

Name _____ Score _____

Punnett Square Challenge

Complete the following crosses. In each problem, make a Punnett Square, list *every* possible genotype and *every* possible phenotype. Each problem is worth 10 points.

1. In humans, brown eyes (B) are dominant over blue (b)*. A brown-eyed man marries a blue-eyed woman and they have three children, two of whom are brown-eyed and one of whom is blue-eyed. Draw the Punnett square that illustrates this marriage. What is the man's genotype? What are the genotypes of the children?

2. In dogs, there is an hereditary deafness caused by a recessive gene, "d." A kennel owner has a male dog that she wants to use for breeding purposes if possible. The dog can hear, so the owner knows his genotype is either DD or Dd. If the dog's genotype is Dd, the owner does not wish to use him for breeding so that the deafness gene will not be passed on. This can be tested by breeding the dog to a deaf female (dd). Draw the Punnett squares to illustrate these two possible crosses. In each case, what percentage/how many of the offspring would be expected to be hearing? deaf? How could you tell the genotype of this male dog? Also, using Punnett square(s), show how two hearing dogs could produce deaf offspring.

3. If two hearing dogs were both Dd, what kind(s) of gametes (eggs/sperm) could each produce?

4. Draw a Punnett Square showing a cross between Heterozygous (Bb) parents. Identify all possible genotypes.

5. In peas, tall plants are dominant to short plants. Complete a Punnett square to show the genotypes and phenotypes expected for the following cross: heterozygous tall x heterozygous tall.

6. In chimpanzees, straight fingers are dominant to bent fingers. Complete a Punnett square to show the genotypes and phenotypes expected for the following cross: heterozygous straight x homozygous bent.

7. A green-leafed luboplant is crossed with a luboplant with yellow-striped leaves. The cross produces 185 green-leafed luboplants. Summarize the genotypes & phenotypes of the offspring that would be produced by crossing two of the green-leafed luboplants obtained from the initial parent plants.

8. Mendel found that crossing wrinkle-seeded plants with pure round-seeded plants produced only round-seeded plants. What genotypic & phenotypic ratios can be expected from a cross of a wrinkle-seeded plant & a plant heterozygous for this trait (seed appearance)?

9. In pea plants, yellow peas are dominant over green peas. Use a Punnett square to predict the phenotypic and genotypic outcome (offspring) of a cross between two plants heterozygous for yellow peas.

10. In pea plants, round peas are dominant over wrinkled peas. Use a Punnett square to predict the phenotypic and genotypic outcome (offspring) of a cross between a plant homozygous for round peas (RR) and a plant homozygous for wrinkled peas (rr).

A green-leafed luboplant (*I made this plant up*) is crossed with a luboplant with yellow-striped leaves. The cross produces 185 green-leafed luboplants. Summarize the genotypes & phenotype of the offspring that would be produced by crossing two of the green-leafed luboplants obtained from the initial parent plants.

ANSWER:

Genotypes of the F2 Offspring	Phenotype(s) of F2 Offspring
25% homozygous dominant (GG) 50% hybrid (Gg) 25% homozygous recessive (gg)	75% green-leafed 25% yellow-striped leaves

OK, first let's jot down some letters & what they stand for. Since the parent luboplants have different leaf colors and 100% of the offspring resemble only one parent (i.e. they are all green), green is the dominant trait. It makes sense then to use:

G = dominant allele for green leaves

g = recessive allele for yellow-striped leaves

TIP: This is important to recognize -
 When two parents have opposite traits,
 and all their offspring look like only one of the parents,
 the trait the offspring have is the **DOMINANT TRAIT**.

The 185 "F1" offspring are all hybrids. How do I know? Lots of practice. The yellow-striped parent **MUST BE "gg"**. The 185 offspring had to have inherited a "g" from that parent plant because that parent plant has no "G's" to pass on. Since the 185 offspring are **ALL green**, they must have a dominant allele for green ("G"), so their entire genotype is "Gg".

Don't believe me? That first cross must have been GG x gg, & its p-square would look like this:

	g	g
G	Gg	Gg
G	Gg	Gg

Notice that 100% are hybrid (Gg) and 100% would look green. IF that green parent had "Gg" for a genotype, then we would

get half of the offspring with a homozygous recessive genotype (gg), which would give us 50% yellow-striped luboplants. THIS IS NOT WHAT HAPPENED. The questions clearly states that all fo the 185 plants are green, pretty good evidence that green-leafed parent luboplant is "GG" & not "Gg".

The offspring of this cross, by the way, are refferred to as the "first filial" or "F1" generation.

Now, our question has to do with crossing two memebers of this F1 generation. That cross would be: Gg x Gg.

The Punnett square showing this cross of two hybrids is:

	G	g
G	GG	Gg
g	Gg	gg

Summary of results:

Genotypes of the F2 Offspring	Phenotype(s) of F2 Offspring
1 of 4 boxes (25%) homozygous dominant (GG)	3 of 4 boxes (75%) green-leafed 1 of 4 boxes (25%) yellow-striped leaves
2 of 4 boxes (50%) hybrid (Gg)	
1 of 4 boxes (25%) homozygous recessive (gg)	

<--BACK TO [QUESTION 3](#)
ON TO [QUESTION 4](#) --->

Mendel found that crossing wrinkle-seeded plants with pure round-seeded plants produced only round-seeded plants. What genotypic & phenotypic ratios can be expected from a cross of a wrinkle-seeded plant & a plant heterozygous for this trait?

ANSWER: 50% HYBRID ROUND-SEEDED, & 50% HOMOZYGOUS RECESSIVE WRINKLE-SEEDED

The first thing to figure out is which trait is dominant & which is recessive. We get this from the 1st sentence. If a wrinkled x round cross produces all round, then round is dominant & wrinkled is recessive.

Define our symbols:

R = dominant allele for round seeds

r = recessive allele for wrinkled seeds

Our wrinkle-seeded parent **MUST** be "rr", because the only way for a recessive trait to show up is if the genotype is homozygous recessive, which is 2 lowercase letters (rr). Our parent that is "heterozygous for this trait" is "Rr", because heterozygous = hybrid= 1 CAPITAL & 1 lowercase.

So our cross for this problem is: rr x Rr.

The p-square you drew should look something like this:

	R	r
r	Rr	rr
r	Rr	rr

Again, you may have your "r's" on top & the "R" & "r" on the left, the combos inside the p-square will end up the same. No problem. Remember, "one from the left & one from the top" when you are filling in the boxes. Of the offspring in this cross, 2 of 4 (50%) are hybrid (Rr) and would have round seeds, and 2 of 4 (50%) are homozygous recessive (rr) and would have wrinkled seeds.

Good work.

<--BACK TO [QUESTION 4](#)

on to a few little [NOTES](#) --->

