HIGHER

H13-10min Capture Recapture: 10-minute Pack

Total Marks

EDEXCEL 1ST0 · Calculator allowed · about 10 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 An angling club wants to estimate the number of perch living in a small lake. In the first catch, 60 perch are caught, marked, and returned to the lake. In the second catch, 45 perch are caught, of which 12 are already marked.

(a) Use the capture-recapture formula to estimate the number of perch in the lake. **(2)**

.....

(b) Give one reason why this value is only an estimate of the true number of perch in the lake, rather than an exact count. **(1)**

(Total for Question 1 is 3 marks)

---

2 Give two ways in which a research team could improve the reliability of a capture-recapture population estimate.

(Total for Question 2 is 2 marks)

---

3 A team estimates the number of otters along a stretch of river. In the first catch, 37 otters are marked. In the second catch, 52 otters are caught, of which 9 are already marked.

(a) Work out an estimate for the number of otters, giving your answer to the nearest whole number. **(2)**

.....

(b) Explain why it makes sense to round your answer in part (a) to a whole number. **(1)**

(Total for Question 3 is 3 marks)

4 In a capture-recapture survey of frogs, some of the marks used in the first catch fade and become hard to see before the second catch takes place.

(a) Explain why this would cause the value of m recorded in the second catch to be smaller than it should be. **(1)**

(b) Hence explain whether this fault would cause the capture-recapture method to overestimate or underestimate the true population. **(2)**

(Total for Question 4 is 3 marks)

Mark scheme · H13-10min Capture Recapture: 10-minute Pack

Question 1

- (a) **M1** (60 x 45) / 12, oe
- (a) **A1** 225 cao
- **(a) Answer: 225**
- (b) **B1** valid reason, e.g. the method relies on catching and marking only a sample of the fish, rather than counting every fish in the lake, so it can only give an approximate figure, oe
- **(b) Answer: e.g. it is based on catching a sample of fish, not counting every fish in the lake**

Question 2

- **B1** any valid method, e.g. use larger sample sizes for n1 and/or n2, oe
- **B1** any different valid method, e.g. reduce the time between the two catches so fewer births, deaths, or movements can occur; repeat the survey and average several estimates; use a marking method that does not affect behaviour or survival, oe
- **Answer: e.g. use larger sample sizes; reduce the time between the two catches; repeat the survey and average the estimates (any two)**

Question 3

- (a) **M1** (37 x 52)/9, oe (= 213.7...)
- (a) **A1** 214 cao (awrt)
- **(a) Answer: 214**
- (b) **B1** valid explanation, e.g. you cannot have a fraction of an otter, so the population estimate must be a whole number of animals, oe
- **(b) Answer: e.g. you cannot have a fraction of an otter; the population must be a whole number**

Question 4

- (a) **B1** valid explanation, e.g. some frogs that are actually marked will not be recognised as marked because their mark has faded, so they get wrongly counted as unmarked, oe
- **(a) Answer: e.g. faded marks mean some truly marked frogs are wrongly recorded as unmarked**
- (b) **B1** overestimate identified
- (b) **B1** correct reasoning, e.g. since m is in the denominator of N = (n1 x n2)/m, a smaller recorded value of m makes N come out larger than it should be, oe
- **(b) Answer: Overestimate**