

# 5.1.99 Independent transfer: Foundation then Higher

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**KEY WORDS** conditional probability • conditional probability

<!-- Session 2 independent transfer -->

## Objective

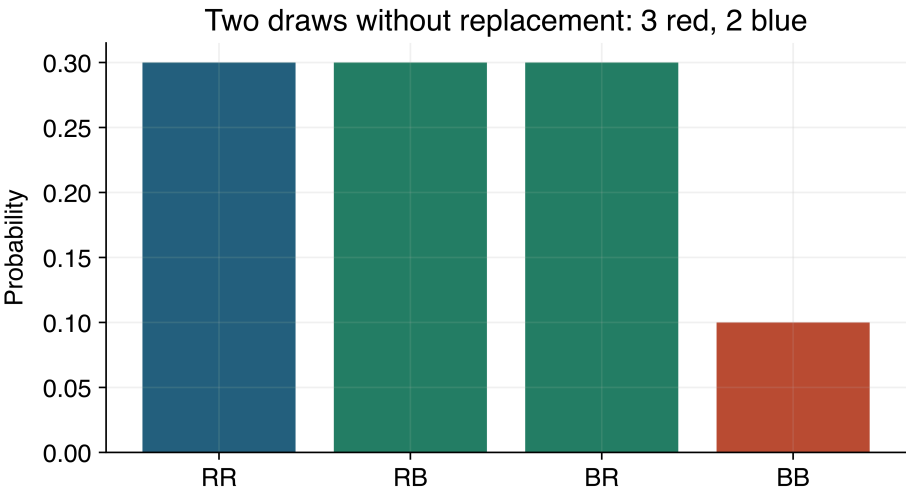
Apply this topic to unfamiliar Foundation and Higher problems; keep the two scopes distinct. Original questions and local marking guidance.

## 1 Key knowledge and worked examples

After a draw without replacement, the population decreases by one and the colour counts depend on the first result. Multiply conditional branch probabilities along a path and add disjoint paths. Independence requires the intersection probability to equal the product of marginal probabilities; reversed conditions are different questions.

A bag contains 3 red and 2 blue counters. With replacement,  $P(\text{two red}) = \frac{3}{5} \times \frac{3}{5} = \frac{9}{25} = 0.36$ . Without replacement, the red-red branch is  $\frac{3}{5} \times \frac{2}{4} = 0.3$ . Label each branch before multiplying.

Using a class of 30 with 18 cyclists, 12 swimmers and 7 doing both,  $P(\text{swim given cycle}) = \frac{7}{18}$ , while  $P(\text{cycle given swim}) = \frac{7}{12}$ . The unconditional swim probability is  $\frac{12}{30} = 0.4$ . For an expected cohort of 1000, suppose 20% have a condition; a test is positive for 90% with it and 10% without it. Expected positive counts are 180 from 200 with the condition and 80 from 800 without it. Of 260 positive tests, the conditional proportion with the condition is  $\frac{180}{260} = \frac{9}{13} \approx 0.6923$ , not 90%. These are stated illustrative model rates, not claims about a real diagnostic test.



Prerequisite example; use the transfer task’s own data.

Given positive: use 180 out of 260, not 180 out of 200

|              | Positive | Negative | Total |
|--------------|----------|----------|-------|
| Condition    | 180      | 20       | 200   |
| No condition | 80       | 720      | 800   |
| Total        | 260      | 740      | 1000  |

Prerequisite example; use the transfer task’s own data.

## 2 Practice

**2.1 Foundation:** A bag has three red and two blue counters. Two are drawn without replacement. Make a complete possibility tree and find the probability of different colours. Explain how the second-stage denominators change.

### 3 Exam-style questions

**3.1 Higher:** In 50 students, 30 study art, 25 study music and 15 study both. Find music given art and art given music. Are the events independent? Reconcile the counts using a two-way table.