Learning Genetics Can Be Fun - Solutions

1. Two black dogs could be homozygous black (BB) or heterozygous black (Bb). Yellow must be homozygous, therefore cannot be the same genotype as black.

2. P Cc x Cc both parents are normal but "carry" the allele for CF. One in four children will
F_1 CC, Cc, Cc, cc inherit it.

3. a) P Rr x rr
b) R, r and r, r
F_1 Rr, Rr, rr, rr 1 round:1 wrinkled
F_2 RR, Rr, Rr, rr 3 round:1 wrinkled

4. P Ll x ll
F_1 Ll, Ll, ll, ll 1 long:1 short

5. P T_ x tt - almost 1:1 therefore unknown parent must be heterozygous.
F_1 327 tall: 321 shortNote: homozygous (TT) would give ALL tall plants in F_1.

6. The presence of all smooth in the offspring means smooth is dominant.
P SS x ss
F_1 Ss
F_2 3:1

7. a) P Ss x Ss
F_1 SS, Ss, Ss, ss
b) P S_ x _ _
The female must be heterozygous as she produced non-spotted pups. The unknown male must be homozygous recessive (ss). If he were homozygous dominant, all pups would be spotted. If he were heterozygous, you would expect a 3:1 ratio in pups.

8. (i) P T_ x tt The male must be heterozygous (Tt) to be able to produce
F_1 tt both trotters and pacers. If he were homozygous dominant
(ii) P T_ x tt he would produce only trotters.
F_1 Tt
(iii) P T_ x Tt
F_1 tt

9. Normal woman Pp (must be heterozygous because father was albino)
Husband pp
Husband's parents both Pp
Children Pp, Pp, pp

10. test cross W_ x ww

11. B - black; b - white; S - short; s - long
a) P BBSs x bbss
F_1 BbSs, Bbss 1 black, short:1 black, long

b) P BbSs x bbss
F_1 BbSs, Bbss, bbSs, bbss 1 black, short:1 black, long: 1 white, short:1 white, long

c) P BBss x BbSs
F_1 BBSs, BBss, BbSs, Bbss 1 black, short:1 black, long

d) i) (a) 1/2 (b) 1/4 (c) 1/2
ii) (a) 1/2 (b) 1/4 (c) 1/2
iii) (a) 0 (b) 1/4 (c) 0

12. B - black; b - white; S - solid; s- spotted

	male		female
a) P	B_S_	x	bbS_
F_1	2 BbS_ , 2 bbS_		

Some white pups so the male must be Bb. The absence of any non-spotted pups suggests that female A is SS but we can't say for sure.

b) P	BbSs	x	B_S_
F_1	bbss	the presence of white, non-spotted pups means that female B must be BbSs	

c) P	BbSs	x	bbss
F_1	bbSs , bbss , BbSs , Bbss		

The genotype of female C can be determined from her phenotype.

13. P Pp x Pp
F_1 PP, Pp, Pp, pp chance of PKU is 1/4

14. P Bb x Bb
F_1 BB, Bb, Bb, bb
a) 1/4 (b) 1/4 (c) 1/2
d) 1 homozygous brown:2 heterozygous brown:1 homozygous blonde. Phenotype: 3 brown:1 blonde
e) not possible because blonde (b) is recessive
f) C = curly; c = straight
g) P Cc x cc
F_1 Cc, Cc, cc, cc
h) C, c (i) c, c (j) 0 (k) 1/2 (l) 1/2
m) 1 heterozygous:1 homozygous recessive. Phenotype: 1 curly:1 straight
n) No. Straight hair is recessive so individual MUST be homozygous (cc).

15. S^R - round; S^L – long
P S^RS^R x S^LS^L
F_1 S^RS^L, S^RS^L, S^RS^L, S^RS^L
P S^RS^L x S^RS^L
F_2 S^RS^R, S^RS^L, S^RS^L, S^LS^L (incomplete dominance)

16. P S^NS^M x S^NS^M

F_1 S^NS^N, S^NS^M S^NS^M, S^MS^M 25% chance of having homozygous recessive child

17. C^RC^R - chestnut; C^MC^M - cremello; C^MC^R - palomino
P C^MC^R x C^MC^M
F_1 C^MC^M, C^RC^M 1 cremello:1 palomino

18. P F^RF^W x F^RF^W
F_1 F^RF^R, F^RF^W, F^RF^W, F^WF^W
a) ½ pink
b) 1/4 red
c) 1/4 white
d) 1:2:1

19. woman $I^B\_$ x man $I^A\_$
F_1 ii is possible if mother and father were both heterozygous. The facts are inconclusive.

20. P ♂ ii x ♀ I^AI^B
F_1 I^Ai, I^Bi

AB ♀ could produce AB offspring if ♂ were type A, B, or AB; she could never produce type O in F_1 because she always donates either A or B.

21. a) P C^hC^a x C^aC^a
F_1 C^hC^a, C^aC^a 1 himalayan:1 albino

b) P CC^a x $C^{ch}C^a$
F_1 2 $C\_$, $C^{ch}\_$, C^aC^a

c) P $C^{ch}C^{ch}$ x $C^{ch}C^a$
F_1 $C^{ch}C^{ch}$, $C^{ch}C^a$ 1 chinchilla:1 light gray

d) P $C^{ch}\underline{C^h}$ x C^aC^a test cross
F_1 5 $C^h\underline{C^a}$, 5 $C^{ch}\underline{C^a}$

22. a) 4 children
b) A is Dd, B is Dd
c) M is dd, N is dd

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