

Survival by Numbers

Use evidence to track natural selection.

HIGH SCHOOL · HS-LS4-2

HS-LS4-2 "Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number..."

NAME _____

DATE _____

COMPARE THE EVIDENCE

Mutation and sexual reproduction create heritable variation in populations. Populations can produce more offspring than limited resources can support, so compare survival rates and offspring totals to predict which traits will become more common.

WORKED EXAMPLE

A lizard population starts with 28 lizards. After a heat wave, 21 survive. What fraction and percent survive?

1. Write surviving/starting: 21/28.
2. Divide top and bottom by 7: 3/4.
3. Convert: $3/4 \times 100 = 75\%$.

Answer: 3/4, or 75%, survive.

PRACTICE 5 problems

- 1** Six crickets each produce 4 young. How many young could be added to the population?

ANSWER _____

- 2** Among 18 insects, a mutation gives 5 a heritable enzyme that digests a new food. What fraction has the enzyme?

ANSWER _____

- 3** Thirty-two hatchlings compete for algae that can feed 14. How many hatchlings cannot be supported?

ANSWER _____

- 4** Of 18 narrow-beaked birds, 12 survive. Of 16 wide-beaked birds, 8 survive. Which type has the higher survival rate?

ANSWER _____

- 5** After a drought, 11 deep-rooted plants survive. Each makes 3 seeds. How many seeds do they make?

ANSWER _____

APPLY IT Show your work

1

In a school garden, 12 waxy-leaf and 12 nonwaxy-leaf seedlings grow during a drought. Water supports only 15 plants. Nine waxy-leaf plants and 6 nonwaxy-leaf plants survive. Each survivor makes 2 seeds, and leaf texture is inherited. In 2 sentences, identify the trait expected to become more common and use the survival and seed evidence.

WORK SPACE

ANSWER _____

2

A student aquarium club tracks a sexually reproducing guppy population with heritable dark spots or light spots. There are 20 guppies of each type, but only 20 safe shelter spaces. Fifteen dark-spotted and 5 light-spotted guppies survive, and each survivor produces 4 offspring. In 2 sentences, calculate each offspring total and explain which trait should become more common.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

In a moth population, mutation and sexual reproduction produce heritable pale and dark color variation. Ten of each color are born. The habitat can feed only 12 adults. After the habitat darkens, 8 dark and 4 pale moths survive, and each survivor produces 5 offspring. Write exactly 3 sentences explaining how all four factors lead dark color to become more common.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Six crickets each produce 4 young. How many young could be added to the population?	24 young
2	Among 18 insects, a mutation gives 5 a heritable enzyme that digests a new food. What fraction has the enzyme?	5/18
3	Thirty-two hatchlings compete for algae that can feed 14. How many hatchlings cannot be supported?	18 hatchlings
4	Of 18 narrow-beaked birds, 12 survive. Of 16 wide-beaked birds, 8 survive. Which type has the higher survival rate?	Narrow-beaked birds, 2/3 versus 1/2
5	After a drought, 11 deep-rooted plants survive. Each makes 3 seeds. How many seeds do they make?	33 seeds

PART 2 • APPLY IT

- Waxy leaves are expected to become more common. Limited water left 9/12 waxy-leaf plants but 6/12 nonwaxy-leaf plants, so waxy-leaf plants made 18 seeds compared with 12.** Survival rates are 9/12 and 6/12. Multiply each survivor total by 2 to compare seed totals.
- Dark-spotted guppies produce 60 offspring, while light-spotted guppies produce 20. Because safe shelter is limited and spot pattern is heritable, the dark-spotted survivors reproduce more, so dark spots should become more common.** Multiply 15 by 4 and 5 by 4. The higher-reproducing inherited trait is expected to increase.

CHALLENGE

Mutation and sexual reproduction created heritable variation in color. Although 60 offspring could be produced, food supports only 12 adults, so competition occurs. Dark moths survived at 8/10 compared with 4/10 pale moths and produced 40 of 60 offspring, so dark color is likely to become more common.

Accept equivalent fractions and correctly simplified survival rates. Explanations should connect heritable variation, limited resources, different survival or reproduction, and an expected change in trait frequency.