**Pink-eared Duck**

**Use-flow Diagram:**

1. **Start:**
   * The user opens the app and selects the option to identify the Pink eared duck.
2. **Confirmation:**
   * The user confirms they want to choose this bird based on its description.
3. Choice Determination:
   * The user confirms they want to choose ageing or sexing for the given bird.
4. **Questions for Age Determination:**
   * Question 1: Tail Feathers (Weight: 20%)

"Rate the likelihood that the duck's tail feathers are narrow and notched (characteristic of juveniles). Please rate the likelihood based on your observation - 1 (Very Unlikely) to 5 (Very Likely)

* + - 1
    - 2
    - 3
    - 4
    - 5
  + Question 2: Tail Feathers (Weight: 20%)

"Rate the likelihood that the duck's tail feathers are Broad and Rounded (characteristic of adult or immature). Please rate the likelihood based on your observation - 1 (Very Unlikely) to 5 (Very Likely)"

* + - 1
    - 2
    - 3
    - 4
    - 5
  + Question 3: Primary Tips (Weight: 20%)

"Rate the likelihood that the duck's primary tips are narrow and pointed (more typical of juveniles or immature). Please rate the likelihood based on your observation - 1 (Very Unlikely) to 5 (Very Likely)"

* + - 1
    - 2
    - 3
    - 4
    - 5
  + Question 4: Primary Tips (Weight: 20%)

"Rate the likelihood that the duck's primary tips are broad (more typical of adult). Please rate the likelihood based on your observation - 1 (Very Unlikely) to 5 (Very Likely)"

* + - 1
    - 2
    - 3
    - 4
    - 5
  + Question 5: Underwing Coverts (Weight: 10%)

"Rate the likelihood that the duck's underwing coverts have heavy buff freckling and grey mottling (indicative of juveniles). Please rate the likelihood based on your observation - 1 (Very Unlikely) to 5 (Very Likely)"

* + - 1
    - 2
    - 3
    - 4
    - 5
  + Question 6: Underwing Coverts (Weight: 10%)

"Rate the likelihood that the duck's underwing coverts have clean white tips (indicative of adult or immature). Please rate the likelihood based on your observation - 1 (Very Unlikely) to 5 (Very Likely)"

* + - 1
    - 2
    - 3
    - 4
    - 5

1. **Sex Determination Questions:**
   * Question 1: Marginal and Lesser Upperwing Coverts Colour

"How would you describe the colour of the marginal and lesser upperwing coverts?"

* + - 1: Near-black with faint buff freckling (Indicative of Male)
    - 2: Browner with heavier buff freckling (Indicative of Female)
  + Question 2: Underwing Covert Barring

"What type of barring is observed on the lesser underwing coverts?"

* + - 1: Continuous black barring (Indicative of Male)
    - 2: Patchy or broken black barring (Indicative of Female)
  + Question 3: Wing Length

"Select the wing length range that best fits your observation."

* + - 1: 190–208 mm (Indicative of Male)
    - 2: 178–201 mm (Indicative of Female)
  + Question 4: Body Feathers

"How would you describe the body feathers?"

* + - 1: Barred body feathers (Suggestive of Male)
    - 2: Different feather patterns (Suggestive of Female)

1. **Results:**
   * The app presents the final determination age or sex.
2. **End:**
   * The user is given the option to start over or exit the app.

**Logic Interpretation Ageing:**

**1. Probabilistic Model Algorithm:**

**Step 1: Assign Scores to Age Categories**

For each question, define how each response (1 to 5) contributes to the probability of each age category.

**Score Assignments for Each Response**

Question 1: Juvenile Tail Feathers (Narrow and Notched)

* 1 (Very Unlikely): Juvenile +0, Adult +5, Immature +4
* 2 (Unlikely): Juvenile +1, Adult +3, Immature +4
* 3 (Neutral): Juvenile +2, Adult +2, Immature +3
* 4 (Likely): Juvenile +4, Adult +1, Immature +2
* 5 (Very Likely): Juvenile +5, Adult +0, Immature +1

Question 2: Adult/Immature Tail Feathers (Broad and Rounded)

* 1 (Very Unlikely): Juvenile +5, Adult +0, Immature +1
* 2 (Unlikely): Juvenile +3, Adult +1, Immature +4
* 3 (Neutral): Juvenile +3, Adult +2, Immature +3
* 4 (Likely): Juvenile +1, Adult +4, Immature +3
* 5 (Very Likely): Juvenile +0, Adult +5, Immature +4

Question 3: Juvenile Primary Tips (Narrow and Pointed)

