



INVESTIGATION 15-1

Expected and Observed Results

Problem: How does chance affect the combination of genes?

Materials

- 2 paper bags
- 100 red beans
- 100 white beans

Procedure

1. Place 50 red beans and 50 white beans into a paper bag. Place 50 red beans and 50 white beans into a second bag. The beans represent genes for flower color.
2. Label one of the bags "female" for the female parent. Label the other bag "male" for the male parent.
3. Use the Punnett square on the next page to predict how many red/red, to red/white, to white/white combinations will be selected.
4. Without looking inside the bags, remove one bean from each bag. The two beans represent the gene combination that results when sperm and egg join.
5. Use the table to the right to record the color combination of the beans each time you remove two beans. Then return them to their original bags and shake the bags. In the table head, a Red/Red combination is indicated by RR, a Red/White by Rr, and a White/White combination by rr.
6. Repeat steps 5 and 6 ninety-nine times. A place has been provided for all one hundred picks.
7. Count and record the total numbers of red/red, red/white, and white/white bean combinations in your data table.
8. Compile and record the class totals.

Data and Observations

Beans	Red/Red	Red/White	White/White
Total			
Class total			

	RR	Rr	rr		RR	Rr	rr
1.				51.			
2.				52.			
3.				53.			
4.				54.			
5.				55.			
6.				56.			
7.				57.			
8.				58.			
9.				59.			
10.				60.			
11.				61.			
12.				62.			
13.				63.			
14.				64.			
15.				65.			
16.				66.			
17.				67.			
18.				68.			
19.				69.			
20.				70.			
21.				71.			
22.				72.			
23.				73.			
24.				74.			
25.				75.			
26.				76.			
27.				77.			
28.				78.			
29.				79.			
30.				80.			
31.				81.			
32.				82.			
33.				83.			
34.				84.			
35.				85.			
36.				86.			
37.				87.			
38.				88.			
39.				89.			
40.				90.			
41.				91.			
42.				92.			
43.				93.			
44.				94.			
45.				95.			
46.				96.			
47.				97.			
48.				98.			
49.				99.			
50.				100.			

Predicted outcome:

Female Parent

Male
Parent

RR _____ %

Rr _____ %

rr _____ %

Analysis

- Which combination occurred most often? _____

- If red is dominant and white is recessive, how many plants have hybrid genes?

- How did your predicted (expected) results of selected combinations compare with your observed (actual) results?

- What was the ratio of red/red to red/white to white/white?

Conclusions and Applications

- What are the chances of selecting the same color in a gene pair each time?

- How does chance affect gene combination?

- How do the results of a small sample compare with the results of a large sample?

