

In peas, round seed shape (R) is dominant to wrinkled seed shape (r), and yellow seed colour (Y) is dominant to green seed colour (y). A pea plant which is homozygous round seed and has green colour is crossed with a pea plant that is heterozygous round seed shape and heterozygous yellow seed colour.

Gametes:

| | | |
|------|---|------|
| RRyy | X | RrYy |
| Ry | | RY |
| Ry | | Ry |
| Ry | | rY |
| Ry | | ry |

| Gametes | RY | Ry | rY | ry |
|---------|------|------|------|------|
| Ry | RRYy | RRyy | RrYy | Rryy |
| Ry | RRYy | RRyy | RrYy | Rryy |
| Ry | RRYy | RRyy | RrYy | Rryy |
| Ry | RRYy | RRyy | RrYy | Rryy |

What are the chances of the offspring being homozygous for round seed? $8/16 = 50\%$

What are the chances of the offspring being homozygous for wrinkled seed? $0/16 = 0\%$

What are the chances of the offspring being homozygous for yellow seed colour? $0/16 = 0\%$

What are the chances of the offspring being homozygous for green seed colour? $8/16 = 50\%$

What is the genotypic ratio? 1 RRYy : 1 RRyy : 1 RrYy : 1 Rryy

What is the phenotypic ratio? 1 round yellow seeds : 1 round green seeds

A purebred wingless red-eyed fruit fly is crossed with a purebred winged sepia-eyed fruit fly to produce F1 flies. A = wings, a = wingless, E = red-eyes, e = sepia-eyes

Gametes:

| | | |
|------|---|------|
| aaEE | X | AAee |
| aE | | Ae |
| aE | | Ae |
| aE | | Ae |
| aE | | Ae |

Complete the Punnett square:

| Gametes | aE | aE | aE | aE |
|---------|------|------|------|------|
| Ae | AaEe | AaEe | AaEe | AaEe |
| Ae | AaEe | AaEe | AaEe | AaEe |
| Ae | AaEe | AaEe | AaEe | AaEe |
| Ae | AaEe | AaEe | AaEe | AaEe |

Two of the F1 flies are mated to produce an F2 generation of flies. What is the phenotypic ratio of the F2 flies?

| | | |
|------|---|------|
| AaEe | X | AaEe |
| AE | | AE |
| Ae | | Ae |
| aE | | aE |
| ae | | ae |

Now complete the Punnett square:

| Gametes | AE | Ae | aE | ae |
|---------|------|------|------|------|
| AE | AAEE | AAEe | AaEE | AaEe |
| Ae | AAEe | AAee | AaEe | Aaee |
| aE | AaEE | AaEe | aaEE | aaEe |
| ae | AaEe | Aaee | aaEe | aaee |

Answer:

9 winged / red eyes : 3 wingless / red eyes : 3 winged / sepia eyes : 1 wingless / sepia eyes

If you cross a pure breeding, black-coated dog with curly fur (BBcc) to a pure breeding yellow-coated dog with straight fur (bbCC), all the puppies will have straight black coats. If you interbreed the F1 dogs with one another to get an F2 generation, what fraction of puppies will have yellow straight fur? B = black coat, b = yellow coat, c = curly, C = straight

First work out the parent gamete:

| | | |
|------|---|------|
| BBcc | X | bbCC |
| Bc | | bC |
| Bc | | bC |
| Bc | | bC |
| Bc | | bC |

Next work out the F1 puppy genotype

| | | | | |
|---------|------|------|------|------|
| Gametes | bC | bC | bC | bC |
| Bc | BbCc | BbCc | BbCc | BbCc |
| Bc | BbCc | BbCc | BbCc | BbCc |
| Bc | BbCc | BbCc | BbCc | BbCc |
| Bc | BbCc | BbCc | BbCc | BbCc |

Finally work out the F2 generation puppy genotype

| | | | | |
|---------|------|------|------|------|
| Gametes | BC | Bc | bC | bc |
| BC | BBCC | BBcC | BbCC | BbCc |
| Bc | BBcC | BBcc | BbCc | Bbcc |
| bC | BbCC | BbCc | bbCC | bbCc |
| bc | BbCc | Bbcc | bbCc | |

Answer: 3/16 will have yellow straight fur