

Competition 8: Evolution puzzles

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?

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?

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

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.

Try to answer as many of these questions as possible. Your competition entry should show the work you did to arrive at your answers. We are happy to accept typed work as well as photos or scans of handwritten work, as long as this is clearly legible.

How to enter

1. Complete your competition entry and make sure it follows the guidelines listed below
2. Fill out the [Competition Cover Sheet](#)
3. Email your entry and your cover sheet as attachments to us at inspire@sjc.ox.ac.uk

Terms & Conditions

1. You must complete the [Competition Cover Sheet](#) and submit it along with your entry to inspire@sjc.ox.ac.uk before the closing date. If we do not receive a completed cover sheet with your entry, we will NOT be able to consider the entry.
2. The competition closes at **5pm on 29 March 2021**.
3. The work you submit must be entirely your own and should be 500 words or less. Please include your name on both the cover sheet AND the entry.
4. Unless specified otherwise, written work and images should be submitted in Word or PDF format, and should be emailed as attachments. Please do NOT use file-sharing systems such as SharePoint or Google Docs.
5. Competition entries from pupils in Year 10 will be evaluated separately from pupils in Year 11.
6. Competition winners will be contacted via email about two weeks after the competition's closing date. Two sets of the following prizes will be awarded:

- a. 1st place: £20 Amazon gift voucher, entry listed on Inspire Digital
- b. 2nd place: £10 Amazon gift voucher, entry listed on Inspire Digital
- c. Up to 5 top entries: entry listed on Inspire Digital