

| Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Scheme                                                                                                                                                                                                     |                         | Marks  | AOs  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------|------|
| 2(a)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | $P(5 \leq X < 12) = P(X \leq 11) - P(X \leq 4)$                                                                                                                                                            |                         | M1     | 1.1b |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | $= 0.8939 - 0.0495$ = awrt <b><u>0.844</u></b>                                                                                                                                                             |                         | A1     | 1.1b |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                            |                         | (2)    |      |
| (b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | $H_0: p = 0.25$ $H_1: p > 0.25$ ( both correct in terms of $p$ or $p$ )                                                                                                                                    |                         | B1     | 2.5  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | $Y \sim B(40, 0.25)$                                                                                                                                                                                       |                         | M1     | 3.3  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b><u>Method 1</u></b>                                                                                                                                                                                     | <b><u>Method 2</u></b>  |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | $P(Y \geq 16) = 1 - P(Y \leq 15)$                                                                                                                                                                          | $P(Y \geq 17) = 0.0116$ | M1     | 1.1b |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | $= 1 - 0.9378$                                                                                                                                                                                             | $P(Y \geq 18) = 0.0047$ |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | $= 0.0262$                                                                                                                                                                                                 | CR: $Y \geq 18$         | A1     | 1.1b |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.0262 > 0.01    16 < 18 or 16 is not in the critical region or 16 is not significant, accept $H_0$ . There is no significant evidence that the proportion of people who bought organic eggs has increased |                         | A1 cso | 2.2b |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                            |                         | (5)    |      |
| (c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | There is evidence that the proportion of people who bought organic eggs has increased [since $0.05 > 0.0262$ or 16 is in critical region]                                                                  |                         | B1ft   | 2.2b |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                            |                         | (1)    |      |
| (8 marks)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                            |                         |        |      |
| Notes:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                            |                         |        |      |
| (a) <b>M 1:</b> For dealing with $P(5 \leq X < 12)$ they need to use the cumulative prob. Function on the calc.<br><b>A1:</b> awrt 8.44 ( from calculator).                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                            |                         |        |      |
| (b) <b>B1:</b> Both hypotheses correct using $p$ or $p$ <b>and</b> 0.25<br><br><b>M1:</b> Realising that the model $B(40, 0.25)$ is to be used. This may be stated or used.<br><b>M1:</b> Using or writing $1 - P(Y \leq 15)$ <b>or</b> $1 - P(Y < 16)$<br><br>a correct CR <b>or</b> $P(Y \geq 17) = 0.0116$ <b>and</b> $P(Y \geq 18) = 0.0047$<br><br><b>A1:</b> awrt 0.0262 <b>or</b> CR $Y \geq 18$ <b>or</b> $Y > 17$<br><br><b>A1cso:</b> A fully correct solution with a correct conclusion in context to include the idea of proportion and increased plus referring to organic |                                                                                                                                                                                                            |                         |        |      |
| (c) <b>B1ft:</b> For $0.0262 < 0.05$ [ft their probability in part(b)] <b>or</b> a CR of $16 \geq 15$ (allow $16 > 14$ ) <b>and</b> a correct contextual conclusion.                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                            |                         |        |      |