

Competition 9: Mathematics of natural selection

To enter this competition, make sure you have first read 'Mathematics of natural selection.'

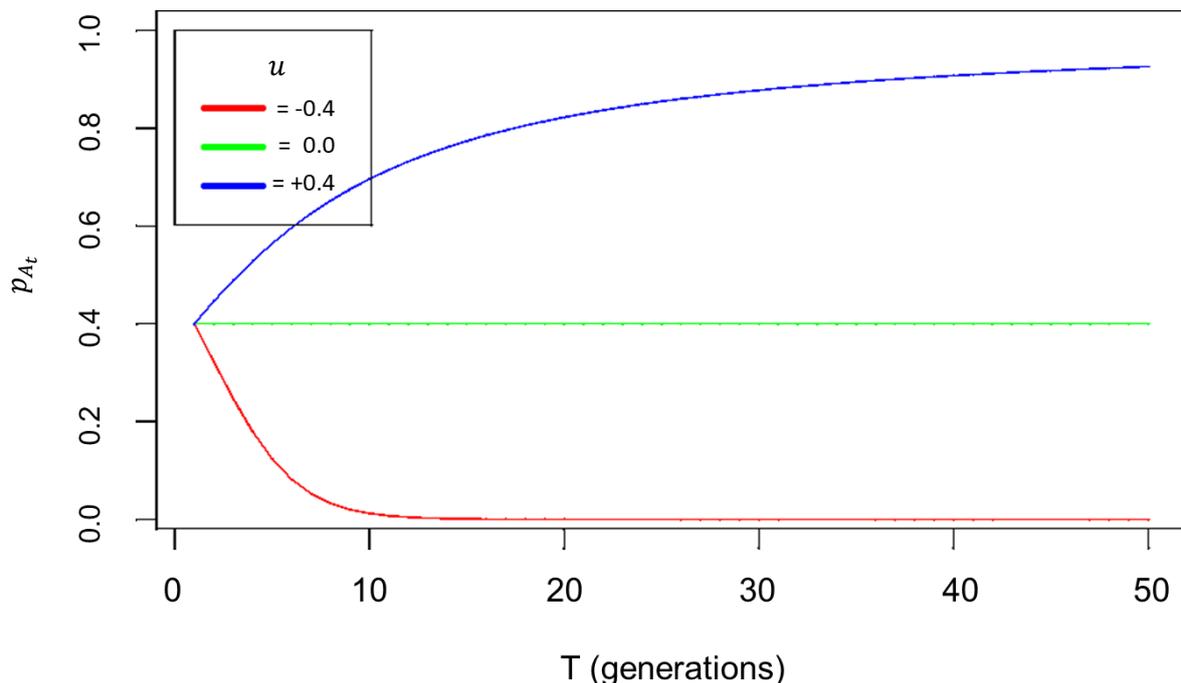
Part 1: To trial the equation discussed in 'Mathematics of natural selection', let's assume that p_{A_0} (the chance an allele is A at time '0') is 0.4. How does p_{A_t} change in the first 5 generations ($t = 1$ to $t = 5$) if u is:

- 0
- 0.4
- -0.4

Part 2: The results for 50 generations are plotted on the graph below. Study the graph, then answer the following questions, using the equations to help you:

- What is happening with the green line?
- Why does the red line go to zero faster than the blue line goes to one?
Hint: look at the equation for $p_{A_{t+1}}$, and your own calculations – what is the factor p_{A_t} is multiplied by when $u = +0.4$ versus when $u = -0.4$?

p_{A_t} as a function of time for three different values of u



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