Gender Determination in Humans

- human gender is determined by one chromosome pair (known as the sex chromosomes)
- sex chromosomes come in two shapes
    - X-chromosome (larger)
    - Y-chromosome (smaller)

Gender	Chromosome Pair
Male	XY
Female	XX

During sexual reproduction, the male partner can donate either an X or a Y-chromosome. The female, however, can only donate an X-chromosome. Thus, it is the male partner that determines the gender of the offspring.

Using a Punnett Square, show the probability of producing either a male or female offspring in any given cross.

Sex-Linked Traits

Sex chromosomes carry genes for many other characteristics besides gender. Such characteristics are said to be sex-linked. Most sex-linked traits are recessive and are carried on the X-chromosome. For this reason, they tend to show up more often in men than in women.

Over 120 genes are known to be sex-linked:

- Hemophilia
- Red-Green Color Blindness
- Congenital Night-Blindness
- Muscular Dystrophy

Example
Hemophilia is the inability to properly clot blood. This creates the very serious possibility of bleeding to death from even a minor cut. The gene for this characteristic is carried on the X-chromosome.

Let's examine the genotypes and phenotypes involved in hemophilia:

Characteristic = Blood Clotting

Traits: Normal Clotting $= X^H$ (Dominant)
Hemophilia $= X^h$ (Recessive)

Note: Because the gene is carried on the X-chromosome, we use a slightly different notation than with other characteristics.

Possible Genotypes/Phenotypes:

Female	**Male**

- A "**normal**" individual has the normal ability to clot blood.
- A "**carrier**" individual has the normal ability to clot blood, but may pass hemophilia on to their offspring.
- A "**hemophilia**" individual has the inability to properly clot blood.

Next, let's examine the possibility of producing offspring with hemophilia for the various types of parent genotypes.