QUESTION 1

(a) 47.5 (cm) *(A1)* *[1 mark]*

(b) (i) 45.85 (cm) *(G2)*

Note: Accept 45.9

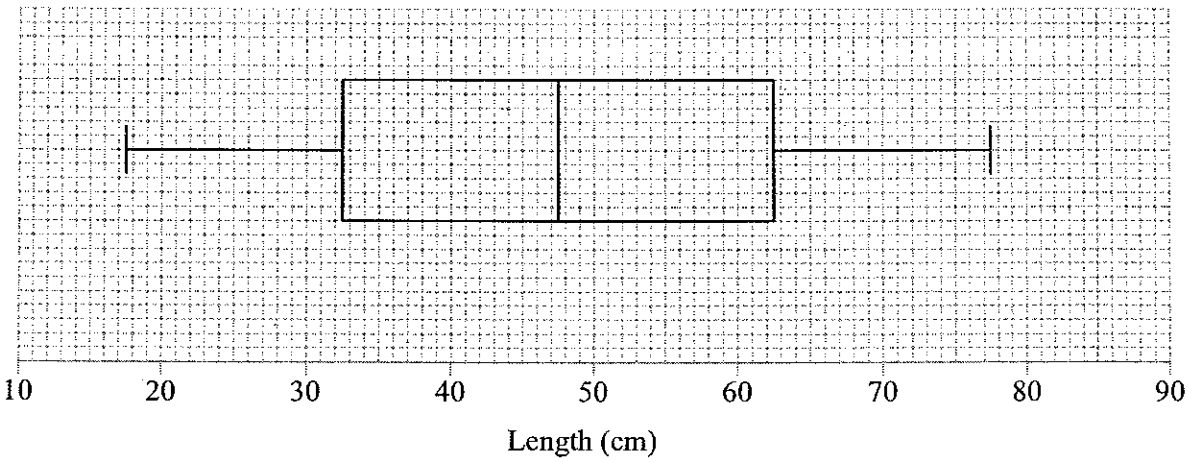
(ii) 17.1 (17.0888...) *(G1)*

(iii) 47.5 (cm) *(G1)* *[4 marks]*

(c) $62.5 - 32.5 = 30$ *(M1)(A1)(G2)* *[2 marks]*

Note: Award *(M1)* for correct quartiles seen.

(d)



(A1) for correct label and scale
(A1)(ft) for correct median
(A1)(ft) for correct quartiles and box
(A1) for endpoints at 17.5 and 77.5 joined to box by straight lines *(A1)(A1)*(ft)*(A1)*(ft)*(A1)* *[4 marks]*

Notes: The final *(A1)* is lost if the lines go through the box.
Follow through from their parts (b) and (c).

(e) $\varepsilon = \left|\frac{43 - 45.85}{45.85}\right| \times 100\,\%$ *(M1)*

Note: Award *(M1)* for their correct substitution in % error formula.

$= 6.22\,\%$ (6.21592...) *(A1)*(ft)*(G2)* *[2 marks]*

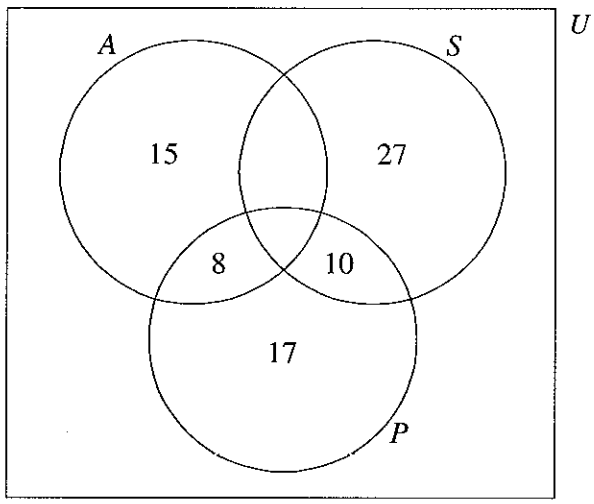
Notes: Follow through from their answer to part (b)(i).
Accept 6.32 % with use of 45.9

Total [13 marks]

QUESTION 2

Part A

(a)



(A1) for rectangle and three labelled intersecting circles
(A1) for 15, 27 and 17
(A1) for 10 and 8 *(A3)* ***[3 marks]***

(b) $48-(8+10+17)$ *or equivalent* *(M1)*
$=13$ *(A1)*(ft)*(G2)* ***[2 marks]***

(c) $50-(27+10+13)$ *(M1)*

Note: Award *(M1)* for working seen.

$=0$ *(A1)*
number of elements in A $=36$ *(A1)*(ft)*(G3)* ***[3 marks]***

Note: Follow through from (b).

(d) 21 *(A1)*(ft) ***[1 mark]***

Note: Follow through from (b) even if no working seen.

(e) 54 *(M1)(A1)*(ft)*(G2)* ***[2 marks]***

Note: Award *(M1)* for 17, 10, 27 seen. Follow through from (a).

Continued...

Question 2 continued

Part B

(a) $\frac{40}{120}\left(\frac{1}{3}, 0.333, 33.3\,\%\right)$ ***(A1)(A1)(G2)*** ***[2 marks]***

Note: Award ***(A1)*** for numerator, ***(A1)*** for denominator.

