Tips for doing Punnett Squares

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| Problem to be used in the example: The gene that causes someone to go bald is an epistatic gene. In the presence of testosterone, the baldness gene acts as a dominant gene, while without high levels of testosterone it acts recessively. If a bald man marries a woman who has normal hair, what % of their children will be bald? Their daughters? Their sons? | |
| **Steps** | **Example** |
| 1st Identify the trait you’re looking at | Baldness & Testosterone |
| 2nd pick a letter to represent the trait | B=normal hair Y= testosterone, male  b=bald X = no testosterone, female |
| 3rd Figure out the genotypes of your parents if they were not provided | This can be tricky because there are two possible genotypes for the man, and two possible genotypes for the woman. I would start by listing all possible genotypes for men and woman so:   |  |  |  |  | | --- | --- | --- | --- | | Women | | Men | | | Possible Genotypes | Possible Phenotypes | Possible Genotypes | Possible Phenotypes | | 1. BBXX | Normal hair | 1. BBXY | Normal hair | | 1. BbXX | Normal hair | 1. BbXY | Bald | | 1. bbXX | Thin hair | 1. bbXY | Very Bald | |
| 4th Rule out any genotypes you can | Mom definitely can not be bbXX cause her hair is normal;  Dad definitely cannot be BBXY Because he is bald |
| 5th Choose a maternal and paternal genotype to start with | BbXX × BbXY |
| 6th Figure out your gametes | **FOIL** 🡪 First, outside, inside, last   |  |  |  | | --- | --- | --- | |  | Maternal Gametes  BbXX | Paternal Gametes  BbXY | | **F**irst | **B**b**X**X 🡪 BX | **B**b**X**Y 🡪BX | | **O**utside | **B**bX**X** 🡪 BX | **B**bX**Y** 🡪BY | | **I**nside | B**bX**X 🡪 bX | B**bX**Y 🡪bX | | **L**ast | B**b**X**X** 🡪 bX | B**b**X**Y** 🡪bY | |
| 7th Create your Punnett Square | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | | Maternal Gametes | | | | | BX | BX | bX | bX | | Paternal Gametes | BX |  |  |  |  | | BY |  |  |  |  | | bX |  |  |  |  | | bY |  |  |  |  | |
| 8th Fill in your Punnett Square, I find it easiest to fill it in with both genotyupes and phenotypes. You can refer back to step 3 if you’re having a difficult time figuring out what’s what.  \*Notice how the phenotype is different for the bolded boxes than it would be if we were looking at normal Mendelian inheritance! This is what step 3 is so important! b acts dominant in the presence of testosternone! | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | | Maternal Gametes | | | | | BX | BX | bX | bX | | Paternal Gametes | BX | BBXX  Normal hair, female | BBXX  Normal hair, female | BbXX  Normal hair, female | BbXX  Normal hair, female | | BY | BBXY  normal hair, male | BBXY  normal hair, male | **BbXY**  **bald, male** | **BbXY**  **bald, male** | | bX | BbXX  Normal hair, female | BbXX  Normal hair, female | bbXX  thin hair, female | bbXX  thin hair, female | | bY | **BbXY**  **bald, male** | **BbXY**  **bald, male** | bbXY  bald, male | bbXY  bald, male | |
| 9th Make a list of the types of genotypes & a list of the types of phenotypes, and the numbers of each   * This information can be used to answer every question one could think of | J   |  |  |  |  | | --- | --- | --- | --- | | Women (1/2 or 50%) | | Men (1/2 or 50%) | | | Possible Genotypes | Possible Phenotypes | Possible Genotypes | Possible Phenotypes | | BBXX 1/8 | Normal hair,  Female:  6/16 which is 3/8 | BBXY 1/8 | Normal hair, male  1/8 | | BbXX 1/4 | BbXY ¼ | Bald, male  6/16 which is 3/8 children | | bbXX 1/8 | Thin hair, female  1/8 | bbXY 1/8 |   \*Beware the wording, does it ask for percent of offspring as a total; percent of sons; or percent of daghters! These will be different! |