



# Capture-Recapture



← **REVISE THIS TOPIC**



1 Peter wants to know how many rabbits are in a field.

On Saturday he catches 9 rabbits from the field.  
He puts a tag on each rabbit and returns it to the field.

On Sunday he catches 12 rabbits from the same field.  
He finds that 4 of these rabbits have been tagged.

(a) Work out an estimate for the total number of rabbits in the field.

$$\frac{9}{x} = \frac{4}{12}$$

$$\frac{x}{9} = \frac{12}{4}$$

$$\frac{x}{9} = 3$$

$$x = 27$$

.....  
27  
(3)

(b) Write down an assumption that you have made when calculating your answer to part (a)

.....  
none of tags are removed or fall off  
.....  
.....

(1)  
(Total for Question 1 is 4 marks)



2 Zoe wants to know how many fish are in a lake.



One day she catches 30 fish.  
She puts a mark on each fish and returns it to the lake.

The following day she catches 40 fish from the same lake.  
She finds that 25 of these fish have been marked.

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

$$\frac{30}{x} = \frac{25}{40}$$

$$\frac{x}{30} = \frac{40}{25}$$

$$x = \frac{40 \times 30}{25}$$

$$x = \frac{1200}{25}$$

$$25 \overline{) 1200} \begin{array}{r} 48 \\ 100 \\ 200 \end{array}$$

48

(Total for Question 2 is 3 marks)

3 Jonathan wants to know how many turtles are on a beach.



One day he catches 18 turtles.  
He puts a mark on each turtle and returns it to the beach.

The following week he catches some turtles from the same beach.  
He finds that 20% of these turtles have been marked.

Work out an estimate for the total number of turtles on the beach.

$$\frac{18}{x} = \frac{1}{5}$$

$$\frac{x}{18} = \frac{5}{1}$$

$$x = \frac{5}{1} \times 18$$

$$x = 90$$

90

(Total for Question 3 is 3 marks)



4 Timon wants to know how many meerkats are in the desert.

One week he catches 150 meerkats.  
He puts a tag on each meerkat and returns it to the desert.

The following week he catches 120 meerkats from the same desert.  
He finds that 45 of these meerkats have been tagged.

Work out an estimate for the total number of meerkats in the desert.

$$\frac{150}{x} = \frac{45}{120}$$

$$\frac{x}{150} = \frac{120}{45}$$

$$x = \frac{120 \times 150}{45}$$

$$x = 400$$

400

(Total for Question 4 is 3 marks)

5 Robin wants to know how many bats live in a cave.

On Thursday he catches 84 bats from the cave.  
He puts a tag on each bat and returns it to the cave.

On Friday he catches 60 bats from the same cave.  
He finds that 7 of these bats have been tagged.

Work out an estimate for the total number of bats in the cave.

$$\frac{84}{x} = \frac{7}{60}$$

$$\frac{x}{84} = \frac{60}{7}$$

$$x = \frac{60 \times 84}{7}$$

$$x = 720$$

720

(Total for Question 5 is 3 marks)





6 Taylor wants to know how many goats live in the mountains.

One week she catches 30 goats from the mountains. She puts a mark on each goat and returns it to the mountains.

The following week she catches 64 goats from the mountains. She finds that 2 of these goats have been marked.

(a) Work out an estimate for the total number of goats in the mountains.

$$\frac{30}{x} = \frac{2}{64}$$

$$\frac{x}{30} = \frac{64}{2}$$

$$\frac{x}{30} = 32$$

$$x = 32 \times 30$$

$$x = 960$$

960

(3)

Taylor assumes that none of the marks have rubbed off between her captures.

(b) If Taylor's assumption is wrong, explain what effect this would have on your answer to part (a)

If marks did rub off then the answer to part (a) would decrease

(1)

(Total for Question 6 is 4 marks)



7 Donald wants to know how many ducks there are at a nature park.

On Tuesday catches some ducks from the nature park.  
He puts a mark on each duck and returns it to the nature park.

On Wednesday he catches 44 ducks from the nature park  
He finds that 3 of these ducks have been marked.

Donald estimates that there are 352 ducks at the nature park.

Work out the number of ducks that Donald marked on Tuesday.

$$\frac{x}{352} = \frac{3}{44}$$

$$x = \frac{3 \times 352}{44}$$

$$x = 24$$

24

(Total for Question 7 is 3 marks)

8 Betty wants to know how many termites live in a nest.

On Monday she catches 150 termites from the nest.  
She puts a mark on each termite and returns it to the nest.

On Tuesday she catches some termites from the nest.  
She finds that 6 of these termites have been marked.

Betty estimates that there are 8750 termites in the nest.

