\*\* CLASS COPY- PLEASE DO NOT WRITE ON\*\*

**Natural Selection of the Carmel Origami Bird**

**Introduction:**

The Carmel Origami Bird (Avis papyrus) lives on the Cool Creek Islands. It feeds on berries and drinks from

natural springs. You might spot one if you’re at the Flowing Well. Only those birds that can successfully fly the

long distance between the sparsely spaced islands will be able to live long enough to breed. In this lab, you will breed several generations of Origami Birds and observe the effect the birds’ form on the evolutionary success of these animals.

**Materials:**

scotch tape, 1 die , 1 meter stick, computer paper, 3 straws, 1 coin

**Procedure:**

1. Make the ancestral bird (the original inhabitant) using these instructions:

a. Cut two strips of paper, each strip 2 cm x 20 cm.

b. Loop one strip of paper with a 1-cm overlap and tape.

c. Repeat for the other strip of paper.

d. Tape each strip 3 cm from each end of the straw.

2. Each bird lays three eggs in each generation. Breed offspring using these instructions:

a. Number the straws 1-3. (Straw 1 is the ancestral bird made in step 1).

b. Mark the head and tail of each straw.

c. The first egg has no mutations. It is a clone of the parent. Use the ancestral (bird from step 1) to save time.

d. The other two chicks have mutations. Determine the mutations by flipping your coin and throwing your die.

Make your birds according to the information below. Record your birds’ dimensions in your data table.

|  |  |
| --- | --- |
| **Coin Flip****(determines where mutation occurs)** | **Die Throw** **(determines how the mutation affects the wings)** |
| head = front wing mutation  | 1 = wing position moves 1 cm toward the end of the straw |
| tail = back wing mutation  | 2 = wing position moves 1 cm toward the middle of the straw |
| 3 = circumference (distance around the wing) increases 2 cm |
| 4 = circumference (distance around the wing) decreases 2 cm |
| 5 = width of wing increases 1 cm |
| 6 = width of wing decreases 1 cm |

3. Test the birds. Release the birds with a gentle, overhand pitch. It is important to release the birds as uniformly as possible (validity). Practice until you feel you can consistently get a good throw. Test each bird at least twice (reliability). Record your data in your data table. **Report your distances to the nearest cm.**

4. The most successful bird is the one that can fly the farthest. It survives long enough to become the parent for the next generation. All other birds die. Circle the surviving bird in your data table.

5. Repeat steps 2-5 for 3 more generations. The most successful bird becomes the parent of the next generation. The successful bird has 3 eggs: one without mutations (identical to the parent) and 2 with mutations (see step 2). Sometimes, mutations are lethal: the chick will not hatch. This will happen if a mutation causes a wing to fall off a straw, if the circumference of the wing is smaller than the circumference of the straw, or any other impossible combination. Fortunately, Avis papyrus is known to “double clutch” when an egg is lost. The bird lays another egg to replace the lost one. If you get a lethal mutation, disregard it and breed another chick

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**Data Table: Dimensions of birds vs. Distance birds flew**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Dimensions of the birds (cm)** | **Distance Birds Flew (cm)** |
|  |  | Front wing to head | Back wing to tail | Circumference of front wing | Circumference of back wing | Width of front wing | Width of back wing | Trial 1 | Trial 2 | Average |
| **Generation 1** | Bird 1 |  |  |  |  |  |  |  |  |  |
| Bird 2 |  |  |  |  |  |  |  |  |  |
| Bird 3 |  |  |  |  |  |  |  |  |  |
|  |  |  |
| **Generation 2** | Bird 1 |  |  |  |  |  |  |  |  |  |
| Bird 2 |  |  |  |  |  |  |  |  |  |
| Bird 3 |  |  |  |  |  |  |  |  |  |
|  |
| **Generation 3** | Bird 1 |  |  |  |  |  |  |  |  |  |
| Bird 2 |  |  |  |  |  |  |  |  |  |
| Bird 3 |  |  |  |  |  |  |  |  |  |
|  |
| **Generation 4** | Bird 1 |  |  |  |  |  |  |  |  |  |
| Bird 2 |  |  |  |  |  |  |  |  |  |
| Bird 3 |  |  |  |  |  |  |  |  |  |

**\*\*\* CIRCLE YOUR MOST SUCCESSFUL BIRD FROM THE FOURTH GENERATION**

**Graph:**

On a page in your composition book, make a line graph that shows the distance of the most successful bird for each generation.

 a. Put generation number on the x-axis (1,2,3, and 4), distance travelled on the y-axis

 b. Include a title for your grapoh

 c. Include the units (in parenthesis) for the y-axis

 d. Draw a best fit line for all data points

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**Natural Selection of the Carmel Origami Bird**

**Analysis:** *Glue this sheet into your composition book. Answer questions thoroughly using complete sentences in the pages of your composition book.*

1. Did this process result in better flying birds? \_\_\_\_\_\_\_\_ Explain the ways that this lab models natural selection.

2. If you kept repeating this process for thousands of generations, would it inevitably result in the “perfect design” for a “bird” made of paper, tape and a straw? Explain.

3. Compare the specifications of your most successful bird with others in the class. Were all of the most successful birds identical? Describe differences. Why are they all not identical?

4. Evolution is the result of two processes: variation and selection.

 a. How did your experiment produce variation among the offspring?

 b. How did your experiment select offspring to breed the next generation?

5. In what way is this lab INACCURATE in showing genetic variation? What are other sources of genetic variation?

6. Predict the appearance of your youngest bird’s descendants under the following conditions.

 a. The selection conditions remain the same and the longest flying bird survives to produce the most offspring.

 b. The selection conditions change and the worst flying bird survives to produce the most offspring.

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