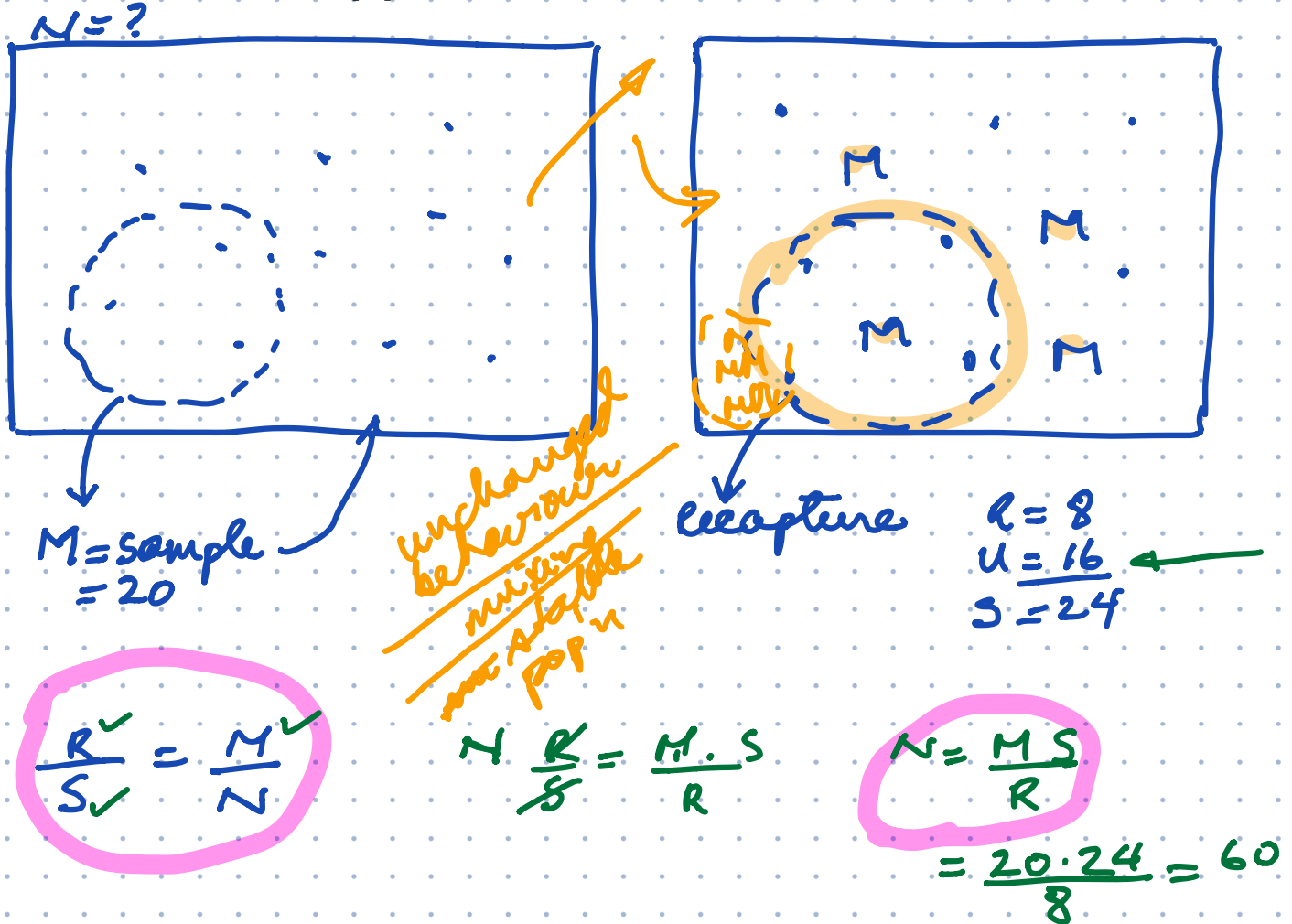


Mark and Recapture

We can rarely go and count all the individuals in an animal population.

Instead we have to take a sample from the population and infer the total population from the sample.

One method is to capture some members of the population, mark them, and then release them. Later a second capture is done, the result of which is a mix of marked and unmarked animals. How can we estimate the total population from this mix?