(a) Work out the number of termites that Betty caught on Tuesday.

$$\frac{150}{8750} = \frac{6}{x}$$

$$\frac{8750}{150} = \frac{x}{6}$$

$$x = \frac{8750 \times 6}{150}$$

$$x = 350$$

350

(Total for Question 8 is 3 marks)



9 Peppy wants to know how many hares there are in a park.

On Monday he catches 24 hares from the park.  
He puts a mark on each hare and returns it to the park.

On Tuesday he catches 36 hares from the park.  
He finds that  $x$  of these hares have been marked.

Peppy estimates the number of hares in the park.  
Peppy's answer is a number between 40 and 50

Write down all of possible values for  $x$ .

$$\frac{24}{n} = \frac{x}{36}$$

$$\frac{n}{24} = \frac{36}{x}$$

$$n = \frac{36 \times 24}{x}$$

$$n = \frac{864}{x}$$

$$40 < n$$

$$40 < \frac{864}{x}$$

$$x < \frac{864}{40}$$

$$x < 21.6$$

$$50 > n$$

$$50 > \frac{864}{x}$$

$$x > \frac{864}{50}$$

$$x > 17.28$$

$$17.28 < x < 21.6$$

$x$  must be an integer

$$\underline{18, 19, 20, 21}$$

(Total for Question 9 is 3 marks)

10 Slippy wants to know how many toads there are in a pond

On Saturday he catches 30 toads from the pond.  
He puts a mark on each toad and returns it to the pond.

On Sunday he catches 40 toads from the pond.  
He finds that 32 of these toads have been marked.

Explain how you know Slippy must have made a mistake.

If 30 were marked on Saturday there cannot be 32 marked on Sunday as this is greater. The max would be 30.

(Total for Question 10 is 1 mark)



11 Ash wants to know how many Pokémon are in the Safari Zone.

On Monday he catches 20 Pokémon in the Safari Zone.  
He puts a mark on each Pokémon and returns it to the Safari Zone.

On Tuesday morning he catches 24 Pokémon in the Safari Zone.  
He finds that 16 of these Pokémon have been marked.  
He does not return these 24 Pokémon to the Safari Zone.

On Tuesday afternoon Ash intends to continue to catch more Pokémon in the Safari Zone until he has caught them all.

Ash estimates that it takes him 12 minutes to catch each remaining Pokémon.  
Ash starts catching Pokémon at 1pm.

Work out an estimate for the time at which Ash will catch the final Pokémon in the Safari Zone.

$$\frac{20}{x} = \frac{16}{24}$$

$$\frac{x}{20} = \frac{24}{16}$$

$$x = \frac{24 \times 20}{16}$$

$$x = 30$$

Caught 24

Total 30

$$30 - 24 = 6 \text{ remaining}$$

$$6 \times 12 \text{ mins} = 72 \text{ mins}$$

$$= 1 \text{ hrs } 12 \text{ mins}$$

$$1 \text{ pm} + 1 \text{ h } 12$$

$$= 2:12 \text{ pm}$$

2:12 pm

(Total for Question 11 is 5 marks)



12 A farmer wants to know how many mice are on his farm.

On Monday he catches 60 mice from the farm.  
He puts a mark on each mouse and returns them the farm.

On Tuesday he catches 80 mice from the farm.  
He finds that 32 of these mice have been marked.

On Tuesday the farmer works out an estimate for how many mice are on the farm.  
Before releasing the 80 mice the farmer ensures that all of them are marked.

On Wednesday he catches 45 mice.  
He works out a new estimate for how many mice are on the farm.  
His estimate on Wednesday is 20% greater than his estimate Tuesday.

Work out the number of mice caught on Wednesday that were marked.

$$\frac{60}{x} = \frac{32}{80}$$

$$\frac{x}{60} = \frac{80}{32}$$

$$x = \frac{80 \times 60}{32}$$

$$x = 150$$

$$80 - 32 = 48 \text{ marked}$$

(but not in capture 2)

$$48 + 60 = 108 \text{ marked total}$$

$$150 + 20\%$$

$$= 150 + 30$$

$$= 180$$

$$\frac{108}{180} = \frac{y}{45}$$

$$y = \frac{108 \times 45}{180}$$

$$y = 27$$





13 Claudia wants to know how many hedgehogs are in a park.

On Monday she catches 35 hedgehogs from the park.  
She puts a mark on each hedgehog and returns them to the park.

On Tuesday she catches some hedgehogs from the park.  
She finds that 5 of the hedgehogs have not been marked.

Claudia estimates that there are 60 hedgehogs in the park.

Work out how many hedgehogs Claudia caught on Tuesday.

$$\frac{35}{60} = \frac{x-5}{x}$$

$$35x = 60(x-5)$$

$$35x = 60x - 300$$

$$35x + 300 = 60x$$

$$300 = 25x$$

$$x = \frac{300}{25}$$

12

(Total for Question 13 is 4 marks)

