Fisheries calculations

Multiple-choice format for relative growth rate, absolute growth rate, and instantaneous growth rate of fish:

Question 1: Relative Growth Rate

During a study, the initial average length of a group of fish was measured as 10 centimetres. After 8 months, their average length increased to 20 centimetres. What is the relative growth rate of these fish?

a) 149%
b) 150%
c) 130%
d) 110%

During a study, the initial average length of a group of fish was recorded as 12 centimetres. After 10 months, their average length increased to 24 centimetres. If the absolute growth in length is calculated as the change in length per unit of time (usually per year), what is the relative growth rate of these fish?

a) 50%
b) 75%
c) 120%
d) 150%

During a study, the fish population showed a relative growth rate of 80% per year. After 3 years, their average length had increased to 28 centimetres. Calculate the initial average length of these fish.

a) 12.5 centimeters
b) 15 centimeters
c) 16 centimeters
d) 18 centimeters

Solution

1. Given data:

Initial average length (L1) = 10 centimeters

Final average length (L2) = 20 centimeters

Time interval (Δt) = 8 months (which is 8/12 years)

The formula for absolute growth rate is:

Absolute Growth Rate = (Change in length) / Time interval

Absolute Growth Rate = (L2 - L1) / Δt

Absolute Growth Rate = (20 - 10) / (8/12) = 10 / (2/3) = 15 centimeters per year

Now, let's calculate the relative growth rate using the formula:

Relative Growth Rate = (Absolute Growth Rate / Initial length) * 100%

Relative Growth Rate = (15 / 10) * 100% = **150%**

Question 2: Absolute Growth Rate

In a controlled experiment, the initial average weight of a group of fish was 80 grams. After 4 months, their average weight increased to 160 grams. Calculate the absolute growth rate of these fish in terms of weight per month.

a) 20 grams per month
b) 30 grams per month
c) 40 grams per month
d) 50 grams per month

During an experiment, the initial average weight of a group of fish was 100 grams. After 8 months, their average weight increased to 220 grams. Calculate the absolute growth rate of these fish in terms of weight per month.

a) 15 grams per month
b) 20 grams per month
c) 25 grams per month
d) 30 grams per month

A batch of fish began with an average weight of 70 grams. The absolute growth rate of these fish is 12 grams per month. If the observation period was 7 months, what is the final average weight of these fish?

a) 154 grams
b) 174 grams
c) 144 grams
d) 184 grams

Solution

Let's calculate the absolute growth rate using the provided data:

Given data:

Initial average weight (W1) = 80 grams

Final average weight (W2) = 160 grams

Time interval (Δt) = 4 months

The formula for calculating the absolute growth rate is:

Absolute Growth Rate = (Change in weight) / Time interval

Absolute Growth Rate = (W2 - W1) / Δt

Absolute Growth Rate = (160 - 80) / 4 = 80 / 4 = 20 grams per month

Correct Answer**: a) 20 grams per month**

Question 3: Instantaneous Growth Rate

3. The fish population in a pond is growing rapidly. At an initial moment in time (t=0), the average length of the fish is 10 centimetres. A short time later (t=1 year), it is measured again, and the average length has increased to 14 centimetres. Calculate the instantaneous growth rate of these fish at that moment.

a) 0.39 cm per year
b) 0.33 cm per year
c) 0.34 cm per year
d) 0.54 cm per year

For question 3 above, calculate the specific growth rate:

a) 39%
b) 33%
c) 34%
d) 54%

. In a pond, the fish population is experiencing rapid growth. At the initial time (t=0), the average length of the fish is 12 centimetres. A short time later (t=0.5 years), the fish are measured again, and the average length has increased to 18 centimetres. Calculate the instantaneous growth rate of these fish at that moment.

a) 0.71 cm per year
b) 0.72 cm per year
c) 0.82 cm per year
d) 0.81 cm per year

Solution

3. Given data:

Initial length (L1) = 10 centimeters

Final length (L2) = 14 centimeters

Time interval (Δt) = 1 year

The formula for calculating the instantaneous growth rate is:

Instantaneous Growth Rate = $(\ln(L2) - \ln(L1)) / \Delta t$

Using this formula, let's calculate the instantaneous growth rate:

Instantaneous Growth Rate = $(\ln(14) - \ln(10)) / 1$

Using a calculator:

Instantaneous Growth Rate $\approx (2.639057 - 2.302585) / 1$

Instantaneous Growth Rate ≈ 0.336472

Answer is 0.34

When this rate is multiplied by 100, it is called the specific growth rate & it is given in %.

3b solution 34%

Multiple-choice format for relative and instantaneous mortality

Compiled by Ebenezer

Question 4: Relative Mortality

In a fisheries study, the initial population of fish was 500 individuals. Over some time, the population decreased to 300 individuals. Calculate the relative mortality rate of these fish.

a) 0.2
b) 0.3
c) 0.4
d) 0.5

What would be the survival of the fish

a. 0.59
b. 0.3
c. 0.4
d. 0.6

In a research project, a fish population initially had 800 individuals. After a certain period, the population decreased to 600 individuals. Calculate the relative mortality rate of these fish.

a) 0.25
b) 0.30
c) 0.40
d) 0.50

Solution

Given data:

Initial population = 500 individuals

Final population = 300 individuals

The formula for calculating the relative mortality rate is:

Relative Mortality Rate = (Initial population - Final population) / Initial population

Relative Mortality Rate = (500 - 300) / 500 = 200 / 500 = 0.4

Correct Answer: The relative mortality rate of these fish is 0.4, or 40%.