Estimate = 60 • Uncertainty

What about 50? 100? 20M 30U Possible

Minimum $N = 20 + 16 = 36$
M + U

22%

$$\rightarrow p(R=8, U=16 / N=60) = \frac{n}{N} = \frac{20 C_8 \cdot \overbrace{40}^{60-20} C_{16}}{60 C_{24}} = \frac{0.22}{0.24} = 0.22$$

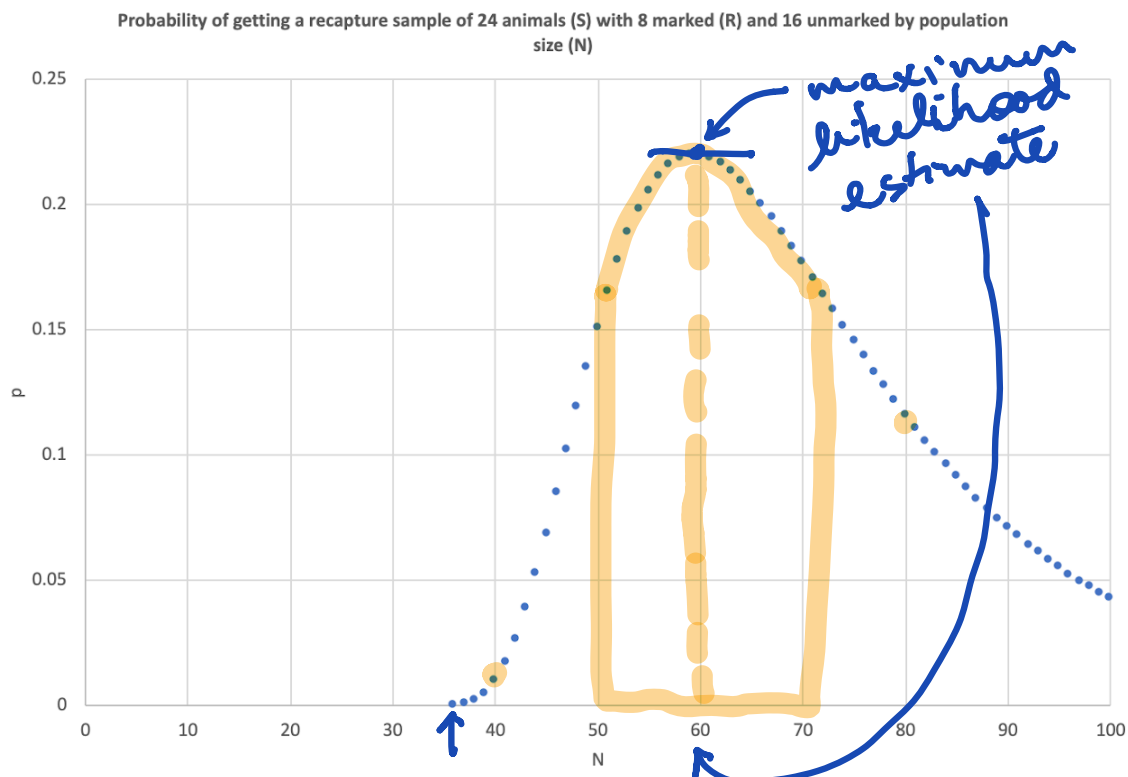


$$p(R=8, u=16/N=40) =$$

$$\frac{20C8 \cdot 40-20C16}{40C24} = 0.00971 \approx 1\%$$



N	p(Recapture Sample)
36	0.000100641
37	0.000601126
38	0.001993206
39	0.004855245
40	0.009710489
41	0.016910462
42	0.026573582
43	0.038580251
44	0.052609433
45	0.068197413
46	0.084802001
47	0.101860817
48	0.11883762
49	0.135254748
50	0.150712434
51	0.164897133
52	0.177581528
53	0.188618782
54	0.19793329
55	0.205509684
56	0.211381389
57	0.215619612
58	0.218323306
59	0.219610400
60	0.219610400
61	0.218458346
62	0.216290025
63	0.213238314
64	0.209430487



100

!