

# Capture - Recapture

Question 1: Hannah wants to estimate the number of eels in a lake.  
She catches and rings 50 eels.  
She returns the 50 eels to the lake.  
The next day Hannah catches 400 eels.  
Of these 400 eels, 10 are ringed.



Work out an estimate for the total number of eels in the lake.

Catches 50 eels

Takes sample

and  $\frac{10}{400}$  are ringed

Assume  $\frac{10}{400}$  of population are ringed

So  $50 = \frac{10}{400}$  of population

$$\frac{50 \times 400}{10} = \text{population}$$

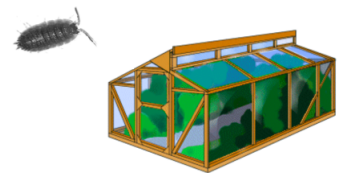
estimate of population = 2000

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## The essentials of the calculation

Multiply the number tagged by the second sample size and divide by the number of tagged items in second sample.

Question 2: Tom wants to estimate the number of woodlice in a greenhouse.  
He catches and marks 32 woodlice.  
The woodlice are then returned to the greenhouse.  
The next day Tom catches 20 woodlice.  
8 of these are marked.



Work out an estimate for the total number of woodlice in the greenhouse.

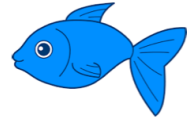
Marked 32

Second sample

$\frac{8}{20}$  marked

$$\text{Estimated population} = 32 \times \frac{20}{8} = 80$$

Question 3: A scientist wants to estimate the total number of fish in a pond.  
On Thursday, she catches 180 fish.  
These fish are marked and returned to the pond.  
On Friday, the scientist catches 305 fish.  
45 of these fish are marked.



- (a) Work out an estimate for the total number of fish in the pond  
(b) What assumptions have you made?

a) 180 marked

Fraction of marked fish  
in second sample

$$= \frac{45}{305}$$

$$\text{Estimated population} = 180 \times \frac{305}{45} = 1220$$

- b) Fish will redistribute themselves throughout the pond so the second sample is a random sample of all fish in the pond.

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Add on question to Q1 about the eels

Catches 50 eels  
and rings them

Second sample  $\frac{10}{400}$  ringed

$$\text{Estimated population} = 50 \times \frac{400}{10} = 2000$$

If some rings slipped off overnight would

your 2000 estimate be an overestimate or an under estimate?

Suppose 20 rings slipped off. It would be the same as ringing only 30. Estimate would be  $30 \times \frac{400}{10}$   
 $= 1200$

So 2000 is an overestimate

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