Question 5: Instantaneous Mortality

In a population of fish, the initial number of individuals was 1000. After a certain period, the population decreased to 700 individuals. If the time interval is 2 years, calculate the instantaneous mortality rate of these fish.

a) 15.41% per year
b) 20.63% per year
c) 25.00% per year
d) 30.81% per year

In a fish population, the initial number of individuals was 1200. After a certain period, the population decreased to 800 individuals. If the time interval is 3 years, calculate the instantaneous mortality rate of these fish.

e) 20.47% per year
f) 25.00% per year
g) 30.27% per year
h) 35.11% per year

Solution

Understood, let's calculate the instantaneous mortality rate using the given data and the formula $Nt = N0 * e^{(-Z * t)}$:

Given data:

The initial number of individuals (N0) = 1000

The final number of individuals (Nt) = 700

Time interval (t) = 2 years

The formula for calculating the instantaneous mortality rate (Z) is:

$Z = -\ln(Nt / N0) / t$

Using this formula, let's calculate the instantaneous mortality rate:

$Z = -\ln(700 / 1000) / 2$

Using a calculator:

$Z \approx -\ln(0.7) / 2$

$Z \approx 0.15407$

The formula for calculating the instantaneous mortality rate is:

Instantaneous Mortality Rate = Z * 100

Instantaneous Mortality Rate = 0.15407 * 100 ≈ 15.41%

Correct Answer: **a) 15.41% per year**

Question 5: Fishing Effort

In a fishing area with an area of 500 square kilometres, the fishing effort is 1200 hours per square kilometre. Calculate the fishing intensity in terms of fishing effort per unit area.

a) 0.0024 hours per square kilometre
b) 0.24 hours per square kilometre
c) 2.4 hours per square kilometre
d) 24 hours per square kilometre

In a fishing ground, the fishing effort is 1500 hours and the area is 0.5 square kilometres. Determine the fishing intensity in terms of fishing effort per unit area.

a) 3000 hours per square kilometre
b) 750 hours per square kilometre
c) 375 hours per square kilometre
d) 150 hours per square kilometre

Solution

Given data:

Fishing effort = 1200 hours

Area = 500 square kilometres

Fishing Intensity = Fishing effort / Area

Fishing Intensity = 1200 / 500 = 2.4 hours per square kilometer

Correct Answer: **c) 2.4 hours per square kilometre**

Question 5: Fish Population Size

In a fish population study, 800 fish were captured and marked in the first sample. In the resampling event, 200 fish were captured, and among them, 40 were previously marked. Calculate the estimated population size

a) 1000 fish

b) 1600 fish

c) 1200 fish

d) 4000 fish

In a wildlife survey, 1200 animals were captured and marked in the initial sample. In the subsequent capture, 300 animals were caught, out of which 50 had been marked earlier. Calculate the estimated population size

a) 600 fish

b) 2400 fish

c) 7200 fish

d) 4800 fish

Solution

Given data:

M = 800 (number of fish captured and marked in the first sample)

R = 200 (number of fish captured in the resampling event)

m = 40 (number of "R" that were already marked)

Using the formula M / N = m / R:

800 / N = 40 / 200

Solving for N:

N = (800 * 200) / 40

N = 4000 fish

Correct Answer: **d) 4000 fish**

Question 5: Catch per unit effort

In a fishing expedition, 300 fish were caught using an effort. The catchability coefficient for this type of fish is 0.6. If the absolute abundance of fish in the stock is 1200, calculate the catch per unit effort (C/f)

a) 720 fish per hour
b) 740 fish per hour
c) 610 fish per hour
d) 640 fish per hour

During a fishing operation, fish were caught using an effort of 80 hours. The catchability coefficient for this fish species is 0.5. If the absolute abundance of fish in the stock is 2000, calculate the catch per unit effort (C/f)

a) 90 per hour
b) 1000 fish per hour
c) 1200 fish per hour
d) 3000 fish per hour

Solution

Given data:

f (effort expended) = 50 hours

q (catchability coefficient) = 0.6

B (abundance of fish) = 1200

Using the formula C/f = qB:

C/f = 0.6 * 1200 = 720 fish per hour

Correct Answer: **The catch per unit effort is 720 fish per hour.**

Question 5: Catchability

In a fishing study, the catch per unit effort (C/f) is measured as 25 fish per hour. The abundance of fish (B) in the stock is estimated to be 1200. Calculate the catchability coefficient (q)

a) 0.0209

b) 0.0219

c) 0.0208

d) 0.0218

In a fishing research project, the catch per unit effort (C/f) is recorded as 15 fish per hour. The estimated abundance of fish (B) in the stock is 1800. Calculate the catchability

a) 0.0083
b) 0.0084
c) 0.0073
d) 0.0074

Solution

let's calculate the catchability coefficient (q) using the provided data and the formula C/f = qB:

Given data:

C/f (catch per unit effort) = 25 fish per hour

B (abundance of fish) = 1200

Using the formula C/f = qB:

$q = C/f / B$

$q = 25 / 1200 \approx 0.0208$

Correct Answer: **a) 0.0208**