STE/Mendelian Genetics

Use the following tables to answer questions 1 to 6.

	Dominant Trait in Animals	Recessive Trait in Animals	Dominant Trait in Humans	Recessive Trait in Humans
Cats	Tabby coat(T)	Black coat(t)	Pigmented skin(P)	Albinism(p)
cattle	Horned(H)	Hornless (h)	Detached Earlobes(D)	Attached earlobes(d)
			Short fingers (S)	Normal fingers (s)
Sheep	White fleece(W)	Black fleece(w)	Widow's Peak (W)	Straight hairline(w)
swine	Uncleft hoof (U)	Normal hoof(u)	Freckled skin (F)	Unfreckled skin (f)
			Straight thumb(T)	Hitchhiker's thumb(t)

1. Show that if two black cats mate their litter will always be black.

	t	t
t	tt	tt
t	tt	tt

2. Suppose that a homozygous white sheep mates with a black sheep. What is the probability that they will have white sheep?

Homozygous means the same= WW

	W	W
w	Ww	Ww
w	Ww	Ww

100% Ww=100% white

3. a)   If a hornless cow gave birth to one horned calf and a hornless one, what was the genotype of the bull?

Since the hornless cow is hh, then the horned calf got his dominant H gene from the bull(father). But the other calf is hh, so the bull must be Hh.

b)   If the horned calf from part (a) went to college and met a nice heterozygous cow who gave him babies, what are the chances that they had a horned calf? A hornless calf?

Heterozygous(different genes) cow = Hh

	H	h
H	HH	Hh
h	Hh	hh

Horned calf = HH, Hh or Hh ¾ = 75%

Hornless = 25%

4. Two unfreckled sisters love milk. Both parents have freckles and argue a lot. Is the unfreckled milkman, who is the only unfreckled man in the neighbourhood, necessarily the real father of the sisters?

Their parents could both be Ff, leading to the possibility that the children are ff. Milkman could be innocent.

5. a)   A widow with a widow's peak marries a straight-hairlined man. If her father's hair looked like her husband's, what is the likelihood that her son will have a widow's peak?

Husband and her father were ww. But she has the dominant feature, so she inherited a w from her father but a W from her mom. That makes the widow Ww.

	W	w
w	Ww	ww
w	Ww	ww

There is a 50% chance(2/4) that her son is ww.

b)   Is the widow's mother someone with a straight hairline?

No. see above explanation

6. If a short-fingered woman marries a long-fingered man, what are the possible genotypes and phenotypes of the children? Draw two separate squares.

	S	S
s	Ss	Ss
s	Ss	Ss

Genotypes 100% Ss

phenotypes 100% short-fingered

Or

	S	s
s	Ss	ss
s	Ss	ss

Genotypes 50% Ss, 50% ss

phenotypes 50% short-fingered, 50% normal-fingered

7. Assume that the genes for albinism and attached earlobes are on separate chromosomes. What are the chances that a man whose genotype is DdPp and a Ddpp woman will have an albino child with attached earlobes?

DdPp ♂ Ddpp ♀	♂ DP	♂ Dp	♂ dP	♂ dp
♀ Dp	DDPp	DDpp	DdPp	Ddpp
♀ Dp	DDPp	DDpp	DdPp	Ddpp
♀ dp	DdPp	Ddpp	ddPp	ddpp
♀ dp	DdPp	Ddpp	ddPp	ddpp

Albinism and attached earlobes are both recessive

The chances of having an albino child with attached earlobes ddpp is 2/16 = 12.5%.