Assessment Schedule – 2008

Statistics and Modelling: Use probability distribution models to solve straightforward problems (90646)

Evidence Statement

Question	Evidence	Code	Judgement
One	Normal distribution $P(X > 60.5)$ $= P(Z > 1.034)$ $= 0.5 - 0.3494$ $= 0.1506$ (GC: 0.15046)	**A**	Accept **CAO** without any working.
Two	Binomial distribution with $p = 0.05$, $n = 10$ $P(X > 2) = 0.0116$ (GC: 0.01151)	**A**	Accept **CAO** without any working.
Three	Poisson distribution $\lambda = 6$ $P(X \geq 12) = 0.02$ (GC: 0.02011)	**A**	Accept **CAO** without any working.
Four	Total weight has a normal distribution with $\mu = 2 \times 1527.5 = 3\,055$ g Var = $31.8^2 + 31.8^2$ so $\sigma = \sqrt{31.8^2 + 31.8^2} = 44.97199$ g $P(X < 3\,000)$ $P(Z < -1.223)$ $= 0.1107$ (GC: 0.11066)	**M A**	Accept **CAO** without any working.
Five	Normal distribution $P(X > 752) = 0.9$ For $P(z > a) = 0.9$, then $a = -1.2815$ $-1.2815 = \frac{752 - \mu}{21.3}$ $\mu = 779.29595$ g	**M A**	Accept **CAO** without any working.
Six	Poisson distribution $\lambda = 0.5$ $P(X \geq 1) = 0.3935$ P (two consecutive months) $= 0.3935 \times 0.3935$ $= 0.1548$	**A** **M**	Accept **CAO** without any working.
Seven	$P(X \geq 1) = 0.17$ $P(X = 0) = 0.83$ $0.83 = \frac{e^{-\lambda} \times \lambda^0}{0!}$ $\lambda = 0.1863$ So the mean number of ferret attacks is 0.1863	**E M A**	Accept CAO without any working.

Eight	μ for distribution of 4 duck eggs and 2 goose eggs $= 4(82.8) + 2(146.3)$ $= 623.8$ g Var for distribution of 4 duck eggs and 2 goose eggs $= 6.98^2 + 6.98^2 + 6.98^2 + 6.98^2 + 1.96^2 + 1.96^2$ so σ for distribution of 4 duck eggs and 2 goose eggs $= \sqrt{6.98^2 + 6.98^2 + 6.98^2 + 6.98^2 + 1.96^2 + 1.96^2}$ $= 14.2325$ g $P(600 < X < 650)$ $= P(-1.6725 < Z < 1.8411)$ $= 0.45279 + 0.46720$ $= 0.91999$	**E M A**	Accept CAO without any working (may vary with rounding of σ).
Nine	Binomial Distribution because: • fixed number of trials, 10 eggs • there are only two outcomes for each trial / binary trials, double-yolk or not • probability of a success on each trial is constant, P(double-yolk) = 0.003 • events / trials are independent, occurrences of double-yolk eggs are independent / given. Parameters are (n =) 10, (p =) 0.003 **OR** $n = 10$, $p = 0.003$	**E**	Must state correct distribution **AND** Give at least 3 conditions, described in context. **AND** State both parameters. *Note: if suggesting a Poisson approximation, the candidate must first acknowledge the distribution is binomial and why, and then justify why an approximation could be used, giving the parameters of either the original binomial distribution, or the approximating distribution.*

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
Use probability distribution models to solve straightforward problems.	Use probability distribution models to solve problems.	Use and justify probability distribution models to solve complex problems.
2 **A**	3 **M** OR 2 **M** + 2 **A**	2 **E** + 3 **M** OR 2 **E** + 2 **M** + 2 **A**

The following Mathematics-specific marking conventions may also have been used in marking this paper:

- errors are circled
- a caret (^) indicates an omission
- **NS** indicates there is not sufficient evidence to award a grade
- **CON** indicates "consistency" where an answer is obtained using a prior – but incorrect – answer, and **NC** indicates the answer is not consistent with wrong working
- **CAO** indicates the "correct answer only" is given but that the Assessment Schedule indicates that more evidence is required
- # indicates that a correct answer is obtained but then further (unnecessary) working results in an incorrect final answer
- **RAWW** indicates "right answer, wrong working"
- **R** indicates "rounding error" and **PR** is "premature rounding", either of which results in a significant round-off error in the answer (if the question requires evidence for rounding)
- **U** indicates incorrect or omitted units (if the question requires evidence for units)
- **MEI** indicates where a minor error has been made and ignored.