* 1 (Very Unlikely): Juvenile +0, Adult +5, Immature +4
* 2 (Unlikely): Juvenile +1, Adult +3, Immature +4
* 3 (Neutral): Juvenile +2, Adult +2, Immature +3
* 4 (Likely): Juvenile +4, Adult +1, Immature +2
* 5 (Very Likely): Juvenile +5, Adult +0, Immature +1

Question 4: Adult Primary Tips (Broad)

* 1 (Very Unlikely): Juvenile +5, Adult +0, Immature +1
* 2 (Unlikely): Juvenile +3, Adult +1, Immature +4
* 3 (Neutral): Juvenile +3, Adult +2, Immature +3
* 4 (Likely): Juvenile +1, Adult +4, Immature +3
* 5 (Very Likely): Juvenile +0, Adult +5, Immature +4

Question 5: Juvenile Underwing Coverts (Heavy Buff Freckling and Grey Mottling)

* 1 (Very Unlikely): Juvenile +0, Adult +5, Immature +4
* 2 (Unlikely): Juvenile +1, Adult +3, Immature +4
* 3 (Neutral): Juvenile +2, Adult +2, Immature +3
* 4 (Likely): Juvenile +4, Adult +1, Immature +2
* 5 (Very Likely): Juvenile +5, Adult +0, Immature +1

Question 6: Adult/Immature Underwing Coverts (Clean White Tips)

* 1 (Very Unlikely): Juvenile +5, Adult +0, Immature +1
* 2 (Unlikely): Juvenile +3, Adult +1, Immature +4
* 3 (Neutral): Juvenile +3, Adult +2, Immature +3
* 4 (Likely): Juvenile +1, Adult +4, Immature +3
* 5 (Very Likely): Juvenile +0, Adult +5, Immature +4

**Step 2: Collect User Responses**

Ask the user to rate each characteristic on a scale of 1 to 5.

**Step 3: Calculate Scores for Each Age Category**

After the user answers all questions, total the scores for each category.

**Step 4: Convert Scores to Probabilities**

Convert the total scores to percentages to represent the probability for each category. The sum of probabilities for all three categories should be 100%.

Example Calculation:

* If the total scores are: Juvenile = 12, Adult = 8, Immature = 6
* Total Points = 12 + 8 + 6 = 26
* Probability Juvenile = (12/26) \* 100 ≈ 46%
* Probability Adult = (8/26) \* 100 ≈ 31%
* Probability Immature = (6/26) \* 100 ≈ 23%
* Total Probability = 46% + 31% + 23% = 100%

**Step 5: Present Probabilities**

Display the normalized scores as probabilities for each age category.

**2. Real-Time Example:**

**Scenario Ratings**

* Q1: 2
* Q2: 4
* Q3: 2
* Q4: 4
* Q5: 1
* Q6: 4

**Step-by-Step Calculation**

Step 1: Assign Scores for Each Response

* **Q1 (2 - Unlikely)**
  + Juvenile: +1, Adult: +3, Immature: +4
* **Q2 (4 - Likely)**
  + Juvenile: +1, Adult: +4, Immature: +3
* **Q3 (2 - Unlikely)**
  + Juvenile: +1, Adult: +3, Immature: +4
* **Q4 (4 - Likely)**
  + Juvenile: +1, Adult: +4, Immature: +3
* **Q5 (1 - Very Unlikely)**
  + Juvenile: +0, Adult: +5, Immature: +4
* **Q6 (4 - Likely)**
  + Juvenile: +1, Adult: +4, Immature: +3

**Step 2: Apply Weights to Each Response**

* **Q1 Weight (20%):** Juvenile 1 \* 0.20 = 0.2, Adult 3 \* 0.20 = 0.6, Immature 4 \* 0.20 = 0.8
* **Q2 Weight (20%):** Juvenile 1 \* 0.20 = 0.2, Adult 4 \* 0.20 = 0.8, Immature 3 \* 0.20 = 0.6
* **Q3 Weight (20%):** Juvenile 1 \* 0.20 = 0.2, Adult 3 \* 0.20 = 0.6, Immature 4 \* 0.20 = 0.8
* **Q4 Weight (20%):** Juvenile 1 \* 0.20 = 0.2, Adult 4 \* 0.20 = 0.8, Immature 3 \* 0.20 = 0.6
* **Q5 Weight (10%):** Juvenile 0 \* 0.10 = 0.0, Adult 5 \* 0.10 = 0.5, Immature 4 \* 0.10 = 0.4
* **Q6 Weight (10%):** Juvenile 1 \* 0.10 = 0.1, Adult 4 \* 0.10 = 0.4, Immature 3 \* 0.10 = 0.3

