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, maleb=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 |

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| 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

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| --- | --- | --- |
|  | Maternal GametesBbXX | Paternal GametesBbXY |
| **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 |

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| 7th Create your Punnett Square |

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| --- | --- |
|  | Maternal Gametes |
| BX | BX | bX | bX |
| Paternal Gametes | BX |  |  |  |  |
| BY |  |  |  |  |
| bX |  |  |  |  |
| bY |  |  |  |  |

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| 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 | BBXXNormal hair, female | BBXXNormal hair, female | BbXXNormal hair, female | BbXXNormal hair, female |
| BY | BBXYnormal hair, male | BBXYnormal hair, male | **BbXY****bald, male** | **BbXY****bald, male** |
| bX | BbXXNormal hair, female | BbXXNormal hair, female | bbXXthin hair, female | bbXXthin hair, female |
| bY | **BbXY****bald, male** | **BbXY****bald, male** | bbXYbald, male | bbXYbald, male |

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| 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
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| --- | --- |
| 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, male1/8 |
| BbXX 1/4 | BbXY ¼ | Bald, male6/16 which is 3/8 children |
| bbXX 1/8 | Thin hair, female1/8  | 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! |