(b) $\frac{34}{120}\left(\frac{17}{60}, 0.283, 28.3\,\%\right)$ ***(A1)(A1)(G2)*** ***[2 marks]***

Note: Award ***(A1)*** for numerator, ***(A1)*** for denominator.

(c) $\frac{8}{28}\left(\frac{2}{7}, 0.286, 28.6\,\%\right)$ ***(A1)(A1)(G2)*** ***[2 marks]***

Note: Award ***(A1)*** for numerator, ***(A1)*** for denominator.

(d) customer satisfaction is **independent** of café ***(A1)*** ***[1 mark]***

Note: Accept "customer satisfaction is **not associated with** the café".

(e) 2 ***(A1)*** ***[1 mark]***

(f) 0.754 ***(G2)*** ***[2 marks]***

Note: Award ***(G1)(G1)(AP)*** for 0.75 or for correct answer incorrectly rounded to 3 s.f. or more, ***(G0)*** for 0.7.

(g) since $\chi^2_{calc} < \chi^2_{crit}$ (5.991) accept (or Do not reject) H_0 ***(R1)(A1)*(ft)**

Note: Follow through from their value in (e).

OR

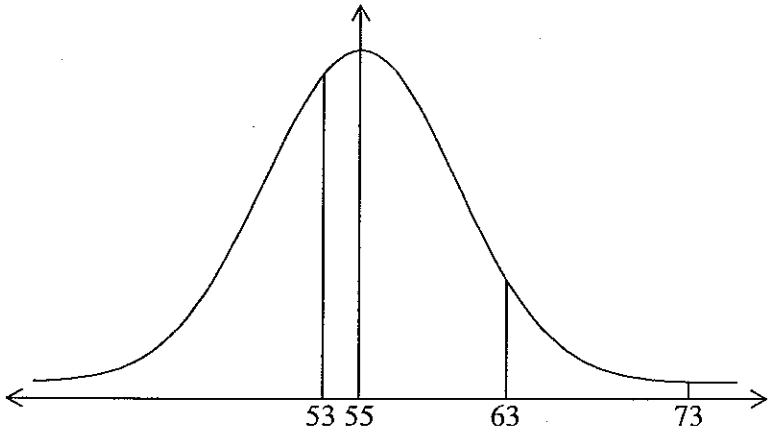
Accept (or Do not reject) H_0 as p-value $(0.686) > 0.05$ ***(R1)(A1)*(ft)** ***[2 marks]***

Notes: Do not award ***(A1)(R0)***.
Award the ***(R1)*** for comparison of appropriate values.

Total [23 marks]

QUESTION 3

(a)



(A1) for normal curve with mean of 55 indicated
(A1) for three lines in approximately the correct position
(A1) for labels on the three lines *(A1)(A1)(A1)* *[3 marks]*

(b) (i) $P(53 \leq \text{Weight} < 63) = 0.486$ (0.485902...) *(M1)(A1)(G2)*

Note: Award *(M1)* for correct region indicated on labelled diagram.

(ii) $P(\text{Weight} > 73) = 0.00506$ (0.00506402...) *(M1)(A1)(G2)* *[4 marks]*

Note: Award *(M1)* for correct region indicated on labelled diagram.

(c) $P(\text{Weight} > w) = 0.3$ *(M1)*

$w = 58.7$ (58.6708...) *(A1)(G2)* *[2 marks]*

Note: Award *(M1)* for correct region indicated on labelled diagram.

(d) Expected number of large size eggs

$= 2000(0.121)$ *(M1)*

$= 242$ *(A1)(G2)* *[2 marks]*

(e) Expected income

$= 2000 \times 0.30 \times 0.388 + 2000 \times 0.50 \times 0.486 + 2000 \times 0.65 \times 0.121 + 2000 \times 0.80 \times 0.00506$ *(M1)(M1)*

Note: Award *(M1)* for their correct products, *(M1)* for addition of 4 terms.

$= 884.20$ USD *(A1)*(ft)*(G3)* *[3 marks]*

Note: Follow through from part (b).

Total [14 marks]

Question 4.

(a) common difference $= 3$ (may be implied) *(A1)*

$u_{11} = 31$ *(A1)(G2)* *[2 marks]*

(b) (i) $\frac{100}{2}(3\times 100 - 1)$ **OR** $\frac{100(2+99\times 3)}{2}$ *(M1)*

14 950 *(A1)(G2)*

(ii) (a) $\frac{n}{2}(3n-1) = 477$ **OR** $\frac{n}{2}\left(2+3(n-1)\right) = 477$ *(M1)*

$3n^2 - n = 954$ *(M1)*

$3n^2 - n - 954 = 0$ *(AG)*

Notes: Award second *(M1)* for correct removal of denominator **or** brackets and no further incorrect working seen.
Award at most *(M1)(M0)* if last line not seen.

(b) 18 *(G2)* *[6 marks]*

Note: If both solutions to the quadratic equation are seen and the correct value is not identified as the required answer, award *(G1)(G0)*.

Total [18 marks]