Consider a fictional disease called 'DISEASE X' which is passed on genetically. You only develop the disease if you have two copies of the gene (i.e. AA). The other harmless version of the gene is labelled B. If you develop the disease, you are unable to have children

Part 1: If your parents both have only one copy of the gene – so they both have AB – what is the probability that you inherit the disease?

¼- you draw a punnet diagram.

	A	B
A	AA	AB
B	AB	BB

Part 2: If the prevalence of the gene in the general population is 20%, and you have one copy – so you have AB – what is the probability that your child develops the disease?

Change of meeting someone with the gene is 0.2 or 20%

The chance of the baby having it is 0.25 and of the ¼ of before. Multiply them together;

0.2 x 0.25= 0.05 or 5%.

Part 3: If you select two people at random from the general population, what is the chance that their child will develop the disease?

0.2 is one person. The chance of two people is 0.2^2 as its now two chances of them having the disease.

So if they have a child it would be 0.2^2 x 0.25 = 0.01 or 1%

This may seem like a low number or percentage it is actually not we have around 7billlion people on the planet, 1% of this is around 70million which is a lot of people effected by the 'X disease'

Part 4: If you are a carrier of the gene (you have only one copy of it, i.e. you are AB), what is the chance that it is passed onto your offspring and continues in the population (i.e. your children are also carriers)?

Punnet diagram from before 75% chance of having the gene as BB is the only right gene to not have the disease

0.2- the chance your partner has the disease

0.75 x 0.2 = 0.15 = 15% chance of your off spring having the disease

***Part 5*:** Finally, if you are a carrier of the gene, what is the probability that your grandchildren are also carriers? Assume that the prevalence of the gene in the general population stays at 20% in your children's generation.

AA- won't work as you cannot of have children so grandchild would be impossible.

So the chances my off spring have the gene but can have children is then 0.5.

0.5 x 0.2 (the chance my partner has the gene)= 0.1 or 10%

Then my offspring partner having gene= 0.2 x 0.1 (from last equation) = 0.02

Chances of kids will have the gene 0.75 x 0.02 = 0.015 or 1.5% chance of my grandkids will have the gene