

Dihybrid Crosses

Gregor Mendel, the father of modern genetics, discovered that in pea plants the gene for round seeds (R) is dominant to the gene for wrinkled seeds (r). He also discovered that yellow seed color (Y) is dominant to green seed color (y). He then made the following cross:

P RRYY X rryy

1. What would be the **genotype** for all the F₁ offspring? Rr Yy
2. What would be the **phenotype** for the F₁ offspring? round round yellow
3. Show Mendel's F₁ cross below. (See the answer to question #1.)

F₁ Rr Yy Male X Rr Yy Female

4. What are the 4 possible gametes (pollen grains or eggs) from these plants?

round, wrinkled, yellow, green

5. Complete the Punnett square of this cross below

| | | | | |
|----|------|------|------|------|
| | Ry | Ry | ry | ry |
| RY | RRYY | RRYy | RrYY | RrYy |
| Ry | RRYy | RRyy | RrYy | Rryy |
| ry | RrYY | RrYy | rrYY | rrYy |
| ry | RrYy | Rryy | rrYy | rryy |

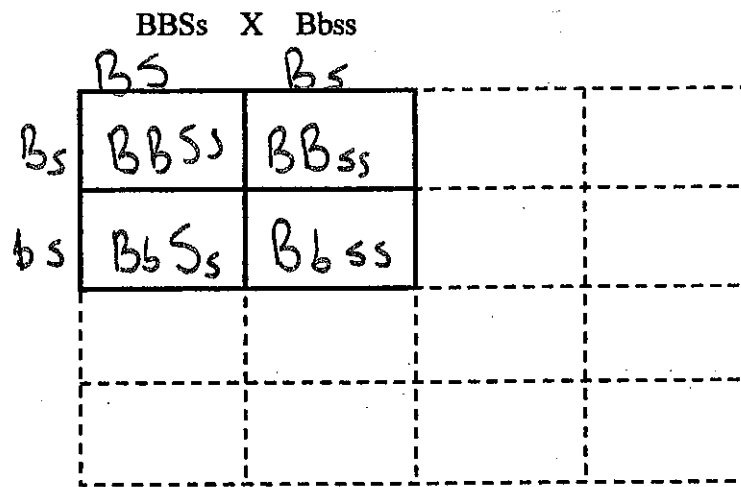
Both Dominant
9/16 : RRYY, RrYY, RRyY, RryY
1 dominant, 1 recessive
3/16 : rrYY, rrYy
3/16 : RrYY, RrYy
1/16 : rryy

6. What are the chances of having offspring with round, yellow seeds? 9/16
7. What are the chances of having offspring with round, green seeds? 3/16
8. What are the chances of having offspring with yellow seeds? 12/16
9. What are the chances of having offspring with, green seeds? 4/16
10. What are the chances of having offspring with pure round, pure yellow seeds? 1/16

In humans free earlobes (E) is dominant to attached earlobes (e), and tongue rolling (R) is dominant to non-rolling (r).

11. What are **all the possible genotypes** of a person with free earlobes who can roll his tongue?
EE RR, Ee RR, EE Rr, Ee Rr
12. What is the **genotype** of a girl with attached earlobes but she cannot roll her tongue? ee rr
13. What are **all the possible genotypes** of a person with free earlobes who cannot roll her tongue?
EE rr, Ee rr

In cats, the gene for black fur (B) is dominant to the gene for brown (b), and the gene for short hair (S) is dominant to the gene for long hair (s). Complete the Punnett square below for the following cross:



Hint: If you're clever, you will only need to use four of the boxes!

4. What proportion of the offspring from the cross shown above would be expected to be black with short hair?
50%

In tomato plants, the gene for purple stems (A) is dominant to the gene for green stems (a), and the gene for red fruit (R) is dominant to the gene for yellow fruit (r). If two tomato plants heterozygous (AaRr) for both traits are crossed, state what proportion of the offspring are expected to have:

5. red fruit 12 16. green stems and red fruit 3
 7. purple stems and red fruit 9

You may want to draw a 16-box Punnett square.

If 640 seeds resulting from the above tomato cross are collected and planted, how many would be expected to grow into plants with:

8. purple stems and yellow fruit? $\frac{3}{16} - 120$ 19. green stems and yellow fruit? $\frac{1}{16} - 40$
 9. green stems and red fruit? $\frac{3}{16} - 120$

You are a geneticist working for a large seed company. One of your colleagues is fired before she can finish some important experiments she was working on. The company president has turned this project over to you. All you know is that your former colleague was working with a rare type of flower that comes in two colors, red and blue and that the plant has either a short stem or a long stem. You do not know which traits are dominant or recessive; however, you do have a bunch of these plants that have red flowers and long stems that you can cross. After many months of work, you finally print up the results of your crosses.

| | Red/Long ⁹ | Red/Short ³ | Blue/Long ³ | Blue/Short ¹ |
|---------|-----------------------|------------------------|------------------------|-------------------------|
| | 5625 | 1574 | 1073 | 630 |
| Trial 1 | 2140 | 713 | 714 | 240 |
| Trial 2 | 1006 | 336 | 335 | 110 |
| Trial 3 | 874 | 292 | 291 | 100 |
| Trial 4 | 866 | 289 | 289 | 100 |
| Trial 5 | 739 | 248 | 244 | 80 |

1. Which traits are probably dominant? Red & Long
 2. Which traits are probably recessive? Blue & Short
 3. Do you think that the original plants that you were given were heterozygous for both traits? Yes
 4. Why do you say this? 9:3:3:1 ratio