

Review for Quiz on Monohybrid Crosses, Answers

1. Smooth leaves (allele S) are completely dominant over hairy leaves (allele s).
 - the F1 plants (SS x ss) will have genotypes Ss
 - the F1 plants (SS x ss) will have phenotypes 100% smooth leaves
 - the F2 plants (Ss x Ss) will have the genotypes 1 SS : 2 Ss : 1 ss
 - the F2 plants (Ss x Ss) will have the phenotypes 3 (75%) smooth leaf : 1 (25%) hairy leafed plant

- 2a) Long tails (L) and no tail (L') are incompletely dominant (∴ blending). LL' produces a short tailed cat.
- 2b) If a short-tailed male cat (LL') is bred with a long-tailed female cat (LL):
 - the kittens will have the genotypes 2 LL : 2LL'
 - the kittens will have the phenotypes 50% long tail : 50% short tail

- 3a) A hybrid male trotter (Tt) is mated with a purebred pacer (tt).
 - the foals will have the genotypes 2 Tt : 2tt
 - the foals will have the phenotypes 50% trotters : 50% pacers
- 3b) The fairy godmother must do a 'test cross' of the unknown male trotter (TT or Tt) against a homozygous recessive female horse (a pacer, tt)
 - if any of the foals are pacers, then the male trotter is heterozygous (Tt)
 - if all of the foals are trotters, then it is most likely that the unknown male trotter is homozygous (TT)
- 3c) The gaits of trotters and pacers are different because the trotter moves the **right** front leg at the same time as the **left** back leg, and vice versa. A pacer moves both the front and back legs on one side of the body and then the front and back leg on the opposite side of the body. On average, pacing is faster.

- 4a) Because a heterozygous horse shows a colour midway between dark brown chestnut (BB) and creamy white cremello (B'B'), the traits are "blended" in the heterozygote (BB') so this is incomplete dominance.
- 4b) Palominos are heterozygous (BB'). To produce only palominos, the breeder should breed purebred chestnut horses (BB) with purebred cremello horses (B'B'). All of their offspring will be heterozygous (BB') and therefore, palomino.

	B	B
B'	BB'	BB'
B'	BB'	BB'

- 5a) Red coat colour (R) and white coat colour (W) are co-dominant because a heterozygous roan individual (RW) displays both traits (not a blending).

- 5b) If two roan cattle are crossed (RW x RW), then
 - the calves will have the genotypes 1 RR : 2 RW : 1 WW
 - the calves will have the phenotypes 1 red : 2 roan : 1 white

6a)	S	s
S	SS	Ss
s	Ss	ss

6. A spotted coat (S) is completely dominant over a non-spotted coat (s).
 - a) Using a Punnett square, show a cross between two heterozygous parents.
 - the puppies of (Ss x Ss) will have the genotypes 1 SS : 2 Ss : 1 ss
 - the puppies will have the phenotypes 3 spotted: 1 non-spotted
 - b) To determine if a spotted female dog with an unknown genotype is homozygous or heterozygous, the breeder must do a 'test cross' of the unknown female with a homozygous recessive (non-spotted) male. If any of the puppies are non-spotted, then the female must be heterozygous (Ss) because the puppies must get one recessive (s) allele from each parent. If all of the puppies are spotted, the female dog is most likely homozygous for the spotted allele (SS).

- 7a) The tiger kittens had both side-ways (S) and long-ways (L) stripes, so the alleles are co-dominant (SL).
- 7b) If a plaid female (SL) kitten was bred to the long-ways striped male (LL):
 - the kittens will have the genotypes 2 SL : 2 LL
 - the kittens will have the phenotypes 50% plaid : 50% long-ways striped