1	T2

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0–7	8–13	14–19	20–24