# Counting Pedigree Ancestors

**Identifying dog pedigrees with math and ancestors.**

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You see it all the time: ads for litters touting multiple relationships to a breed great. Litter A boasts "Sir Pantsalot appears 10 times in their pedigree," while litter B claims "Sir Pantsalot is behind the dam 14 times." How can you compare such claims?

Given this sort of information, you can't. Counting appearances in a pedigree isn't enough. When in the pedigree does Sir Pantsalot appear? If the 10 appearances are all 10 generations back, his influence will be very small. And where does he appear? If all 14 appearances are behind the dam, and none behind the sire, then this litter is not inbred on the great Sir Pantsalot at all. Inbreeding requires that a common ancestor be behind both the sire and dam.

Simply counting appearances isn't informative; nor is classifying a litter as "outcrossed," "inbred," "really inbred," and "really, really inbred" satisfactory. There's a better way: you can quantify the degree of inbreeding. Wright's Coefficient of Inbreeding gives the probability that two alleles (alternate forms of a gene) are identical by descent. That is, the same allele is inherited through both the sire and dam. It's a function of how many common ancestors are behind a litter's sire and dam, and how closely related those ancestors are to the litter in question.

Here's where a lot of people get mixed up. A common ancestor must be behind both parents. No matter how many times the same ancestor appears behind just one parent, it doesn't make the target litter inbred. Breeding an inbred male to an inbred female won't produce inbred progeny unless the male and female share a common ancestor. To take it to extremes, breeding a dog of one breed (which can be considered an inbred strain of dogs) to a dog of another breed produces a litter of non-inbred mixed breeds. However, breeding two mixed-breed littermates together produces inbred mixed breeds.

To get a true feel for how the COI works, take the time to compute a few by hand. It's easy as long as you're just doing a few generations. Start with the simple case of Boscoe, a dog from a half brother-sister mating. Both Boscoe's sire and dam are in turn sired by the great stud Barky. Instead of using the traditional pedigree, redraw it without the dogs that aren't common ancestors (that is, don't appear behind both sire and dam), and with the common ancestor's name (Barky) appearing only once.

What we want to know is the probability of Boscoe inheriting the identical allele coming down from Barky through (or by way of) both Bowser and Buffy. Assuming Barky is a heterozygote, that is, has both an A and an allele, there is a 50-percent chance that he will pass the same allele (either A or a) to both Bowser and Buffy. There is also a 50-percent chance that Bowser will pass on whichever allele he got from Barky to Boscoe, and a 50-percent chance Buffy will pass on whichever allele she got from Barky to Boscoe.