**Step 3: Calculate Total Weighted Scores for Each Category**

* **Juvenile Total Score**: 0.2 (Q1) + 0.2 (Q2) + 0.2 (Q3) + 0.2 (Q4) + 0.0 (Q5) + 0.1 (Q6) = 1.0
* **Adult Total Score**: 0.6 (Q1) + 0.8 (Q2) + 0.6 (Q3) + 0.8 (Q4) + 0.5 (Q5) + 0.4 (Q6) = 3.7
* **Immature Total Score**: 0.8 (Q1) + 0.6 (Q2) + 0.8 (Q3) + 0.6 (Q4) + 0.4 (Q5) + 0.3 (Q6) = 3.5

Step 4: Calculate Probabilities

* **Total Points Across All Categories**: 0.9 (Juvenile) + 3.7 (Adult) + 3.5 (Immature) = 8.1
* **Probability Juvenile**: (0.9 / 8.1) \* 100 ≈ 11.11%
* **Probability Adult**: (3.7 / 8.1) \* 100 ≈ 45.6%
* **Probability Immature**: (3.5 / 8.1) \* 100 ≈ 43.2%

Step 4: Present Results

* **Probabilities**:
  + Juvenile: ≈ 11.11%
  + Adult: ≈ 45.6%
  + Immature: ≈ 43.2%

\*

**Logic Interpretation Sexing:**

**1. Probabilistic Model Algorithm:**

**Characterists:**

1. **Marginal and Lesser Upperwing Coverts Color**
2. **Underwing Covert Barring**
3. **Wing Length**
4. **Body Feathers**

**Assigning Weights**

1. **Marginal and Lesser Upperwing Coverts Color [Question Weight: 25%]**: This feature can be quite distinctive in many bird species. Assuming it is a reliable indicator for Pink-eared Ducks, we might assign a significant weight.
   * Weight: 30%
2. **Underwing Covert Barring [Question Weight: 25%]**: If this characteristic is also a reliable indicator of sex in Pink-eared Ducks, it should be given a weight that reflects its importance.
   * Weight: 30%
3. **Wing Length [Question Weight: 25%]**: Wing length can be a strong indicator of sex, especially if there is a notable size difference between males and females.
   * Weight: 30%
4. **Body Feathers [Question Weight: 25%]**: This could be a less definitive characteristic compared to others, as it might be influenced by factors like molting or wear. Therefore, it might be assigned a lower weight.
   * Weight: 10%

**Total Weight Distribution**

* Marginal and Lesser Upperwing Coverts Color: 30%
* Underwing Covert Barring: 30%
* Wing Length: 30%
* Body Feathers: 10%
* Total: 100%

**Gender Determination Logic**

For each characteristic, define how the observation contributes to the probability of being male or female. For example:

* If the **Wing Length** is within the male range, assign the full weight (30%) to male for that characteristic.
* If the **Underwing Covert Barring** is more indicative of a female, assign the full weight (30%) to female.

**Calculation**

After observations, sum up the weights contributing to each gender based on the characteristics observed.

**2. Real-Time Example:**

**Scenario Ratings**

* Q1: Near-black with faint buff freckling [Question weight (Q1) = 25%]
* Q2: Patchy or broken black barring [Question weight (Q2) = 25%]
* Q3: 190–208 mm [Question weight (Q3) = 25%]
* Q4: Different feather patterns [Question weight (Q4) = 25%]

**Solution:**

1. **Q1 - Marginal and Lesser Upperwing Coverts Color**: Near-black with faint buff freckling (Indicative of Male)
2. **Q2 - Underwing Covert Barring**: Patchy or broken black barring (Indicative of Female)
3. **Q3 - Wing Length**: 190–208 mm (Indicative of Male)
4. **Q4 - Body Feathers**: Different feather patterns (Suggestive of Female)

**Assigned Weights:**

1. **Marginal and Lesser Upperwing Coverts Color**: 30%
2. **Underwing Covert Barring**: 30%
3. **Wing Length**: 30%
4. **Body Feathers**: 10%

**Step-by-Step Calculation:**

Step 1: Allocate Weights Based on Responses

* **Q1**: Near-black with faint buff freckling (Male) - 30%\*(Q1=25%)
* **Q2**: Patchy or broken black barring (Female) - 30%\*(Q2=25%)
* **Q3**: Wing Length 190–208 mm (Male) - 30%\*(Q3=25%)
* **Q4**: Different feather patterns (Female) - 10%\*(Q4=25%)

Step 2: Sum the Weights for Each Sex

* **Total Male Score**: 30%\*25% (Q1) + 30%\*25% (Q3) = 15%
* **Total Female Score**: 30%\*25% (Q2) + 10%\*25% (Q4) = 10%

Step 3: Present Results

* **Probabilities**:
  + Male: 15%/25%\*100= 60%
  + Female: 10%/25%\*100 = 40%